Lee County
Southwest Florida
BOARD OF COUNTY COMMISSIONERS

John Manning
District One

Cecil L Pendergrass
District Two

Larry Kiker
District Three

Brian Hamman
District Four

Frank Mann
District Five

Roger Desjarlais
County Manager

Richard Wm. Wesch
County Attorney

Donna Marie Collins
Hearing Examiner

April 12, 2019

Dr. Ann Hodgson, U.S. Army Corps of Engineers
Jacksonville District
P.O. Box 4970
Jacksonville, FL 32232-0019

Comments submitted via: *LakeOComments@usace.army.mil*

Dear Dr. Hodgson:

Lee County (the County) is an 804-square-mile metropolitan area of over 700,000 residents located along the Gulf Coast of Southwest Florida. Known for its 50 miles of white sand beaches on the Gulf of Mexico, The County receives approximately 5 million visitors a year that generate approximately $3 billion in economic impacts.

The Caloosahatchee River is the only flood-control outlet leading west from Lake Okeechobee, a portion of the Okeechobee Waterway, and combined with the St. Lucie Canal, part of the only navigable passage between the Gulf of Mexico and the Atlantic Ocean. The River extends approximately 70 miles from Lake Okeechobee, through the Caloosahatchee Estuary, to the lower Charlotte Harbor Basin at San Carlos Bay. The Caloosahatchee River passes through parts of Glades, Hendry, and Lee counties.

The County, containing the Caloosahatchee River and Estuary (CRE), suffers from too much water in the wet season and too little water in the dry season largely due to regional water management practices by the SFWMD and U.S. Army Corps of Engineers (Corps) in fulfillment of multiple agency objectives and state and federal obligations. The CRE is a major recipient of extraordinarily harmful high releases of water from Lake Okeechobee discharges. Yet often during the dry season, there are times when even minimal flows required for the CRE cannot be achieved. Both the River and Estuary play a critical role in the quality of life and tourist-based economy of the County. Consequently, the County has devoted considerable time and resources working with the Corps and South Florida Water Management District (SFWMD) to address the health and sustainability of the CRE.

This correspondence provides National Environmental Policy Act (NEPA) scoping input on the development of the new Lake Okeechobee System Operating Manual (LOSOM) pursuant to Section 1106 of Water Resources Development Act (WRDA) of 2018, and an overview of the critical elements important for the CRE. Attachment "A" provides a more detailed synopsis of the resources within the CRE ecosystem, the needs of the Caloosahatchee, an overview of the interrelationship between ecological and water resources impacted, and important considerations for the LOSOM. Attachment "B" provides a summary of applicable State and Federal authorities that should be considered in conjunction with this NEPA process as they pertain to the CRE.

The Impacts from High and Low Lake Okeechobee Discharges on the CRE.

The ecological health of the CRE depends on the proper salinity occurring at the right time and place. During the wet season freshwater inflows are often too high, resulting in salinities that are too low throughout much of the Estuary. During the dry season inflows are often too low resulting in salinities that are too high, particularly in upstream areas. Previous Lake management has not provided the operational flexibility needed to achieve an optimal distribution of flows for a healthy and restored estuary.

P.O. Box 398, Fort Myers, Florida 33902-0398 (239) 533-2111
Internet address http://www.leegov.com
AN EQUAL OPPORTUNITY AFFIRMATIVE ACTION EMPLOYER

- The lack of flow when the CRE needs freshwater results in sustained high salinities which can cause significant adverse impacts to habitat and species dependent on a healthy CRE. Lack of freshwater supply can also negatively impact the operations of County water supply infrastructure. High salinity levels:
    - Adversely impact endangered, threatened or listed species and the habitat on which they depend (including, but not limited to, tape grass)
    - Adversely impact the nursery function of the estuary that is critical for the survival of early life stages of commercially and recreationally important fish and shell fish species.
    - Impede meeting the minimum flow and level (MFL) that prevents significant harm to the CRE
    - Complicate the Olga Water Treatment Plant operations
- High volume discharges from Lake Okeechobee also upset the salinity balance in the CRE causing harm sending too much freshwater at the wrong time. High freshwater discharges can:
    - Kill or damage critical habitat such as seagrass beds and oyster reefs
    - Inhibit or preclude reproduction, survival and/or utilization of nursery areas by estuarine-dependent species.
    - Fuel algal blooms that threaten habitat, species and human health

The Scope of LOSOM. The regulation of Lake Okeechobee water levels is performed by the Corps, in consultation with the SFWMD. Lake Okeechobee is managed as part of the Central and Southern Florida (C&SF) Project. In conjunction with the development of LOSOM, new environmental and capital infrastructure is contemplated to be completed including:

- Herbert Hoover Dike (HHD) rehabilitation,
- Kissimmee River Restoration Project,
- Comprehensive Everglades Restoration Plan (CERP) C-43 West Basin Storage Reservoir, and
- C-44 Reservoir and Stormwater Treatment Area.

The concept of "shared adversity" has historically balanced the interests of existing legal users of water, including agricultural irrigation and urban water supply, with other authorized project purposes such as flood control and navigation. Moving forward, the LOSOM must improve on balancing those needs with the needs of the natural ecosystems including the Lake ecology itself, the Everglades and ***downstream receiving waters (all estuaries)***.

Improvements Needed from Previous Lake Management Schedules. Optimal water levels in the Lake (LORS 12.5 to 15.5 feet) should be reevaluated to determine if there are opportunities for improved management of discharges to the estuaries. While the Lake Okeechobee Regulation Schedule (LORS) 2008 was an improvement over the previous Water Supply and Environment (WSE) regulation schedule, it too contained several inequities that must be addressed in the LOSOM.

The management of the Lake must avoid the practice of holding water levels artificially high right up until the rainy season and then discharging to the estuaries. The schedule should allow for more of the water to be discharged during the dry season for the ecological health of the CRE, rather than holding it and compounding the impacts of watershed runoff during wet periods. We support situational flexibility as a fundamental principle in LOSOM.

New Factors to Consider. Since the time in which LORS 2008 has been implemented, new updated data and additional policy dictates that several new factors should be considered regarding the CRE including:

- The existing condition utilized in LORS 2008 was the 2007 water year. While we understand there may be limitations in the years for the period of record due to the models used, the period of record should be the longest period for which full data sets are available: 1965 to 2015 or more recent if available. This period needs to also capture performance during extremely wet and extremely dry years, both we will see more of as a consequence of future climate change. The most recent land use data should also be considered. Two possible "No Action" Alternatives should include the (a) current schedule with none of the new infrastructure and (b) the current schedule with the new infrastructure. "New infrastructure" refers to project listed above under "Scope of LOSOM".
- Rule 40E-8.221, F.A.C. (the MFL for the Caloosahatchee) was updated in 2018 and must be considered in the LOSOM process. It should be noted that while the MFL is a legally defined quantity, MFLs identify the point at which further withdrawals would cause significant harm to the water resources, or ecology, of the area as applicable, pursuant to Sections 373.042 and 373.0421, F.S. Significant data and studies were conducted from 2001 (original MFL Rule adoption) to 2018 when the new MFL was ultimately adopted. The new MFL for the Caloosahatchee is a mean monthly flow of 400 cfs at S-79. An exceedance occurs when the 30-day moving average flow at S-79 is below 400 cfs and the 30-day moving average salinity at the Ft. Myers monitoring station exceeds 10 psu. The Project Implementation Report (PIR) for the C-43 West Basin Reservoir shows that the reservoir ***contributes*** to restoration of the Caloosahatchee Estuary but does not achieve full restoration in and of itself. The reservoir significantly reduces low flows to the Caloosahatchee during the dry season, but has a much smaller effect on high flows during the wet season. The high flow problem is addressed by other CERP components which allow diversion of Lake water during the wet season. To be clear, MFLs are not a restoration target. Compliance with the current MFL is but one critical target to consider. The revised LOSOM should aim to supplement water supplies to the CRE to achieve a restoration target, not simply meet the MFL.
- The SFWMD developed a Water Reservation Rule for the Caloosahatchee that identifies and reserves from consumptive use all water contained within and released via operation of the Caloosahatchee River (C□43) West Basin Storage Reservoir. The water reservation was adopted by the Governing Board on May 15, 2014, and it became effective on July 16, 2014 (Rule 40E□10.041, F.A.C.). In the PIR for the C-43 West Basin Reservoir, the water identified to be reserved for the C-43 Reservoir contributes to, but does not achieve full restoration of, the CRE. Again, LOSOM should supplement water supplies to achieve a ***restoration target***.
- The Corps must consider water quality in the LOSOM process. While we understand that the LOSOM is operational in nature, given the inordinate impact of those operations related to algal blooms, salinity, the water quality of the Lake itself, and the relationship between volumes of water in the basin and discharges linked to meeting total maximum daily loads (TMDLs), we strongly believe that a water quality analysis (including nutrient loading) is necessary. The analysis should also address increased nutrient loading from the C-43 Reservoir during the dry season.

