CENTRAL AND SOUTHERN FLORIDA PROJECT

WATER CONTROL PLAN FOR
WATER CONSERVATION AREAS, EVERGLADES NATIONAL PARK, AND
ENP-SOUTH DADE CONVEYANCE SYSTEM

JACKSONVILLE DISTRICT
U.S. ARMY CORPS OF ENGINEERS
16 April 2012

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

List of Tables

Table No.

List of Figures
(Figures follow WCP Tables)

Figure No.

List of Appendices (Appendices within MWCM)

List of Internet Maps

Map No.

List of Internet Map Hyperlinks

Map No.		Hyperlink
1	WCAs Overview	http://www.saj.usace.army.mil/Divisions/Operations/Branches/MultiProject/WaterMgt/Images/Maps/120403-A-CE999-239.jpg
2	Inset A	http://www.saj.usace.army.mil/Divisions/Operations/Branches/MultiProject/WaterMgt/Images/Maps/120403-A-CE999-225.jpg
3	Inset B	http://www.saj.usace.army.mil/Divisions/Operations/Branches/MultiProject/WaterMgt/Images/Maps/120403-A-CE999-227.jpg
4	Inset C	http://www.saj.usace.army.mil/Divisions/Operations/Branches/MultiProject/WaterMgt/Images/Maps/120403-A-CE999-229.jpg
5	Inset D	http://www.saj.usace.army.mil/Divisions/Operations/Branches/MultiProject/WaterMgt/Images/Maps/120403-A-CE999-231.jpg
6	Inset E	http://www.saj.usace.army.mil/Divisions/Operations/Branches/MultiProject/WaterMgt/Images/Maps/120403-A-CE999-233.jpg
7	Inset F	http://www.saj.usace.army.mil/Divisions/Operations/Branches/MultiProject/WaterMgt/Images/Maps/120403-A-CE999-235.jpg
8	Inset G	http://www.saj.usace.army.mil/Divisions/Operations/Branches/MultiProject/WaterMgt/Images/Maps/120403-A-CE999-237.jpg

WATER CONTROL PLAN
WATER CONSERVATION AREAS, EVERGLADES NATIONAL PARK, AND ENP-SOUTH DADE CONVEYANCE SYSTEM

7-01. **General Objectives.** The Central and Southern Florida (C&SF) Project was designed and constructed by the U.S. Army Corps of Engineers (Corps). The local sponsor for this project is the South Florida Water Management District (SFWMD). The Corps operates and maintains project works on the St. Lucie Canal; Caloosahatchee River; Herbert Hoover Dike and Lake Okeechobee major spillways; and the main outlets for Water Conservation Areas Nos. 1, 2, and 3. The SFWMD operates the remainder of the project in accordance with regulations prescribed by the Corps. The Congressionally-authorized project purposes include flood control, agricultural irrigation, municipal and industrial water supply, preservation of fish and wildlife, water supply to Everglades National Park, preservation of Everglades National Park, prevention of saltwater intrusion, drainage and water control, groundwater recharge, recreation, and navigation.

Water management operations at the main outlets for Water Conservation Areas Nos. 1, 2, and 3 are determined through a decision-making process that considers all the Congressionally-authorized project purposes for the Water Conservation Areas (WCAs). The decision-making process to determine quantity, timing, and duration of the potential releases from the WCAs include consideration of various information related to water management. This information includes but is not necessarily limited to: C&SF Project conditions, estuary conditions/needs (e.g. Biscayne Bay, Florida Bay), WCAs conditions/needs, WCA water levels, Everglades National Park (ENP) conditions/needs, East Coast Canals (ECC) available capacity, ENP-South Dade Conveyance System (SDCS) available capacity, current climate conditions, climate forecasts, hydrologic outlooks, projected WCAs level rise/recession, and water supply conditions/needs.

The WCAs(See **WCAs Overview**) are regulated to provide flood control; water supply for agricultural irrigation, municipalities and industry, and ENP; regional groundwater control, and prevention of saltwater intrusion; enhancement of fish and wildlife; and recreation. Another objective is the maintenance of marsh vegetation in the WCAs, which will provide a dampening effect on hurricane-induced wind tides. Levees 40 (L-40), L-36, L-35(A), L-35, L-37, L-33, L-30, L-31(N), and L-31(W) form the east coast protection levee. The east coast protection levee prevents floodwaters, which historically flowed eastward from the Everglades, from flowing into the developed areas along the southeast coast of Florida.

All elevations in this document are in feet, National Geodetic Vertical Datum of 1929 (feet, NGVD) unless otherwise

noted. A footnote has been included at the bottom of each page for ease of reference.

7-02. **Major Constraints**.

a. **Water Conservation Areas**.

1. **WCA No. 2B and WCA No. 3B**. WCA No. 2B and WCA No. 3B overlie the Biscayne Aquifer. Regulation schedules are not used for WCA No. 2B and WCA No. 3B due to high rates of seepage from these areas. However, releases from WCA No. 2A and WCA No. 3A to WCA No. 2B and WCA No. 3B, respectively, can be made. The WCA No. 2A Regulation Schedule and S-151 operating criteria (shown in Table 7-5 and Appendix A) provide the ability to provide water to WCA No. 2B and WCA No. 3B, respectively.

