Appendix A

WATER CONTROL PLAN

Chapter 7 of the
System Operating Manual, Volume 3

Note: This Appendix A of the Environmental Impact Statement (EIS) will be inserted as Chapter 7 of Volume 3 of the Central and Southern Florida System Operating Manual (SOM), which covers Lake Okeechobee and the Everglades Agricultural Area. References to other chapters or appendices herein refer to portions of the SOM, Volume 3. The final version of Volume 3 will be publicly available upon completion of the final EIS.

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7 WATER CONTROL PLAN (WCP)

This WCP defines and describes the operational guidance for Lake Okeechobee and the Everglades Agricultural Area (EAA). All elevations in this document are in feet in relation to the National Geodetic Vertical Datum of 1929 (NGVD29) unless otherwise stated.

The Congressionally authorized project purposes for Lake Okeechobee, the Okeechobee Waterway (OWW), and the EAA collectively include flood control, water supply, navigation, recreation, enhancement of fish and wildlife, and drainage and water control. Central and Southern Florida Project (C&SF) water supply can include water supply for agricultural irrigation, municipal and industry, and the Everglades National Park (ENP). The non-federal sponsor (NFS) for the C&SF Project is the South Florida Water Management District (SFWMD). The U.S. Army Corps of Engineers (USACE) operates and maintains the S-77, S-78, S-79, S-308, S-80, and S-271 outlets from Lake Okeechobee and many culverts around the lake to manage the lake and its outlet canals in accordance with its project purposes. USACE maintains the S-351, S-352, and S-354 outlets from Lake Okeechobee; however, the NFS operates those structures and the remainder of the C&SF Project components within the basin in accordance with regulations prescribed by USACE. Chapters 2 and 3 of this volume of the System Operating Manual (SOM) provide detailed descriptions of all C&SF Project features in the Lake Okeechobee and EAA Basin.

7.1 General Objectives

This WCP defines water management operations for the system that are intended to balance the project purposes while recognizing the state of Florida's responsibility to allocate water supplies within its borders. Regarding Lake Okeechobee, the SFWMD is the agency responsible for allocating water.

7.2 Project Relationships

The project areas within this document are hydraulically and/or hydrologically linked to C&SF Project features within adjacent areas that may be described in other volumes of the SOM with their own accompanying WCPs. Around half of surface-water inflows (55 percent of surface-water inflows between 2008 and 2022) into the project area come from the Kissimmee River (SOM Volume 2 - Kissimmee River-Lake Istokpoga Basin). The outflows from the project area go south into the Water Conservation Areas (SOM Volume 4 - Water Conservation Areas, Everglades National Park, and South Dade Conveyance System), east and southeast to the coastal canals (SOM Volume 5 - East Coast Canals), and east/west to the St. Lucie and Caloosahatchee Estuaries. The federal project also interacts with many non-federal water management features, many of which have their

own operating plans. Chapter 3 of this volume of this SOM describes the non-project features that interact with this project basin.

7.3 Constraints and Considerations

The major constraints that can restrict, prevent, and/or result in changes to normal water management operations throughout the project area are grouped into four subsections for ease of reference: structural constraints (7.3.1), meteorological constraints (7.3.2), environmental considerations (7.3.3), and hydrologic constraints (7.3.4). View infrastructure referenced in this section geographically in Figure 7-1. These constraints may become interrelated and typically evolve under specific circumstances such as, but not limited to, physical, legal, social, and other major conflicts between authorized project purposes (e.g., flood control, water supply, navigation, recreation, and the enhancement of fish and wildlife). Environmental and ecological considerations are also described, and though these do not have the constraining ability of a structural constraint, they can impact water management decision making within the basin. All applicable constraints are considered in the decision-making process for determining water management operations, which Section 7.5 further defines.

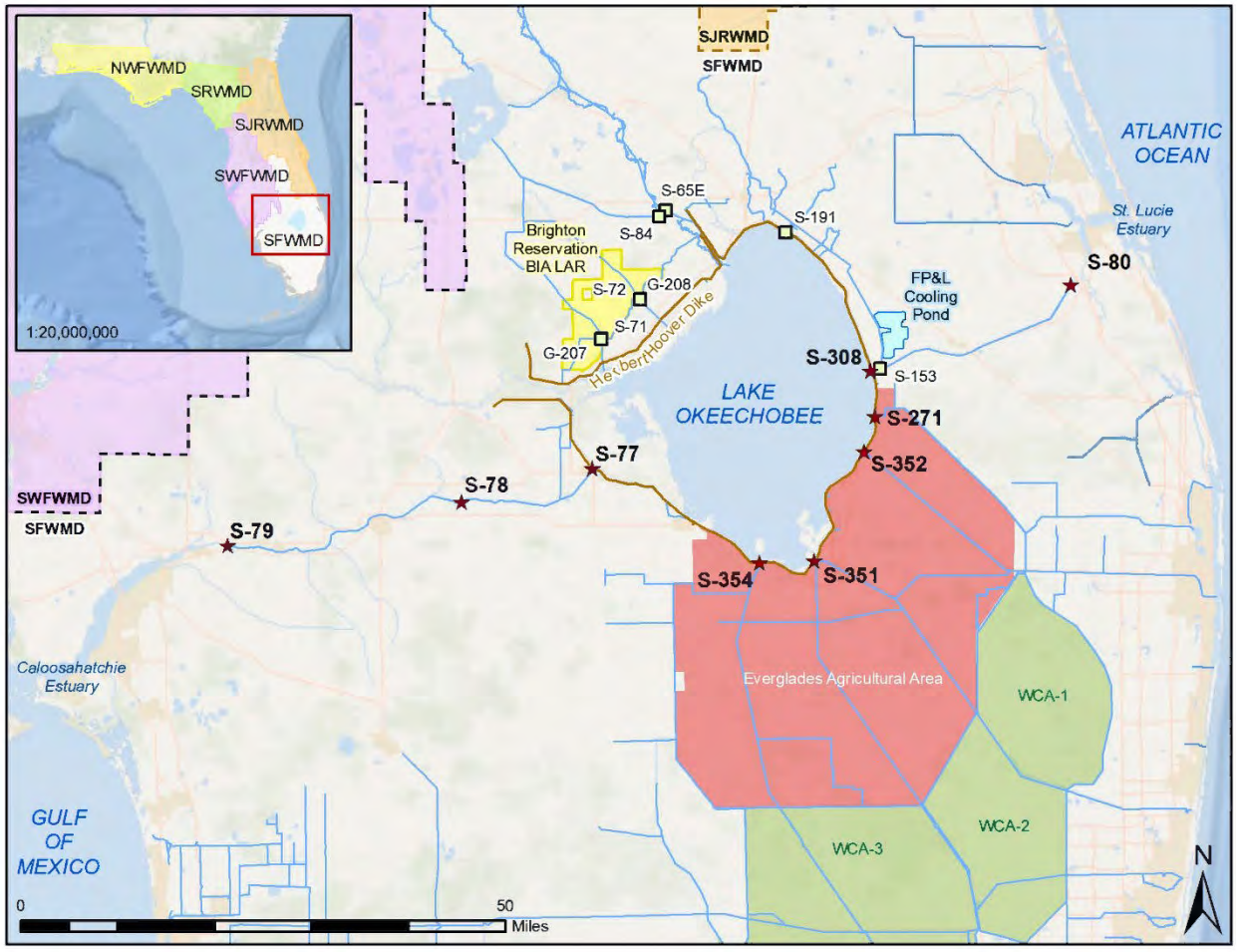


Figure 7-1: Infrastructure Map

7.3.1 Structural Constraints

Structural constraints include the physical limits of system infrastructure to be operated safely and within their engineered design parameters. These represent current conditions at the time of publishing.

Structure descriptions in Appendix A of this volume of the SOM contain a compilation of water control criteria, guidelines, diagrams, and specifications (maximum allowable gate opening (MAGO) curves, maximum head differential, pump-station rating curves, etc.) that describe the operations of the pertinent structure(s) covered in this WCP. In general, they indicate controlling or limiting rates of release and/or water levels from a structural capability standpoint and do not represent an operational strategy.

7.3.1.1 Herbert Hoover Dike (HHD)

HHD exhibited signs of structural distress during high lake-stage events (1995, 1998, and 2003). This distress included areas of significant seepage through the embankment and foundation and the initiation of backward erosion piping (seepage eroding soil from the embankment or foundation). The likelihood of these potential failure modes occurring was low with lake elevations below 18.5 feet, but as the lake level increased above that elevation, the likelihood of further erosion of the dam and the potential for a breach of HHD increased. As a result, USACE completed several major studies and identified rehabilitation measures to address concerns with HHD's performance under sustained high water levels. The HHD Dam Safety Modification Study (2016) assessed the likelihood of failure and risk of HHD using both the Lake Okeechobee Regulation Schedule of 2008 and the Lake Okeechobee Regulation Schedule Run 25, which was the active regulation schedule for Lake Okeechobee from 1994 through 1999. HHD rehabilitation does not eliminate dam safety risk but reduces it to tolerable risk levels within the assumptions of the 2016 Study.

There is an increased risk to the dike at lake stages over 19.3 feet. Any significant storm or rain event, especially when antecedent stages are higher, could lead to lake levels above 19.3 feet. Historically rapid lake rises have been seen throughout the decades, but recent examples are in 2017 (Hurricane Irma) when the lake rose 3.5 feet in 4 weeks, in 2011 when a non-tropical event caused the lake to rise 2.3 feet in 3 weeks, and in 2008 (Tropical Storm Fay) when the lake rose 3.8 feet in 3 weeks. See the HHD Emergency Action Plan (EAP) for water management actions during high water.

The HHD Surveillance Plan (Appendix C of the EAP for HHD) specifies lake water levels and inspection locations/frequencies. HHD inspections at lake stages that previously caused seepage and backward erosion piping will continue to occur until observed high lake stages confirm expected performance in areas of the dam that were modified. Once performance has been confirmed, the HHD Surveillance Plan will be updated accordingly.

7.3.1.2 Capacity of S-77 Spillway

The design capacity for S-77 Spillway is 9,300 cubic feet per second (cfs); however, the maximum release is constrained to 8,900 cfs when lake elevation is above 16.5 feet because the S-77 Stilling Basin was not designed to dissipate the energy when making releases at high lake stages. Flow capacity can be limited sometimes by the gravity head across the structure while maintaining the downstream canal levels within their optimum ranges. Canals are operated within their optimum ranges to the extent practicable unless stages are in Zone A or Water Shortage Management Zone. See Sections 7.5.2, 7.5.5, and 7.5.9 below regarding canal ranges for more information. See also Section 7.3.1.5 regarding MAGOs.

7.3.1.3 Capacity of S-78 Spillway and the Ortona Lock Chamber

The design capacity for S-78 Spillway is 8,660 cfs for all floods up to the standard project flood (SPF). However, it has been determined that the actual maximum release rate at S-78 is approximately 9,300 cfs (combined discharge via S-78 Spillway/Ortona Lock Chamber). Under certain conditions, the capacity at S-78 can become the limiting factor in releases at S-77.

7.3.1.4 Maximum Head

Most hydraulic structures have a maximum design head differential. The head is the difference, in feet, between the headwater elevation and the tailwater elevation. Exceeding the maximum head increases risk of structural failure through overturning or sliding. Within the Lake Okeechobee and EAA Basin, this is of particular concern at S-71, S-72, S-84, S-65E, and S-191 during a combination of low water levels in Lake Okeechobee and high water levels upstream of the structure(s) when they are closed. As of 2022, tailwater weirs at S-71, S-72, S-65E, and S-84 have been constructed and have alleviated structural stability concerns under non-zero flow conditions. Under conditions where the head across the structure is higher or anticipated to be higher than listed below, water managers should aim to reduce the head across the structure and complete additional analyses on the structure under those head conditions. Table 7-1 provides maximum head analyzed for the above referenced structures. No specific information on maximum analyzed head at S-191 is provided.

Table 7-1: Maximum Analyzed Head

Structure	Maximum Analyzed Head (feet)
S-71	13
S-72	14
S-65E	15
S-84	15.5

7.3.1.5 Maximum Allowable Gate Openings (MAGOs)

MAGOs constrain the size of the gate openings on a structure at given head and tail conditions. A MAGO curve is a set of curves showing gate opening limitations for a water control structure, given surrounding conditions, including headwater and tailwater elevations, the structure's geometry, and channel protection downstream. A MAGO curve regulates the amount of water released through a structure to maintain safe operations under normal conditions. MAGOs are important to prevent persistent high flow velocities that accompany gate operations and that can produce high erosive forces. Erosion of the

channel bottom may cause significant scour, which can lead to upstream head cutting that threatens the integrity of the structure itself or undermines the channel banks leading to instability, failure, and damage downstream.

7.3.1.6 Water Supply at Low Lake Stages

The ability for the SFWMD to provide water supply releases from the Lake to the EAA via gravity at S-351, S-352, and S-354 is significantly reduced as Lake Okeechobee recedes below 11 feet. USACE has previously issued a Department of the Army permit to the SFWMD to install temporary portable forward pumps at these locations, so the SFWMD may continue to allocate water supplies during low lake levels. In December 2022, the SFWMD applied for an Army Permit to reauthorize the action to install and operate temporary portable forward pumps, but a permit has not been issued at the time of this WCP. The forward pumps are capable of pumping 600 cfs at S-351, 400 cfs at S-352, and 400 cfs at S-354. The City of Okeechobee may experience challenges withdrawing water directly from Lake Okeechobee when levels recede below 11 feet.

7.3.1.7 Water Supply to Brighton Reservation at Low Lake Stages

The ability for the SFWMD to provide water supply to the Seminole Tribe of Florida (STOF) Brighton Reservation via Pump Station G-207 on the Harney Pond Canal and Pump Station G-208 on the Indian Prairie Canal are limited or severely impacted at certain times:

- When Lake Okeechobee stage recedes below 13 feet, water supply delivery via Pump Station G-208 requires the use of temporary booster pumps at the S-72 tailwater weir.
- When Lake Okeechobee stage recedes below elevation (EL.) 11 feet, limited conveyance capacity is available in the canals (measured locally from the lakeside of Structures S-71 and S-72).
- When Lake Okeechobee stage recedes below EL. 10 feet and EL. 8 feet, water supply delivery is not achievable via Pump Station G-207 and Pump Station G-208, respectively, as the respective canals become disconnected from Lake Okeechobee.

7.3.1.8 Florida Power and Light (FP&L) Company Martin Reservoir

The west dike of the FP&L cooling reservoir is relatively close (500 feet) to the L-65 Borrow Canal. To preserve the stability of the FP&L dike, which failed in 1979, it is essential to maintain the water level in the L-65 Borrow Canal as near optimum level as possible (Table 7-5). The SFWMD, with USACE's permission, modified the gates at S-153 by splitting the gates approximately in half. The lower half remains detached from the

upper half until the whole gate needs to be opened for flood control. This precludes accidental drawdown of the borrow canal or deliberate drawdown as was the case of vandalism that occurred only hours before the FP&L dike failure in 1979.

7.3.2 Meteorological Constraints

Meteorological constraints include potential challenges that result from South Florida's sometimes extreme weather that may limit water management operations. When large rainfall events occur, which are frequent, releases from Lake Okeechobee to the east, west, and south are limited until runoff from downstream basins has subsided.

7.3.2.1 Storm Surge during High Tide at S-79

Extreme water levels in the estuary downstream of S-79 can occur due to storm surge and tide. These events may cause overtopping of the spillway gates at S-79. During this condition, lock operators may close the gates if the head is reversed at the structure. When the storm surge or high tide recedes, the lock operators will reopen the gates to maintain the headwater within its optimum range (Table 7-3) to the extent possible. The top elevation of the gates at S-79 in the closed position is 4.2 feet. This constraint may limit releases from Lake Okeechobee by restricting upstream operations at S-77 and/or S-78.

7.3.2.2 High Tides in the South Fork of the St. Lucie River

The St. Lucie settlement subdivision on the south fork of the St. Lucie River experiences flooding during high rainfall events and extreme high tides (called King, Spring, or Neap Tides). Flooding can occur with rainfall in the subdivision, wind in the St. Lucie Estuary or south fork of the St. Lucie River, tidal surge, and/or when S-80 releases occur. Due to the potential for flooding, the S-80 tailwater should not exceed EL. 3 feet when lake releases are being conducted. This includes reducing ongoing releases at S-80 and S-308 when storm-induced or daily tidal surge is expected to cause an S-80 tailwater EL. of 3 feet or above. An effort should be made to release water at S-80 on an outgoing or low tide and to reduce S-80 releases on an incoming or high tide such that the S-80 tailwater does not exceed EL. 3 feet. If S-80 releases are necessary, such as when local runoff in the basin would cause flooding if not released, and the S-80 tailwater elevation is expected to exceed 3 feet, then USACE will notify the Martin County Emergency Operations Center (https://www.martin.fl.us/EM). This constraint may limit releases from Lake Okeechobee by restricting S-308 operations and may become a significant concern during high lake levels.

7.3.2.3 Debris in Spillway Gates

Temporary and permanent structures and facilities are on Lake Okeechobee including the Belle Glade Marina, the campground on Kreamer Island, and the Okee Taintee Recreation Area by the Kissimmee River. These structures can create significant waterborne debris during either high lake levels or storm surge. This debris can potentially block spillway gates at nearby structures impeding necessary water management operations. For example, in the aftermath of Hurricane Wilma in 2005, a mobile home was submerged upstream of the S-351 Spillway gate impeding normal operations for several weeks.

7.3.3 Environmental Considerations

Environmental conditions listed below are considered during the water management decision-making process but do not necessarily limit operations. The listed issues are significant in the operation of the system due to their impacts and stakeholder feedback and can have considerable political and social ramifications.

7.3.3.1 Algal Blooms (ABs) in Lake Okeechobee, the St. Lucie Canal, the Caloosahatchee River, and Downstream Estuaries

Water quality and the risk or presence of ABs are important considerations for Lake Okeechobee operations. ABs have become increasingly prevalent and intense in recent years both on the lake and in the connected systems. Risks to human health and the environment associated with ABs and water quality in general are extraordinarily complex to quantify or classify. Some periods may occur where the risks to human health and the environment associated with ABs are high, and USACE may reduce or pause releases from Lake Okeechobee. At times, ABs may occur in either or both the St. Lucie Canal and the Caloosahatchee River or in other downstream areas. During these times, operational changes may be made, while maintaining water-management objectives, to help reduce the formation of blooms, break up blooms, or reduce the risk of public exposure to ABs. Lake Okeechobee operations must still meet the Congressionally authorized project purposes and follow the plan for water management described in this WCP. Section 7.5.7 further details operations specific to ABs.

7.3.3.2 Ecological Considerations for the St. Lucie and Caloosahatchee River Estuaries

Freshwater releases from Lake Okeechobee may impact oyster spawning, salinity, water quality, water clarity, the abundance and distribution of submerged aquatic vegetation (SAV) (e.g., seagrass), and the overall ecological health in the St. Lucie and Caloosahatchee River Estuaries. Releases in the stress and damaging ranges, as

defined by RECOVER, can cause salinity levels in the estuaries to be undesirably low, and low releases can cause salinities to become undesirably high. The months of March through June are a critical reproduction period for many estuarine-dependent organisms. During this time, freshwater releases to the estuaries should be monitored closely, so larvae are retained within the estuaries and not flushed out to the marine system by excessive releases. Freshwater releases should be monitored to aid in maintaining optimum salinity conditions for oyster reproduction and seagrass growth. Lake Okeechobee operations must still meet the Congressionally authorized project purposes and follow the plan for water management described in this WCP.