- Optimal flow distribution for the Caloosahatchee estuary. The distribution of flows within certain ranges was assessed in LORS. These ranges were (1) too course to capture anything but very large differences between alternatives and (2) had only a qualitative target "fewer high flows and fewer low flows are better". Given that an optimal distribution of flows is the restoration goal, the performance of LOSOM should be judged against this goal. The EST05 flow distribution, outlined here, is the optimal ecological flow target at S-79 used in the PIR for the C-43 West Basin Reservoir. We recommend that EST05 or a similarly well-justified ecological flow distribution be used to evaluate the performance of LOSOM as utilized in the PIR for the C-43 West Basin Reservoir.

EST05	
Flow Range	Percent of Mean Monthly Flows
0 to 450	0%
450 to 500	42.8%
500 to 800	31.7%
800 to1500	19.2%
1500 to 2800	5.6%
2800 to 4500	0.7%
>4500	0%

- Sea level rise impacts in the CRE present a new dynamic for understanding future conditions. As seas rise, the impact on the Estuary becomes more pronounced introducing higher salinities further upstream into the ecosystem. Corps Guidance (outlined in Attachment B) requires such analysis for incorporating the direct and indirect physical effects of projected future sea level change "across a project life cycle in managing, planning, engineering, designing, constructing, operating, and maintaining USACE projects and systems of projects." This should be applied to LOSOM.
- The Hydrologic Target for the Caloosahatchee Estuary should be an ecologically-based distribution of mean monthly flows measured at S-79 that has been optimized for a healthy estuarine ecosystem (e.g. EST05 mentioned earlier). In evaluating performance, time of year should be considered. For example, supplemental flows at the S-79 Structure during the dry season would help alleviate tape grass mortality due to salinity intrusion. High discharges during the March-June peak nursery months should be avoided.
- Salinity Targets should also be ecologically-based. Salinities at different locations in the estuary can be derived from regression algorithms or hydrodynamic models. Four locations are recommended to provide an adequate representation of ecological health (Ft Myers Yacht Basin, Cape Coral Bridge, Shell Point, Sanibel Causeway). Salinity envelopes, currently used for weekly ecological assessments conducted by the SFWMD for weekly environmental operations meetings, are recommended for initial use. For example, a salinity envelope of 10 – 30 practical salinity units (PSU), based on optimal salinity for oysters is currently employed at the Cape Coral Bridge. This could be refined to include thresholds for successful reproduction and mortality. Evaluation of performance should also address cumulative impacts (i.e. consecutive days or periods that might have consequences; low salinity might be survivable for a single event, but multiple events within a certain time period might be harmful).
- Resourced Based Performance- Output from the 2x2 or regional system model (RSM) can be used to drive numeric simulation models of oyster and seagrass populations (See Buzzelli et al. 2015). The advantage that these models have over other performance measures is that they: 1) quantify the response of the primary indicators of estuarine health that are both targeted for restoration and 2) have a memory and, unlike the other performance measures, can reflect cumulative effects over seasons and years.

Recommendations and Comments on LOSOM and the Process.
We therefore respectfully request the following:

1. The Corps include these comments and parameters as conditions that must be factored into the NEPA LOSOM process;
2. The Corps convene technically focused workshop[s] to allow full unconstrained discussion regarding the modeling inputs and parameters to be used in the LOSOM process based on science and an unbiased evaluation of LOSOM alternatives;
3. ***Flows to the Caloosahatchee should always be measured at the Franklin Lock (S-79)***. Hydrologic performance should be assessed through comparison with the ecologically based flow distribution, EST05.
4. The salinity gradient in the Caloosahatchee Estuary should be evaluated using ecologically based salinity envelopes at Ft. Myers (0-10 psu), Cape Coral Bridge (10 -30 psu), Shell Point (10-30 psu) and the Sanibel Causeway (10-30 psu). Days inside and outside this envelope would be appropriate performance measures. The Corps should consider refining these envelopes to include thresholds associated with reproductive failure and mortality of indicator organisms (e.g. Oysters).
5. Evaluate performance of oyster and seagrass populations.
6. Address cumulative impacts such as consecutive days or periods that might have consequences; low salinity for a single event and salinity from multiple events within a certain time period that might be harmful.
7. Address water quality impacts including, but not limited to, increased dry season nutrient loads from the C-43 Reservoir, algal blooms, salinity, the water quality of the Lake itself and the relationship between volumes of water in the basin and discharges linked to meeting total maximum daily loads (TMDLs).
8. Attachment B "Table of Authorities" should be considered as constraints or parameters in the planning process.[1]

Sincerely,

Roland Ottolini, P.E., Director
Lee County Division of Natural Resources
ROttolini@leegov.com

C: Lee County Commissioners
Roger Desjarlais, County Manager
David Harner, Deputy County Manager
Richard Wm. Wesch, County Attorney

[1] Note that constraints are structural, meteorologic, environmental, and hydrologic conditions that restrict, prevent and/or result in water management operations. These constraints may become interrelated and typically evolve under specific circumstances such as, but not limited to, physical, legal, political, social and major conflicts between authorized project purposes (i.e. flood control, water supply, environment, navigation and recreation).

Attachment "A"

Lake Okeechobee is a central component of the C&SF Project and an interconnected regional aquatic ecosystem. The Lake has multiple functions, including flood control, agricultural and urban water supply, fulfilling Seminole Tribe water rights, navigation, recreation and tourism activities, and fish and wildlife preservation and enhancement. Operation of the Lake affects a wide range of environmental and economic issues. Lake operations must carefully consider the entire and sometimes conflicting needs of the C&SF Project.

Because the C&SF Project is a federal project, water discharges from the Lake through Corps operated structures and all discharges to the east and west are the decision of that agency and other considerations. These include Corps operational authorizations for the HHD, navigation, and periodic constraints such as scheduled and emergency structure maintenance.

1. Lake Okeechobee Regulation Schedules

Since the early part of the 1900s and until the middle of 2000, the Lake was operated using a variety of calendar-based regulation schedules. During the 1990s, the SFWMD and the Corps conducted a study to develop and implement a more comprehensive regulation schedule. Schedules have continued to evolve since that time.

The WSE decision tree included ranges of release rates for managing or regulating Lake stage. In 2002, the SFWMD, working with a group of stakeholders, developed the first adaptive protocols document (SFWMD et al. 2003) to help guide release recommendations where flexibility existed in the schedule. The Adaptive Protocols were predicated on looking for improvements within the Lake and downstream water resources, without negatively impacting any of the C&SF Project purposes.

During 2003 through 2005, Lake Okeechobee experienced consecutive very wet summers, where the existing schedule and water control plan constrained water management, providing minimal flexibility to adapt to real-time circumstances. In order to improve Lake operations under the unusually wet conditions, a series of operational schedule deviations were approved and implemented by the Corps. As with every previous Lake schedule, high water levels caused adverse effects to the Lake's ecosystem, and required freshwater releases for flood control harmful to the Caloosahatchee and St. Lucie Estuaries.

In 2005, the Corps proposed to lower Lake levels and begin development of a new regulation schedule through the preparation of an environmental impact statement. During this process, the high risk of structural failure of the HHD was identified by the Corps and SFWMD. In October 12, 2005, the SFWMD Governing Board unanimously passed Resolution Number 2005-1029, to request the Corps, on an expedited basis, take the necessary actions to modify the Lake Okeechobee water control plan for the purpose of achieving a more refined balance between the competing needs of the Lake ecosystem, estuarine ecosystems, the greater Everglades ecosystem, flood control, recreation and water supply; and routinely operate the Lake at lower levels while addressing the multi-purpose objectives of the Lake. After the SFWMD independent report of the technical inspection of the HHD was released in April 2006, the Corps immediately received a letter of concern from the Governor of Florida regarding the potential failure of the dike and recommended the Corps consider pursuing a regulation schedule to maintain Lake Okeechobee at lower levels through the hurricane season.

The newly recognized danger to public health and safety resulted in an expedited study schedule with the priority of preventing high risk, high Lake stages. 2008 LORS is considered an interim schedule because its

primary purpose is to regulate high Lake levels while repairs to the dike are completed. Until the HHD repairs are complete, the Lake would be operated approximately one foot lower than the previous schedule and managing the limited supply during dry periods for multi-use purposes. 2008 LORS is implemented by the Corps through their C&SF Project Water Control Plan for Lake Okeechobee and Everglades Agricultural Area (Water Control Plan), including Parts A-D (Corps 2008).

The final supplemental environmental impact statement (Corps 2007) for 2008 LORS made it clear that the issue of public health and safety regarding the integrity of the HHD was the dominant factor in the decision-making process to select a preferred alternative regulation schedule. The Adaptive Protocols for Lake Okeechobee Operations describes how the SFWMD staff and Governing Board make recommendations to the Corps concerning 2008 LORS and the Water Control Plan (Corps 2008) provisions while considering the SFWMD's multiple statutory objectives and responsibilities outlined in Chapter 373, F.S. The Adaptive Protocols were used when the Lake stage was in the Low, Baseflow and Beneficial Use sub-bands to provide guidance to water managers for discretionary releases for ecosystem benefits or to improve conditions related to the C&SF Project purposes.