2. **Water Supply Releases from WCAs during Low Water Conditions.** During low water conditions, it is difficult to draw water from the interior of the WCAs. The regulation schedules for Water Conservation Areas Nos. 1, 2A, and 3A include minimum canal water levels (14.0 feet, 10.5 feet, and 7.5 feet, respectively) below which water releases from the WCAs must be preceded by an equivalent volume of inflow. The canal levels may continue to recede due to evaporation and seepage; however, as long as there is an inflow volume equal to the outflow volume, water can be released and there is not a requirement to maintain the minimum elevation.

3. **Maintenance of Marsh Vegetation in WCAs to Prevent Wind Tides**. A major factor in water management for WCA No. 3A is the maintenance of marsh vegetation. Prolonged high and low water levels are detrimental to the establishment and maintenance of vegetation within the marsh. If large areas of open water develop as a result of a loss of vegetation, risk of potential hurricane-induced wind tides increases.

b. **WCA No. 3 and ENP-South Dade Conveyance System.** The ability of the ENP-SDCS to manage groundwater and surface water is often dependent upon hydrological conditions created by the unique characteristics of the ENP-SDCS such as but not limited to influential underlying groundwater, flat adjacent terrain, and ecologically sensitive tidal locations downstream of the ENP-SDCS. Additional or more intense discharge from WCA-3A due to the lowering of the Regulation Schedule for WCA-3A may have the potential to, under certain conditions, decrease the flood damage reduction performance as a result of the combined effect of (1)the canal stages prescribed by Interim Operational Plan for Protection of the Cape Sable seaside sparrow, (2)the drainage system components available, (3)the limits on flow to Northeast Shark River Slough (G-3273 and L-29 Borrow Canal), and, (4)how the system is operated to conform with the specified canal stages for most of the normal wet season rainfall variation.

1. **Rainfall Plan**. In 1985, the Corps implemented a rainfall-based delivery formula for releases from Water Conservation Area No. 3A into the Shark River Slough portion of ENP through the S-12s and S-333 (See **Inset A**). There are a number of limitations on the use of S-333 for meeting Rainfall Plan target flows to Northeast Shark River Slough (NESRS), designed to prevent detrimental impacts to publicly (e.g. U.S. Highway 41/Tamiami Trail) and privately owned lands. These limitations are enumerated in Table 7-1 Interim Operational Procedure for Restricted Rain-Driven Water Deliveries to ENP via Northeast Shark River Slough (Rainfall Plan). Implementation of structure gate changes with respect to Rainfall Plan target flows occur after a multi-day time-delay. This delay results from both the calculation of target flows, which requires date specific data as well as the scheduling and travel time to manually operate the S-12s.

2. **S-12 Stability and Risk of Overtopping**. The stability analysis of the S-12s is predicated on a maximum design headwater elevation of 12.4 feet with the differential head across the structure limited to 5.5 feet; also, the as-built crest elevation of L-29 and crown elevation of U.S. Highway 41/Tamiami Trail in the S-12A to S-12D reach has been established to protect against the risk of overtopping from an adjacent flood stage of 12.4 feet. The exceedance of these design conditions should be considered an immediate increase in risk to levee stability and would require decisive and prescribed measures to reduce the WCA No. 3A stage. In addition, application of the Florida Department of Transportation (FDOT) road base impact criteria to this reach of U.S. Highway 41/Tamiami Trail (estimated crown elevation of 14.95 feet) would result in a not to exceed regulated water stage of approximately elevation of 11.5 feet, adjacent to the roadbed (corresponds to WCA No. 3A three gage average stage of 12.45 feet, based on historical regression). While this water stage could be temporarily exceeded, it should be considered adverse with operational measures applied to reduce its duration. See Section 7-02b(7) for further information.

3. **Gap at S-334 in the East Coast Protection Levee**. When S-334 (See **Inset B**) was constructed, a breastwall was not provided; however, in 1995 S-334 was modified providing a breastwall to elevation 17.4. The top of the S-334 gate in the closed position is at elevation 10.1 feet. In addition, the U.S. Highway 41/Tamiami Trail crossing through L-31(N) is at elevation 10.6 feet.

4. **Protection of Cape Sable Seaside Sparrow (CSSS) and Multiple Listed Species**. On February 19, 1999, the U.S. Fish and Wildlife Service (FWS) issued a Final Biological Opinion (BO) under the provisions of the Endangered Species Act (ESA) of 1973, as amended, for actions required to assure the continued existence of the endangered Cape Sable seaside sparrow (CSSS), as affected by operation of components of the Central

and Southern Florida (C&SF) Project in Miami-Dade County. The FWS BO required rapid implementation of structural and operational changes to existing operations of the constructed portions of the C&SF Project, specifically Modified Water Deliveries (MWD) to Everglades National Park (ENP) Project and the Canal-111 South Dade (C-111) Project, which were then operating under Test 7 of the Experimental Program of Water Deliveries to ENP. The FWS BO concluded that the continuation of Test 7, Phase I operations would cause adverse modification of CSSS critical habitat and would jeopardize the sparrow's continued existence. The FWS BO presented a Reasonable and Prudent Alternative (RPA) that would avoid jeopardizing the CSSS. The RPA recommended that the certain hydrological conditions be met for protection of the CSSS. It is recognized in the 1999 FWS BO that there could be times when unseasonably large rainfall events could overwhelm the ability of the water management system to provide the necessary hydrologic conditions. Although the final BO was not issued until 1999, Emergency deviations from Test 7 were implemented in 1998, 1999, 2000 and 2001 to allow USACE to conduct water control operations to protect the CSSS. Beginning in 1999 and through early 2002, a multi-agency team evaluated water management alternatives to ensure the continued existence of the CSSS resulting in implementation of the Interim Operational Plan (IOP) for Protection of the CSSS in late 2002.