The restoration, coordination, and verification program (RECOVER) (2020b) Northern Estuaries Performance Measure categorizes three ranges of the salinity envelope for estuary ecology in both the Caloosahatchee River Estuary (CRE) and the St. Lucie Estuary (SLE). There are three categories: damaging, stressful, and optimum, and each envelope has a corresponding structural inflow range, listed in Table 7-2. These 14-day moving-average flow ranges provide valuable information to consider during the assessment of how water management actions could impact estuary ecology. Surface-water flows into the Caloosahatchee are typically measured at S-79, and flows into the St. Lucie include S-80, S-97, S-49, and Gordy Road.

Table 7-2: RECOVER Flow Envelopes (RECOVER, 2020b)

Estuary	14-day Average Optimum Flow (cfs)	14-day Average Stress Flow (cfs)	14-day Average Damaging Flow (cfs)
CRE	750 to 2,100	2,100 to 2,600	> 2,600
SLE	150 to 1,400	1,400 to 1,700	> 1,700

7.3.3.3 Ecological Considerations for Lake Okeechobee

The RECOVER (2020a) Lake Okeechobee Stage Performance Measure varies from 11.5 to 15.5 feet NVGD29 with more narrow seasonal stage targets of 12 feet in the dry season to 15 feet in the wet season as shown in Figure 7-2. The “normal” envelope below shows the optimal ecological lake stages under normal conditions. A “recovery” envelope is for years where lake levels should be lower to facilitate vegetation recovery. The RECOVER Lake Okeechobee Stage Performance Measure highlights the benefits of operating the lake within the preferred envelope and the damaging effects of extreme stages (above 17 feet or below 10 feet) to the large variety of plants, fish, and wildlife that thrive within Lake Okeechobee. Extreme high (greater than 17 feet) and low (less than 10 feet) water levels may, respectively, completely inundate or dry out Lake Okeechobee’s littoral zone and can have multi-year impacts on the littoral and nearshore areas of Lake Okeechobee. Efforts should be made to prevent prolonged high/low lake levels (above 15.5 feet or

below 11.5 feet) and to avoid extreme high and low lake levels (greater than EL. 17 feet and less than EL. 10 feet); this should benefit wading bird foraging, nesting, spawning, habitat for other wildlife, and the feeding habitat for fish. Section 7.5.8 provides further information on Lake Okeechobee recovery operations (ROs).

It is also important to note that various endangered and threatened species reside throughout the Lake Okeechobee and EAA Basin. The Everglade snail kite is one of these endangered species, and the western side of Lake Okeechobee was designated as critical habitat for Everglade snail kites in 1977 (50 CFR 17.95). While the RECOVER Lake Okeechobee Stage Performance Measure only partially overlaps the preferred snail kite nesting target levels, regularly achieving the ecological envelope enhances the snail kite population. Another important consideration is the lake recession rate during the nesting season (February to June). The optimum water-level recession rate for nesting kites is approximately 0.05 feet/week while a recession rate of greater than 0.16 feet/week has been shown to result in higher rates of nest failure. This recession-rate target developed in the Lake Okeechobee System Operating Manual (LOSOM) Performance Indicator for Lake Okeechobee Everglade Snail Kite Nesting and the snail kite nesting conditions should be considered when making Lake Okeechobee release decisions. The envelope (11.5 to 15.5 feet with more narrow seasonal stage targets of 12 feet in the dry season to 15 feet in the wet season) and the optimal snail kite recession rate are both operational considerations. It should be noted that operationally it is extremely difficult to achieve prolonged success in either of these (staying within the envelope all the time or never exceeding the optimal recession rate) and is even more difficult to achieve both being in the envelope and maintaining optimal recession rates at the same time. Being above the envelope cannot be avoided during large rainfall events with the limited outlet capacity compared to the inflow capacity. Several things can lead to water levels below the envelope and higher than optimum recession rates for snail kites during the dry season especially. The largest being very high evapotranspiration rates, water-supply operations around the lake, and to a lesser extent, releases to tide.

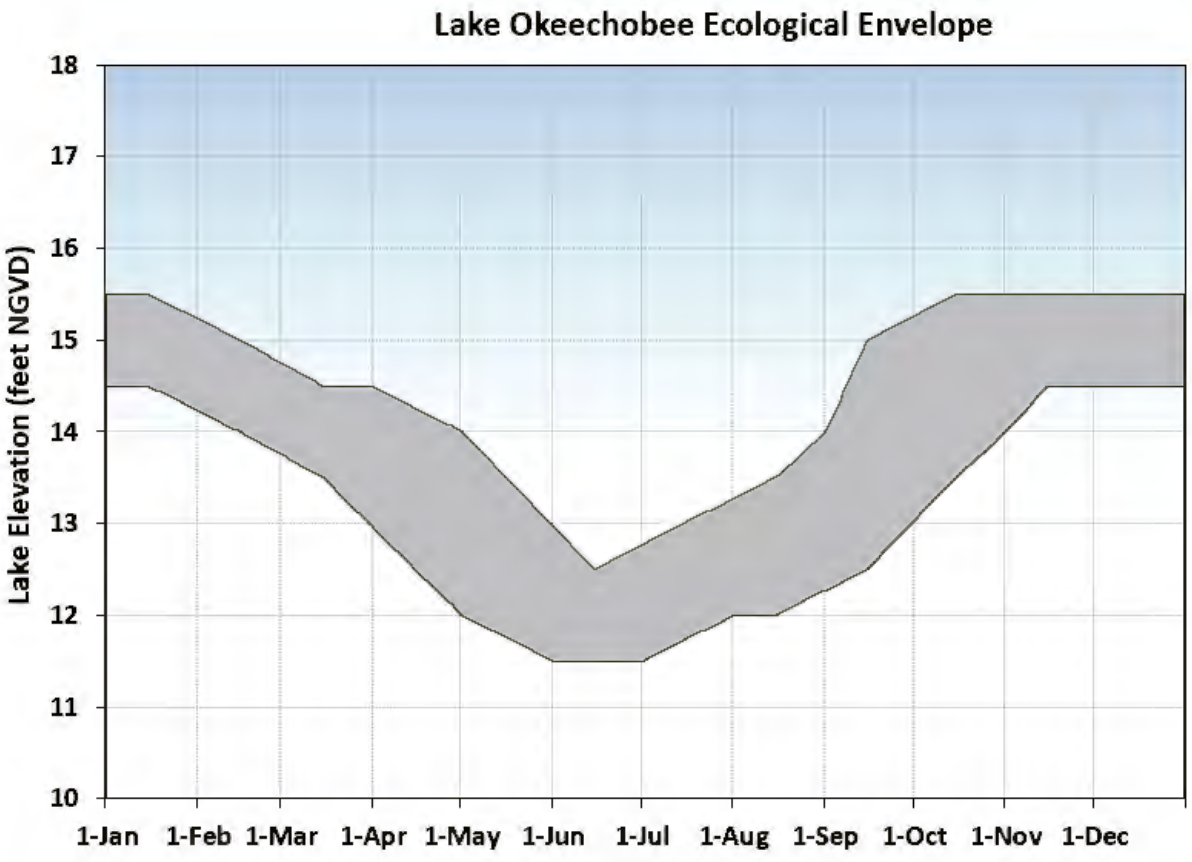


Figure 7-2: RECOVER Normal Lake Okeechobee Ecological Envelope

7.3.3.4 Ecological Considerations in the Greater Everglades

The effects of water levels on fish, wildlife, and vegetation in the Greater Everglades are important considerations in evaluating seasonal water levels along with recession and ascension rates there. The regulation schedules for Water Conservation Area 1 (WCA-1), WCA-2A, and WCA-3A include a "floor" elevation; the floors 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-island habitats can be adversely affected by prolonged high and low water conditions. Timing and the location of releases into the WCAs should consider wading bird nesting throughout the Greater Everglades.

Overdrainage within northern WCA-3A has resulted in increased fire frequency and the associated loss of tree islands, wet prairie, and aquatic slough habitat. Peat fires and soil oxidation are a main concern, particularly in the late dry season. In addition, the Alley North Wading Bird Colony, the largest wading bird colony in North America, lies within northern WCA-3A. During the spring breeding season (January through May) it is

extremely important to prevent water depths falling below ground surface elevation to prevent nest predation, nest abandonment, and a lack of sufficient prey resources for foraging (refer to Combined Operating Plan (COP) biological opinion (BO) targets for the wood stork). This is the period where releases from Lake Okeechobee can really benefit the ecology in WCA-3A. Another consideration is recession rate; recession rates in the WCAs should not exceed defined thresholds for wading bird foraging (see the COP BO requirement).

Prolonged inundation of tree islands in southern WCA-3A should be avoided when possible. Water depths within southern WCA-3A should follow COP BO targets and not exceed defined tree-island thresholds (reference COP EIS).

7.3.4 Hydrologic Constraints

This section describes potential issues throughout the Lake Okeechobee and EAA Basin due to hydrologic conditions pertaining to flow and water levels in the canals and in the lake.

7.3.4.1 S-77 Tailwater

An S-77 tailwater above EL. 12 feet may impact local drainage in and around the town of Moore Haven. For this reason, the S-77 tailwater stage should be monitored and typically not be allowed to exceed EL. 12 feet because of lake operations.

7.3.4.2 S-80 Headwater

During heavy rain events and at high tide, an effort is made to keep the S-80 headwater within EL. 13.5 and EL. 15.5 feet. During high-water events, at around EL. 17.3 feet, the machinery pits at the structure are in danger of becoming flooded. The lockmaster should begin monitoring for this situation at S-80 headwater at approximately EL. 16.5 feet. This constraint limits releases from Lake Okeechobee by restricting S-308 operations.

When the St. Lucie Canal at S-80 headwater recedes to around EL. 13.5 feet, the Indiantown Marina begins to experience mooring problems (i.e., problems with reaching the dock safely and securing the lines) with large vessels. At approximately EL. 16.5 feet, water begins to rise over the docks.

When the St. Lucie Canal at S-80 is below EL. 12 feet, problems occur with the nearby local irrigation pump intakes.

7.3.4.3 C-44 Canal Bank Erosion

C-44 Canal land elevations are lowest at the Tieback Levee of C-44 near Lake Okeechobee. In the early 1900s, a drainage district that the state of Florida authorized

had excavated the C-44 Canal by dredge. The canal was excavated through sandy soils throughout its length, resulting in nearly vertical banks. USACE subsequently deepened the canal using similar dredging techniques. Lake Okeechobee releases and boat wakes have been frequent enough to prevent natural bank stabilization and induce bank erosion.

To limit the extent of bank erosion caused by sloughing during decreasing releases from Lake Okeechobee, adjustments to water management operations may be performed, as necessary, to limit the C-44 Canal from rapid water-level changes. In addition, to help reduce erosion downstream of HHD due to high velocities, the minimum headwater elevation at S-80 during Lake Okeechobee releases shall be10 feet, whenever possible.

7.3.4.4 EAA Canal Capacity

Congressionally authorized levels of flood control and water supply will be maintained and accounted for during all Lake Okeechobee operational decisions. EAA Canal conveyance capacity may limit releases south from the lake if local rainfall or concurrent water-supply deliveries are taking place.

7.3.4.5 Stormwater Treatment Area (STA) Capacity Limitation

STAs are constructed wetlands that remove and store nutrients through plant growth and the accumulation of dead plant material that is slowly converted to a layer of peat soil. The SFWMD operates STA-1E, STA-1W, STA-2, STA-3/4, and STA-5/6 and determines treatment capacity during real-time operations. The volumes of Lake Okeechobee releases delivered to the STAs (STA-2 and STA-3/4) during the implementation of LOSOM however will be limited by the STAs' treatment capacity to meet the requirements of the federal National Pollution Discharge Elimination System permit and the state of Florida Everglades Forever Act permit issued to the SFWMD.

Capacity to treat water from Lake Okeechobee and the EAA is based on many factors and varies significantly over time based on conditions. The STAs require seasonal, annual, and interannual operational management to maintain vegetation. Extreme weather events may cause damage to the STAs and impair their ability to treat water for extended periods of time (e.g., in 2004, 2005, and 2017). Flows south from Lake Okeechobee toward the STAs may not be possible in the early dry season (November to December time frame) to allow the vegetation to recover from wet season operations or significant storms. The SFWMD will determine the exact duration and timing of STA recovery periods, but period duration will generally increase with the intensity of a wet season or major storm.

The SFWMD determines the capacity of the STAs to treat Lake Okeechobee water on a weekly and daily basis. If the SFWMD determines STA treatment capacity is not available, Lake Okeechobee releases to the WCAs will be limited.

7.3.4.6 Water Conservation Area (WCA) Capacity Limitation

The WCAs each have their own regulation schedules and their own unique ecosystems. WCA operations are detailed in Volume 4 of the SOM. High water in the WCAs can cause levee safety concerns and lead to environmental harm in the Greater Everglades system. Lake Okeechobee water will not typically be released to the WCAs if impacts are expected. High water or adverse environmental conditions in the WCAs may limit lake releases south to the WCAs.

Lake Okeechobee releases to the WCAs may be made if all downstream WCAs are within the criteria listed below. Downstream WCAs refer to the WCAs downstream of the WCA receiving Lake Okeechobee water. For example, if it is desired to make a release to WCA-3A (via STA-3/4), then WCA-1 and WCA-2A water levels do not constrain the release to WCA-3A since they are upstream of WCA-3A. However, if it is desired to make a release to WCA-2A (via STA-2 or STA-3/4), and if the WCA-3A water level is too high, then no release to WCA-2A would be made.

Section 7.5.2 lists criteria for releases to WCAs in Zone A. If releases from Lake Okeechobee to the WCAs are made below Zone A, they may only be made if there is treatment capacity in the STAs as defined in Section 7.3.4.5 and if:

- WCA-1 is below 17.4 feet.
- WCA-2A is below 14.7 feet.
- WCA-3A is below 10.75 feet.

WCA stages are defined in their respective regulation schedules (Volume 4 of the SOM).

7.3.4.7 Salinity Intrusion in the Caloosahatchee River

During dry periods, Caloosahatchee River flow at S-79 may decrease such that navigation lockages through the W.P. Franklin Lock allow a saltwater wedge to move upstream of S-79. Normally, lockages are conducted “on demand,” which provides numerous opportunities for the saltwater wedge to move upstream. Eventually, the chloride content of the water available for the municipal water intakes at the Olga Water Treatment Plant may exceed the state of Florida’s drinking water standard of 250 milligrams per liter (mg/L). The Olga Water Treatment Plant limits the withdrawals from the C-43 Canal during January to May or whenever the chloride levels of the C-43 Canal reach 240 mg/L and instead uses water from the aquifer storage and recovery wells at Olga Water Treatment Plant to meet the dry season peak demands. When the chloride level upstream of S-79 is rising and reaches 180 mg/L, the SFWMD can also request that USACE reduce the number of lockages occurring at S-79 to one every 4 hours (see Section 7.9 for the Drought Contingency Plan (DCP)). When the number of lockages is

reduced at S-79, the number of opportunities for saltwater wedge migration is also reduced. The SFWMD, in coordination with Lee County, can request USACE to implement a short-term high rate of release from Lake Okeechobee (S-77) to flush the high-chloride-content water through S-79.

7.3.4.8 St. Lucie Canal (C-44) Design Capacity Limitation

Two constraints limit the maximum capacity of the St. Lucie Canal to 14,800 cfs. The first is gaps in the tieback levees where the Florida East Coast Railroad (FECRR) crosses the St. Lucie Canal approximately 1 mile east of Port Mayaca (S-308). The low point of the gaps is at approximately EL. 24.5 feet. The second is the bridge where the FECRR crosses the canal because the bridge would be inundated with water at the full design capacity of the canal. The bridge can be lifted and would need to be lifted to achieve the SPF. Under these conditions, the USACE South Florida Operations Office (SFOO) will notify the FECRR to suspend train operations 24 hours in advance of tailwater elevations that will exceed the bottom chord of the railroad bridge at the St. Lucie tieback levee (EL. 20.5 feet).

7.4 Standing Instructions to Project Operator

Both USACE and the SFWMD operate C&SF Project components. Appendix A of this volume of the SOM provides MAGO curves and structure details. Appendix E of this volume of the SOM provides detailed instructions to operators. Operators of USACE-operated structures in the Lake Okeechobee and EAA Basin report to the SFOO in Clewiston, Florida. Operators of SFWMD-operated structures in the basin report to various field offices throughout (Big Cypress Basin – Naples, Clewiston, Fort Lauderdale, Homestead, Miami, Okeechobee, St. Cloud, and West Palm Beach) and to the headquarters in West Palm Beach.

7.5 Operational Strategy to Meet Project Objectives

The complexity of water management operations is a consequence of the multiple, varied, and sometimes competing goals for the regional C&SF system. USACE and the SFWMD determine water management operations in the project area through a decision-making process, outlined in the following sections, that considers all Congressionally authorized project purposes for Lake Okeechobee, the OWW, and the EAA collectively including flood control, water supply, navigation, recreation, the enhancement of fish and wildlife, and drainage and water control.

7.5.1 Overall Plan for Water Management

The decision-making process to determine the quantity, timing, and duration of releases from Lake Okeechobee considers what has occurred in the recent past, current system conditions, and forecasted system conditions. Water managers monitor information from across and beyond the C&SF Project to aid in water management decision making. This information generally includes, but is not limited to:

- current climate conditions
- climate and weather forecasts
- hydrologic and tropical outlooks
- water-supply conditions
- estuary conditions
- Lake Okeechobee stage and ecological conditions
- navigation and recreation conditions
- STOF water supply conditions
- AB conditions
- STA conditions
- WCA conditions
- ENP conditions
- minimum flows and levels (MFLs)
- available water storage

Water managers then use the information to analyze and/or model trends such as:

- future water-level projections
- rainfall deficits/surplus
- estuary salinity levels
- Lake Okeechobee projected stage ascension/recession
- WCAs' projected stage ascension/recession

Forecasts for climate, meteorology, and tropical activity from many different sources can be used, but preference will be given to National Oceanographic and Atmospheric Administration (to include the National Weather Service, the Climate Prediction Center, and the National Hurricane Center (NHC)) products. The SFWMD employs meteorologists who issue forecasts that can be used as well, especially for shorter-term rainfall forecasts.

Computer models and other forecasting tools are used by water managers for determining trends and guiding operational decisions. These water management tools evolve over time as science and technology advance. Chapter 6 of this volume of the SOM discusses several forecasting tools available for Lake Okeechobee, and Chapter 6 of Volume 4 of the SOM discusses these tools for the WCAs in detail. These include, but are not limited to, the Corps Water Management System model for the Lake Okeechobee watershed including the lower Kissimmee River Basin and the upper Kissimmee Chain of Lakes as well as the South Florida Water Management Model Dynamic Position Analysis, which is run by the SFWMD. Forecasting tools are often used to analyze Lake Okeechobee stage, basin runoff, inflows/outflows, and other hydrologic data. Additionally, the SFWMD has salinity models for both the SLE and the CRE that are used to evaluate the effects of different flow regimes on salinity conditions in both estuaries.