With the completion of the HHD rehabilitation, the Kissimmee River Restoration Project, the Comprehensive Everglades Restoration Plan (CERP) C-43 West Basin Storage Reservoir, and C-44 Reservoir and Stormwater Treatment Area projects, LOSOM will provide even more opportunity to improve on Lake Okeechobee operations that are so closely linked with the health of the CRE.

The following Table represents the history of Lake Okeechobee schedules and their corresponding impacts.

History of Lake Okeechobee Management

Period (Years)	Lake Level (NGVD)	Conditions	Estuary Impacts
1951-1978	< 15.5 feet	This level is approximately the same as the highest ground elevations within the HHD and water levels of 15.5 feet flood virtually the entire marsh. During dry seasons, drawdowns occurred regularly in the marsh. The lowest level was 10.14 feet in 1956.	Plant diversity and health were relatively strong: productive fisheries and abundant wading birds, wintering water fowl, and Everglade Snail Kite were reported. Lake Okeechobee flows cannot be said to have impacted the estuary more than natural freshwater flows and seasonal differences. Generally, there were both gains and losses in species and total numbers with high and low freshwater discharge into the estuary during this period. Invertebrate populations declined during periods of high discharge. However, the release of water from Lake Okeechobee caused changes in salinity, oxygen content, hydrogen ion concentration and turbidity of estuary waters. These conditions were severe enough to cause temporary movements of marine life from the lower river, the southern part of Matlacha Pass, and sections of San Carlos Bay, adversely impacting the sports fisheries there. Red Tide outbreaks occurred.
1978-1992	15.5 - 18.5 feet	These water levels never allowed the marsh to dry. Between 1978 and 1988, the Lake was above 15 feet 55% of the time. The extended high water created an "ecological emergency" as described by the state-convened Lake Okeechobee Littoral Zone Technical Advisory Group (LOLZTG 1988). The lowest level of this period was 9.79 feet in 1981.	High water levels required frequent, large-volume discharges of fresh water to the Estuary after rain events to protect the structural integrity of the HHD. These discharges frequently caused the brackish estuary water to turn fresh, adversely impacting estuary and river ecosystems.
1992-2000	15.65 - 16.75 feet	The regulations ("Run 25") were revised partly in response to the LOLZTG recommendations. This still did not allow drawdowns in the littoral zone except during droughts. Results from this period included: - significant decline in Everglade Snail Kite nesting	Adverse ecological impacts in the Estuary occurred as a result of hydrological changes in the timing, distribution, quality, and volume of fresh water released into the estuary from the watershed and Lake Okeechobee. Poor salinity conditions negatively impacted submerged aquatic vegetation (SAV), oysters, and other estuarine species. Nutrient load increases to the CRE caused excessive growth of floating aquatic plants, planktonic

		- significant decline in nesting and wading birds - loss of bulrush and other deep-water plant zones - formation of a large organic berm made of dead plants at outer marsh edges - fisheries crash The SFWMD Governing Board declared an emergency (in 2000) and conducted an emergency drawdown to help restore the marsh community. Between 1978 and 2000, the Lake had been above 15 feet 53% of the time. The drought of 2000-01 significantly lowered water levels in the Lake. Portable forward pumps were used for the first time to continue delivering water to permitted users, after gravity flow from the Lake was no longer possible. Pumping and draught caused the Lake to drop to its lowest level ever of 8.97 feet, breaking the previous 88-year record by more than 9 inches.	algae, and marine algae. Increased occurrences of red tide toxic algae were reported, as well.
2000-2008	>17 – 8.82 feet	WSE allowed the Lake to drop lower than previous schedules but still allowed high Lake levels to prioritize the availability of water for water supply. High water events (>17 feet) in 2003, 2004 and 2005 created serious problems, including: - Loss of ~45,000 acres of plant communities - Loss of water-related bird breeding use - Fisheries crashed	Algal blooms in the Estuary, massive accumulations of drift algae, and the geographic extent of red tides off shore increased. Salinity changes displaced key submerged aquatic plant species and the fauna those plants typically support.

		- The black crappie population did not recover for almost a decade - Hurricanes stirred the mud bottom in the center of the Lake, which also greatly increased phosphorus levels and led to water quality problems. Portable forward pumps were used again during the 2007-08 drought and the Lake reached 8.82 feet- another record low.	
2008-2014	12.5 - 15.5 feet, <16 feet	LORS08 are the regulations that were adopted in 2008. Lower levels were employed partly to ensure the safety of the HHD, but also in recognition of the harmful impacts from higher Lake levels. The 2015 South Florida Ecosystem Report detailed that in the 6 years since the adoption of LORS, there was substantial recovery of: - SAV - Bass and crappie fisheries - Wading bird breeding and feeding - Everglade Snail Kite breeding and feeding LORS includes a seasonally-adjusted schedule to help guide water management decisions. The three primary bands are as follows and described below: - High Lake Management Band - Operations Band - Water Shortage Management Band	Damaging high flows washed the Estuary nursery out of the River into the Gulf of Mexico, dumping harmful levels of excess nutrients and colored dissolved organic matter that harmed seagrass, habitat, and water quality. However, lack of flow and droughts caused salinities to rise to harmful levels in the upper estuary killing the freshwater habitat needed for recreational and commercial fisheries and the food web. Water stagnation from lack of flow caused harmful algal blooms in the upriver pools.
2015-2017	<16 feet	From August 2015 to August 2016, record high rainfall occurred in Lake Okeechobee and its watershed. This period was marked by water levels above 16 feet (with a high of 16.4 feet). Submerged Aquatic Vegetation (SAV) acreage	The continued presence of red tide in the coastal areas caused harm to animals, and numerous incidents of poisoning and wildlife death were reported. Rising salinity levels threatened oysters and tape grass as a result of insufficient freshwater flows.

		in Okeechobee declined 45%, from 33,345 acres to 18,525 acres. This represents a loss of 23 square miles of plant communities. Wading bird nesting in 2016 was 49% below the 10-year average.	

Sources:

1. Gray, Paul N., A Brief History of Lake Okeechobee Ecosystem Responses to Water Level Management, *Audubon of Florida*, April 2017. (internal citations omitted).
2. Milam, Pete, Lake Okeechobee Regulation Schedule Study, *United States Army Corps of Engineers Jacksonville District*. Retrieved from https://www.sfwmd.gov/sites/default/files/documents/lake_o_reg_sched_study.pdf.
3. U.S. Army Corps of Engineers Jacksonville District Fact Sheet: Lake Okeechobee/Water Management. Retrieved from https://www.saj.Corps.army.mil/Media/Fact-Sheets/Fact-Sheet-Article-View/Article/479989/lake-okeechobee-water-management/.
4. Sanibel-Captiva Conservation Foundation Annual Caloosahatchee Condition Reports. Retrieved from http://www.sccf.org/water-quality/caloosahatchee-condition-reports.
5. Gunter, G. and G. E. Hall. 1965. A Biological Investigation of the Caloosahatchee Estuary of Florida. Gulf Research Reports 2 (1): 1-71. Retrieved from http://aquila.usm.edu/gcr/vol2/iss1/1.
6. South Florida Water Management District White Paper: "Caloosahatchee River/Estuary Nutrient Issues," October 10, 2005. Retrieved from http://crca.caloosahatchee.org/crca_docs/Caloosahatchee_Nutrient_Draft.pdf.

2. Lee County's Interest in LOSOM- CRE Downstream Receiving Waters are Integrally Linked to Lake Management

Currently, freshwater flows to the CRE fluctuate widely, producing a salinity regime that often impacts the health and productivity of fish and wildlife found in the estuary (Corps and SFWMD 2010).[2] Salinity levels are typically either too low during the wet season (due to high inflows from watershed runoff and/or Lake Okeechobee discharges) or too high during the dry season (due to insufficient freshwater inflows). Extreme and extended high and low salinity levels can trigger die-offs of SAV, increase chances for algal blooms and severely impact oysters, species that are indicators of the estuary's overall health (Corps and SFWMD 2010). High volume discharges may impact oyster spawning, the salinity envelope, water quality and overall ecological health in the St. Lucie and Caloosahatchee Estuaries. This constraint may limit releases from Lake Okeechobee by restricting S-77/S-308 operations and may become a significant concern during high Lake levels. During dry and/or high temperature periods, there is also the potential for the Caloosahatchee River (C-43) and St. Lucie Canal (C-44) to have algal blooms.

During dry periods, the 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's drinking water standard of 250 parts per million (ppm).

When the chloride level above S-79 is rising and reaches 180 ppm, the SFWMD can request that the Corps reduce the number of lockages occurring at S-79 to one lockage every four hours. When the number of lockages are reduced at S-79, the number of opportunities for saltwater wedge migration to occur are reduced.