The 2006 IOP BO only covers impacts through November 2010. Relevant new species information pertinent to the BO for the 2011 Everglades Restoration Transition Plan (ERTP) is contained in Appendix F of this Master Water Control Manual (MWCM). The BO resulting from the ERTP contains numerous terms and conditions that relate to the operations of constructed features in a manner which ensures the continued existence of listed species, and in some instances, is designed to enhance species conditions while maintaining the Congressionally-authorized C&SF Project purposes. The species include the endangered CSSS, endangered Everglade snail kite, endangered wood stork, and wading bird species.

5. **U.S. Highway 41/Tamiami Trail South of L-29 Borrow Canal**. When FDOT has roadway subbase concerns, S-333 will be closed when the tailwater is above 7.5 feet. S-333 discharges would be limited to avoid causing downstream water levels to exceed 7.5 feet. Completion of the Tamiami Trail Bridge Modification Project projected for December 2013, will allow the limit of 7.5 feet to be reassessed.

6. **L-31(N)/C-111**. The L-31(N) and C-111 canal system has several structures where water management operations are limited (See **Inset C** and **Inset D**, respectively). Tailwater elevations of 6.0 feet and 5.3 feet at S-331 and G-211, respectively, create undesirable conditions relative to adjacent agricultural and residential areas.

7. **WCA No. 3A Inflows and Release Ability**. WCA No. 3A primarily receives inflow via the S-11s from WCA No. 2A; however, other inflows include S-140, S-150, S-8, S-9, and S-9A (See **Inset E**). The design capacity of the S-11s is approximately 17,200 cubic feet per second (cfs) under Standard Project Flood (SPF) conditions. The pump stations (S-8, S-9, S-9A, and S-140) that transfer water into WCA No. 3A include a total design capacity of approximately 9,000 cfs.

The S-12s are not capable of achieving the original design discharge of 32,000 cfs. There has been a change in the discharge rating curves for the S-12s over time which can be attributed, in part, to the accumulation of sedimentation and the growth and increased density of vegetation. In particular, the increased density of vegetation acts as a tailwater weir that increases the water level downstream of the structures, thereby limiting discharge. The U.S. Geological Survey (USGS) periodically updates the discharge rating curve for each of the S-12s. The most recent discharge rating curve available should be used for determination of S-12 discharge capability.

The original design headwater of the S-12s was 12.4 feet and the peak average elevation for WCA No. 3A under the SPF event was 13.90 feet (C&SF Part I, Supplement 33). The as-built crest elevation of the L-29 Borrow Canal and crown elevation of U.S. Highway 41/Tamiami Trail in the S-12A to S-12D reach has been established to protect against the risk of overtopping from an adjacent flood of elevation 11.5 feet (corresponds to WCA No. 3A three gage average stage of 12.45 feet, based on historical regression). See Section 7-02b(2) for further information.

During high water periods in WCA No. 3A, a temporary gap in the Old Tamiami Trail of approximately 60 linear feet has been created approximately 150 feet west of S-346 on an as-needed basis for a limited duration. Infrastructure modifications to be implemented on a temporary basis should be considered during high water periods; however, when temporary infrastructure modifications or other permanent structural features/modifications are necessary, additional National Environmental Policy Act of 1970 (NEPA) analysis may be required. Considering the limitations on discharge through the S-12s, downstream conveyance improvements at the S-12s (potentially including removal of portions of the Old Tamiami Trail) or additional outlets should be considered to mitigate for increased SPF stages within WCA No. 3A during high water events. This includes further degradation of the north portion of L-28, to increase outflows, although the potential for downstream effects, including impact to the U.S. Highway 41/Tamiami Trail roadway and hydro-period/nesting condition effects on CSSS Subpopulation A would require further investigations and potentially additional NEPA documentation.

8. **WCA No. 3B Release Capability**. The outlet for WCA No. 3B was originally S-12E. However, S-12E never functioned as intended due to tailwater conditions which were higher than designed. Subsequent construction of the ENP-SDCS has made S-12E a non-functional structure; the gates have been removed and steel plate has been welded to prevent flow through the structure. The currently available release routes from WCA No. 3B are: 1) to tide through S-31 and S-26 via the Miami Canal (C-6), 2) to ENP through S-355A and S-355B into the L-29 Borrow Canal subject to the L-29 stage constraint, and 3) to the L-31(N) through S-337 and S-335. The G-69 structure was removed in 2007 as the function of that structure was tied to the L-67 pilot test. The original design discharge capability from WCA No. 3B (through the S-355s, S-31, and S-337) is approximately 3,305 cfs.