Current C&SF system conditions, forecasted climate, hydrologic and system trends, and multi-agency coordination and public stakeholder input provide key information that will be used to evaluate the needs of the system and help determine Lake Okeechobee operations within the bounds of this WCP. One of the primary resources for stakeholder coordination with USACE is periodic scientist calls (PSCs). PSCs occur periodically to discuss system conditions and to collect information and observations (past, present, and forecasted) from agency and stakeholder technical staff as well as the public. As a component of these PSCs, three seasonal assessment meetings are established occurring in the middle of the dry season (February to March), the start of the wet season (May to June), and the early dry season (November to December) to help gather information during these key transitional times and determine a seasonal water management strategy. The SFWMD prepares weekly environmental conditions reports that present forecasts, ecological data, and system conditions that USACE considers during decision making. The SFWMD also prepares weekly operational position statements that provide the SFWMD requests for water management operations. Additional forums for receiving input on system conditions may be conducted as well. Chapter 9 of this volume of the SOM provides additional information about interagency coordination.

7.5.1.1 Lake Okeechobee Operations

Lake Okeechobee stage (past, present, and predicted) is a fundamental metric used in lake operations. The lake stage is determined using multiple gages over the 700-square-mile lake and typically includes both interior gages and gages around the rim. Find pertinent gages to the regulation schedule and to the basin in Chapter 5 of this volume of the SOM. Lake stage is managed through releases at the main outlets from Lake Okeechobee: S-77, S-308, S-351, S-352, S-354, and S-271, shown in Figure 7-3.

The LOSOM Regulation Schedule (Figure 7-4) zones are seasonally varying lake stages, which signify a transition between different operational strategies. The LOSOM Regulation Schedule has four zones from high to low lake stage: Zone A, Zone BC, Zone D, and the Water Shortage Management (WSM) Zone. The upper part of the LOSOM Regulation schedule, Zones A and BC, represent where Lake Okeechobee stages are higher than desired, and releases are needed to rapidly control and reduce lake stage. The lowest zone, the WSM Zone, represents where lake stage is lower than desired and where the SFWMD may implement regional water shortage restrictions. Zone D is the largest zone and where lake stages can be managed while providing beneficial releases across the system.

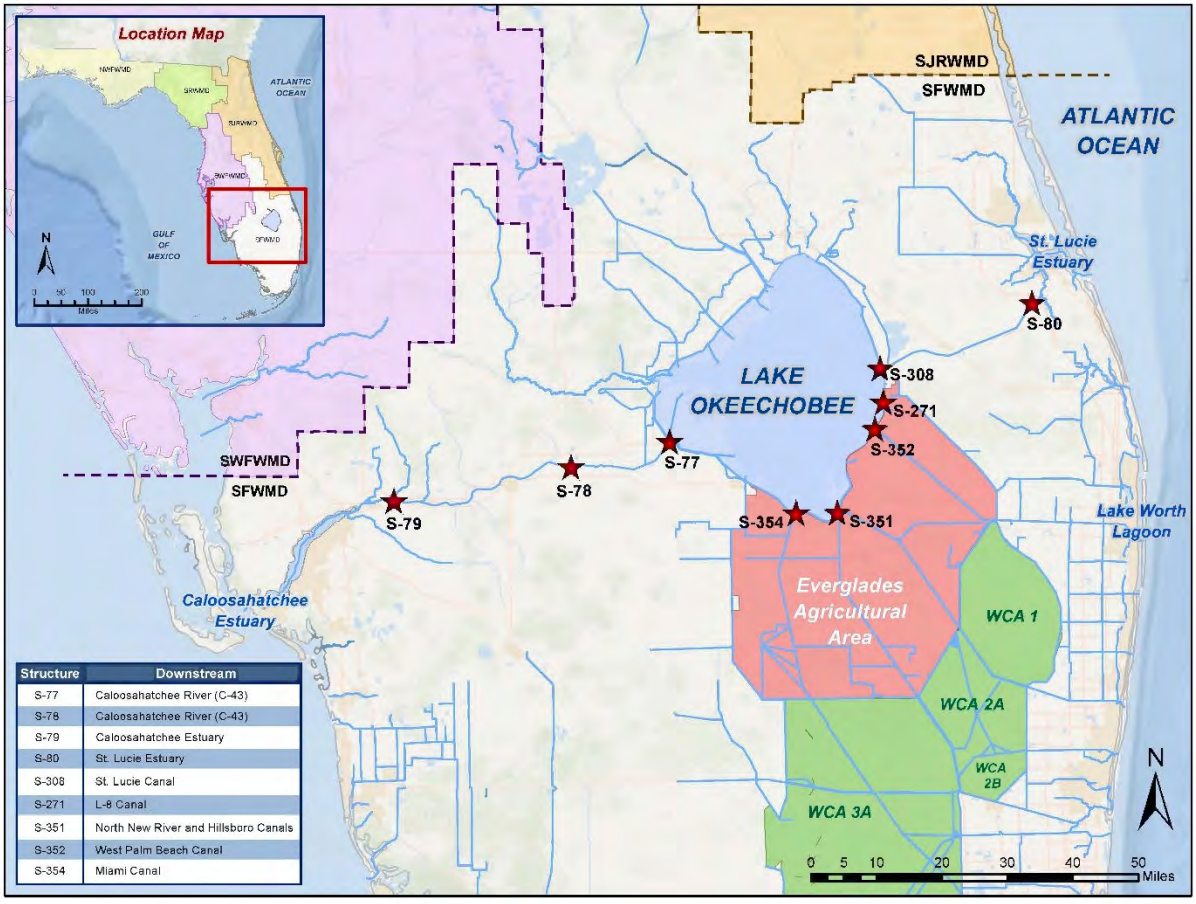
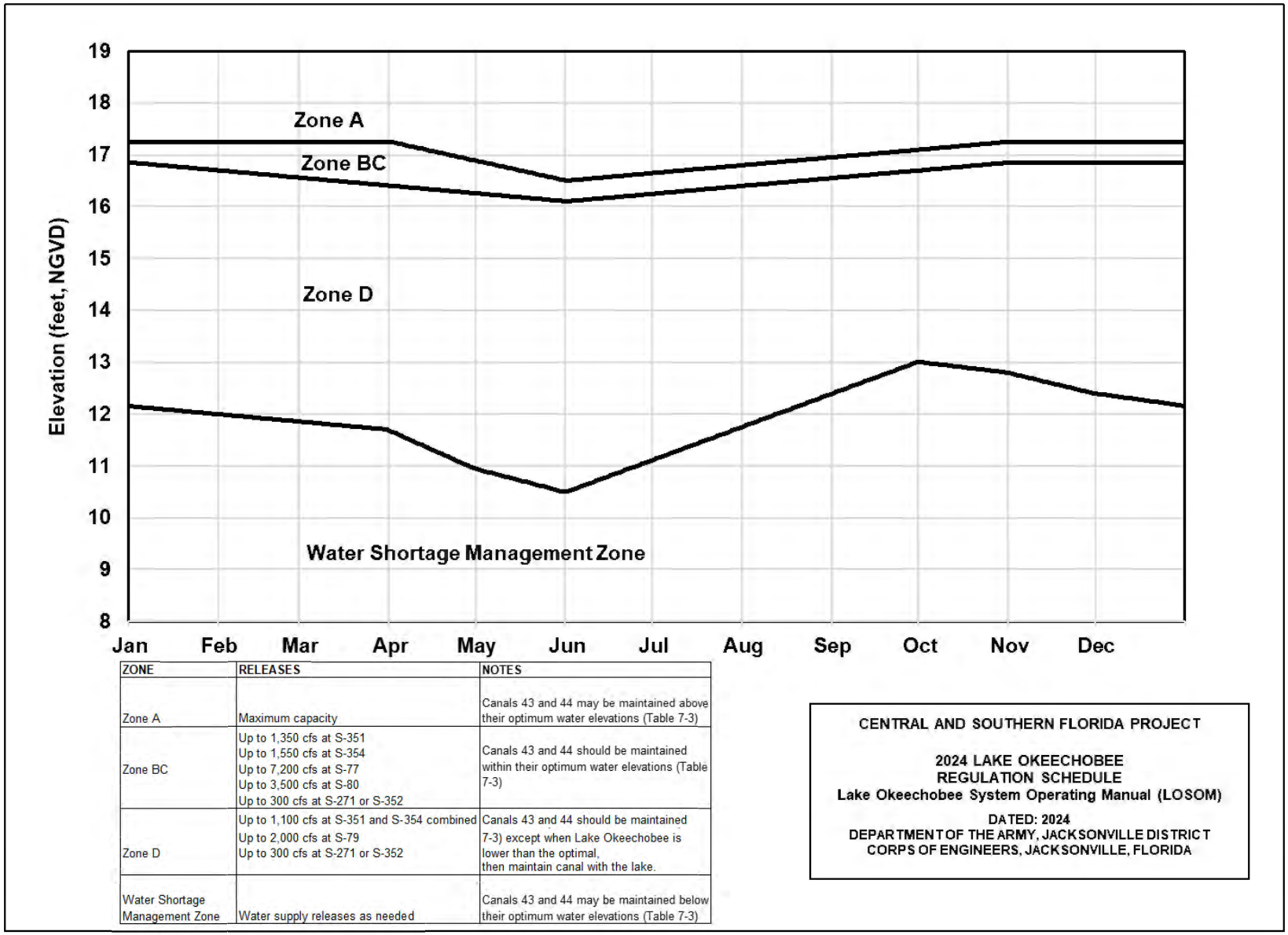


Figure 7-3: Main Outlets from Lake Okeechobee



ZONE	RELEASES	NOTES
Zone A	Maximum capacity	Canals 43 and 44 may be maintained above their optimum water elevations (Table 7-3)
Zone BC	Up to 1,350 cfs at S-351 Up to 1,550 cfs at S-354 Up to 7,200 cfs at S-77 Up to 3,500 cfs at S-80 Up to 300 cfs at S-271 or S-352	Canals 43 and 44 should be maintained within their optimum water elevations (Table 7-3)
Zone D	Up to 1,100 cfs at S-351 and S-354 combined Up to 2,000 cfs at S-79 Up to 300 cfs at S-271 or S-352	Canals 43 and 44 should be maintained 7-3) except when Lake Okeechobee is lower than the optimal, then maintain canal with the lake.
Water Shortage Management Zone	Water supply releases as needed	Canals 43 and 44 may be maintained below their optimum water elevations (Table 7-3)

Figure 7-4: LOSOM Regulation Schedule

Maximizing beneficial lake releases during the dry season is fundamental to the overall strategy for managing Lake Okeechobee for its multiple project purposes. It is the operational intent of this WCP to manage lake stages by providing beneficial releases for the environment to the west and south and for water users throughout the dry season while protecting the sensitive ecologies throughout the system and heeding system constraints, notably in the STAs (see Section 7.3.4.5). During the wet season, local rainfall along C-43 and within the EAA, as well as STA and WCA conditions and water levels, will often limit the ability to make releases from the lake in Zone D.

Beneficial releases in Zone D are made to the west toward the CRE via S-77, S-78, and S-79, south toward the Greater Everglades via S-351 and S-354, and southeast toward the Lake Worth Lagoon (LWL) via S-271 and S-352. Releases to the CRE and LWL are most beneficial during the dry season when basin runoff to these areas can be insufficient to maintain salinity levels. Releases to the Everglades are also most beneficial during the dry season when local rainfall can be insufficient to maintain water levels for the enhancement of fish and wildlife. This strategy of managing lake stages mostly during the dry season is also beneficial for water supply to the Lake Okeechobee Service Area and Lower East Coast Service Area when conditions are driest and water usage is highest. Releases described above shall balance all Congressionally authorized project purposes, including water supply, especially as the lake level declines towards the WSM Zone.

Flow targets defined in Zone D generally seek to stay within the optimal flow range of 750 to 2,000 cfs at S-79 as informed by the 2020 RECOVER Northern Estuaries Performance Measure: Salinity Envelope. The use of past, present, and forecasted conditions throughout the lake's watershed and the connected C&SF system, operational recommendations from the SFWMD, and stakeholder coordination help to determine Zone D releases. Zone D releases are not large enough to significantly impact lake stage in the short term, so the long-term trends are important in this zone.

Releases within Zone D are defined as up to 1,100 cfs south via S-351 and S-354 with the ability to distribute between the two structures depending on downstream canal and STA conditions as determined by the SFWMD. The operational intent is to send maximum desirable releases, up to the allowable flows, with a focus on flows south during the dry season. Promoting water south during the dry season creates synergy between lake management objectives and beneficial timing of water releases to the Everglades. The term "up to maximum desirable" is used to indicate the intent to send water south while acknowledging and adjusting for constraints and other needs within the system such as local rainfall in the EAA, STA conditions as determined by the SFWMD (see Section 7.3.4.5), regional water-supply conditions, WCA conditions, downstream channel conditions, ecological conditions throughout the Greater Everglades, etc. The decisions on the quantity and timing of these Everglades-focused releases will consider the current

and projected water levels, climate forecasts, and conditions to appropriately balance the entire system for all Congressionally authorized project purposes.

The subsections of Section 7.5 below first describe the LOSOM Regulation Schedule zones and then detail additional operational practices that may be implemented to help reduce potentially harmful conditions in parts of the system (e.g., AB Operations) or to help system conditions recover (e.g., Lake Okeechobee ROs). The subsections of Section 7.5 conclude by describing how operations under LOSOM may achieve operational objectives for flood risk management, water-quality water supply, recreation, the enhancement of fish and wildlife, and navigation.

7.5.1.2 Seasonal Assessment Points

Water managers will analyze the past, present, and forecasted system conditions at three key seasonal assessment points: the early dry season (November to December), the middle of the dry season (February to March), and the early wet season (May to June). These key points align with inflection points in the LOSOM Regulation Schedule Zones and coincide with the three seasonal assessment PSC meetings. These meetings provide an opportunity to gather information and input from partner agencies and stakeholders on system conditions and desired outcomes during the upcoming season. The risk of entering the WSM Zone will be appropriately considered, in consultation with the SFWMD.

During each release decision, conditions such as the time of year in relation to the dry season, climate forecasts, and the proximity of the lake stage to the WSM Zone will be assessed. The intent is to evaluate all authorized project purposes for Lake Okeechobee at these times and develop a strategy that balances them in a way that is best for the current and desired conditions in the upcoming season. The conditions in Section 7.5.1 will be evaluated in detail at each of these points. At these assessment points, USACE will gather information from agencies and stakeholders, develop a seasonal strategy, and clearly communicate that strategy to the public.

In the early dry season (November to December), it is apparent how much water the system has received during the wet season and whether the system has sufficient water for water supply and downstream environments for the dry season (see Section 7.5.4.1.1). Present and recent past conditions throughout the C&SF system (i.e., Lake Okeechobee stage and ecological conditions, salinity, and ecological conditions in the northern estuaries, WCA water levels and ecological condition, status of STAs, the SFWMD water-supply risk evaluation, and conditions across the Greater Everglades) are considered and evaluated alongside forecast information such as El Niño-Southern Oscillation (ENSO) and other meteorological forecasts. STA rest periods and conditions, as determined by the SFWMD, will be incorporated when developing the strategy for flows

south during the dry season. With this information, input from the SFWMD, the seasonal assessment PSC meeting, and other information described in Section 7.5.1 above, an initial dry-season strategy is developed that identifies projected lake stages, water-supply risk, and recommended releases to begin the dry season. This strategy will be clearly communicated to stakeholders and the public. This is also a key time to evaluate whether lake ROs (Section 7.5.8) are recommended.

In the middle of the dry season (February to March), water levels in Lake Okeechobee and throughout the system have typically receded from the early dry-season levels, and conditions provide greater understanding of how much water is available in the system to carry through the dry season. Currently, the initial dry-season strategy and projections are reevaluated considering updated system conditions, the Lake Okeechobee stage, stage recession and ascension rate, and the climate forecast and outlook for the remaining portion of the dry season and into the early wet season. The projected lake stage at the end of the dry season and the projected wet-season forecast should also provide better clarity as forecasts and projections improve over time. The operational intent is to allow Lake Okeechobee to recede as the dry season progresses, in preparation for the upcoming wet season, and to maintain releases for water supply and downstream environments. The recession rate of the lake is important to monitor throughout the dry season for ecological reasons and to limit the risk of entering the WSM Zone, especially if the lake stage is in the middle-to-lower portion of Zone D where lower-than-average rainfall was experienced in the early dry season or is forecasted for the remainder of the dry season and the coming wet season.

In the early wet season (May to June), water levels in Lake Okeechobee and throughout the C&SF system are typically approaching their yearly minimums. A key consideration during this time of year is the available capacity within the system to take wet-season inflows and whether there are current or projected shortfalls for water supply (including environmental water supply). The start of the normal wet-season rainfall is the primary focus as this can lead to rapid ascension rates or an increased risk to entering the WSM Zone if typical wet-season rainfall patterns do not occur.

7.5.2 Zone A Operations

Zone A, as shown in Figure 7-4, is above the line that varies seasonally between EL. 17.25 and EL. 16.5 feet. The goal within Zone A is to reduce water levels as soon as possible by maximizing Lake Okeechobee releases. Maximum practicable releases will be made to the C-43 Canal, C-44 Canal, LWL via the L-8 Canal or West Palm Beach Canal and C-51 Canal, and south to the STAs/WCAs via the EAA canals. Releases will be maximized while accounting for downstream channel conditions, estuary conditions, conditions in the STAs as determined by the SFWMD, and conditions in the WCAs. Release rates will also consider constraints described in Section 7.3. Lake Okeechobee

releases to provide water supply (e.g., agricultural irrigation, municipal and industry, the ENP and STOF water supply, and the environment) may be made at any time within Zone A. Lake Okeechobee releases in Zone A are described below in no specific order:

- Release water south from Lake Okeechobee pumping the maximum practicable to the WCAs when the EAA canals (Hillsboro Canal, North New River (NNR) Canal, and Miami Canal) have available conveyance capacities, and the STAs have the available treatment capacity as determined by the SFWMD. Conveyance generally refers to the flow-carrying capacity of a channel or canal. Lake releases to the WCAs are secondary to EAA Basin runoff to avoid flood risk management impacts. The maximum tailwater elevation at S-351 and S-354 will not exceed 12 feet when conveying Lake Okeechobee releases.
- Maximum practicable release from S-77 to the C-43 Canal, when there is conveyance capacity downstream of S-77, S-78, and S-79, and the combined flow of Lake Okeechobee releases and local basin runoff will not cause flood risk management impacts. Priority of releases for the C-43 Canal are C-43 Basin runoff and then Lake Okeechobee releases. The combined flow from the basin and the lake will not exceed the design capacity of S-78 and S-79.
- Maximum practicable release from S-308 to the C-44 Canal, when there is conveyance capacity downstream of S-308 and S-80, and the combined flow of Lake Okeechobee releases and C-44 Basin runoff will not cause flood risk management impacts. Priority of releases for C-44 Canal are local basin runoff and then Lake Okeechobee releases. The combined flow from the basin and the lake will not exceed the design capacity of S-80.
- Maximum practicable release from S-271 to the L-8 Canal and/or S-352 to the West Palm Beach Canal, when there is conveyance capacity downstream of S-271 and S-352, and the combined flow of Lake Okeechobee releases and local basin runoff will not cause flood risk management impacts. Priority of releases for canals are local basin runoff and then Lake Okeechobee releases. The combined flow from the basin and the lake will not exceed the design capacity of downstream structures.

All releases shall be within the design capacity of the structure and not exceed the MAGOs (see Appendix A of this SOM Vol. 3). C-43 and C-44 Canals may be operated outside their optimum levels in this zone.