In addition, the SFWMD typically requests the Corps to implement a short-term high rate of discharge from Lake Okeechobee to flush the high chloride content water through S-79.

a. Overview of the CRE

The CRE is a highly productive estuary where the influx of nutrient-rich freshwater runoff mixes with salt water from the Gulf of Mexico. The Estuary is an important nursery ground for many species, including some commercially and recreationally important or endangered fish and shellfish. Alterations to the watershed upstream and downstream of the S-79 Structure have resulted in wide variations in freshwater inflows to the estuary on both an annual and inter-annual basis. The extreme fluctuations in freshwater inflows affect water quality including salinity, which impacts estuarine fish and wildlife health and productivity. Protection of estuarine species including habitat-forming organisms (submerged aquatic vegetation and oysters), requires a less extreme range of flows through the S-79 Structure.

b. Environmental Features

i. Habitat-Estuary

Existing habitat forming species found throughout the length of the CRE downstream of the S-79 Structure include: tape grass, *Vallisneria americana*, in the upper low salinity (oligohaline) region of the river;

[2] Document to Support a Water Reservation Rule for the CERP Caloosahatchee River (C-43) West Basin Storage Reservoir Project (August 2014).

eastern oysters, *Crassostrea virginica*, in the lower mesohaline region of the river, and seagrasses (turtle grass, *Thalassia testudinum*, and shoal grass, *Halodule wrightii*) in the more marine portion of the system in San Carlos Bay.

- SAV beds are important to the ecology of shallow estuarine and marine environments. SAV provides habitat for many benthic and pelagic organisms, functions as nurseries for juveniles and other early life stages, stabilizes sediments, improves water quality, and forms the basis of a detrital food web (Kemp et al. 1984, Fonseca and Fisher 1986, Carter et al. 1988, Killgore et al. 1989, Lubbers et al. 1990). Because of the importance of SAV beds, estuarine restoration initiatives often focus on SAV (Batiuk et al. 1992, Johansson and Greening 2000, Virnstein and Morris 2000). SAV are commonly monitored to gauge the health of estuarine systems (Tomasko et al. 1996) and their environmental requirements can form the basis for water quality goals (Dennison et al. 1993, Stevenson et al. 1993). Although there are species specific variations, SAV distributions in coastal areas are limited by four environmental factors: light, salinity, temperature, and nutrients (Dennison et al. 1993, Kemp et al. 2004). Sparse beds of the marine seagrass *Halodule wrightii* (shoal grass) extend up from San Carlos Bay almost to the Cape Coral Bridge (Hoffacker et al. 1994, Chamberlain and Doering 1998b) and are restricted to the shoreline margins. Downstream of Shell Point, *Halodule* forms mixed beds with *Thalassia testudinum* and other less common species in San Carlos Bay and Pine Island Sound.
    - Tape grass, *Vallisneria americana*, is an important upper estuarine SAV species and is sensitive to saltwater intrusion. It is therefore a good indicator of the effects of varying freshwater inflow to the River, especially during periods of low flow in the dry season. When present, this species is located near the shoreline in the upper portions of the river to a depth of about 1.0 m. Tape grass is a salt-tolerant freshwater angiosperm that provides important nursery habitat for blue crabs, white shrimp, and other species in the oligohaline zone (Rozas and Minello 2006). Downstream of the S-79 Structure, its greatest coverage occurs from Beautiful Island to the Ft. Myers Bridges (15 to 20 miles [24 to 32 km] upstream of Shell Point, Hoffacker et al. 1994, Chamberlain and Doering 1998b). In this portion of the River, salinity during the dry season routinely exceeds the accepted threshold of 10 psu for a sustainable population. Saltwater migration during the dry season is of sufficient magnitude to routinely cause mortality of tape grass in the upper river (Doering et al. 2001, Figure 4-3). Hunt and Doering (2005) examined the effects of salinity relative to other environmental drivers (light and temperature) using a numerical model and showed that in some years salinity intrusion in the upper portions of the river (downstream of the S-79 Structure) was a major driver of tape grass decline. Supplemental flows at the S-79 Structure during the dry season would help alleviate mortality due to salinity intrusion.
- Reefs formed by the eastern oyster are a prominent feature of estuarine landscapes in Florida (Barnes et al. 2007) and historically were abundant in the Caloosahatchee River's estuary (Sackett 1888). Oyster reefs are important because they filter water, which can enhance water clarity, remove nutrients, protect shorelines, and provide essential fish habitat (Coen et al. 1999, Wall et al. 2008, Beck et al. 2009). Existing oyster reef habitat in the river has been estimated to cover approximately 18 acres (0.07 km2) based on a survey conducted in 2004 (Figure 4-4, RECOVER 2007) and is much reduced relative to the historical distribution (Sackett 1888). While oyster reef habitat in the Caloosahatchee River is centered around Shell Point, clumps of oysters may be found up to the Cape Coral Bridge (about 6 miles [10 km] upstream of Shell Point, SFWMD 2003).

ii. Species of Concern[3]

The rare, threatened, and endangered species of management concern to the refuges include, but are not limited to, the wood stork (*Myctria americana*); roseate spoonbill (*Platalea ajaja*); roseate tern (*Sterna dougallii dougallii*); black skimmer (*Rynchops niger*); American oystercatcher (*Haematopus palliatus*); snowy plover (*Charadrius alexandrinus*); Wilson's plover (*Charadrius wilsonia*); red knot (*Calidris canutus*); piping plover (*Charadris melodus*); bald eagle (*Haliaeetus leucocephalus*); mangrove cuckoo (*Coccyzus minor*); black-whiskered vireo (*Vireo altiloquus*); gray kingbird (*Tyrannus dominicensis*); Florida prairie warbler (*Dendroica discolor paludicola*); Florida bonneted bat (*Eumops floridanus*); West Indian manatee (*Trichechus manatus*); ornate diamondback terrapin (*Malaclemys terrapin macrospilota*); loggerhead sea turtle (*Dermochelys coriacea*); green sea turtle (*Chelonia mydas mydas*); Kemp's ridley sea turtle (*Lepidochelys kempii*); hawksbill sea turtle (*Eretmochelys imbricata*); gopher tortoise (*Gopherus polyphemus*); American alligator (*Alligator mississippiensis*); American crocodile (*Crocodylus acutus*); eastern indigo snake (*Drymarchon corais couperi*); Gulf sturgeon (*Acipenser oxyrinchus desotoi*); and smalltooth sawfish (*Prisits pectinata*). Please see further detail on species in Attachment B.

iii. Special Designations (Refuges, Parks, etc.)

Located along Florida's southwest Gulf coast in Lee and Charlotte counties, the J.N. "Ding" Darling National Wildlife Refuge (NWR) Complex includes Pine Island, Matlacha Pass, Island Bay, Caloosahatchee, and J.N. "Ding" Darling NWRs. The Refuge Complex is part of the largest undeveloped mangrove ecosystem in the United States, and is world famous for its spectacular wading bird populations. Nesting and roosting islands make up the majority of the lands in these four satellite refuges of the Refuge Complex. The Pine Island, Matlacha Pass, Island Bay, and Caloosahatchee refuges were each established with the primary purpose as a preserve and breeding ground for native birds. These four refuges currently cover a total of about 1,201 acres (486 hectares [ha]), as follows: Pine Island – 602.24 acres (243.72 ha); Matlacha Pass – 538.25 acres (217.82 ha); Island Bay – 20.24 acres (8.19 ha); and Caloosahatchee – 40 acres (16.19 ha). Located within an estuarine system consisting predominantly of mangrove swamps, these four refuges provide a diversity of habitats that include mangrove islands and shorelines; saltwater marshes and ponds; tidal flats; and upland hardwood forests. They also provide protection for federally and state-listed species, as well as many species of wading birds, waterbirds, raptors and birds of prey, nearctic-neotropical migratory birds, shorebirds, and seabirds.

- Pine Island NWR[3] is approximately 602.24 acres (243.72 ha) with 18 mangrove islands and little upland habitat located in Pine Island Sound. The acquisition boundary is held in fee title with several islands covered under Bureau of Land Management (BLM) withdrawals.
- Matlacha Pass NWR[4] is approximately 538.25 acres (217.82 ha) encompassing 31 islands and peninsulas and the Terrapin Creek Tract near the Sanibel Causeway at Bunche Beach. Piping

[3] Pine Island NWR was established "... as a preserve and breeding ground for native birds" by President Theodore Roosevelt through Executive Order 939 in 1908.

[4] Three small islands were established as Matlacha Pass NWR by President Theodore Roosevelt through Executive Order 943 on September 26, 1908.

plover critical habitat is designated on the refuge. The acquisition boundary is held in fee title with several islands covered under BLM withdrawals.

- Island Bay NWR[5] consists of six undeveloped and roadless tracts of land on five small islands totaling approximately 20.24 acres (8.19 ha), is predominantly upland hardwood forests, and is located in the Cape Haze area of Charlotte Harbor. The acquisition boundary is held in fee title.
- Caloosahatchee NWR[6] is 40 acres (16.19 ha) on four mangrove islands, located on the Caloosahatchee River, in Fort Myers.
- J.N. Ding Darling NWR[7] consists of over 6,400 acres of mangrove forest, submerged seagrass beds, cordgrass marshes, and West Indian hardwood hammocks. Approximately 2,800 acres of the refuge are designated by Congress as a Federal Wilderness Area.