Water levels in the L-29 Borrow Canal are also influenced by S-333 releases from WCA No. 3A to the L-29 Borrow Canal. This influences the S-355A and S-355B tailwaters and has the potential to limit discharge capacity from the S-355s.

9. **WCA No. 3B Seepage**. The southeast corner of WCA No. 3B has a very high transmissive rate that results in significant accumulation of water in the L-30 Borrow Canal. This seepage reduces the conveyance capacity from WCA No. 3A to the East Coast Canals (ECC) in Miami-Dade County. Specifically, S-338 may not always be capable of routing WCA No. 3A releases and seepage from WCA No. 3B to tide due to structure capacity limitations.

10. **Pump Station Mechanical Longevity**. The mechanical longevity of an individual pump unit can be affected by numerous conditions some of which are addressed in the pump manufacturer’s Operation and Maintenance Manual(s) while others have been realized through site specific conditions at the pump station location and addressed through specific procedures at the pump station. Individual pump units at pump stations will be operated to avoid conditions that could lead to mechanical breakdowns of the pump units. This includes, but is not limited to, avoiding repeatedly cycling of pumps units between “On” and “Off”, rotating the use of pump units from different pump stations that service the same body of water, and engaging the use of individual pump units of a pump station or pump stations that service the same body of water in a staggered manner including when it is prior to “On” criteria occurring. The pump station operator will establish specific procedures to maximize pump unit availability.

c. **8.5 Square Mile Area Southwest Corner**. The southwest corner of the 8.5 Square Mile Area (SMA) is susceptible to increased groundwater levels resulting from the operation of 8.5 SMA Project features. The combination of local conditions, including, but not limited to, proximity to ENP NESRS,

comparatively low ground surface elevation, and the high transmissive layers of the surficial aquifer system, create opportunities for increased seepage to the southwest corner from operation of the pump station 357 (S-357). As a result, S-357 is currently restricted from full design operations and requires real-time monitoring and less than design discharges. See Table 7-5 and Appendix A for further information on S-357 operations.

7-03. **Overall Plan for Water Management.** Day-to-day water management operations for the structures within the WCAs and ENP-SDCS will necessitate the use of operating criteria and other related information contained within this Water Control Plan (WCP) and MWCM. This WCP and the MWCM Structure Descriptions and Rating Curves (Appendix A) contain a compilation of water control criteria, guidelines, diagrams, and specifications that govern the release functions of the pertinent structure(s) for the Congressionally-authorized project purposes. In general, they indicate controlling or limiting rates of discharge and storage space required for the project purposes.

a. **Water Conservation Areas**. Regulation schedules contain instructions and guidance on how project water management structures (spillways, culverts) are to be operated to manage water levels in the WCAs. The regulation schedule essentially represents the seasonal and monthly limits of storage which guides project regulation for the planned purposes. The regulation schedules vary from high stages in the late fall and winter to low stages at the beginning of the wet season. This seasonal range permits the storage of runoff during the wet season for use during the dry season. In addition, it serves to maintain and preserve the vegetation in the WCAs, which is essential to fish and wildlife and the prevention of wind tides. Regulation schedules must take into account the various and sometimes conflicting project purposes.

Conceptually, reservoir storage is commonly divided into the inactive zone, the water supply (conservation) zone, and the flood control zone. The distribution of water between the flood control and water supply zones varies seasonally in the WCAs. The regulation schedules for Water Conservation Areas Nos. 1, 2A, and 3A include a minimum water level, as measured in the borrow canals, (14.0 feet, 10.5 feet, and 7.5 feet, respectively) below which water releases from the WCAs must be preceded by an equivalent volume of inflow. Note that this does not mean that a minimum stage is maintained in the WCAs. When water levels fall below the minimum levels, transfers from Lake Okeechobee or the WCAs are made to meet water supply demands. For example, if the L-67A canal stage measured at the S-333 headwater fell below 7.5 feet, water could be transferred from Lake Okeechobee and/or WCA No. 2A through WCA No. 3A to meet ENP and East Coast water supply demands.

The three WCAs, located south and east of Everglades Agricultural Area (EAA) and west of the urbanized East Coast comprise an area of approximately 1,350 square miles (approximately 864,000 acres). The three WCAs make up a large segment of the original Everglades. Flow is generally slow across the WCAs due to flat slopes and relatively dense vegetative cover, and significant backwater effects can develop. The flat ground slopes and dense vegetation often lead to sloping pool conditions in the WCAs. An interior levee across the southern portion of WCA No. 2 subdivides it into WCA No. 2A and 2B. This levee reduces water losses due to seepage into the extremely pervious aquifer that underlies WCA No. 2B, and obviates the need to raise existing levees to the grade needed to provide protection against wind tides and wave run-up. Two interior levees, L-67A and L-67C run diagonally from pump station S-9 in a southwest direction to S-333 subdividing WCA No. 3 into WCA No. 3A and 3B. These levees reduce water losses due to seepage through the extremely transmissive layers of the Surficial Aquifer System that underlies WCA No. 3B.

1. **WCA No. 1**. Currently being updated, refer to Figure 7-8 which includes Section 7-03b. from 1996 WCAs WCP.

2. **WCA No. 2A**. Currently being updated, refer to Figure 7-8 which includes Section 7-03c. from 1996 WCAs WCP.