7.5.3 Zone BC Operations

Zone BC, as shown in Figure 7-4, varies seasonally between 17.25 and 16.1 feet. Allowable releases in this zone are defined as:

- south via S-351: up to 1,350 cfs
- south via S-354: up to 1,550 cfs
- west via S-77: up to 7,200 cfs
- east via S-80: up to 3,500 cfs
- east via S-271 or S-352: up to 300 cfs

The goal of Zone BC is to reduce the risk of water levels entering Zone A and to rapidly reduce lake stages. Zone BC releases from Lake Okeechobee can be made up to 7,200 cfs at S-77, up to 3,500 cfs at S-80, up to 300 cfs to the LWL via L-8 Canal and West Palm Beach Canal and C-51 Canal, and south via S-351 and/or S-354 subject to downstream conditions (up to 1,350 and 1,550 cfs, respectively). Lake releases are secondary to the use of the C-43, C-44, EAA Canals, L-8 Canal, West Palm Beach Canal, and C-51 Canal to first relieve flooding within the local drainage area. Water may be sent to the WCAs via the STAs, if capacity is available, as determined by the SFWMD (see Section 7.3.4.5 for STAs) and as determined by USACE (see Section 7.3.4.6 for WCAs).

The C-44 and C-43 Canals will be maintained within their optimum ranges to the maximum extent practicable in this zone; see Table 7-3. All other canals will be operated within their operating ranges in this zone; see Table 7-5.

Actual rates of release from Lake Okeechobee will vary depending on, but not limited to, downstream channel conditions, estuary conditions, conditions in the STAs as determined by the SFWMD, and conditions in the WCAs. All releases shall be within the design capacity of the structure and not exceed the MAGOs (see Appendix A of this volume of the SOM).

Releases within Zone BC are defined as maximum “up-to” flows, and the releases may be less than these limits based on system conditions, design capacity, MAGOs, and optimal canal levels. Lake Okeechobee releases to provide water supply (e.g., agricultural irrigation, municipal and industry, the ENP and STOF water supply, and the environment) may be made at any time within Zone BC and are not limited to allowable release rates.

7.5.4 Zone D Operations

As shown in Figure 7-4, Zone D varies seasonally between 16.85 and 10.5 feet. Allowable releases in this zone are defined as:

- south combined S-351 and S-354: up to 1,100 cfs
- west via S-79: up to 2,000 cfs
- east via S-80: no release
- east via S-271 or S-352: up to 300 cfs

Lake Okeechobee releases to provide water supply (e.g., agricultural irrigation, municipal and industry, the ENP and STOF water supply, and the environment) may be made at any time within Zone D and are not limited to allowable release rates. See Section 7.5.13 for more details on water-supply operations.

Allowable release limits are defined as a maximum "up-to" flows for each structure(s). The releases during any operational decision cycle may be less than these limits based on system conditions and subject to downstream conditions.

The C-44 and C-43 Canals will be maintained within their optimum ranges to the maximum extent practicable in this zone; see Table 7-3. All other canals will be operated within their operating ranges in this zone; see Table 7-5.

During each operational decision cycle (generally weekly), flow targets will be established within these limits unless other water management strategies are being employed (see Section 7.5.6 through Section 7.5.8).

Zone D releases from Lake Okeechobee may be made up to 2,000 cfs as measured at S-79. Releases to the C-43 Canal through S-77 in Zone D are made to achieve defined flow targets at S-79. Local runoff and water withdrawals can still cause flows to exceed or fall short of the target at S-79. Lake Okeechobee has no releases at S-80 in Zone D, and only beneficial releases up to 300 cfs are provided to the LWL (via S-271 or S-352) unless the lake ROs are implemented. Releases to the C-44 Canal through S-308 in Zone D are made to maintain optimal canal elevations for navigation and water supply. Section 7.5.8 provides further details on the lake ROs.

Lower releases (generally considered up to 350 cfs at S-79, lower release rates at S-351 and S-354, and no releases to the LWL) may be made in the lower portions of Zone D, and SFWMD guidance will be incorporated into release decisions. These lower releases will minimize the risk of entering the WSM Zone and maximize the potential for beneficial releases through the end of the dry season. The SFWMD recognizes it maintains the legal responsibility to govern the water within its boundaries to supply water to the STOF, the environment, and permitted users and to implement MFLs for Lake Okeechobee, the CRE, and the Everglades. USACE recognizes the state has the right and primary responsibility for water supply. When there is a risk of entering the WSM Zone, USACE will rely on SFWMD-guided lower releases (e.g., up to 350 cfs at S-79 and lower release rates at S-351 and S-354), and USACE-release decisions will be used in a manner that meets project purposes and are not detrimental to the SFWMD's responsibilities to implement MFLs. USACE will also manage water supplies from Lake Okeechobee as provided in Section 7.5.13 of this WCP.

Some examples of when there is a risk of entering the WSM Zone are when:

1. in the early dry season, Lake Okeechobee is within 1.5 feet of the WSM Zone, and forecasts predict normal or below-normal rainfall for the remainder of the dry season.
2. the wet season has not started by early June, and the lake stage is less than 14.5 feet NGVD29.
3. in the dry season, Lake Okeechobee is below, or in the lower half of, the ecological envelope (Figure 7-2), and lake stage is decreasing, or forecasts predict below-normal rainfall for the remainder of the dry season.
4. in the middle of the wet season, forecasts by USACE and/or the SFWMD indicate that the lake is likely to be below 14.5 feet NGVD29 at the beginning of the dry season.

It is important to note that releases from the C-43 Reservoir can, once operational, supplement lower lake-release targets at S-79 during dry times; see Section 7.5.17. These reservoir releases may result in flow at S-79 that will likely be above the Caloosahatchee River MFL (≥ 457 cfs) and potentially in the optimal salinity range (≥ 750 cfs). Lake-release decisions will consider the availability of the C-43 Reservoir to maintain optimal flows to the CRE.

7.5.4.1 Principal Considerations

Observed, current, and forecasted conditions, as described in Section 7.5.1, will be evaluated to determine releases in Zone D within allowable release limits for each of the primary outlet structures. This section describes how to evaluate these conditions, specifically within Zone D, to maximize beneficial use of water within the C&SF Project. Several principal considerations of the evaluation are described in the following subsections. Higher or lower releases may be made within the allowable limits of Zone D under certain conditions. Higher releases are generally considered the up-to limits (2,000 cfs at S-79, 300 cfs at the LWL, and 1,100 cfs at S-351 and S-354). Lower releases are generally considered up to 350 cfs at S-79, lower release rates at S-351 and S-354, and no releases to the LWL. Moderate releases are generally considered 1,200 cfs at S-79, medium releases at S-351 and S-354, and 200 cfs to the LWL.

Flows within the allowable release limits will be considered by stepping though the conditions within the following framework.

7.5.4.1.1 Lake Stage

As with all operational zones, past, present, and forecasted lake stage is a key metric for determining releases out of the lake within Zone D. The relative location of the stage

within Zone D is an important consideration and can generally be categorized as in the upper, middle, or lower portion of the zone. Stage trends such as rapidly rising or falling stage, stage reversals, and rates of ascension/recession will also be considered in operational decisions. Larger lake releases are generally warranted if stages are in the upper portion of Zone D or stages are rising; conversely, lower releases are generally warranted if stages are in the lower portion of Zone D or stages are receding.

The time of year is equally important due to the variability and uncertainty of Florida's rainfall patterns during the wet season and the Atlantic hurricane season. Stages in the upper portion of Zone D at the beginning of the wet season carry a higher risk of entering Zone A than at the end of the wet season. Florida's wet season typically begins May to June and ends October to November. It mostly overlaps with the Atlantic hurricane season, which occurs between 1 June and 30 November. During these times, having lake storage to accept a major rain event is a key consideration because lake stages can rise rapidly, and it takes long durations to reduce water levels in Lake Okeechobee. Larger releases shall occur if stages are higher at the beginning of the wet season, and lower releases shall occur if stages are lower in the middle to the end of the wet season.

Finally, the forecasted/projected lake stage with different release scenarios will be evaluated to determine the risk of entering either Zone A or the WSM Zone. These forecasts can be prepared with various tools that Chapter 6 of this volume of the SOM discusses. Larger releases will be considered if the risk of entering Zone A is higher; conversely, lower releases will be considered if the risk of entering the WSM Zone is higher.

7.5.4.1.2 Lake Okeechobee Net Inflow (LONIN)

LONIN is a calculation of the flows in and out of the lake that gives water managers a measure of current basin hydrologic conditions. LONIN provides an estimate of natural and controlled lake inflow/outflow and is an indicator of short-term hydrologic variability in the lake tributary basins. A working definition of the LONIN is given by:

LONIN = rainfall - evapotranspiration + inflow

LONIN can be evaluated daily or averaged over multiple days or weeks. Further details on LONIN calculations can be found below. Considerations of LONIN should be informed by the time of year and where highly positive LONIN at the end of the wet season or in the dry season may not result in the same release regimen as at the beginning of the wet season. Highly positive values of LONIN should lead to higher releases within the allowable release limits; conversely, highly negative values should lead to lower releases.

LONIN = Δstor + S351 + S354 + S352 + S77 + S308 + S271

- Δstor is the daily change in storage determined by taking the lake water levels for the current and previous days and computing the corresponding change in lake storage from the elevation-storage relationship (Table 7-8). This value is converted from acre-feet to the equivalent average daily inflow (cfs) by dividing by 1.9835.
- S351 is the mean daily flow through the S-2/S-352 complex (cfs)
- S354 is the mean daily flow through the S-3/S-354 complex (cfs)
- S352 is the mean daily flow through the S-352 structure (cfs)
- S77 is the mean daily flow through the S-77 structure (cfs)
- S308 is the mean daily flow through the S-308 structure (cfs)
- S271 is the mean daily flow through the S-271 structure into the L-8 Canal measured at Canal Point (cfs)

All structure flow terms in the above equation can be positive (out of the lake) or negative (into the lake). When flows are negative, the effect of pumping or gravity flow into the lake is removed from the LONIN estimate since inflows are accounted for in the Δstor variable.

7.5.4.1.3 Forecasts

Short-term forecasts for rainfall and inflows and longer-term forecasts of climate conditions will be used to help determine releases out of the lake. Rainfall forecasts provide short-term outlooks for basin inflows, runoff in downstream canals, and stage increases. Longer-term forecasts for precipitation and for ENSO conditions should be used for seasonal strategies. Generally, ENSO conditions can affect South Florida precipitation trends in the dry season, especially when the intensity of the event is moderate-to-strong; therefore, the ENSO condition should be considered during both the dry season and the tail end of the wet season. Moderate-to-strong is typically defined as temperature anomalies in the Niño 3.4 Index Region more than 1 degree Celsius, but ENSO conditions outside these thresholds can also be considered. During the dry season, La Niña conditions pose an increased risk of below-normal rainfall, and El Niño conditions pose an increased risk of above normal rainfall. Tropical forecasts are often shorter term, and releases before potential impacts typically cannot influence lake stage much, but water managers can consider the relative activity of the season where the frequency, intensity, proximity, etc. of tropical cyclones to help make release decisions. Generally, larger releases will be considered if forecasts are wet, and lower releases considered if forecasts are dry. Chapter 6 of this volume of the SOM includes additional details about forecasting within the basin.

7.5.4.1.4 Downstream Capacity

Downstream capacity of all receiving water bodies must be considered to determine releases from Lake Okeechobee. All the canals downstream of lake outlets have flood risk management objectives. Local rainfall in the C-43, C-44, L-8, West Palm Beach, Hillsboro, NNR, and Miami Canals can reduce canal conveyance capacity and thus limit the ability to release lake water to these water bodies while local runoff is occurring. Releases south are additionally constrained by the storage capacity in the WCAs and the treatment capacity of the STAs as determined by the SFWMD. See Section 7.3.4.5 for details on STA constraints and see Section 7.3.4.6 for details on WCA constraints.

Understanding the current and forecasted runoff and treatment capacity of the STAs is an important operational consideration when determining releases from Lake Okeechobee. Additionally, the capacity within downstream storage reservoirs such as the C-43 Reservoir should be evaluated. See Section 7.5.17 for more details on available storage. Distributing the releases out of the lake west, south, and to the LWL up to the allowable release limits based on the downstream capacity will be considered.

7.5.4.1.5 System Conditions

C&SF Project conditions will be evaluated to inform water management decision making, within the bounds of this WCP including the constraints. The primary areas of interest within the C&SF system include Kissimmee Basin, Northern Estuaries, Lake Okeechobee, Lower East Coast/Upper East Coast, EAA, STAs, WCAs, STOF Reservations, and the ENP.

The C&SF system is vastly complex from engineering, human environment, and ecological standpoints. New challenges have continued to emerge throughout the operation of the project and especially when managing Lake Okeechobee. The complex and varied issues and needs throughout the system required to meet and balance all the project objectives will be considered. Specific release guidance with respect to specific issues or needs cannot be listed here due to their complexity and volume, but within the allowable release limits and after stepping through the framework outlined here, the conditions of the system will be considered when determining releases out of the lake. Chapter 9 of this volume of the SOM includes additional details about interagency coordination and how this information is obtained from partner agencies.

7.5.4.1.6 Synthesis

Synthesizing these considerations and guidance is unique for each release decision because system conditions will be unique each time. Decision makers have the flexibility to synthesize all this information at the time of the decision, and there is no specified

hierarchy. Some examples of varied system conditions and how they might be integrated into a release decision are included below. These examples are provided to clarify the intent of the operations with some situations that could occur during a specific time of year. They are not intended to be comprehensive or interpreted as the only situations that would lead to the specific releases. All release decisions consider the existing and projected conditions at that time. Downstream capacity in these examples includes canal conveyance capacity, STA capacity, and WCA capacity.

1. Lake levels are rising (positive LONIN) in the upper portion of Zone D and above the ecological envelope in November (end of the wet season): northern WCA-3A would benefit from more inflows, salinity in the CRE is in the optimal range for oysters and would benefit from lake flows, and the LWL would not benefit from water to maintain optimum salinity. ENSO conditions are neutral. This scenario constitutes conditions where releasing water from Lake Okeechobee would benefit the lake for flood risk management and lake ecology, the CRE ecology, and the Everglades ecology while there is lower risk of stages entering the WSM Zone. Release decision: Release 2,000 cfs at S-79 and 1,100 cfs at S-351 and 354 subject to downstream capacity and reassess at the mid-dry season assessment point based on rainfall patterns, lake-level projections for June, recession rates, and system conditions.
2. Lake levels are in the upper portion of Zone D in October and receding (negative LONIN): a strong La Niña is forecasted for the dry season, CRE salinity levels are high and lake water could help bring levels down to optimal, the WCAs are below schedule and could benefit from increased inflows, the LWL would not benefit from water to maintain optimum salinity. Early in the dry season, releasing water to lower lake levels and to help manage salinity in CRE would be beneficial, but due to the increased risk of below normal rainfall (La Niña), maximum releases are not recommended. Release decision: Release 750 cfs at S-79 and medium releases at S-351 and S-354 subject to downstream capacity and reassess at the mid-dry season assessment point based on rainfall, lake levels, and water supply needs.
3. Lake levels are rising (positive LONIN) in the middle portion of Zone D in August, rainfall has been below normal over the lake but above normal in the Greater Everglades, and tropical activity has been minimal. A weak El Niño is present. There is a desire to make some releases to manage lake stage going into the peak of Atlantic hurricane season, but flows to the Everglades would not be beneficial; in addition, with below-normal rainfall, releases should be moderate within Zone D. The ENSO condition is weak and primarily influences rainfall in the dry season, not the wet season. Release decision: Release 1,200 cfs at S-79 and 0 cfs at S-351 and S-354 subject to downstream capacity and reassess as the wet season progresses based on LONIN and ascension rates.

4. Lake levels are in the lower portion of Zone D and receding in April (negative LONIN): CRE could benefit from lake water to maintain salinity, C-43 Reservoir has available water, the LWL would benefit from lake water to maintain optimum salinity, and lake nutrient concentrations in the lake are high. The Everglades would benefit from lake releases at the end of the wet season. ENSO conditions are neutral. Due to the lake stage and stage trends, releases from the lake would be minimal to avoid entering the WSM Zone. As the CRE benefits by receiving water to maintain salinity, the reservoir releases will help to provide that assistance. Release decision: Release 350 cfs at S-79, lower releases at S-351 and S-354, and release 200 cfs at S-271 subject to downstream capacity.

7.5.5 Water Shortage Management (WSM) Zone Operations

The WSM Zone varies seasonally between EL. 10.5 to EL. 13 feet and below. In this zone, no prescribed releases come from the lake. However, the SFWMD may make or request releases to allocate water supply within the basin from SFWMD- or USACE-operated structures, respectively. The operational intent of this zone is to manage the water available in the system as needed for water supply. The SFWMD manages water-shortage restrictions in the Lake Okeechobee Region in accordance with the Water Shortage Plan as specified Chapter 40E-21, Florida Administrative Code (F.A.C.) and the Regional Water Shortage Plans in Part III of Chapter 40E-22. Further details are in Section 7.9, DCP Operations. C-43 and C-44 Canals may be operated outside their optimum levels in this zone. All other canals will be operated within their operating ranges in this zone; see Table 7-5.

7.5.6 Near Zone Boundary Operations

When lake levels are above the WSM Zone, are rising, and are projected (within several weeks) to go into the adjacent higher zone, then water management decisions can be made as if levels are already in the adjacent zone. These operations do not apply when lake levels are in the WSM Zone.

An example of this is when the lake level is currently in Zone BC, and a large rain event within the next week forecasts enough rain to bring water levels into Zone A, Zone A releases could be made. Rapidly rising lake stages near zone lines can be an additional reason for operating as if levels are already in the adjacent zone. Whenever possible, transitions between higher releases to the estuaries should be implemented gradually (see Section 7.5.15.2). At any point, if the forecast changes or rainfall is not realized, releases under this operation may be terminated.

7.5.7 Algal Bloom (AB) Operations

While USACE does not have general authority to implement pollution control measures for the C&SF Project, it can incorporate operational methods to minimize nutrients and their effects on fish and wildlife to the maximum practicable extent. USACE can also consider water quality when making water management decisions (ER 1100-2-8154, Water Quality Management, 31 May 2018). Both the regulation of nutrient runoff to surface water and the enforcement of water-quality standards are the responsibility of the state of Florida.

ABs, as defined here, encompass freshwater blue-green species as well as saltwater species. USACE will consider ABs or the risk of ABs in Lake Okeechobee, in any downstream canals, in the northern estuaries, and in the nearshore and offshore waters near the northern estuaries during operation of Lake Okeechobee within all zones of the schedule. The operation of Lake Okeechobee is the sole authority of USACE, but federal and state agencies with water-quality regulation authority and expertise may make recommendations and supply information to help inform USACE decisions.

The Florida Department of Environmental Protection (FDEP) provides a weekly update on freshwater ABs (https://floridadep.gov/AlgalBloomWeeklyUpdate). The FDEP also provides a dashboard interactive map detailing sampling results (https://floridadep.gov/AlgalBloom). The Florida Wildlife Conservation Commission (FWCC) provides updates on saltwater ABs (https://myfwc.com/research/redtide/statewide/). The Florida Department of Health (FDOH) establishes whether an AB presents a risk to human health, and it can issue health advisories for recreational waters where there is a risk of the public encountering an existing AB as it deems appropriate. The U.S. Environmental Protection Agency's 2019 Document "Recommended Human Health Recreational Ambient Water Quality Criteria or Swimming Advisories for Microcystin and Cylindrospermopsin" recommends values for states to consider as the basis for swimming advisories in recreational waters including a recommended recreational value of 8 parts per billion (equivalent to µg/L) for microcystin.