3. Water, Land and Air Resources

Flows within the historic Caloosahatchee River are controlled through the operation of multiple water control structures (S-77, S-78, and S-79). The final lock and dam structure (Franklin Lock and Dam or S-79) was completed in 1966 at Olga to assure freshwater supply and prevent upstream saltwater intrusion. Discharges from Lake Okeechobee and the Caloosahatchee River Watershed between the S-77 and S-79 structures are regulated by the Corps. Presently, the C-43 Canal spans 44 miles (70 km) from S-77 at Lake Okeechobee to S-79, while the CRE begins at S-79 and spans 26 miles (42 km) to Shell Point where it empties into San Carlos Bay.[8]

The modern Caloosahatchee River Watershed is a series of linked regional subbasins and includes the S-4 basin adjacent to Lake Okeechobee, the East Caloosahatchee Basin, the West Caloosahatchee Basin, the Tidal Caloosahatchee Basin (TCB) located downstream of S-79, and the Cape Coral Coastal Basin (referred to as the Coastal Basin in Figure 8C-11) to the north of the CRE (Figure 8C-11; Balci and Bertolotti 2012, Buzzelli et al. 2017). The primary land use type within the Caloosahatchee River Watershed today is agricultural, which comprises 44%. Urban land use comprises 14% and open water comprises 12% (Buzzelli et al. 2018). But more recent land coverage and use data should be used in the LOSOM analysis. The surface area of the CRE is 21.6 square miles (55.9 square km) with an average depth of 8.9 ft. (2.7 m) (Buzzelli et al. 2013a). The flushing time ranges from 2 to 30 days (Buzzelli et al. 2013b).[9]

Finally, Mote Marine Laboratory and Aquarium and the State Department of Health have both been working to gain a better understanding between harmful algal blooms, red tide in particular.[10] Additionally, for several months in 2018, intensive *Microcystis* blooms plagued communities along the tidal Caloosahatchee River and adjoining canals around Cape Coral, Florida. The FDEP had been conducting monthly sampling in the area and reported on the presence of *Microcystis aeruginosa* and *microcystin* toxin concentrations in the water. On September 17, 2018, FDEP measured *microcystin* concentrations of 46 µg L-1 (micrograms per liter). According to the World Health Organization,

---

[5] Island Bay NWR was established as a "preserve and breeding ground for native birds" on October 23, 1908, through Executive Order 958 signed by President Theodore Roosevelt.

[6] Caloosahatchee NWR was established by President Woodrow Wilson on July 1, 1920, through Executive Order 3299, also as a "... preserve and breeding ground for native birds."

[7] J.N. Ding Darling NWR was created when President Harry S. Truman signed an Executive Order creating the Sanibel National Wildlife Refuge in 1945. The refuge was renamed in 1967 in honor of the pioneer conservationist, Jay Norwood Darling, who was instrumental in the effort to block the sale of a parcel of environmentally valuable land to developers on Sanibel Island.

[8] South Florida Water Management District, *South Florida Environmental Report* (2019).

[9] *Id.*

[10] https://mote.org/news/florida-red-tide#Will I experience respiratory irritation during a Florida red tide?

microcystin concentrations greater than 20 µg L-1 in recreational waters are considered "high risk" for acute health effects.[11] Work on these relationships continues.[12] Management of Lake Okeechobee must account for not just the water-related impacts of harmful algal blooms, but the air-related impacts as well.

a. Water Quantity/Quality and Timing

The two major sources of surface water inflows to the Estuary are the C-43 Canal, which discharges at the S-79 Structure, and the TCB Basin surrounding the Estuary to the west and downstream of S-79 (Figure 3-1). Historically, inflows from the TCB to the estuary are not well known but this is changing as collection of 5 years of flow data from selected creeks has recently been completed. Despite limited data, modeling efforts have estimated annual TCB inflows. The relative contribution of freshwater flows to the downstream estuary from TCB and the S-79 Structure varies from year to year and during the wet and dry seasons. On average, the contribution of flows from the TCB to the downstream estuary accounts for about 20 percent of the total freshwater inflows on an annual basis, 23 percent during the wet season and 16 percent during the dry season. The lower percentage for the dry season than the wet season reflects the unproportioned regulatory releases from Lake Okeechobee. Overall, the contribution of freshwater flows to the Estuary from the TCB can be relatively significant in some years.[13]

High volume releases to the Caloosahatchee Estuary have resulted in documented negative effects on the estuarine ecology. Research has shown that even prolonged moderate releases transform the estuarine systems into freshwater habitats within three to four weeks. The dramatic and rapid changes in salinities, and associated siltation that occurs, can produce long-term negative effects on these estuaries. In addition, continuous flow releases at these levels tend to create critically low benthic oxygen situations at the transitional zone between the freshwater and the saltwater (Atlantic Ocean or Gulf of Mexico).[14] High volume releases generate even more problems because of greater potential for environmental disruption and associated public concern.

Occasionally, the SFWMD may request, or the Corps may initiate releases from Lake Okeechobee to the Caloosahatchee River for water quality enhancement purposes. Primarily, this release for water quality enhancement is to reduce salinity at the Lee County Olga water supply treatment plant intakes above W. P. Franklin Lock. An additional reason, but much less frequent, is a similar request to break up algae blooms in the river.

---

[11] https://coastalscience.noaa.gov/news/study-explores-airborne-health-risks-from-cyanobacteria-blooms-in-florida/

[12] https://fgcu360.com/2018/11/27/team-awarded-funds-study-impact-local-algae-blooms/

[13] From the 2019 South Florida Environmental Report (Section 8.c): The daily rainfall for the past three water years (WY2016–WY2018) over the entire watershed was highly variable (Figure 8C-13). In WY2018, the total rainfall for the Caloosahatchee River Watershed was 63.0 inches (1600 mm), with 91% received during the wet season (Figure 8C-14). This was 17% higher than the long-term annual average (52.2 inches, or 1326 mm; WY1997–WY2018), 24% higher than WY2017 (48.1 inches, or 1222 mm), and comparable to WY2016 (62.3 inches, or 1582 mm). Total WY2018 wet season rainfall (57.2 inches, or 1453 mm) was remarkably higher than the previous two water year wet seasons (43.2 and 41.1 inches, or 1097 and 1044 mm, for WY2017 and WY2016, respectively) and the long-term wet season average (41.4 inches, or 1052 mm). The maximum daily rainfall (7.4 inches, or 188 mm) occurred on September 10, 2017, when Hurricane Irma made landfall and was the highest daily rainfall for the long-term period, WY1997–WY2018 (Figure 8C-13). During WY2018, it rained 232 days (64 %), with 9 days having rainfall greater than 1.0 inches (25 mm).

[14] Jacksonville District, U.S. Army Corps of Engineers. *Central and Southern Florida Project Water Control Plan for Lake Okeechobee and Everglades Agricultural Area.* (2008). p. 7-22.

The design capacity for S-78 spillway is 8,660 cfs for all floods up to the standard project flood (SPF). However, during rainfall events over the Caloosahatchee River Basin (rainfall runoff) in conjunction with Lake Okeechobee releases via S-77, it has been determined that the actual maximum discharge rate at S-78 is approximately 9,300 cfs (combined discharge via S-78 spillway/Ortona lock chamber). For this reason, while considering rainfall runoff, the Lake Okeechobee release at S-77 is constrained to prevent no more than 9,300 cfs at S-78. This constraint limits releases from Lake Okeechobee by restricting S-77 operations and becomes a significant concern during high lake levels.

i. Minimum Flows and Levels – minimum necessary to prevent significant harm

While adopted in 2001, the MFL for the CRE have consistently not been met, resulting in high and harmful salinity levels. The 2001 Caloosahatchee River MFL criteria were based on the salinity tolerance of *Vallisneria americana* (tape grass). *Vallisneria* was selected as an indicator because of its location in the estuary, its sensitivity to enhanced salinity, and its important habitat functions such as: sediment stabilization, nursery area, and food support for different living organisms.

An independent peer review in the Technical Documentation to Support Development of MFLs for the CRE (September 2000 Draft) identified four major flaws that needed to be addressed in future revisions:

1. Lack of a hydrodynamic/salinity model
2. Lack of a numerical population model for *Vallisneria*
3. No quantification of the habitat value of *Vallisneria* beds
4. No documentation as to the effects of MFL flows on downstream estuarine biota

Perhaps most importantly, the peer review noted that the MFL was based on a single species (tape grass) and recommended that information from multiple indicators be incorporated. It was determined that the MFL could not be met at the time it was established. Therefore, as required by rule, a recovery strategy was identified to provide the water needed to meet the MFL. This recovery strategy is the C-43 West Basin Reservoir that will be included in the formulation of the new LOSOM. A total of 11 scientific studies were conducted over a 5-year period (from 2011-2016) focusing on the effects of freshwater inflows and their impacts on other indicators within the estuary.