3. **WCA No. 2B**. Currently being updated, refer to Figure 7-8 which includes Section 7-03d. from 1996 WCAs WCP.

4. **WCA No. 3A**. In addition to receiving releases from the S-11s (WCA No. 2A), WCA No. 3A receives inflow from S-150 by gravity and from pumping at S-8, S-9, S-9A, and S-140. S-9 and S-9A remove runoff in the east coast area from the South New River Canal up to the design capacity of 2,880 cfs and 500 cfs, respectively. Pumping should begin at S-9/S-9A with S-381 open (deflated), when the stage in the South New River Canal exceeds 4.0 feet. When S-381 is closed, S-9A is used to return seepage from WCA No. 3A. S-140 removes water from the L-28 Borrow Canal up to the design capacity of 1,305 cfs. S-140 is used to maintain canal levels below 10.5 feet unless gravity flow into WCA No. 3A is possible at an adequate rate. S-140 discharges runoff into WCA No. 3A from the L-28 Interceptor Canal. S-142, with a design capacity of 430 cfs, discharges from WCA No. 3A into the North New River Canal. In addition, SFWMD can pump runoff from the North New River Canal and C-13 into WCA No. 3A through S-142 by operating pump station G-123.

To create storage in WCA No. 3A for expected inflow, the S-12s and/or S-333 may be utilized to release up to the projected WCA No. 3A inflow. The projected WCA No. 3A inflow will be determined when large adjustments to structures which discharge into WCA No. 3A are planned and/or regional large rainfall events are forecasted. These pre-emptive/proactive

releases at the S-12s and/or S-333 will be discontinued as the weekly (or other interval) Rainfall Plan target flow calculations dictate. Implementation of pre-emptive/proactive releases will result in an accounting of the amount of water released in excess of the Rainfall Plan target flows.

The S-12s (S-12A, S-12B, S-12C, and S-12D) and S-333 are the main sources of outflow from WCA No. 3A and it is through these structures that the ENP water deliveries are made. However, both S-12A and S-12B have a closure period (1 November through 14 July and 1 January through 14 July, respectively) for the protection of CSSS subpopulation A. The S-12s consist of four, six-gate spillways with a combined capacity designed to be 32,000 cfs under the SPF stages. However, see 7-02b(7) for further information regarding actual capacity. S-333 is a single-bay gated spillway with a design discharge of 1,350 cfs. S-333 also discharges from WCA No. 3A to the ENP-SDCS for water supply and when conditions in NESRS and/or the L-29 Borrow Canal result in the transfer of S-333 discharges to S-334. S-151 discharges from WCA No. 3A to C-304 in WCA No. 3B for flood diversion and for the purpose of providing water supply to Miami area canals and the ENP-SDCS. S-151 may discharge up to the design discharge of 1,105 cfs subject to the headwater at S-31 not exceeding 9.0 feet (See **Inset F**).

S-343A, S-343B, and/or S-344 may discharge from WCA No. 3A into the Big Cypress National Preserve when the WCA No. 3A water level is in Zone A. However, these structures also have a closure period from 1 November through 14 July for the protection of the CSSS subpopulation A. S-14 was built to provide gravity drainage from the lower reaches of the Levee 28 borrow pit, via the Levee 29, Section 2, borrow pit, through the U.S. Highway 41/Tamiami Trail into ENP. However, S-14 never functioned as intended due to tailwater conditions which were higher than design assumptions and currently is not operational.

The Interim Regulation Schedule for WCA No. 3A Parts A, B, and C (Figures 7-5A, 7-5B, and 7-5C, respectively); the Rainfall Plan summarized in Table 7-1; the WCA No. 3, ENP, and ENP-SDCS Operational Guidance shown in Table 7-5; the Historical Transitioning Between IOP Columns 1 and 2 shown in Table 7-7; and various information within this WCP and the MWCM are utilized for management of WCA No. 3A water levels. A 3-gage average elevation (Sites 63, 64, and 65) is utilized for management of WCA No. 3A water levels.

Water supply deliveries to ENP are made through the S-12s and S-333 into Shark River Slough (SRS). The Rainfall Plan is utilized to calculate these deliveries (S-12s and S-333 target flows) to ENP. The flow was historically distributed with a target of 45 percent of the total flow from WCA No. 3A to be delivered at the S-12s and the remaining target of 55 percent to be delivered at S-333. The actual conditions existing in WCA No. 3A and/or ENP will determine the distribution with higher

distribution to the east generally occurring during periods of moderate to low flows. For information on weekly Rainfall Plan calculations, refer to the below link:

https://my.sfwmd.gov/portal/page/portal/pg_grp_tech_pubs/PORTLET_tech_pubs/dre-277.pdf

S-339 and S-340 prevent overdrainage of the northern end of WCA No. 3A, and force water through the marsh to allow natural filtering processes. These structures also provide the ability to transfer water to ENP and to Miami-Dade County canals including ENP-SDCS. These structures are normally closed, and operated according to the Operations Schedule for Canal 123, Structures 339 and 340 (Figure 7-6). Site 62 (Gage 3-2/"Deer Gage") is the indicator gage for operation of these structures.