Categorizing or quantifying risk to human health and the environment associated with ABs and water quality in general is extraordinarily complex and subject to updates based on new policies, new science, and new information. USACE will continue to use all available data to determine how water management actions may affect AB exposure and a risk to the public. Specific information USACE will review to aid in water management operational decisions includes, but is not limited to, any information provided by the FDEP, the FWCC, the FDOH, satellite imagery, and AB potential data from the National Oceanic and Atmospheric Administration (NOAA) (https://coastalscience.noaa.gov/research/stressor-impacts-mitigation/hab-monitoring-

system/cyanobacteria-algal-bloom-satellite-lake-okeechobee-fl/). In recognition that AB tools, predictive models, and technology continue to develop and improve, USACE will continue to adapt and employ the best available scientific information to inform water management operational decisions during an AB.

If the risk to the public associated with ABs and toxin levels in lake releases is determined to be high, USACE may pause or delay releases. USACE relies on outside, expert agencies to identify and classify ABs and their risk to human health and safety. Releases may still be made from the lake to provide water supply, and releases may still be made from the lake into canals to maintain navigational depths even if releases to tide are paused or delayed. USACE has operational flexibility to reduce or discontinue releases from Lake Okeechobee, but releases may still need to be made due to high water levels, wet conditions, and forecasted wet conditions, especially storms, etc. This flexibility is inherent to releases from the lake being defined as “up-to” limits in each zone and the absence of required minimum releases. The decision to make or not make releases out of the lake based on AB conditions is unique each time. USACE must weigh the risks of reducing or discontinuing releases against risks associated with ABs. The release decision is the responsibility of USACE, but it is integral for other agencies to provide information on the water-quality conditions and provide insight into how different actions may impact those conditions. Particularly, agencies should provide contextual information to accompany any data being transmitted to USACE. Chapter 9 of this volume of the SOM offers more information on this coordination.

During dry conditions and/or high-temperature periods, the Caloosahatchee Canal (C-43) and St. Lucie Canal (C-44) have the potential to develop an AB. These blooms can occur even when lake releases are not being made and are not necessarily directly related to lake operations. This is typically because stratification can occur in C-43, which encourages ABs, and still water in C-44 could encourage blooms in that reach. Short-term high rates of release from Lake Okeechobee can be effective at breaking up such ABs and may be used for short durations that would be coordinated with the state. These releases will be limited to ensure the 14-day average flow at S-79 does not exceed 2,100 cfs.

7.5.8 Lake Okeechobee Recovery Operations (ROs)

The primary objective for lake ROs is to lower lake levels during the winter/spring before the onset of the wet season to allow for recovery of lake ecology, specifically submerged aquatic vegetation (SAV). The operational strategy for these operations intends to slowly bring water levels down by making moderate, non-harmful releases to the estuaries and to the Everglades within Zone D. Allowable release limits under ROs are applicable only in Zone D (not in the WSM Zone) and are:

- up to 2,100 cfs at S-79
- up to 1,400 cfs total SLE inflows (accounting for other SLE inflows in addition to S-80)
- up to 300 cfs to the LWL at S-271 and S-352
- up to maximum practicable south at S-351 and S-354

RO releases can be pulsed according to Section 7.5.15.1. ROs can be used in Zone D to address ecological recovery from extreme high lake stage events. The goal of lake ROs is to lower lake stages (referred to as a drawdown) to help expedite the reestablishment of SAV within the lake. Most evidence of recovery has been from extreme low-stage events (less than 10 feet) during regional droughts (2001, 2007, 2008, and 2011), but recent evidence from 2019 shows benefits of even moderately low stages. Light penetration in Lake Okeechobee improves non-linearly as stages decline due to the combination of reduced depth, shoreline bathymetry, reduced turbidity, reduced phytoplankton growth, and positive feedback to water clarity as SAV coverage expands. It should be noted that SAV coverage on the lake has varied widely over the years under different regulation schedules and hydrologic conditions. Impacts from high water events are reduced both in duration and extent when followed by low lake stages (RECOVER Lake Okeechobee Performance Measure Lake Stage, 2020).

The desired result of ROs is to achieve a lake stage below 12 feet for 90 days (non-consecutive) between mid-April and September or to recede below 11.5 feet for at least 60 days (non-consecutive) between May and August. These standards are based on the 2020 RECOVER criteria for returning to a normal ecological envelope. For reference, Figure 7-5 depicts the recovery envelope. The mark of success will be based on an improvement to lake ecological indicators. At any point during the drawdown, the operation may be terminated if conditions change, such as, but not limited to, lake stage reversals, estuary conditions, tropical activity, etc. USACE will continually monitor conditions and the progress of the drawdown, engage stakeholders, and use the best available information to manage the lake.

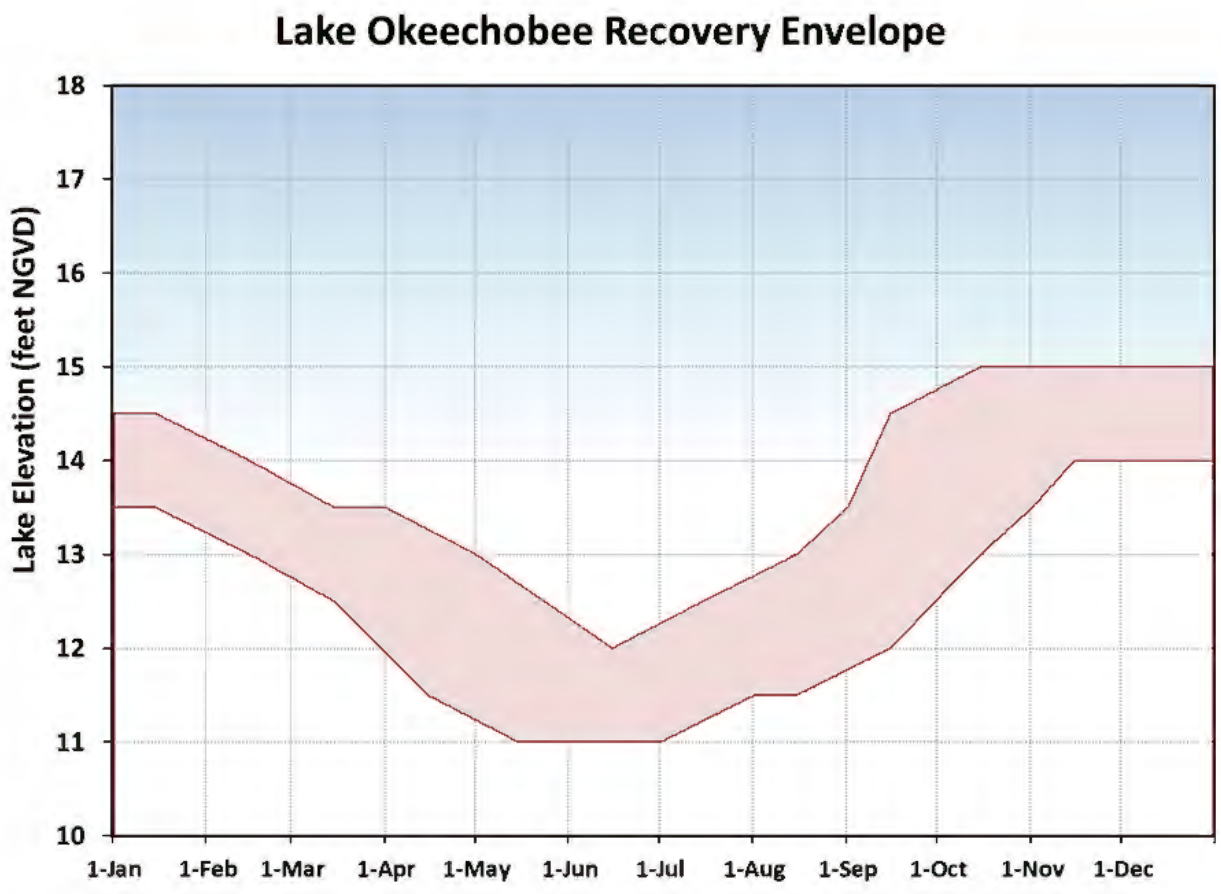


Figure 7-5: Lake Okeechobee Recovery Envelope (RECOVER, 2020)

Ensuring lake stages recede before the onset of the wet season reduces the risk of high-volume releases (lake stages in Zones A or BC) to the estuaries during the summer months, which is an overall benefit for the estuaries. Summer is when inflows into the estuaries are already high from surrounding basins and when the risk of ABs is higher, and therefore large lake releases are the least desirable. By making releases considered optimal as defined by RECOVER (2020) during the dry season, the risk of high, undesirable flows during the following wet season is reduced though not eliminated.

At least one of the following criteria in the previous year will determine whether ROs would be considered. These criteria are good indicators of lake ecology stress but are not hard triggers, and any decision to implement these ROs will be evaluated based on the unique circumstances by considering all system conditions as defined in the operational strategy thus far. Additionally, RO implementation would be discussed with agencies and stakeholders, and the specific plan would be announced before any actions were taken.

1. Lake stage exceeded 17 feet.
2. Lake stage did not recede below 13 feet for at least 30 days (non-consecutive) in the months of June and July.

3. SAV coverage either fell below 11,000 acres on the lake or was significantly reduced from previous years. (The 11,000 acres is based on freshwater bass having a strong relationship with vascular SAV cover – there is almost no recruitment of age-0 bass when SAV < 11,000 acres (Hanlon and Jordan, in review). SAV coverage data is typically collected by the SFWMD annually, but other data sources could be used).

Conditions that would be cause for considering not to implement ROs in any given year include many factors, but some specific ones are included here:

1. ENSO/climate conditions – If a moderate-to-strong La Niña is likely, then do not implement a drawdown due to the risk of below-normal rainfall in the dry season and increased demands on lake water. La Niña conditions increase the risk of lake levels getting too low impacting water supply, navigation, recreation, and potentially lake ecology. Moderate-to-strong is typically defined as temperature anomalies in the El Niño region 3.4 more than 1 degree Celsius and at least a 50 percent probability of the La Niña occurring for any upcoming 3-month window, but ENSO conditions outside these thresholds can also be considered.
2. ENSO/climate conditions – If a moderate-to-strong El Niño is likely, then do not implement a drawdown due to an increased risk of large inflows into the lake during the dry season reducing the probability of successfully achieving a drawdown.
3. Lake stages have already receded below 11 feet for any length of time in last 5 years.

It should be noted that accuracy of climate outlooks is currently limited, and the effects on Lake Okeechobee inflows are varied, but forecast improvements are expected. Other outlooks and teleconnections may help project future hydrologic conditions. These include, but are not limited to, the Atlantic Multidecadal Oscillation, the North Atlantic Oscillation, and the Pacific Decadal Oscillation.

Releases could be made in Zone D starting in the dry season up to 2,100 cfs at S-79, up to 1,400 cfs at the SLE (to include combined flows from S-80, S-97, S-49, and Gordy Road), up to 300 cfs at S-271 and S-352, and up to maximum practicable south. Releases to the east toward the SLE will be made at S-80 up to 1,400 cfs and will be adjusted based on weekly average inflows from other structure inflows. Release rates within these “up-to” limits would be adjusted regularly based on system conditions and lake-level projections. Exactly when and how much to release within limits will be based on the considerations including, but not limited to, coordination with stakeholders and partner agencies, current and historical lake levels, recession rates, climate outlooks, ENSO forecasts, precipitation forecasts, drought conditions, water-supply conditions, and nesting activities and ecological conditions in the lake, Northern Estuaries, and the

Greater Everglades. USACE should make the decision to enter Lake Okeechobee ROs at the end of the wet season/beginning of the dry season and proceed until the beginning of the wet season (typically late May to early June timeframe). ROs and strategies for implementation will be clearly communicated to the public at the beginning, throughout, and following action. If the drawdown is not accomplished between mid-April and September, then normal operations would resume, and the recovery would be reevaluated the following dry season. The intent is to achieve the drawdown before wet season rain and inflows cause the lake to begin to rise as once this occurs, a recession would be very difficult to achieve with the allowable release limits in ROs.

7.5.9 Canal Regulations

Canals within the Lake Okeechobee and EAA Basin are maintained within their optimal or operating ranges to provide their authorized flood risk management, navigational depths, and/or conveyance of water-supply deliveries. Optimal ranges are ranges that generally meet all the project purposes (i.e., water supply, navigation, and conveyance of flood water). Operating ranges are all-encompassing stages within which the canal can be operated and include higher and lower levels that may not be optimal for all project purposes but may be required to convey flood waters. C-43 and C-44 have specific optimal canal ranges that indicate a range of water levels that optimize the project purposes of flood control, navigation, and recreation along the canal. All remaining project canals in the basin have defined operating ranges. These ranges encompass a larger spread of water levels that intend to capture normal conditions in these canals. Table 7-3, Table 7-4, and Table 7-5 at the end of this chapter, list canal ranges. These ranges help define operations of the structures and canals. Storm and pre-storm operations may require levels outside these ranges, but generally these ranges should be maintained whenever possible.

The OWW (see Section 7.5.16 for description and map) is generally operated within its optimal ranges (Table 7-3). When lake levels are in the WSM Zone, canals may be operated below their optimal ranges; conversely, when levels are in Zone A, canals may be operated above their optimal ranges. Within any zone of the lake schedule, releases from the lake may be paused when levels rise above these ranges and increased when levels fall below these ranges.

The canals throughout the rest of the basin are operated within the operating ranges shown in Table 7-5. These ranges capture operations for flood risk management, navigational depths, and conveyance of water-supply deliveries. See Section 7.5.13.2 for more detail on EAA Canal operating ranges for flood risk management and for more detail on water supply.

7.5.10 Flood Risk Management

Three main methods of flood risk management are employed to manage risk to life and property adjacent and downstream of Lake Okeechobee (C-43, C-44, and the EAA). First, the HHD surrounds Lake Okeechobee except where it ties to high ground on either side of Fisheating Creek (natural inflow point). Locks, spillways, and vertical-lift, gated culverts on HHD are closed completely in advance of a hurricane or tropical storm to contain the lake for the duration of the storm event and prevent storm surge into adjacent canals. HHD culverts maintain flood risk management by providing drainage via flap gates even when vertical-lift gates are closed. Some culverts have two sets of vertical-lift gates, one on the lakeside and one on the landside, and the lakeside gates are to be closed during storm operations while the landside gates remain operational. Second, lake stage is managed for flood risk management in addition to the other authorized project purposes. Water is released from the lake, when stages are in Zone A and Zone BC, to provide storage capacity sufficient to accept a major rain event in addition to reducing ecological impacts of high water. Due to the very large basin that drains into the lake and the often-limited outlet capacity, it can take a prolonged period for releases to impact lake stage. The main outlet structures to make releases from Lake Okeechobee include S-308, S-271, S-352, S-351, S-354, and S-77. Third, the canals within the basin are maintained between the water-level ranges shown in Table 7-4 and Table 7-5 except when extreme wet or dry conditions prevail. Find further details on operations for flood risk management on the OWW in Appendix E of this volume of the SOM, and for Storm Operations along the OWW see Section 7.6.2.

Excess canal water may be sent to Lake Okeechobee, the estuaries, flow equalization basins (FEBs), STAs, or WCAs depending upon the severity of the rainfall event, water levels, etc. To maintain EAA Canal levels, water is typically pumped into the A-1 FEB and STAs or, if necessary, directly to the WCAs based on diversion criteria in the STA permits. The FEBs provide flow attenuation to the STAs; water is delivered to them more frequently during storm events to protect the STAs from large volume inflows. To maintain C-43 Canal levels, C-43 water downstream of S-77 is typically released to tide at S-78/S-79 or could be pumped into the C-43 Reservoir if there is operational capacity (pending completion). If Lake Okeechobee water level is low enough (below 11.5 feet), C-43 water upstream of S-78 may be sent to the lake via gravity from S-77. To maintain C-44 Canal levels, C-44 water downstream of S-308 is typically released to tide at S-80. If Lake Okeechobee water level is low enough (below 14 feet), C-44 water upstream of S-80 may be sent to the lake via gravity using the S-308 Spillway and/or Lock. Excess water in C-44 can also be pumped into the C-44 Reservoir if there is capacity (see Section 7.5.17).

Appendix A of this volume of the SOM provides canal design elevations and as-built pump capacities that will be different from the canal-level operating ranges in Table 7-3 and

Table 7-5 in many cases. Canal levels are determined with all Congressionally authorized project purposes in mind and not solely on design capacity. All the C&SF Project pump stations were designed to remove 3/4-inch runoff per day from their drainage areas within the EAA.

Numerous culverts on HHD provide flood risk management to adjacent lands and areas. Most of those culverts provide passive flood risk management via flap gates that allow water to flow from the landside of HHD into Lake Okeechobee when head exists. These flap gates can engage even when the vertical-lift gates are closed. Several culverts (S-265, S-266, S-284, S-285, S-290, and S-291) on the Kissimmee River (C-38), the Harney Pond Canal (C-41), and the Indian Prairie Canal (C-40) provide flood risk management by dual-leaf, vertical-lift slide gates that are set to maintain operating ranges listed in Table 7-4.

7.5.10.1 Releases through Lock Chambers during High Lake Okeechobee Stages

During very high lake stages, and to provide storage in anticipation of the possibility for above-normal storm tides and rain, the locks in the Caloosahatchee River (C-43) have been used to augment releases from Lake Okeechobee when additional capacity is needed to lower the lake. Due to safety concerns, this operation should only be done on a very limited basis or during maintenance work, such as when spillway gates are out of service. Since the locks were not designed for this type of operation, possible damage to the structure could result. Careful consideration should be taken to not exceed the MAGO curves and to keep the hydraulic jump on the apron to preclude possible impacts downstream of the structure. Implementing these operations would require additional analysis on specific operational conditions. See the most recently updated EAP for HHD.

7.5.10.2 Flood Risk Management in the EAA and L-8 Basins

Storm-water runoff from the EAA is pumped south to the STAs or north into Lake Okeechobee. To reduce nutrient loading into Lake Okeechobee, EAA runoff is pumped south to the FEBs/STAs whenever possible. The West Palm Beach, Hillsboro, NNR, and Miami Canals are operated for flood risk management when local rainfall occurs by sending storm-water runoff south to the FEBs/STAs first and back to Lake Okeechobee secondly. During, in response to, or in anticipation of a forecasted hurricane, tropical storm, or large rain event, these canals are generally maintained toward the lower end of the operating ranges listed in Table 7-5. This is done to provide drainage into the canals. However, during rain events, canal water levels may exceed the ranges listed in Table 7-5 for short periods of time. The L-8 Canal is designed to move water south as well as north back into Lake Okeechobee via S-271.

The structures at the south end of the EAA that provide flood risk management include both federal and non-federal structures. These non-federal structures were added when STAs and FEBs were added to the system. For more detailed information about STA/WCA boundary operations, refer to SOM Volume 4 - Water Conservation Areas, Everglades National Park, and South Dade Conveyance System.

- Pump Station S-5A, which has a capacity of 4,600 cfs, primarily moves water from the West Palm Beach Canal (L-10/L-12) into the inflow and distribution works that then can distribute the flow between STA-1E, STA-1W, or the L-8 FEB.
- Pump Station S-6, which has a capacity of 2,925 cfs, primarily moves water from the Hillsboro Canal (L-14/L-15) south into STA-2 but can also move water into WCA-1 via G-338 or WCA-2 via G339.
- Pump Station G-370, which has a capacity of 2,775 cfs, moves water from the NNR Canal (L-20/L-19) into the A-1 FEB and STA-3/4.
- Pump Station S-7, which has a capacity of 2,490 cfs, moves water released from the STA-3/4 into WCA-2A. The spillway gates at S-7 can reverse flow and move water from WCA-2A back to the STA outflow distribution canal and then into WCA-3A.
- Pump Station G-434 and Pump Station G-435, which have a capacity of 1,120 and 480 cfs, respectfully, move water from the NNR Canal (L-20/L-19) into STA-2.
- Pump Station G-372, which has a capacity of 3,760 cfs, moves water from the Miami Canal (L-25/L-24) into the A-1 FEB and STA-3/4.
- Pump Station S-8, which has a capacity of 4,160 cfs, moves water released from STA-3/4 and STA-5/6 (flow-way 1 and flow-way 2) into WCA-3A.