Component	Method
1 Hydrodynamics	Influence of alterations on hydrodynamics
2 Inflow vs. Salinity	Monthly freshwater-salinity relationships
3 Water Quality	Relationships between inflow, salinity, and water quality
4 Zooplankton	Inflow, zooplankton and habitat compression
5 Ichthyoplankton	Relationships between ichthyoplankton and inflow
6 Benthic Fauna	Macrofauna-salinity patterns relative to inflow
7 *Vallisneria* data	Empirical relationships between tape grass, S, and inflow
8 *Vallisneria* model	Model exploration of tape grass, S, light, and inflow
9 Oyster Habitat	Salinity patterns for oyster habitat in lower CRE
10 Blue Crabs	Relationships between blue crab landings, rainfall, and inflow
11 Sawfish	Dry season inflow, hydrodynamics, and habitat extent

The current MFL (adopted in 2018) includes the following parameters (Rule 40E-8.221, F.A.C.):
(2) Caloosahatchee River. The MFL for the Caloosahatchee River is the 30-day moving average flow of 400 cubic feet per second (cfs) at S-79.

(a) A MFL exceedance occurs during a 365-day period when the 30-day moving average flow at S-79 is below 400 cfs and the 30-day moving average salinity exceeds 10 at the Ft. Myers salinity monitoring station (located at latitude 26° 38' 57.84" N, longitude 81° 52' 5.68" W). Salinity at the Ft. Myers salinity monitoring station shall be measured at 20% of the total river depth at mean low water.
or (b) A MFL violation occurs when a MFL exceedance occurs more than once in a 5-year period.

As a legal matter, these parameters or any modifications/revisions thereof, are a critical element of LOSOM to achieve this MFL.

ii. Water Reservations-All water produced from the C-43 Reservoir

The SFWMD reserved from allocation, all water stored within and transferred from the C-43 Reservoir to the Caloosahatchee River for the protection of fish and wildlife located downstream of the S-79 Structure (Franklin Lock and Dam). For the purpose of the water reservation rule, the term "Caloosahatchee River" means the surface waters that flow through the S-79 Structure, combined with tributary contributions below the S-79 Structure that collectively flow southwest to San Carlos Bay as defined in Section 40E-8.021 F.A.C. The current Reservation (adopted in 2014) includes the following parameters (Rule 40E-10.041, F.A.C.):

(3) Caloosahatchee River (C-43) West Basin Storage Reservoir:

(a) All surface water contained within and released, via operation, from the Caloosahatchee River (C-43) West Basin Storage Reservoir is reserved from allocation.
(b) The water reserved under this subsection will be available for fish and wildlife upon a formal determination of the Governing Board, pursuant to state and federal law, that the Caloosahatchee River (C-43) West Basin Storage Reservoir is operational.
(c) The reservation contained in this subsection and the criteria contained in Section 3.11.4 of the "Applicant's Handbook for Water Use Permit Applications within the South Florida Water Management District," incorporated by reference in Rule 40E-2.091, F.A.C., shall be revised pursuant to subsection 373.223(4), F.S., in light of changed conditions or new information and prior to the approval described in paragraph (3)(b) above.

LOSOM must work in tandem with the Caloosahatchee water reservation to achieve true restoration of the CRE. The Modeling for LOSOM needs to assume that all water released from the C-43 Reservoir reaches S-79.

iii. Restoration Targets

A suite of external drivers and ecological responses are monitored in the Caloosahatchee River Watershed and CRE (Figure 8C-12).[15] These variables include rainfall, freshwater discharge, and nutrient loads as external drivers, and patterns of salinity, estuarine nutrient concentrations, oyster habitat status, and SAV community composition as the estuarine ecological responses. Salinity gradients are a conservative property of the water body and therefore are useful to connect the sources of freshwater inflow,

[15] South Florida Water Management District, *South Florida Environmental Report* (2019).

circulation, and biological indicators (Wilber 1992, Jassby et al. 1995, Hagy and Murrell 2007, Pollack et al. 2011).[16] All of these factors must be considered to achieve CRE restoration.

b. Water Quality

While LOSOM itself may not be adding structural components or include dredge and fill activities regulated under the Clean Water Act, Lake Okeechobee operations must include water quality considerations. A Basin Management Action Plan (BMAP) is a comprehensive set of strategies - permit limits on wastewater facilities, urban and agricultural best management practices, conservation programs, financial assistance and revenue generating activities, etc. - designed to implement the pollutant reductions established by a Total Maximum Daily Load (TMDL)[17].

i. TMDLs for the CRE

Water quality measurements in Lake Okeechobee were first documented in 1970. The current five-year average load is more than four times higher than the TMDL of 140 mt/yr. (five-year average) considered necessary to achieve the state of Florida's in-lake Total Phosphorus (TP) target of 40 parts per billion (ppb). Despite a long history of regulatory and voluntary incentive-based programs to control phosphorus inputs into Lake Okeechobee, no substantial reduction in loading occurred during the 1990s. As a result, the Florida legislature passed the Lake Okeechobee Protection Act (LOPA) [Section 373.4595, F.S. in 2000, mandating that the TMDL be met by 2015 and that the SFWMD, Florida Department of Environmental Protection (FDEP), and Florida Department of Agriculture and Consumer Services (FDACS) work together to implement an aggressive program to address the issues of excessive TP loading and exotic species expansion. In 2007, the Florida legislature substantially expanded the LOPA to include protection and restoration of the Lake Okeechobee watershed and the Caloosahatchee and St. Lucie Estuaries.

The TMDL for the Caloosahatchee was adopted in 2009 established for Total Nitrogen (TN), which causes high chlorophyll a (chla) concentrations in the CRE downstream of the Franklin Lock and Dam (Control Structure S-79). Thirty-eight percent of the Caloosahatchee Basin drains via tributaries that empty directly into this portion of the river and estuary. The remaining 62 percent of the Caloosahatchee Basin's runoff flows into tributaries and canals connected to the portion of the river upstream of S-79. The water in the Caloosahatchee River upstream of the S-79 control structure is regularly released into the estuary through S-79, which is managed by the Corps. The TMDL for the Tidal Caloosahatchee estuary downstream of the S-79 Franklin Lock is 9,086,094 pounds of TN per year, which represents, based on model simulated flows and concentrations from 2003 through 2005, a 22.8% reduction.[18]

ii. BMAP for the CRE

The Caloosahatchee Estuary BMAP was adopted in November 2012 (FDEP 2012) to implement the TN TMDL in the watershed. As of November 30, 2016, the total model estimated reductions for TN are 181,680 pounds per year (lbs. /yr., or 82,409 kilograms per year [kg/yr]), or 47% of the TN reductions needed to meet the portion of the Caloosahatchee TMDL. According to the most recent South Florida Environmental Report (SFWMD, 2019), the long-term loading of TN and TP to the CRE at S-79 is 3,070

---

[16] *Id.*

[17] A TMDL represents the maximum amount of a given pollutant that a waterbody can assimilate and still meet water quality standards, including its applicable water quality criteria and its designated uses. TMDLs are developed for waterbodies that are verified as not meeting their water quality standards. They provide important water quality restoration goals that will guide restoration activities. FDEP. Final TMDL Report, Nutrient TMDL for the Caloosahatchee Estuary (2009).

[18] Rule 62-304.800, F.A.C.

metric tons/year and 297 metric tons/year respectively. Discharge from Lake Okeechobee accounts for about 36% of the nitrogen load and 25% of the phosphorus load.

iii. LOSOM Must Consider the Implications of the TMDL and BMAP

When the TMDL was adopted, it was estimated that the TN load from Lake Okeechobee once the adopted TMDL for Lake Okeechobee had been achieved would be 6,222,155 lbs/yr. That has not occurred.

Through May 31, 2017, 73 projects have been completed. An additional 15 projects have been added to the BMAP, which are underway or planned. The projects completed to date are estimated to achieve total reductions of 218,542 lbs/yr of TN, or 56 percent of the reductions needed to meet the portion of the TMDL allocated to the TCB.[19] Given that 36% of the nitrogen load and 25% of the phosphorous load to the Caloosahatchee are from Lake Okeechobee; therefore, meeting the requirements of the TMDL and implementing the BMAP are integrally linked to LOSOM.

It is critical to address water quality impacts including, but not limited to, the water quality of the Lake itself and the relationship between volumes of water in the basin and discharges linked to meeting total maximum daily loads.

[19] Department of Environmental Protection. *5-Year Review of the Caloosahatchee Estuary Basin Management Action Plan*. (December 2017).

Attachment "B": Table of Authorities

For summary purposes, the following Table of Authorities is provided to guide constraints and parameters with regard to the CRE system and Lake Okeechobee management.