5. **WCA No. 3B**. A calendar-based regulation schedule has not been historically used for WCA No. 3B due to the limited inflow and high rates of seepage from the area. The regulatory outlet for WCA No. 3B was originally S-12E. However, S-12E never functioned as intended due to tailwater conditions which were higher than design assumptions. Subsequent construction of the ENP-SDCS has made S-12E a non-functional structure. Currently, releases from WCA No. 3B can be made through S-31, S-337, S-355A, and S-355B.

b. **Everglades National Park**. The Interim Regulation Schedule for WCA No. 3A Parts A, B, and C (Figures 7-5A, 7-5B, and 7-5C, respectively); the Rainfall Plan summarized in Table 7-1; the Water Conservation Area 3, ENP, and ENP-SDCS Operational Guidance shown in Table 7-5; the Historical Transitioning Between IOP Columns 1 and 2 shown in Table 7-7; and various information within this WCP and the MWCM are utilized for management of WCA No. 3A water levels and releases to ENP.

1. **Shark River Slough**. The S-12s have no minimum required low flow discharge however, as established in Public Law 91-282 there is an annual average ENP minimum delivery of 315,000 acre-feet which is to be accommodated by implementation of the Rainfall Plan target flows. The Rainfall Plan addresses the overall objectives of providing water deliveries that vary in response to hydro-meteorological conditions in the basin. The Rainfall Plan is summarized in Table 7-1. L-67 Extension and Borrow Canal were originally constructed to provide a means of supplying water directly into SRS inside ENP and help prevent water from spreading eastward onto private property during large S-12 releases. S-346 is a culvert structure equipped with stop logs located in the L-67 Extension Borrow Canal just south of U.S. Highway 41/Tamiami Trail. Normally, S-346 can be open when S-12D is open and is closed when all S-12s are closed.

2. **Water Deliveries to the Eastern Panhandle of ENP via C-111**. The purposes of S-18C are to maintain a desirable freshwater head to prevent saltwater intrusion through C-111, pass flood flows up to 40 percent SPF without exceeding design stages upstream, and act as a control point for water deliveries to the eastern panhandle of ENP. Gate operations are remotely controlled to maintain an optimum range between 2.0 and 2.6 feet upstream of S-18C. Material on the southern side of the C-111 between S-18C and S-197 was degraded to improve sheetflow of freshwater from S-18C to ENP and Florida Bay as well as to moderate the frequency of S-197 gate openings.

S-197 maintains optimum water control stages in C-111 and prevents saltwater intrusion during high tides. Most of the time, S-197 is closed and diverts discharge from S-18C over land to the eastern panhandle of ENP and releases water only during major floods according to S-197 Operating Criteria (Table 7-4).

c. **ENP-South Dade Conveyance System**. The ENP-SDCS water levels are managed by use of: Canal Stages in ENP-South Dade Conveyance System Prompting Deliveries (Table 7-2); Water Conservation Area 3, ENP, and South Dade Conveyance System Operational Guidance (Table 7-5); and other information in this WCP and the MWCM. Table 7-5 also contains reference to Pre-Storm / Storm /and Storm Recovery Operations for South Dade Conveyance System (Table 7-6). The L-31(W) Borrow Canal has been backfilled immediately downstream of S-174 which was required for the construction of the C-111 Southern Detention Area (SDA)(See **Inset G**). Target stages are not provided for the reach from S-18C to S-197.

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

2. **Water Supply**. The ENP-SDCS was authorized for the purpose of improving the supply and distribution of water supplies to ENP, and for expanding agricultural and urban needs in Miami-Dade County. The ENP-SDCS design was superimposed over the existing South Miami-Dade County flood control canal system. The ENP-SDCS was designed to supply, during a 10-year drought, the peak month ENP minimum delivery requirements of 160 cfs to Taylor Slough delivered at S-332 and 75 cfs to the ENP panhandle delivered at S-18C with transient seepage losses; 145 cfs to the

C-2 and C-4 basins; 305 cfs to the C-1 basin, 260 cfs to the C-102 basin; 210 cfs to the C-103 basin; and 140 cfs to the C-113 basin. The original design criteria considered that, except at the coastal salinity structures, canal stages in general would be permitted to recede approximately 1.5 feet below the optimum levels before supplemental water was introduced into the ENP-SDCS (See Section 7-06 for additional details).

d. **8.5 Square Mile Area.** The 8.5 SMA Project features are designed to mitigate for increased flood risk as a result of increased water levels in NESRS and other areas of ENP resulting from the Modified Water Deliveries to ENP Project (MWD). This is consistent with the 2000 General Reevaluation Report (GRR) and Final Supplemental Environmental Impact Statement (FSEIS) Recommended Plan (Alternative 6D).

The constructed features of the 8.5 SMA Project available for water management operations include: a canal (C-357), a detention cell/stormwater treatment area, and a pump station (S-357). S-357 provides flood mitigation to the residents of the 8.5 SMA (Las Palmas Community). The 8.5 SMA Project features are to be operated to maintain the surface and groundwater levels within the project area between the L-357(W) levee and L-31(N) levee at pre-MWD levels and preserve or enhance the hydropatterns of land located west of the L-357(W) levee (ENP and the publicly owned natural areas). The 8.5 SMA Project water management operations are contained in the 2011 8.5 SMA Project Environmental Assessment and Water Conservation Area 3, ENP, and ENP-South Dade Conveyance System Operational Guidance (Table 7-5). The 8.5 SMA Project features will work in conjunction with S-331, the flood control structure for the immediate area.