Large rainfall events can cause the EAA canals to approach the upper end of their operating ranges in Table 7-5. To maintain the authorized flood risk management in the EAA, Pump Station S-2 and Pump Station S-3 move water from the NNR, Hillsboro, and Miami Canals north into Lake Okeechobee. See Section 0 for more details on operations prior to and during a hurricane, tropical storm, or large rain event. However, the operations of Pump Station S-2 and Pump Station S-3 are subject to the state of Florida's Lake Okeechobee Operating Permit, which states that pumping for flood risk management shall not be initiated prior to EAA Canal stages reaching 12.5 feet.

Under normal operations, Pump Station S-4 moves water north into Lake Okeechobee to provide flood risk management for the Clewiston area. This basin is not hydraulically connected to the southern portion of the EAA and has no southern outlet. Pump Station S-4 operates more frequently and under less extreme rainfall conditions than S-2 or S-3.

7.5.10.3 Caloosahatchee Canal (C-43) and St. Lucie Canal (C-44) Flow into Lake Okeechobee

As a flood risk management tool, when the Lake Okeechobee water level drops below the optimum canal elevations in C-43 and C-44, the following strategy may be implemented to help provide flood risk management.

When the stage in C-43 at the S-77 tailwater is higher than the S-77 headwater, S-77 can be operated to allow water to flow back into Lake Okeechobee. This operation can occur when Lake Okeechobee water levels are below 11.5 feet.

S-308 can be operated to allow runoff water to flow back into Lake Okeechobee when Lake Okeechobee water levels are below 14 feet. Significant local rainfall in the C-44 Basin may cause canal levels to rise faster than S-308 can move it back into the lake, and S-80 may still need to open to maintain canal levels.

Lake Okeechobee water levels and seasonal strategy will be evaluated together when deciding whether to allow runoff back into the lake from the C-43 and C-44.

7.5.11 Achieving Natural System Goals, Objectives, and Benefits

The intent and balance of LOSOM, developed with extensive stakeholder engagement and multi-disciplinary analysis, aim to achieve synergy with the Congressionally authorized purposes for Lake Okeechobee. This balance aims to maximize systemwide benefits with the available water through flexible water management operations. Section 601(b)(1)(A) of the WRDA 2000-approved Comprehensive Everglades Restoration Plan (CERP) is the framework for modifications and operational changes to the C&SF Project. However, this WCP (2024) is not an implementation of CERP. While the Plan was formulated with consideration for the natural system, and the implementation of this WCP will consider ecological conditions throughout the system, since this WCP is not a CERP action, the Plan has no specific natural system goals, objectives, or benefits. Individual CERP projects have evaluated natural system goals, objectives, or benefits; their respective Project Operating Manuals (POMs) are attached to this volume of the SOM.

7.5.12 Water Quality

USACE does not control the quality of the water that enters or exits the C&SF system. The state of Florida is responsible for regulating water quality for surface water throughout the entire system. Common water-quality issues within Lake Okeechobee include, but are not limited to, excess turbidity and nutrients and occurrence of ABs and associated toxins. Factors leading up to and causing ABs in the lake are vastly complex and are not only based on current conditions but also on practices of past decades that contributed to the legacy nutrient loads within the sediment/muck in the lake.

Storm events may affect water quality within the lake due to wind, high inflows, and subsequent increased lake stages. Wind can stir up sediment from the bottom of the lake that resuspends nutrients into the water column. High surface-water inflows into the lake increase the nutrient load in the lake water column. High water, because of storms, can move this sediment and nutrient loads into the littoral marshes. These conditions all lead to increased risk of ABs the following summer. Evidence of this phenomenon was seen in the significant ABs in the summers of 2016 and 2018 following El Niño and hurricane events over the lake. Sustained high water and wind events can also impact SAV abundance within the lake. Healthy SAV can help prevent significant blooms from occurring within the lake by naturally fixing nutrients thereby leaving less available to fuel large blooms. SAV play a significant role in fixing nutrients within the lake, so when wind and high water negatively impact SAV, more nutrients are available for blooms.

Available phosphorous and nitrogen within the estuaries can fuel freshwater ABs within the estuaries, especially at high concentrations and when conditions are conducive to algal growth (warm, calm water and low salinity). Nutrients within the estuaries originate from the local basins, the drainage basins along the OWW, and from Lake Okeechobee releases. USACE may implement AB Operations, as described in Section 7.5.7, withholding Lake Okeechobee releases to tide and/or modifying the pulse release during times when algae is either present or forecasted to be present.

High turbidity water in the estuaries can cause a decline in water clarity and cause harm to fish and wildlife resources. High turbidity water can lead to less available light in the water column affecting the photosynthesis process for seagrasses and other SAV. Additionally, high turbidity associated with poor water clarity can cause economic impacts to the local communities by affecting recreational activities within the estuaries. Nutrients and turbidity are important considerations during Lake Okeechobee operations, but operations must still meet the Congressionally authorized project purposes and follow the plan for water management described in this WCP.

7.5.13 Water Supply

This WCP defines water management operations for the system that are intended to meet the project purposes while recognizing the state of Florida's responsibility to allocate water supplies within its borders. Regarding Lake Okeechobee, the agency responsible for allocating water is the SFWMD. The SFWMD's decisions regarding water-supply allocations are not modified by USACE. The SFWMD may request water releases for various reasons including for the STOF as a separate and distinct water user, municipal and agricultural water supply, aquifer protection, to maintain appropriate salinity envelope in the estuaries, environmental releases south to the Everglades as well as to other portions of the system, or any other beneficial uses the SFWMD deems appropriate. USACE intends to make releases that are consistent with the SFWMD's requests and

does not anticipate a conflict with federal project purposes in any zone of the schedule. USACE will make SFWMD-requested water releases when Lake Okeechobee is above the WSM Zone consistent with LOSOM.

Water-supply releases are also made to the Caloosahatchee Canal (C-43) and St. Lucie Canal (C-44) to maintain optimum canal levels listed in Table 7-5. It is important to note that the SFWMD's request for restricted water-supply deliveries may not be sufficient to maintain optimum canal levels for navigation when Lake Okeechobee is in the WSM Zone, and per Section 7.5.5 canal levels may be maintained below their optimal levels within this zone.

Numerous culverts around HHD provide water-supply releases from Lake Okeechobee to adjacent lands. The SFWMD or USACE make these gravity releases as requested by the SFWMD, the local drainage districts, or by downstream water users. Table 7-5 shows operating ranges for the landside canal/ditch for these water-supply deliveries. Several culverts to the north (S-265, S-266, S-284, S-285, S-290, and S-291) on the Kissimmee River (C-38), the Harney Pond Canal (C-41), and the Indian Prairie Canal (C-40) maintain canals levels upstream of Lake Okeechobee for water supply by dual-leaf, vertical-lift slide gates that are set to maintain operating ranges listed in Table 7-4.

7.5.13.1 Seminole Tribe of Florida (STOF) Water Supply

The STOF has two reservations within the C&SF system: the Brighton Reservation just north of Lake Okeechobee in the Indian Prairie Basin and the Big Cypress Reservation just west of WCA-3A. Figure 7-6 shows the locations of the Brighton and Big Cypress Reservations.

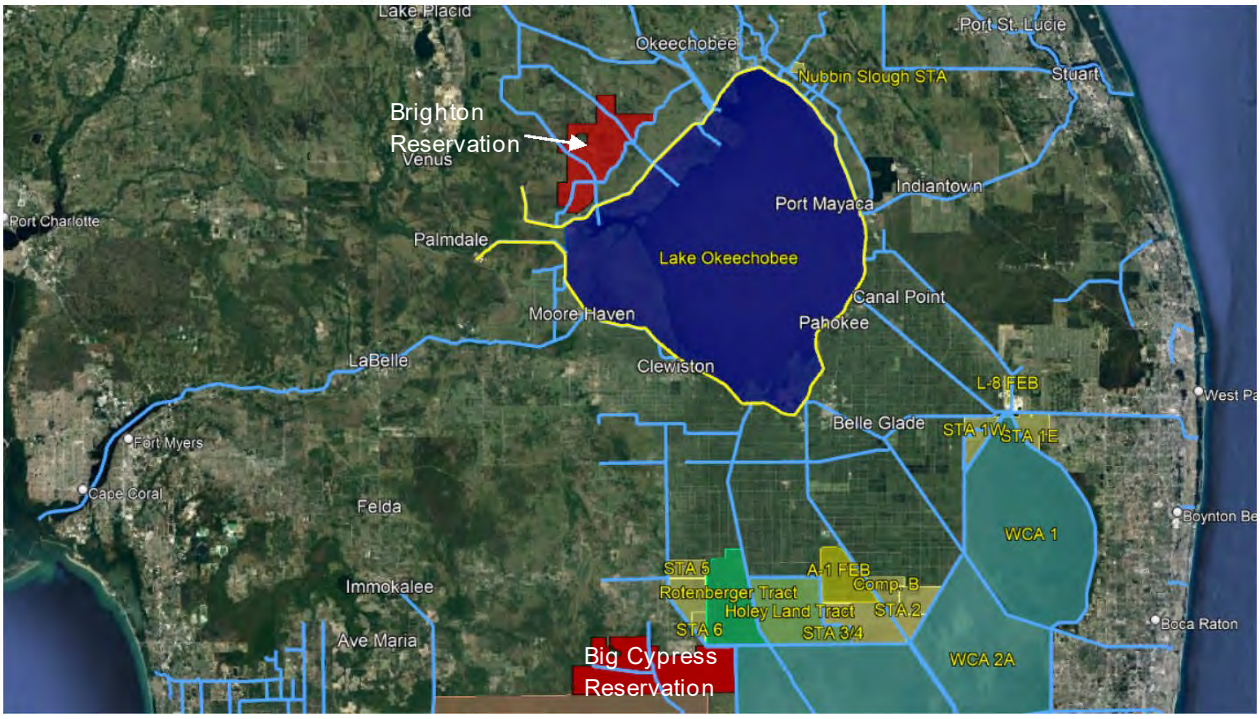


Figure 7-6: STOF Reservations within C&SF System

The STOF is a distinct and unique Lake Okeechobee water user. A 1987 Water Rights Compact between the STOF, the state of Florida, and the SFWMD specifically defines the nature and extent of STOF's water rights and their use within the confines of the area of the SFWMD. As described in Section 285.165, Florida Statutes, the Compact is "the sole source of regulation of water use and the management and storage of surface water and groundwater on reservation and Tribal Trust lands." In addition, Section 7 of the Seminole Indian Land Claims Settlement Act of 1987, Public Law 100-228, gives the Compact "the force and effect of Federal law for the purposes of enforcement of the rights and obligations of the tribe."

The Brighton Reservation is about 35,000 acres and receives its primary water supply from the local basin including Lake Istokpoga (see SOM Volume 2 - Kissimmee River-Lake Istokpoga Basin) and receives its secondary water supply from Lake Okeechobee. Water from Lake Okeechobee is delivered to the Brighton Reservation through two canals: C-41 and C-40. For the C-41 Canal (Harney Pond Canal), Pump Station G-207 (non-project structure, SFWMD owned) pumps water from Lake Okeechobee into the canal to maintain water levels, providing water supply between S-70 and S-71 when Lake Istokpoga is in Zone C of its regulation schedule. Pump Station G-207 has a design capacity of 135 cfs and provides water supply to maintain canal levels in C-41. For the C-40 Canal (Indian Prairie Canal), Pump Station G-208 (non-project structure, SFWMD owned) maintains water levels between S-75 and S-72 when Lake Istokpoga is below its regulation schedule with deliveries from Lake Okeechobee. Pump Station G-208 has a

design capacity of 135 cfs and provides water supply to maintain canal levels in C-40. The Brighton Reservation withdraws water from both C-40 and C-41 for water supply.

The Seminole Big Cypress Reservation is about 54,000 acres and receives its primary water supply from the West and North Feeder Canals. When local basin water is not available, water supply is delivered to the Seminole Big Cypress Reservation through Pump Station G-409 (non-project structure, SFWMD owned) from the C&SF system, including Lake Okeechobee water, via the Miami Canal and NNR Canal. Pump Station G-409 has a design capacity of 190 cfs. The Water Control Plans of the Seminole Big Cypress Reservation Water Conservation Plan Project are part of Volume 4 of the SOM.

7.5.13.2 Water Supply in the EAA and L-8 Basin

When local rainfall is insufficient to maintain water levels in the EAA, water is moved south from Lake Okeechobee. Water is moved out of Lake Okeechobee into the West Palm Beach Canal through S-352, into the NNR and Hillsboro Canals through S-351, to the Miami Canal through S-354, and to the L-8 Canal through S-271. Canal stages are generally kept toward the mid to upper end of the operating ranges shown in Table 7-5 to meet water-use requirements within their respective service areas and to provide water supply to coastal counties, WCAs, and the ENP.

Releases from Lake Okeechobee to the STAs/WCAs or the LWL via the EAA and L-8 Canals may require similar timing with releases for water supply to those basins. Releases to the STAs/WCAs or the LWL will be made if the SFWMD can still provide water-supply deliveries to those basins. Table 7-5 shows the operating ranges for structures in the Lake Okeechobee and EAA. Lake releases and operational criteria defined in this WCP do not modify the ability of the SFWMD to provide water supplies from Lake Okeechobee.

7.5.14 Recreation

Recreation is an authorized project purpose the C&SF Project. The project area provides abundant recreational facilities, both private and public; however, no specific water management operations are required solely for this purpose. Lake and canal levels are not specifically managed for recreation although lake levels do affect recreation facilities and activities. For example, lake levels influence boat launching ramps, pleasure crafts, sightseeing vessels, and bank and small-boat fishing. Recreational activities within Lake Okeechobee include fishing, birding, boating, and eco-tourism. Recreational activities within the EAA and areas surrounding Lake Okeechobee include hunting, fishing, hiking, and eco-tourism, which can be dependent upon water deliveries and levels in these areas. Optimal canal elevations along the OWW, Table 7-3, provide sufficient depth for mooring boats at local marinas and for access to boat ramps.

7.5.15 Fish and Wildlife

Water management throughout the C&SF system can affect fish and wildlife resources. Ecological conditions throughout the system are important considerations in the decision-making process for Lake Okeechobee operations (see Section 7.5.1). Lake levels and releases out of the lake are managed to balance all project purposes. The natural and the water management system are complex, and operational actions that benefit one area or resource can directly impact another. For example, operations that can benefit fish and wildlife resources within Lake Okeechobee itself may cause impacts to estuarine resources. Meeting authorized project purposes often requires striking a balance between the various areas within the basin when making operational decisions.

Generally, the plan for water management was developed based on strong consideration for fish and wildlife resources. Specifically, the releases out of the lake have been designed to manage lake levels in the most beneficial way possible for downstream ecosystems and users. Prioritizing flows south out of the lake, particularly in the dry season, toward the Greater Everglades is one of the key components. Releasing water west in Zone D to the CRE at rates that aid in maintaining optimal salinity ranges is another key aspect to the plan that enhances fish and wildlife resources. Implementing ROs can help to enhance fish and wildlife resources in the lake after high water or when conditions have degraded (see Section 7.5.8). The subsections below outline some additional water management tools that can be implemented to enhance fish and wildlife resources.

The RECOVER program establishes performance measures for Lake Okeechobee and the Northern Estuaries. The performance measures have been developed to evaluate water levels and flows for a suite of ecological indicators including fish and wildlife and their aquatic and wetland habitats. Some of these performance measures can be excellent tools to allow managers to evaluate system conditions based on the science done to develop these measures. Find the latest RECOVER Performance Measures here: https://www.saj.usace.army.mil/Missions/Environmental/Ecosystem-Restoration/RECOVER/

7.5.15.1 Pulse Releases

Lake Okeechobee releases will only be implemented in a pulse release in Zone D and if delivering the releases in a pulse pattern would reduce the impacts or provide a benefit to the downstream estuary. The decision to implement a pulse release is determined by USACE but is usually informed by the SFWMD or other agency technical input.

A pulse release attempts to simulate the natural flow response to a rainstorm event within the basins. The premise is that the receiving body should respond ecologically to the

pulse release in a similar fashion as if a rainstorm had occurred in the upstream watershed. Because the watershed has the potential to receive a variety of rainfall events, an average flow rate is targeted for the duration of the desired pulse release (e.g., 7-day, 2,000-cfs-average daily or 14-day, 3,500-cfs-average daily). USACE develops a pulse release pattern, usually in coordination with the SFWMD, at either S-79 or S-80 with daily targeted flows that average out to the desired flow for the pulse duration. By measuring flows at the downstream structures, as opposed to the lake structures, the operators account for basin inflow on C-43 and C-44. Releases at S-77 and S-308 are made to achieve the target flows downstream, which can be more (in the case where significant water withdrawals come from the canal) or less (in the case of basin runoff entering the canal) than the downstream flows.

Forecasted rainfall, current runoff conditions, and ecological conditions are considered during the development of the pulse pattern to implement the lake release in the most beneficial way possible. The local operators target the daily flows each day, independently of previous days' operations, and typically do not adjust flows the next day if local runoff exceeded the previous day's targets. Occasionally, the USACE, Jacksonville District (SAJ) Water Management Section may make an adjustment mid pulse to redistribute the daily flows in response to large basin inflows.

7.5.15.2 Transitions between Lake Okeechobee Releases to Tide

When either increasing or decreasing targeted releases out of Lake Okeechobee to tide, it is least disruptive to estuarine environments to do so slowly. When releases or flows are changed rapidly, the salinity gradient changes rapidly, which can stress estuarine biota. When releases or flows are modified slowly, the biota have an opportunity to adjust and/or move to desirable salinity levels. When possible, a transition strategy will be implemented when transitioning between release targets. These strategies should be based on current conditions in each estuary and are not prescribed here. Conditions in each estuary are unique during each transition and during these conditions, and recommendations for the transition strategy can be obtained through coordination with the SFWMD and through PSCs for Lake Okeechobee. Local basin inflows along the Caloosahatchee Canal and River and the St. Lucie Canal will be considered in the transition strategy for lake releases. Transition strategies will only apply when releases from the lake are being made and do not apply to local basin inflows alone. Transition strategies shall not exceed 4 weeks in duration and will be clearly communicated to the public.

Transition strategies are encouraged, but not required, as sometimes rapid increases in releases are necessary for lake management especially when dam safety or flood risk management concerns are present.

7.5.16 Navigation

The OWW, seen in Figure 7-7, traverses the state of Florida from the Atlantic coast to the Gulf of Mexico and includes the St. Lucie Canal (C-44), Route 1 and Route 2 across Lake Okeechobee, and the Caloosahatchee Canal (C-43). From the Gulf of Mexico to Tice (in Lee County) (reporting mark Seaboard Coast Line Railroad) the authorized channel depth is 10 feet, then from Tice along C-43 through the Ortona Lock (La Belle) to Julian Keen Jr. Lock (Moore Haven) the depth is 8 feet. Two routes run through Lake Okeechobee. Route 1 goes from Moore Haven, follows the southern rim canal to the City of Clewiston, and then extends through the center of the lake to Port Mayaca Lock (Port Mayaca) with an authorized depth of 8 feet. Route 2 goes from Moore Haven, follows the southern rim canal all the way around the lake near Clewiston, South Bay, Canal Point, and finally to Port Mayaca and has an authorized depth of 6 feet. Then Route 2 goes from Port Mayaca, through C-44 to St. Lucie Lock (Stuart), and then ends at the Intercoastal Waterway with an authorized depth of 8 feet.