Authority	Date Established	Relevance to LOSOM
Federal Authorities		
U.S. Endangered Species Act 16 USC §1531 et seq.	1973	The Corps should consider listings under the Endangered Species Act for species and habitat when discharging or not discharging to the Caloosahatchee.
U.S. Coastal Zone Management Act 16 USC §1451 et seq.	1972	The U.S. Congress recognized the importance of meeting the challenge of continued growth in the coastal zone by passing the Coastal Zone Management Act (CZMA) in 1972. This act, administered by NOAA, provides for the management of the nation's coastal resources. The goal is to "preserve, protect, develop, and where possible, to restore or enhance the resources of the nation's coastal zone."
U.S. Fish and Wildlife Conservation Act 16 USC §2901	1980	The Corps should consider this statutory mandate that encourages all federal departments and agencies to utilize their statutory and administrative authority, to the maximum extent practicable, and consistent with each agency's statutory responsibilities, to conserve and to promote conservation of non-game fish and wildlife and their habitats.
Clean Water Act 33 U.S.C. §1251 et seq.	1972	The Clean Water Act (CWA) establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. The CWA made it unlawful to discharge any pollutant from a point source into navigable waters, unless a permit was obtained. EPA's National Pollutant Discharge Elimination System (NPDES) permit program controls discharges. Point sources are discrete conveyances such as pipes or man-made ditches. Industrial, municipal, and other facilities must obtain permits if their discharges go directly to surface waters. Harmful algal blooms include but are not limited to: red tides, blue-green algae, and cyanobacteria. Nutrient pollution and harmful algal blooms cause major environmental damage as well as serious health problems in people and animals.
Corps Sea Level Rise Guidance and Regulation No. 1100-2-8162	1986-Present	This concept has formed the basis of USACE policy and technical guidance, beginning with a 1986 USACE guidance letter requiring consideration of sea level change (SLC) in the planning and design of coastal flood control and erosion protection projects. Subsequent planning guidance in 1989 required that project plans be formulated based on the observed local relative rate of change (historic rate), and consider the consequences to the project of the full range of NRC scenarios. An update in 2000 (Appendix E, Section IV, paragraph E-24.k) of ER 1105-2-100 addressed sensitivity to the historic and NRC high rate scenario (equivalent to 1.5 m at 2100). More detailed planning and engineering policy in 2009 and 2011 was followed by the release of the current guidance, USACE 2013 that requires consideration of three scenarios. USACE coastal practitioners, however, also are

		allowed to consider a higher rate of sea-level change (for example, global rise of 2.0 m at 2100 global scenario) if justified by project conditions (USACE 2013).
Florida Authorities		
Article II Section 7, The Florida Constitution: "Natural Resources and Scenic Beauty"	1996	The Corps is advised that Florida's Constitution provides that is the policy of the State to conserve and protect its natural resources and scenic beauty.
Chapter 68, FAC: "Aquatic Plant Control Permits"		The Corps should consider Florida's robust regulatory scheme for protecting aquatic plant species.
Chapter 403, F.S.: "Environmental Control"		The Corps should consider Florida's robust regulatory scheme under the Florida Air and Water Pollution Control Act. Section 403.021(2), F.S. of said Act provides that it is the public policy of the State to conserve the waters of the state and to protect, maintain, and improve the quality thereof for public water supplies, for the propagation of wildlife and fish and other aquatic life, and for domestic, agricultural, industrial, recreational, and other beneficial uses and to provide that no wastes be discharged into any waters of the State without first being given the degree of treatment necessary to protect the beneficial uses of such water." Basin Management Action Plans (Section 403.067(7)(a)1, F.S.
Chapter 380, F.S.: "Land and Water Management"		The Corps should consider that the State of Florida, in order to protect the natural resources and environment of the State, enacted the Florida Land and Water Management Act to ensure a water management system that will reverse the deterioration of water quality and provide optimum utilization of the State's limited water resources, facilitate orderly and well-planned development, and protect the health, welfare, safety, and quality of life of the residents of the State.
Chapter 379, F.S.: "Fish and Wildlife Conservation"	1977	The Corps should consider Florida's robust regulatory scheme that empowers its Fish and Wildlife Conservation Commission and other state agencies to protect marine life and their habitat from pollution, overfishing, and other deleterious impacts to marine resources.
§379.2401 F.S.		The Corps is advised that it is the policy of the State of Florida to manage and preserve its renewable marine fishery resources. This law emphasizes protection and enhancement of the marine and estuarine environment in such a manner as to provide for optimum sustained benefits and use to all the people of this state for present and future generations.
§379.2291 F.S.: "Florida Endangered and Threatened Species Act"	1977	The Corps should consider that Florida harbors a wide diversity of fish and wildlife and that it is the state's policy to conserve and wisely manage these resources, with particular attention to those species defined by the Fish and Wildlife Conservation Commission, the Department of Environmental Protection, or the United States Department of Interior, or successor agencies, as being endangered or threatened. As Florida has more

		endangered and threatened species than any other continental state, it is the intent of the Florida Legislature to provide for research and management to conserve and protect these species as a natural resource.
§379.2251 F.S.		The Corps is reminded that this law empowers the Florida Fish and Wildlife Conservation Commission to enter into cooperative agreements with the Corps for the purpose of preserving saltwater fisheries within and without state waters and for the purpose of protecting against depletion or any abuse whatsoever. Such authority includes the authority to enter into cooperative agreements whereby officers of the Fish and Wildlife Conservation Commission are empowered to enforce federal statutes and rules pertaining to fisheries management. When differences between state and federal laws occur, state laws shall take precedence.
Chapter 373 F.S.: "Florida Water Resources Act of 1972"	1972	The Corps should consider that this Act provides authority for all Florida water management districts and the FDEP to protect the water resources of the state, including natural resources, fish, and wildlife. Chapter 373, Florida Statutes is a robust regulatory scheme devoted to the protection of the State's water resources and specifically includes the Florida Springs and Aquifer Protection Act in §373.801 et seq.
Section 373.042: Minimum Flows and Levels / Rule 40E-8.221, F.A.C.	2001 and 2018	Section 373.042(1), F.S. defines MFLs as the point at which further water withdrawals would be significantly harmful[20] to the water resources or ecology of the area. MFLs are established for priority waterbodies within their boundaries. MFLs are used both in planning for future water uses and in regulating water withdrawals. For waterbodies that are below their minimum flow or level, or are projected to fall below their minimum flow or level within 20 years, the WMD is required to implement a recovery or prevention strategy to ensure the MFL is maintained over the long term. The Caloosahatchee MFL was adopted in 2001 and revised in 2018 and the flows to achieve the MFL must be considered in the LOSOM.
Section / Rule 40E□10.041, F.A.C.)	2014	A water reservation is a legal mechanism to prevent the consumptive use of water for the protection of fish and wildlife or the public health and safety. Specifically, Section 373.223(4), F.S, provides that: The governing board or the department, by regulation, may reserve from use by permit applicants, water in such locations and quantities, and for such seasons of the year, as in its judgment may be required for the protection of fish and wildlife or the public health and safety. Such reservations shall be subject to periodic review and revision in the light of changed conditions. However, all presently existing legal uses of water shall be protected so long as such use is not contrary to the public interest.
§373.4595, F.S.: "Lake Okeechobee Protection Act"	2000, 2007	The Corps is advised that Florida law protects the Lake's water quality. Water quality measurements were first documented in 1970. The current five-year average load is more than four times higher than the Total Maximum Daily Load (TMDL) of 140 mt/yr (five-year average) considered necessary to achieve the in-lake TP target of 40 parts per billion (ppb). Despite a long history of regulatory and voluntary incentive-based programs to control phosphorus inputs into the Lake, no substantial reduction in loading occurred during the

[20] Chapter 40E-8.021 (31), F.A.C.: Significant Harm – means the temporary loss of water resource functions, which result from a change in surface water or groundwater hydrology, that takes more than two years to recover but is less severe that serious harm.

		1990s. As a result, the Florida legislature passed The Lake Okeechobee Protection Act (LOPA) in 2000, mandating that the TMDL be met by 2015 and that the SFWMD, FDEP, and FDACS work together to implement an aggressive program to address the issues of excessive TP loading and exotic species expansion. In 2007, the Florida legislature substantially expanded the LOPA to include protection and restoration of the Lake Okeechobee watershed and the Caloosahatchee and St. Lucie Estuaries.
Chapter 258.35 et seq.: "Florida Aquatic Preserve Act of 1975"		The Corps should consider that certain aquatic preserves in Lee County are explicitly protected by this statute, which provides for the protection of these areas for future generations. (§258.39(21), (22), (28), and (29) and §258.392). Florida's Board of Trustees of the Internal Improvement Trust Fund has a statutory mandate to maintain those aquatic preserves.
§187.201(7) F.S.		The Corps is advised that the State Comprehensive Plan codifies Florida's obligation to assure the availability of an adequate supply of water for all competing uses deemed reasonable and beneficial and shall maintain the functions of natural systems and the overall present level of surface and ground water quality. Florida shall improve and restore the quality of waters not presently meeting water quality standards.
§187.201(8)(b) F.S.		The Corps is advised that the State Comprehensive Plan codifies Florida's obligation to protect coastal resources, marine resources, and dune systems from the adverse effects of development, encourage land and water uses which are compatible with the protection of sensitive coastal resources, and protect and restore long-term productivity of marine fisheries habitat and other aquatic resources.
§187.201(9)		The Corps is advised that the State Comprehensive Plan codifies Florida's obligation to protect unique natural habitats and ecological systems, such as wetlands, tropical hardwood hammocks, palm hammocks, and virgin longleaf pine forests, and restore degraded natural systems to a functional condition. This law also prohibits the destruction of endangered species and protects their habitats.
§163.3177(6)(d) F.S.		The Corps is advised that Florida law compels local governments within the State to adopt Comprehensive Plans, which must include a conservation element for the conservation, use, and protection of natural resources in the area, including water, water recharge areas, wetlands, waterwells, estuarine marshes, soils, beaches, shores, flood plains, rivers, bays, lakes, harbors, forests, fisheries and wildlife, marine habitat, minerals, and other natural and environmental resources, including factors that affect energy conservation. It is the intent of this section to preserve these resources for future generations.
Gulf States Marine Fisheries Compact		The Corps should consider that Florida is a member of the Gulf States Marine Fisheries Commission (GSMFC), an organization of the five states of TX, LA, MS, AL, and FL, whose coastal waters are the Gulf of Mexico. Authorized under Public Law 81-66, signed on July 16, 1949, and codified as §379.2254 F.S., it has as its principal objective the conservation, development, and full utilization of the fishery resources of the Gulf of Mexico, to provide food, employment, income, and recreation to the people of these United States. The duty of the said commission shall be to make inquiry and ascertain from time to time such methods, practices, circumstances and conditions as may be disclosed for bringing about the conservation and the prevention of the depletion and physical waste of the fisheries, marine, shell and anadromous, of the Gulf coast.