7-04. **Flood Control**. During high water events, water is passed southward from WCA No. 1 into WCA No. 2A; from WCA No. 2A into WCA No. 3A; and from WCA No. 3A into ENP and/or the ENP-SDCS. All of the S-10, S-11, and S-12 gates are usually opened to allow for a smooth transition of water through the WCAs and into ENP and/or ENP-SDCS. However, S-12A and S-12B both have a closure period from (from 1 November through 14 July and from 1 January through 14 July, respectively) for the protection of CSSS subpopulation A. Discharges from the WCAs to tide via east coast canals can also be made. When the east coast canals are full, discharging water eastward from the WCAs could cause or aggravate local flooding. This is also possible if the east coast canals are being utilized for discharge to tide from the WCAs and a significant rainfall event over the east coast canals occurs. Therefore, water from the WCAs can only be discharged to tide via the east coast canals when rainfall over adjacent areas has not produced large amounts of runoff. The discharge capacity to tide through the coastal structures is relatively small compared to the primary structures (i.e. S-10s, S-11s, and

S-12s). For example, S-39 has a design discharge of approximately five percent of that of a single S-10 structure. In addition, favorable conditions for an extended period are required to make meaningful discharges through the coastal structures.

a. **Hurricane and Tropical Storm Regulations**. These regulations may be supplemented by, but not superseded by, emergency action plans contained in SAJP 500-1-1. SAJP 500-1-1 should be consulted for related emergency preparation and actions. The SFWMD has specific instructions and regulations contained in their Hurricane Procedure Plan, which is updated annually. When a hurricane or tropical storm alert is initiated, Corps of Engineers personnel from the South Florida Operations Office will inspect S-10, S-11, and S-12 and make sure they are operating properly. The Water Management Section, Jacksonville District Office, U.S. Army Corps of Engineers will provide the desired gate settings to the South Florida Operations Office personnel to be used during the alert period. Table 7-5 also contains reference to Pre-Storm / Storm /and Storm Recovery Operations for South Dade Conveyance System (Table 7-6).

b. **Water Conservation Areas**. The S-10, S-11, and S-12 spillways were sized to pass the SPF. The basic purpose of these spillways are to provide a means of controlling flow and providing conveyance from their respective Water Conservation Area to the tailwater for all flood discharges up to the Spillway Design Flood (SDF). Rapid removal of flood storage in the WCAs is limited due to the slow movement of water in the densely vegetated WCAs. The relatively flat terrain and dense vegetation often lead to sloping pool conditions in the WCAs and backwater effects. When conditions in the coastal canals permit, some additional discharges to tide can be made by SFWMD from the WCAs. The peak SPF stage in WCA No. 1 is approximately 18.3 feet with a concurrent total storage of approximately 494,000 acre-feet. The peak SPF stage in WCA No. 2A is approximately 16.6 feet with a concurrent total storage of approximately 596,000 acre-feet. WCA No. 3A storage is approximately 2.7 million acre-feet when the headwater at the S-12s is 12.4 feet, NGVD. Analysis conducted in 2011 indicated that the current configuration of WCA No. 3A inflow and outflow structures would result in a peak SPF elevation within WCA No. 3A (3-gage average) and at the headwater of the S-12s of 15.20 and 13.76 feet, respectively. The levees around the WCAs were generally based on minimum freeboard requirements above the SPF water surface profile (3.0 feet in WCA No. 1 and 2.5 feet in WCA No. 2A and 3A).

c. **ENP-South Dade Conveyance System**. The C&SF Project features in South Miami-Dade County maintain optimum stages for the purposes of flood control, water supply, groundwater recharge, and prevention of saltwater intrusion. The C-111

Basin spillways (S-338, S-196, S-174, S-176, S-177, and S-18C) were designed to pass 40 percent of the SPF without exceeding design stages, and to control discharges during floods in excess of design to prevent damaging velocities at the structures and in the canal. The structures are operated as outlined in Table 7-5; Optimum Water Control and Design Elevations (Table 7-3); and S-197 Operating Criteria (Table 7-4). S-334 and S-335 should be operated consistent with the intent to avoid the creation of antecedent conditions downstream that would increase the risk of flooding relative to the stages prescribed by the IOP for Protection of the CSSS as adverse antecedent conditions (higher canal or detention area stage or both) can result in being above range more frequently, longer, and by a higher stage.

d. **Lake Okeechobee and the Everglades Agricultural Area**. Releases can be made from Lake Okeechobee and the EAA to the WCAs. To maintain EAA canals at their optimum levels, EAA canal water is typically pumped into STAs or, if necessary during storm events, the WCAs. The allowable release from Lake Okeechobee to the WCAs is defined by the lake level. The actual rates of release from Lake Okeechobee will vary depending on, but not limited to, downstream channel conditions, estuary conditions, conditions in the WCAs, and conditions in the STAs. For further information on Lake Okeechobee and EAA water management operations, refer to the Water Control Plan for the Lake Okeechobee and Everglades Agricultural Area.