Table 7-6 shows datum and project depths. This table shows authorized project dredge depths, not minimum water levels. Occasionally, when lake levels are low, these depths will not be met. See Section 7.5.13 on Water Supply for more details about when water-supply deliveries may not be able to provide sufficient depth for navigation. Optimal canal elevations along the OWW allow for sufficient water depths and bridge clearances along the canals.

During extended dry periods or declared water-shortage periods, the SFWMD may request that USACE implement reduced hours of lockages on the OWW as part of their Water Supply Plan and the DCP, further detailed in Section 7.9. Normally, lockages are conducted “on demand,” which require numerous cycles of lock water to be released downstream of the lock. During reduced hours of lockages, water is conserved and saltwater migration upstream of S-79 is potentially reduced.

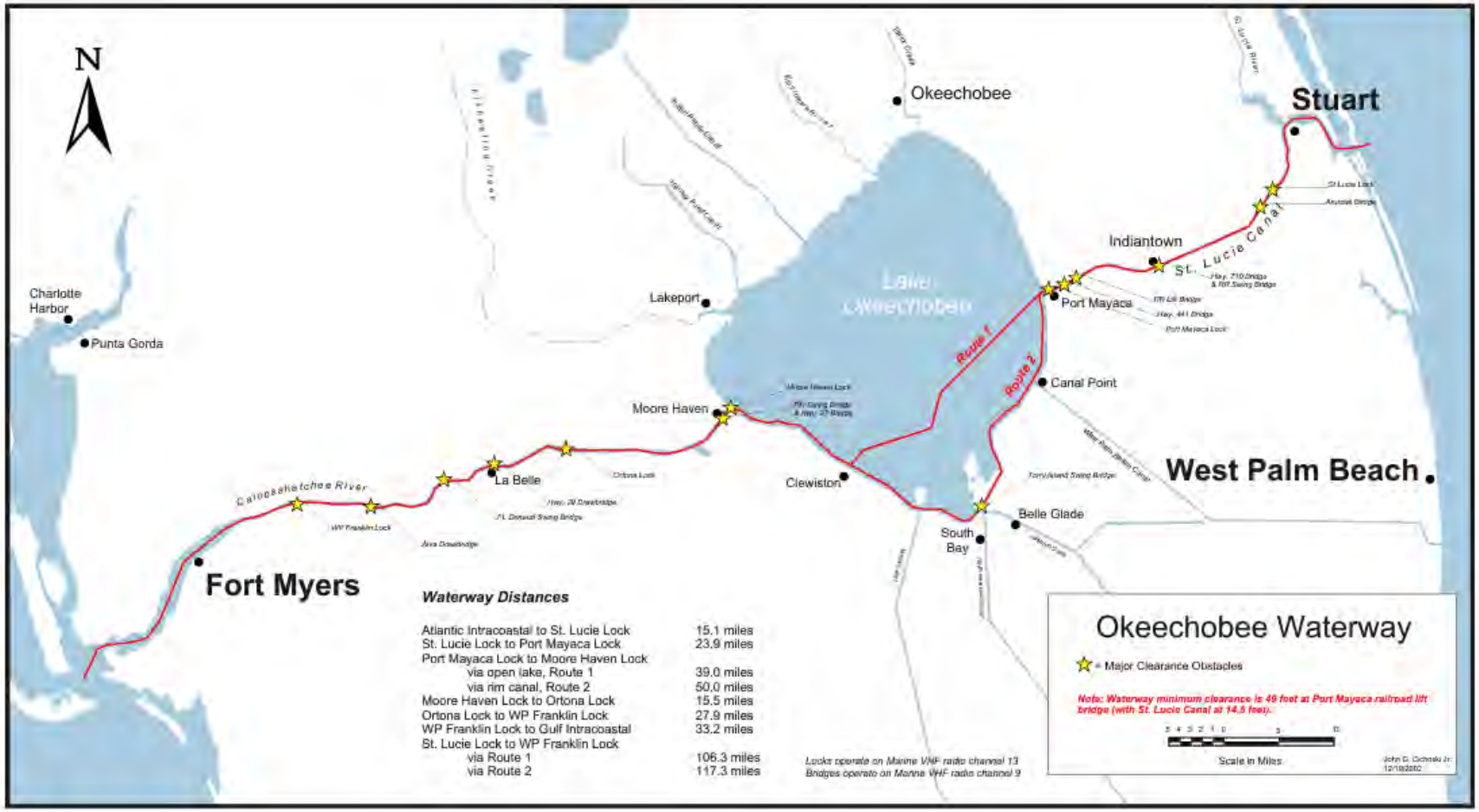


Figure 7-7: Okeechobee Waterway

7.5.17 Water Storage

Within the Lake Okeechobee and EAA Basin are two CERP storage reservoirs and numerous state-designated lands that store water from the C&SF Project regional system.

The Caloosahatchee River West Basin Storage Reservoir (C-43 Reservoir) is adjacent the C-43 Canal in Lee County (see Figure 7-8) downstream of S-78. The two-celled reservoir is designed to store approximately 170,000 acre-feet of water to improve water deliveries to the estuary, provide for dry-season flow, reduce the magnitude of wet-season, high-volume flows, restore downstream salinity levels, and ensure the availability of water for the natural system needs of the CRE. The main inflow pump station (S-470) has a capacity of 1,500 cfs, and the reservoir outflows via two release structures with a design outflow of 1,650 cfs under normal conditions and can achieve an outflow up to 4,500 cfs if water levels in the reservoir need to be brought down. It is expected that this reservoir will come online within a few years of implementation of this WCP. The POM, to be attached to this volume of the SOM, provides detailed operations.

The C-44 Reservoir/Storm Water Treatment Area Project (C-44 Reservoir) is adjacent the C-44 Canal in Martin County between S-308 and S-80 (see Figure 7-8). The reservoir is designed to store approximately 50,800 acre-feet of water to reestablish a natural pattern of freshwater flows and regulate the timing and quality of water delivered to the SLE and the Indian River Lagoon in concert with the other project features including STAs and the C-23, C-24, and C-25 Basin projects. The main inflow pump station (S-401) has a capacity of 1,100 cfs, and the outflow gravity structure (S-402) has a capacity of 1,100 cfs that releases water into the adjacent STA for treatment. The C-44 Reservoir began Operational Testing and Monitoring Phase in November of 2021. The POM, to be attached to this volume of the SOM, provides detailed operations.

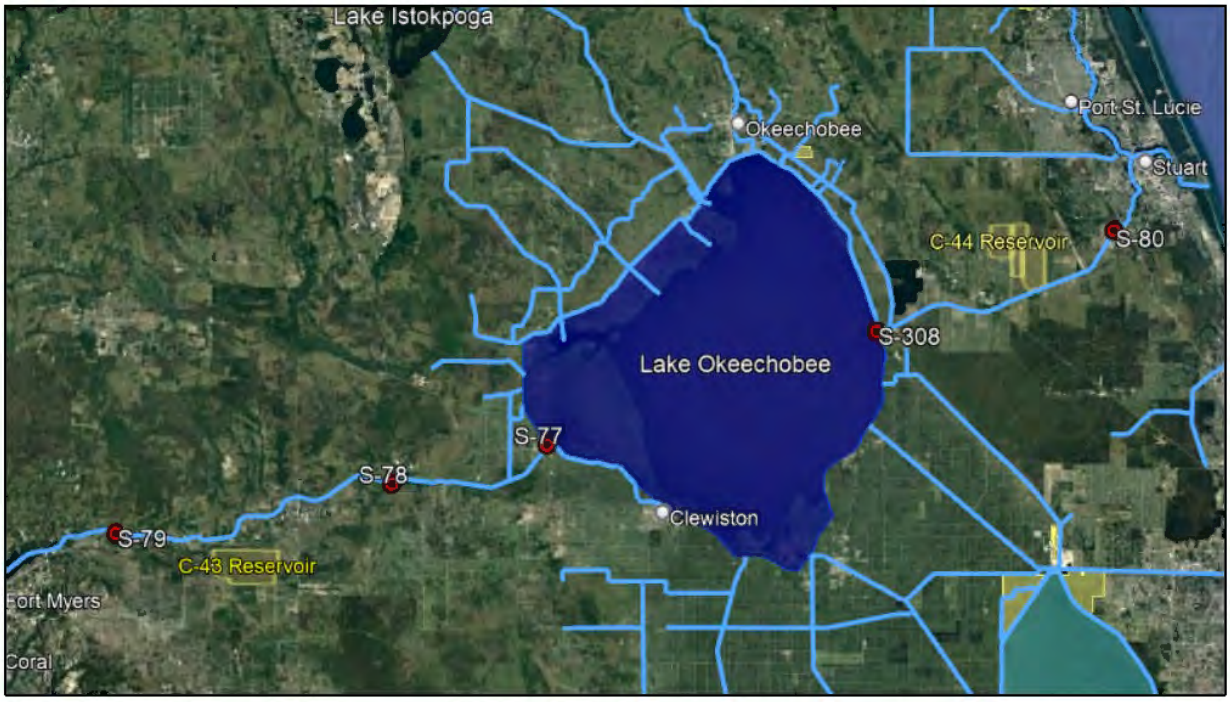


Figure 7-8: C-43 and C-44 Reservoirs

The SFWMD has been working with a coalition of agencies, environmental organizations, ranchers, and researchers to enhance opportunities for storing excess surface water on private and public lands. Over the years, these partnerships have made thousands of acre-feet of water retention and storage available throughout the Greater Everglades system. The Dispersed Water Management Program currently has projects throughout the Lake Okeechobee and EAA Basin.

7.6 Pre-storm/Storm Operations

This section provides criteria to prepare the project area for forecasted storm events. These regulations describe operating criteria for hurricanes, tropical storms, and other significant events that could cause flooding impacts if operations are not adjusted. This section details the HHD, C-44, C-43, and EAA Canals' pre-storm operations. For more information on forecasting and agencies' roles and responsibilities, see Chapter 6 of this volume of the SOM.

SFWMD meteorologists monitor the tropics and evaluate tropical cyclone products issued by the NHC and the Weather Prediction Center. The meteorologists advise the SFWMD Operations Office of both tropical systems that require enhanced monitoring over the next 120 hours and of specific tropical cyclones with the potential to bring tropical storm-strength winds within the next 72 hours. The SFWMD Operations Office has further defined operational procedures to implement depending on the timing or amount of advanced warning prior to the onset of tropical storm-force winds. SFWMD operational

procedures are delineated based on time prior to the onset of tropical storm-force winds. The EAPs may supplement these regulations but not supersede them. Section 7.10 details EAPs further.

The USACE District Engineer and both SFWMD and USACE executive levels will be briefed prior to initiating pre-storm operations. This may occur up to 5 days prior to the projected storm's arrival or as soon as the cone of uncertainty issued by the NOAA NHC shows South Florida to likely be in the path of a storm. USACE, South Atlantic Division (SAD) will be notified of operations outside of the WCP that are initiated and/or of emergency deviations that are initiated (see Section 7.11 for deviation procedures).

7.6.1 Herbert Hoover Dike (HHD)

Within 24 hours of an impending hurricane or tropical storm, all HHD structures, spillways, and navigational locks shall be closed for the duration of the storm until such time, after the event passes, that conditions can be assessed. Pump stations will remain operational throughout storms to provide authorized flood risk management to surrounding basins. Structures that allow flow back into the lake via gravity-driven flap gates will be left unbolted and available to pass flood water from adjacent basins into Lake Okeechobee. Some culverts have two sets of vertical-lift gates, one on the lakeside and one on the landside; the lakeside gates are to be closed during storm operations while the landside gates remain operational. Pre-storm inspections should be completed for all flap gates on HHD to ensure that they are operating properly and that they will close automatically if the lake stages rise. The structures may reopen to begin operations again at the permission of the Chief SFOO. If a spillway is needed to be opened while HHD is closed during a storm, the operating agency must first get permission from the USACE, SAJ Water Management Section prior to opening. An example of this was in 2019 in Hurricane Ian when Spillway S-354 was used to gravity flow EAA canals into the lake when a pump station lost its prime under low lake conditions and storm surge. For a listing and map of these structures, see Table 7-7 and Figure 7-9.

If contact with the Chief SFOO is lost, the gates shall remain closed until contact is resumed. All targeted Lake Okeechobee releases shall be discontinued and shall not be resumed until ordered by personnel of the USACE, SAJ Water Management Section.

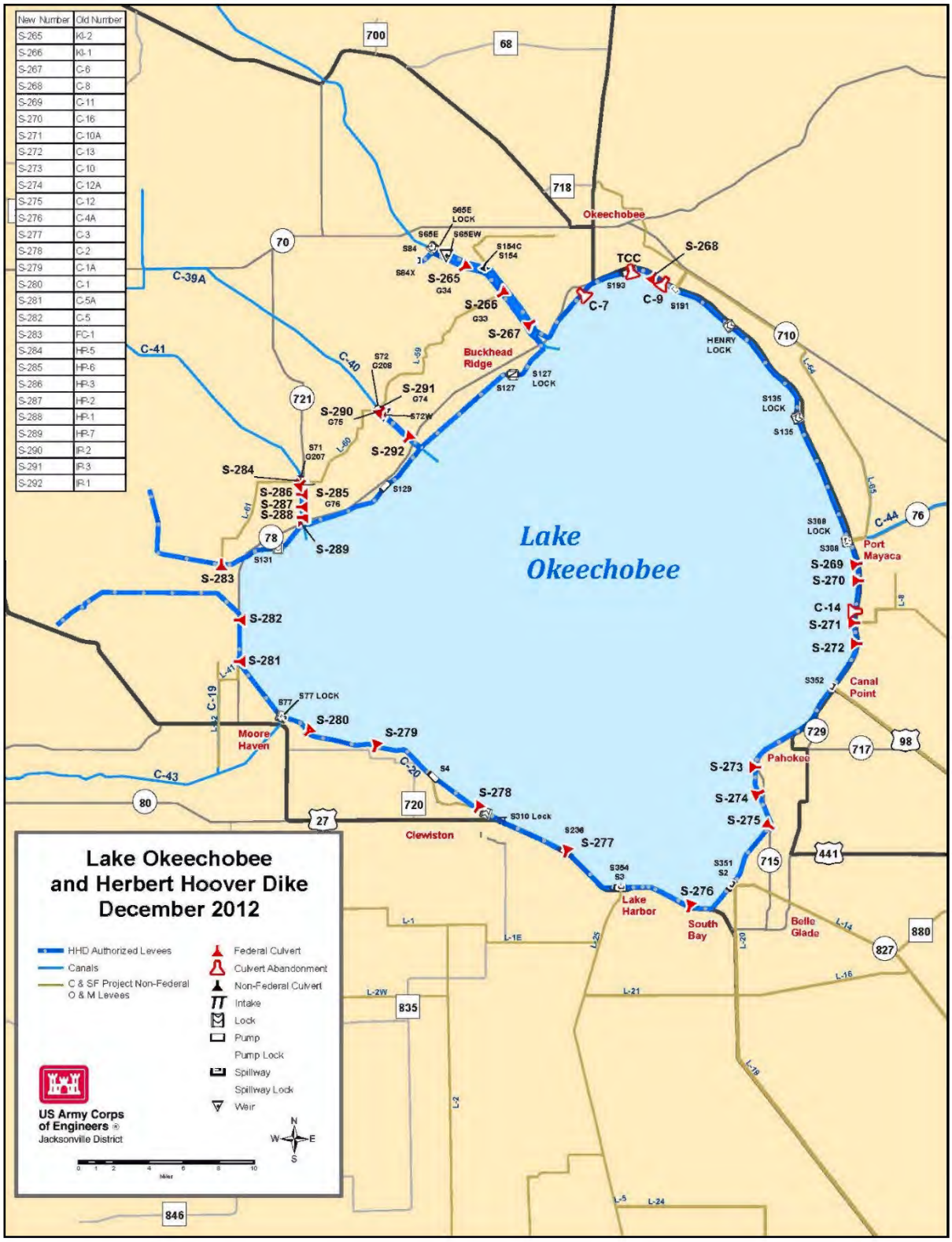


Figure 7-9: HHD Culvert Map

The following pump stations are not used for pre-storm operations; however, SFWMD personnel should man them and pump them as directed by SFWMD Water Managers to maintain appropriate headwater stages during significant rain events:

- S-2
- S-3

SFWMD personnel should man the following pump stations and pump them to maintain the headwater range indicated below when and as directed by SFWMD Water Managers:

- S-4 - 14 to 10 feet
- S-127 - 14 to 13.25 feet (may be lowered to 13 feet)
- S-129 - 13.5 to 12.75 feet (may be lowered to 12.5 feet)
- S-131 - 13.5 to 12.75 feet (may be lowered to 12.5 feet)
- S-133 - 14 to 13.25 feet (may be lowered to 13 feet)
- S-135 - 14 to 13.25 feet (may be lowered to 13 feet)

7.6.2 Okeechobee Waterway (OWW)

The SFOO and USACE, SAJ Water Management Section will specify C-43 and C-44 Canal ranges. The ranges listed below are based on experience and are subject to change based on guidance and local conditions.

Canals may be maintained at the low end of the ranges listed to prepare for large storm tides and rain. Conversely, the canal stage is allowed to rise to the high end of the range during the event to reduce any potential flood impacts downstream. USACE personnel should man these structures and release local runoff as necessary to maintain the indicated headwater elevation ranges during a storm event to the extent possible. These ranges are wider than the normal optimal canal ranges:

- S-78 - 10.4 to 11.5 feet
- S-79 - 2.5 to 2.8 feet
- S-80 - 13.5 to 15.5 feet

S-79 gates may be closed, or the gate opening may be reduced as necessary in the judgment of the lockmaster to reduce the quantity of saltwater intrusion from the higher-than-normal storm tides. The gates will be opened as necessary when the upstream elevation exceeds the downstream elevation until optimum levels can again be maintained. It is not uncommon for large tides and storm surge to overtop the gates at S-79.

7.6.3 EAA and Areas Adjacent Lake Okeechobee

The SFWMD shall ensure S-76 (in the L-8 Canal) is open in advance of a storm and leave it open until the storm has passed.

In the southern portion of the L-8 Canal, the SFWMD operates Structures G-541, S-5AE, S-5AW, and S-5AS in advance of the storm as directed by SFWMD Water Managers.

SFWMD personnel should man the following pump stations and pump them as directed by SFWMD Water Managers to maintain appropriate headwater stages. It should be noted that S-7 and S-8 have non-project divide structures that provide the main control for flood risk management in those canals:

- in the West Palm Beach Canal: S-5A and G-541
- in the Hillsboro Canal: S-6
- in the NNR Canal: S-7, G-370, G-371, G-372, G-434, and G-435
- in the Miami Canal: S-8, G-357, G-372, and G-373

The following structures should be placed in automatic operation, and the SFWMD should check them as soon as possible following the storm:

- S-47D
- S-71
- S-72
- S-84/X
- S-65E/EX1
- S-153
- S-154
- S-191
- S-169W
- S-47B

In preparation for a forecasted hurricane, tropical storm, or large rain event, EAA canals are typically drawn down toward the bottom of their operating ranges in Table 7-5. During storm events, canals may temporarily exceed or drop below those ranges, but it is the operational intent to maintain canals within the operating ranges whenever possible.