Refuges, Preserves, and Special Designations		
Great Calusa Blueway Paddling Trail		The Corps should consider this precious resource and the State's obligations (described above) to protect same. The Great Calusa Blueway Paddling Trail flows through the coastal waters of Lee County from the Pine Island Sound to Estero Bay, up the Caloosahatchee River and through its tributaries for 190 miles.
Cayo Costa State Park		This 2,461-acre State park is a pristine island with nine miles of undeveloped shoreline. Shorebirds, manatees, porpoises, and sea turtles thrive here. Fish such as flounder, snook, trout, redfish, snapper, whiting, sheepshead, and tarpon are also found in abundance.
Pine Island Sound Aquatic Preserve	Designated in 1970	This 58,500-acre preserve is heavily monitored for water quality and ecosystem health. Species diversity on its islands are high, with thirteen species of wading and diving birds. Wildlife habitats include mollusk reefs, mangrove swamps, saltwater marshes, and sponge and seagrass beds. The FDEP manages this aquatic preserve.
Matlacha Pass Aquatic Preserve	Designated in 1972	This 14,600-acre preserve is equipped with continuous water-quality-data collection equipment at three sites. Seagrasses and wading and diving bird colonies are also monitored by FDEP. Wildlife habitats include mollusk reefs, mangrove swamps, and sponge and seagrass beds.
Estero Bay Aquatic Preserve	Designated in 1966	This 10,493-acre preserve is comprised of hundreds of small islands, many with no upland area. The FDEP monitors seagrasses, wading and diving bird rookeries, and water quality here. The Estero Bay Aquatic Preserve was Florida's first designated aquatic preserve. Its habitats include mangrove forests, seagrass beds, salt marshes, tidal flats, and oyster bars. Approximately 40 percent of the state's endangered and threatened species are found within this area. The estuary also indirectly supports a variety of commercial and sport fisheries by providing nursery area for same, and is an important home for bird nesting colonies and a valuable stopover area for migrating birds. The FDEP manages this preserve. Listed species found here include the following: <u>Plants</u> Twisted airplant: State Threatened Giant wild pine: State Endangered <u>Birds</u> Red knot: Federally Threatened Snowy plover: State Threatened Piping plover: Federally Threatened Marian's marsh wren: State Threatened Little blue heron: State Threatened Reddish egret: State Threatened Tricolored heron: State Threatened Southeastern American kestrel: State Threatened American oystercatcher: State Threatened

		Wood stork: Federally Threatened Roseate spoonbill: State Threatened Black skimmer: State Threatened Least tern: State Threatened Roseate tern: Federally Threatened <u>Reptiles</u> American alligator: Federally Threatened (Similarity of Appearance to Threatened Species) Atlantic loggerhead turtle: Federally Threatened Atlantic green turtle: Federally Threatened American crocodile: Federally Threatened Leatherback turtle: Federally Endangered Atlantic hawksbill turtle: Federally Endangered Kemp's ridley turtle: Federally Endangered <u>Mammals</u> Big Cypress fox squirrel: State Threatened Florida manatee: Federally Threatened <u>Fish</u> Smalltooth sawfish: Federally Endangered
J.N. Ding Darling National Wildlife Refuge and Bird Sanctuary	Designated in 1945	This Federally-protected wildlife refuge is part of the largest undeveloped mangrove ecosystem in the United States. The refuge consists of over 6,400 acres of mangrove forest, seagrass beds, cordgrass marshes, and West Indian hardwood hammocks. Approximately 2,800 acres of the refuge are designated by Congress as a Federal Wilderness Area. The refuge was created to safeguard and enhance the pristine wildlife habitat of Sanibel Island, to protect endangered and threatened species, and to provide feeding, nesting, and roosting areas for migratory birds. It provides important habitat to over 245 species of birds. It is also home to the Sanibel Island Rice Rat, found only on Sanibel Island and listed as a threatened species by the State of Florida due to habitat loss, predation, and competition.
Four Mile Cove Ecological Preserve		This 365-acre preserve in Cape Coral abuts the Caloosahatchee River and is home to eagles, ibis, herons, other wading and migratory birds, raccoons, snakes, and other wildlife. The City of Cape Coral leases the property from the State on the condition that it is operated as a preserve.
Bob Janes Preserve	Acquired in 2006	This 5,620-acre preserve was purchased by Lee County and the State of Florida and is managed by Lee County. The preserve includes large swaths of cypress swamp, wet prairie, several creeks, freshwater marshes and wet flatwoods. It provides habitat for wide-ranging species such as white-tailed deer, wild turkey, and Northern bobwhite. Thirteen species listed as endangered, threatened, or of special concern have been documented within the boundaries of the preserve including (but not limited to) the Crested Caracara, Gopher Tortoise,

		Red-Cockaded Woodpecker, Eastern Indigo, Florida Panther, Florida Black Bear, and the Florida Burrowing Owl.
Corkscrew Regional Ecological Watershed and Swamp Sanctuary		This 13,000-acre sanctuary in the heart of the Corkscrew Watershed in Southwest Florida, part of the Western Everglades. It is primarily composed of wetlands. These include the largest remaining virgin bald cypress forest in the world (approximately 700 acres), which is the site of the largest nesting colony of Federally Endangered Wood Storks in the nation. In addition to the Wood Stork, Corkscrew provides important habitat for numerous other Federal and State listed species, including the Florida Panther, American Alligator, Gopher Tortoise, Florida Sandhill Crane, Limpkin, Roseate Spoonbill, Snowy Egret, Tricolored Heron, White Ibis, Big Cypress Fox Squirrel and the Florida Black Bear. Several rare plants are also found here, most notably the Ghost Orchid.
Hickey Creek		Hickey Creek Mitigation Park is co-managed by the Lee County Department of Parks and Recreation and the Florida Fish and Wildlife Conservation Commission. It consists of a variety of habitats including palmetto-oak scrub, pine flatwoods, and seasonal wetlands.
Great Florida Birding & Wildlife Trail		Lee County is home to fourteen sites along the Great Florida Birding and Wildlife Trail. They are Bowditch Point Park, Caloosahatchee Regional Park, Cayo Costa State Park, Estero Bay Preserve State Park, Hickey's Creek Mitigation Park, J.N. "Ding" Darling National Wildlife Refuge, Lakes Regional Park, Lighthouse Beach Park, Little Estero Island Critical Wildlife Area, Lovers Key State Park, Matanzas Pass Preserve, Rotary Park Environmental Center, San Carlos Bay Buche Beach Preserve, and Six Mile Cypress Slough Preserve.
Rare, Threatened, or Endangered Species		
U.S. Endangered Species Act		1. Wood Stork; 2. Roseate Spoonbill; 3. Roseate Tern; 4. Black Skimmer; 5. American Oystercatcher; 6. Snowy Plover; 7. Wilson's Plover; 8. Red Knot; 9. Piping Plover; 10. Bald Eagle; 11. Mangrove Cuckoo; 12. Black-Whiskered Vireo; 13. Gray Kingbird; 14. Florida Prairie Warbler; 15. Florida bonneted bat; 16. West Indian Manatee;

		17. Ornate Diamondback Terrapin; 18. Loggerhead Sea Turtle; 19. Green Sea Turtle; 20. Kemp's Ridley Sea Turtle; 21. Hawksbill Sea Turtle; 22. Gopher Tortoise; 23. American Alligator; 24. American Crocodile; 25. Eastern Indigo Snake; 26. Gulf Sturgeon; 27. Smalltooth Sawfish *Beyond rare, threatened, and endangered species, the Refuges are also important for wading birds, waterbirds, raptors and birds of prey, migratory birds, shorebirds, and seabirds.
Florida Endangered and Threatened Species Act		1. Roseate Spoonbill (species of special concern); 2. Black Skimmer (species of special concern); 3. American Oystercatcher (species of special concern); 4. Snowy Plover (threatened); 5. Gopher Tortoise (threatened); 6. Sanibel Island Rice Rat (species of special concern); 7. Reddish Egret (species of special concern); 8. Brown Pelican (species of special concern), 9. Little Blue Heron (species of special concern); 10. Snowy Egret (species of special concern); 11. Tricolored Heron (species of special concern); 12. White Ibis (species of special concern); and 13. Least Tern (threatened)