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

Section 601(b)(1)(A) of the WRDA 2000 approved CERP as the framework for modifications and operational changes to the C&SF Project. However, this WCP (2024) is not an implementation of CERP. Therefore, the Identification of Water and Reservations or Allocations for the Natural System in Section 601 of WRDA 2000 does not apply to this WCP. Individual CERP projects have evaluated consistency with this requirement; their respective POMs are attached to the SOM.

7.8 Consistency with Savings Clause and State Assurance Provisions

Section 601(b)(1)(A) of the WRDA 2000 approved CERP as the framework for modifications and operational changes to the C&SF Project. However, this WCP (2024) is not an implementation of CERP. Therefore, the Savings Clause in Section 601(h)(5) of WRDA 2000 and state assurances checks do not apply to this WCP. Individual CERP projects have evaluated Savings Clause consistency, and state assurances checks may be found in their respective POMs attached to the SOM.

7.9 Drought Contingency Plans (DCPs)

Regional DCPs describe the 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. Appendix B of this volume of the SOM provides the DCP for Lake Okeechobee and the EAA. This is a broad overview of the relevant state rules and guidelines as the state of Florida maintains the authority to allocate water within the C&SF Project.

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. The SFWMD's Water Shortage Plan is codified in Chapter 40E-21 (Water Shortage Plan) and Chapter 40E-22 (Regional Water Shortage Plan), F.A.C. The SFWMD's Water Shortage 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 serious 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 how 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 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 Emergency Operations Center. The SFWMD Comprehensive Emergency Management Plan follows the framework of the National Incident Management System. The National Incident Management System is a nationwide effort that is federally mandated for local, state, and federal agencies per Homeland Security Presidential Directive 5.

7.10 Flood Emergency Action Plans (EAPs)

Flood EAPs outline operating criteria for projects that require flood damage reduction operations. These 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. USACE regularly updates the HHD Lake Okeechobee Structures EAP, and it includes criteria for S-351, S-352, S-354, S-193, S-310, S-77, S-78, S-79, S-80, and S-308. Also, for hurricane and tropical storm emergency response within USACE, SAJ, refer to the SAJ All-Hazards Plan, dated June 2021. The most up-to-date EAPs should be consulted for related emergency preparation and actions. Local emergency management offices should be notified as necessary.

7.11 Deviation from Normal Regulation

Deviations from the WCP are occasionally needed to avoid or reduce negative impacts related to water management operations and to respond to conditions not anticipated during WCP development. Deviations are temporary variations from the WCP based on engineering judgment, engineering experience, and prevailing circumstances, and they require USACE, SAD approval. Any deviations must follow ER 1110-2-240, Water Control Management, 30 May 2016, be consistent with the project authorization, and be within existing authorities.

USACE, SAJ, the NFS, the STOF, and other agencies can request deviations from normal operating criteria. The USACE, SAJ Water Management Section is responsible for evaluating the deviation requests and transmitting them through the District Commander to the Division Commander (USACE, SAD) for final decision. Deviation requests usually fall into the categories of emergencies, unplanned minor deviations, or planned deviations. WCP deviations shall consider USACE Environmental Principles, in accordance with authorization and approved purposes, and comply with the National Environmental Policy Act (NEPA), the Endangered Species Act (ESA), and related laws and regulations.

7.11.1 Emergencies

Examples of emergencies that may result in a need to deviate from normal operating criteria include drowning and other accidents, a 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, SAJ must be informed of the problem and the emergency operating changes as soon as practicable. The operating agency will furnish a written confirmation showing the deviation and conditions to USACE, SAJ after the incident. USACE, SAJ will communicate conditions with USACE, SAD. In addition, USACE will inform the SFWMD, the FDEP, the STOF, and any other agencies or stakeholders as appropriate for the circumstance. Necessary actions under emergency conditions may be initiated by the District Commander. Requests for and approval of emergency deviations may be transmitted by telephone or electronic media. A follow-up evaluation, including all the requirements for planned deviations, shall be documented and furnished to the Division Commander as soon as practicable.

7.11.2 Unplanned Minor Deviations

Unplanned instances create a temporary need for minor deviations from the normal operating criteria, yet they are not considered emergencies. Construction and research/science activity account for the major portion of these deviations. Examples of activities that may require short-term deviations include construction of utility stream or canal crossings, bridgework, major construction contracts, and science and research activities within the basins. 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 conditions in the area, and possible alternative measures. 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 email. The operating agency will furnish written confirmation explaining the deviation and its need to the USACE, SAJ Water Management Section. USACE, SAJ will communicate with USACE, SAD. In addition, USACE will inform the SFWMD, the FDEP, the STOF, and any other agencies or stakeholders as appropriate for the circumstance.

7.11.3 Planned Deviations

Each circumstance of a planned deviation should be analyzed on its own merits in the request. The requesting agency can be either USACE, the NFS, or another government or agency, but each request should contain the following information:

1. A description of the proposed deviation including purpose, proposed change from the approved WCP, duration, and other details about the deviation.
2. The outcomes of adhering to the WCP and of employing the proposed deviation.
3. Alternative deviation plans to include the application of risk and uncertainty in the analysis and the consequences of each.
4. Effects of the proposed deviation on project and system operation and on other project purposes such as flood control, hydropower, water quality, water supply, navigation, recreation, or fish and wildlife.
5. A review of the Potential Failure Mode Analysis for the dam and an analysis of the effect of the deviation on the probability of failure and on consequences associated with the deviation.
6. The potential flood threat with and without the proposed deviation.
7. Current and predicted maximum storage, elevation, river stage, and other pertinent information with and without the proposed deviation.
8. A review of the alternatives under provisions of pertinent laws and regulations including, but not limited to, NEPA and ESA when applicable.
9. A description of the coordination that has been done with affected entities, both USACE and non-USACE, and the effect on other local, regional, state, tribal, and federal agencies.
10. Written comments from agencies, organizations, businesses, and individuals who may be impacted by, or supportive of, the proposed change in flows including federal, state, and local agencies; tribes; industries, organizations, and other stakeholders; and the public.
11. A discussion of any other relevant issues.
12. District Commander, or designee, recommendation.

USACE, SAJ will analyze each proposed deviation and will request approval from USACE, SAD. In addition, USACE will inform the SFWMD, the FDEP, the STOF, and any other agencies or stakeholders as appropriate for the circumstance.

7.12 Rate of Release Change

Control structures should be opened and closed gradually. This provides an even transition to the new flow regime and minimizes the hydraulic effects downstream. Special

attention should be given to the MAGO curve for each structure to ensure that the tailwater has a chance to build up before large-scale openings are made. Appendix A of this volume of the SOM provides MAGO curves for gated structures within the basin.

7.12.1 St. Lucie Canal (C-44)

Because of its length and size, rapid changes in flows in C-44 can result in large waves traveling back and forth over the length of the canal. Gate changes should be made slowly to avoid excessive instantaneous peak flows that can exacerbate bank stability issues in the canal and contribute to erosion. Find further details about gate operations at S-80 in Appendix E of this volume of the SOM.

7.13 Seepage Control

Seepage into the canals can reduce the conveyance capacity, but the normal operations specified in Section 7.5 consider seepage control. While rehabilitation of HHD should drastically reduce the seepage of water through the dike, it is still expected to be present in small quantities.

7.14 Atypical Operations for Reservoir, Storage, and Treatment Area Performance

This WCP does not prescribe any atypical operations for reservoir, storage, or treatment areas. The SFWMD maintains operating plans for all state STAs, FEBs, and dispersed water management storage projects. Atypical operations for any CERP projects will be evaluated in their respective POMs attached to the SOM.

7.15 Aquifer Storage and Recovery System Plan

The Kissimmee River Aquifer Storage and Recovery system is near the confluence of the C-38 Canal/Kissimmee River and Lake Okeechobee west of the town of Okeechobee. When operational, this facility had a recharge and recovery capacity of 5 million gallons per day. The aquifer storage and recovery system is currently non-operational pending infrastructure upgrades that are the responsibility of the NFS.

7.16 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 CERP 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 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 CERP, which includes a monitoring component to address biological, hydrological, and water-quality parameters. In accordance with the programmatic regulations for CERP, RECOVER is required to prepare a technical report, at least once every 5 years, that presents an assessment of whether CERP goals and purposes 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 CERP performance.

Although the LOSOM project is not part of CERP, as CERP projects come online, they will include their own Adaptive Management Plans to establish tools to help address such remaining uncertainties. Individual CERP projects may have Adaptive Management Plans, and the associated operational guidance may be found in their respective POMs attached to the SOM.

Implementation of adaptive management measures that require WCP revisions and all updates shall consider USACE Environmental Principles, in accordance with authorization and approved purposes, and shall comply with NEPA, ESA, related laws and regulations, and SAD approval. An analysis and documentation of the lessons learned should follow the use of any adaptive management strategy.

7.17 References

COP. 2020. Final Environmental Impact Statement Combined Operating Plan Appendix A: Water Control Plan. Approved August 2020. U.S. Army Corps of Engineers, Jacksonville, FL.

Hanlon, C, and A. Jordan. Influence of habitat, storm events, and other factors on largemouth bass abundance in Lake Okeechobee, FL. Unpublished; in review.

RECOVER. 2020a. RECOVER Lake Okeechobee Performance Measure: Lake Stage Documentation Sheet. Approved March 4, 2020. U.S. Army Corps of Engineers, Jacksonville, FL, South Florida Water Management District, Florida Fish and Wildlife Conservation Commission, U.S. Fish and Wildlife Service, and Audubon of Florida.

RECOVER. 2020b. RECOVER Northern Estuaries Performance Measure: Salinity Envelope Documentation Sheet. Approved July 7, 2020. U.S. Army Corps of Engineers, Jacksonville, FL, South Florida Water Management District, Florida Fish and Wildlife Conservation Commission, U.S. Fish and Wildlife Service, and Audubon of Florida.

Tables

Table 7-3: Okeechobee Waterway Optimum Canal Elevations

Structure	Headwater Canal or Water Body	Optimum Water Control Elevation (feet NGVD29)
S-77	Lake Okeechobee	N/A
S-78	Canal 43	10.6–11.5[1]
S-79	Canal 43	2.8–3.2
S-308	Lake Okeechobee	N/A
S-80	Canal 44	14–14.5[1]

Note 1: Same as Lake Okeechobee when lake levels are below bottom of range.

Table 7-4: HHD Culvert Operating Ranges

Structure	Canal on Landside of HHD	Canal Operating Range (feet NGVD29)
S-265	Old Kissimmee River	16.5–18
S-266	L-59	16.5–18
S-267	LD-4	13–14
S-268	LD-4	13–14
S-269	C-11 Ditch	12–13
S-270	C-16 Ditch	12–13
S-271	L-8/Canal Point	12–15[1]
S-272	S-272 Canal Pelican Lake WCD Main Canal	13.5
S-273	Pelican Island Canal	16.5
S-274	S-274 Inflow Canal	Note 1
S-275	S-275 Inflow Canal	16.5
S-276	South Shore Drainage District Canal 3	16.5
S-277	South Florida Conservancy District Canal 2	8
S-278	C-21/Industrial Canal	13.7–15.6[1]
S-279	LD-1/Disston Island Conservancy District Canal 1	10–14
S-280	LD-1/LD-3/Disston Island Conservancy District Canal 1	10–14
S-281	L-41	13.5–15.4
S-282	Nicodemus Slough	12.5–16
S-283	L-50/L-61	13–13.5
S-284	L-61	17.3–19
S-285	L-60	16–17.5
S-286	C-41	13.6–15.6
S-287	C-41	13.6–15.6
S-288	C-41	9.6–16.8
S-289	L-49 Toe Drain	13–13.5
S-290	L-60	16.7–18.5
S-291	L-59	16.5–19
S-292	C-40	13.3–17.8

Note 1: Same as Lake Okeechobee when lake levels are below bottom of range.

Table 7-5: EAA and Lake Okeechobee Area Canal Operating Ranges

Structure	Canal or Water Body	Canal Operating Range (feet NGVD29)
S-2	Hillsboro/N. New River	10–13
S-3	Miami Canal	10–13
S-4	Canal 20	9.5–14
S-5A	West Palm Beach Canal	9–13[3]
S-5AE	Levee and Canal 8	12–18
S-5AW	Levee and Canal 9	9–13
S-5AS	Levee and Canal 10	12–18
S-6	Hillsboro Canal	8–13[3]
S-7	L-5 Canal/STA 3/4 Discharge Canal	8.7–12.5[3]
S-8	L-5 Canal/STA 3/4 Discharge Canal	9–12.5[3]
S-47D	Canal 19	12–13
S-47B	Canal 19	13–15.4[3]
S-65E/EX1	Canal 38 (Kissimmee River)	Note 1
S-71	Canal 41	Note 1
S-72	Canal 40	Note 1
S-76	Levee and Canal 8	12–15[2]
S-84	Canal 41A	Note 1
S-127	L-48 Borrow Canal	13.25–14
S-129	L-49 Borrow Canal	12.75–13.5
S-131	L-50 Borrow Canal	12.75–13.5
S-133	L-D4 Borrow Canal	13.25–14
S-135	L-47 Borrow Canal	13.25–14
S-153	L-65 Borrow Canal	18.6–19.1
S-154	L-62 Borrow Canal	21.8–23.8
S-169W	Industrial Canal	13.7–15.6[2]
S-191	Canal 59 and L-63(N) and L-63(S) Borrow Canals	18–19.7
S-192	Taylor Creek	18–19.7
S-235	L-D1 and L-D3 Connecting Canal	10–14
S-236	South Florida Conservancy District Canal 2	12.5–13.5

Note 1: See SOM Volume 2 - Kissimmee River-Lake Istokpoga Basin.
Note 2: Same as Lake Okeechobee when lake levels are below bottom of range.
Note 3: Divide structure upstream.

Table 7-6: Authorized Navigation Depths and Datum for Okeechobee Waterway

Channel Segment	Project Depth (feet)	Project Datum (feet NGVD29)
Gulf of Mexico to Tice	10	-0.88
Tice to Ortona Lock (S-78)	8	-0.88
Ortona Lock (S-78) to Julian Keen Jr. Lock (S-77)	8	10.06
Lake Okeechobee		12.56
Lake Okeechobee – Julian Keen Jr. Lock (S-77) to Clewiston	8	12.56
Lake Okeechobee – Clewiston to Port Mayaca Lock (S-308) across lake route (Route 1)	8	12.56
Lake Okeechobee – Clewiston to Port Mayaca Lock (S-308) south shore route (Route 2)	6	12.56
Lake Okeechobee – Taylor Creek channel	6	12.56
Port Mayaca Lock (S-308) to St. Lucie Lock (S-80)	8	12.56
St. Lucie Lock (S-80) to Intracoastal Waterway	8	-0.10

Table 7-7: HHD Structures Closed for Storm Operations

Structure	Responsible Agency
G-36[1]	SFWMD*
S-77[1]	USACE
S-135[1]	SFWMD*
S-193[1]	SFWMD*
S-265[3]	USACE
S-266[3]	USACE
S-267[2]	USACE
S-268[2]	USACE
S-269[2]	USACE
S-270[2]	USACE
S-271[2]	USACE
S-272[2]	USACE
S-273[3]	USACE
S-274[3]	USACE
S-275[2]	USACE
S-276[2]	USACE
S-277[2]	USACE
S-278[2]	USACE
S-279[2]	USACE
S-280[2]	USACE
S-281[2]	USACE
S-282[3]	USACE
S-283[2]	USACE
S-284[3]	USACE
S-285[3]	USACE
S-286[2]	USACE
S-287[2]	USACE
S-288[3]	USACE
S-289[2]	USACE
S-290[3]	USACE
S-291[3]	USACE
S-292[2]	USACE
S-308[1]	USACE
S-310[1]	SFWMD*
S-351	SFWMD*
S-352	SFWMD*
S-354	SFWMD*

* USACE will close if the SFWMD cannot

[1]Includes navigational lock.

[2]Lakeside gates will be closed with the flap gates operational allowing flow into the lake during storm events.

[3]Lakeside gates will be closed with the flap gates operational. The land side weirs/gates will be operated/set as needed by the SFWMD to provide flood releases during the event.

Table 7-8: Lake Okeechobee Elevation Storage Relationship 2012

Elevation	Storage Volume	Elevation	Storage Volume	Elevation	Storage Volume
ft NGVD29	(acre-feet)	feet NGVD29	(acre-feet)	feet NGVD29	(acre-feet)
8	1,329,506	12.1	2,629,458	16.2	4,285,506
8.1	1,356,107	12.2	2,666,063	16.3	4,329,412
8.2	1,382,985	12.3	2,702,878	16.4	4,373,463
8.3	1,410,137	12.4	2,739,901	16.5	4,417,656
8.4	1,437,563	12.5	2,777,132	16.6	4,461,990
8.5	1,465,259	12.6	2,814,567	16.7	4,506,464
8.6	1,493,225	12.7	2,852,207	16.8	4,551,076
8.7	1,521,460	12.8	2,890,049	16.9	4,595,825
8.8	1,549,960	12.9	2,928,092	17	4,640,708
8.9	1,578,726	13	2,966,333	17.1	4,685,724
9	1,607,755	13.1	3,004,772	17.2	4,730,871
9.1	1,637,045	13.2	3,043,407	17.3	4,776,149
9.2	1,666,596	13.3	3,082,235	17.4	4,821,554
9.3	1,696,405	13.4	3,121,257	17.5	4,867,087
9.4	1,726,471	13.5	3,160,469	17.6	4,912,744
9.5	1,756,792	13.6	3,199,871	17.7	4,958,525
9.6	1,787,366	13.7	3,239,460	17.8	5,004,428
9.7	1,818,193	13.8	3,279,235	17.9	5,050,450
9.8	1,849,270	13.9	3,319,195	18	5,096,592
9.9	1,880,596	14	3,359,338	18.1	5,142,851
10	1,912,169	14.1	3,399,662	18.2	5,189,225
10.1	1,943,988	14.2	3,440,166	18.3	5,235,712
10.2	1,976,050	14.3	3,480,848	18.4	5,282,312
10.3	2,008,355	14.4	3,521,707	18.5	5,329,023
10.4	2,040,901	14.5	3,562,740	18.6	5,375,843
10.5	2,073,686	14.6	3,603,947	18.7	5,422,770
10.6	2,106,708	14.7	3,645,325	18.8	5,469,802
10.7	2,139,967	14.8	3,686,873	18.9	5,516,939
10.8	2,173,459	14.9	3,728,590	19	5,564,179
10.9	2,207,185	15	3,770,474	19.1	5,611,519
11	2,241,141	15.1	3,812,523	19.2	5,658,959
11.1	2,275,328	15.2	3,854,735	19.3	5,706,497
11.2	2,309,742	15.3	3,897,110	19.4	5,754,130
11.3	2,344,382	15.4	3,939,644	19.5	5,801,858
11.4	2,379,247	15.5	3,982,338	19.6	5,849,680
11.5	2,414,335	15.6	4,025,189	19.7	5,897,592

Elevation	Storage Volume	Elevation	Storage Volume	Elevation	Storage Volume
ft NGVD29	(acre-feet)	feet NGVD29	(acre-feet)	feet NGVD29	(acre-feet)
11.6	2,449,644	15.7	4,068,196	19.8	5,945,594
11.7	2,485,174	15.8	4,111,356	19.9	5,993,684
11.8	2,520,921	15.9	4,154,669	20	6,041,861
11.9	2,556,886	16	4,198,133		
12	2,593,065	16.1	4,241,745		