7-05. **Standing Instructions to Operators/Damtenders**. Specific instructions to operators are found in Appendix E of this MWCM. The spillways in the C-111 Basin are designed to pass 40 percent of the SPF (approximately a 1-in-10 year flood) without exceeding damaging levels. The C&SF Project would considerably reduce damages for floods greater than the design flood up to the SPF. The S-10, S-11, and S-12 spillways are designed to pass the SPF. The Corps is responsible for the operation and maintenance of the S-10s, S-11s, S-12s, and S-355A&B.

Spillways can have four possible flow regimes resulting from the effects of spillway gates and tailwater effects. Generally, in the area covered by this plan, only the two flow regimes listed below occur:

a. **Submerged Uncontrolled Flow**. The spillway gates are fully opened and the discharge is controlled by tailwater conditions.

b. **Submerged Controlled Flow**. The spillway gates are partially open and the discharge is controlled by the combined effects of the headwater and tailwater conditions and the gate opening(s).

The S-10, S-11, and S-12 spillways generally are operated under highly submerged flow conditions. Before large releases are made, the spillway gates should be opened gradually to allow

tailwater stages to rise above 13.0 feet at the S-10s and 10.0 feet at the S-11s.

The spillway discharge rating curves that are being used must be applicable to the particular flow regime encountered. The spillway gates should be opened and closed gradually to provide an even transition to the new flow regime and to minimize hydraulic effects downstream. The tailwater stage should be allowed to build up before the next gate opening operation takes place.

The stilling basin reduces kinetic energy of the flow entering the downstream channel. The stilling basin and downstream riprap are intended to prevent scour downstream of the spillway from undermining or otherwise threatening the integrity of the structure. Spillway gate openings should be checked against the Maximum Allowable Gate Opening (MAGO) Curve (Appendix A) to ensure that the gate openings do not exceed the allowable gate opening for non-damaging operations. Those MAGO curves are based on retaining the hydraulic jump within the stilling basin and providing safe velocities over the riprap and to ensure the safety of the structure. For large floods, the MAGO curves may be exceeded in the "Riprap Control" range, and correspondingly some damage to the riprap will likely occur.

All spillway gates should be operated at the same gate opening. As a practical consideration, the spillway gates at S-10, S-11, and S-12 should not be adjusted such that the gate opening differs by more than approximately one foot. Violation of this precaution could result in erosive action due to excessive velocities, turbulence, and return flow.

7-06. **Water Supply**. Except for the ENP water supply deliveries, SFWMD allocates water to the various users. Some of the beneficial uses that have been identified specifically in legislation or later approved plans are water supply for municipal and industrial use, water supply for irrigation of agriculture, water supply for ENP, and water supply for salinity control and dilution of pollutants in project canals.

The Surficial Aquifer System underlies approximately 3,000 square miles of Miami-Dade, Broward, and Southern Palm Beach Counties. It is a surficial, highly permeable, wedge shaped aquifer that is approximately 200 feet thick at the coast but thins to a few feet thick near its western boundary 35 to 40 miles inland. This aquifer, and surficial aquifers in Palm Beach County, provide water for municipal and industrial (M&I) water supply and agricultural irrigation along the southeast coast. Seepage and water supply releases from the WCAs prevent saltwater intrusion along the coast and recharge the surficial aquifers.

At times, water supply releases are also made from the WCAs to the EAA. The WCAs can function to store water from rainfall

events which may later be released when additional water is needed in the developed areas and ENP.

One of the objectives of the C&SF Project is to increase the water supply to ENP by reducing flow to the east coast during wet periods and to retain enough water in storage to meet water supply needs of the project area. When there is insufficient water available in the WCAs, water is transferred from Lake Okeechobee through the WCAs to meet the needs of the east coast and ENP. SFWMD can make water supply releases to the east coast from the WCAs through S-5A(S), S-39, S-38, S-143, S-141, S-142, S-31, S-337, S-339, S-340, S-151, and S-333.

In order to meet water supply demands in the ENP-SDCS south of S-331, deliveries typically begin when the water levels fall below the stages listed in Table 7-2. These stages are not meant to be maintained at these levels because even with water supply deliveries, the water levels in the canals usually decline considerably below these stages. For additional operating criteria, refer to Table 7-3 and Table 7-5.

Table 7-2

Canal Stages in ENP-South Dade Conveyance System Prompting Water Supply Deliveries

Canal	Reach	Elevation (feet, NGVD)
Levee 29 Borrow Canal	S-333 to S-334	3.5
Levee 30 Borrow Canal	S-32A to S-335	4.0
Levee 30 Borrow Canal	S-335 to U.S. 41	3.5
Levee 31N Borrow Canal	U.S. 41 to S-331/S-173	3.5
Levee 31N Borrow Canal	S-331/S-173 to S-176	4.0
Canal 111	S-176 to S-177	3.0
Canal 111	S-177 to S-18C	2.0
Canal 111	S-18C to S-197	1.0

7-07. **Recreation**. Recreation is an authorized project purpose for the C&SF Project including the WCAs. There are abundant recreational facilities within the project area, both private and public. Recreation is considered in the decision-making process. And while infrequent, recreation needs may result in a water release.

7-08. **Water Quality**. On 12 October 1988, the United States filed suit against the State of Florida Department of Environmental Regulation (DER) and the South Florida Water Management District (SFWMD) alleging violation of Florida environmental laws by diverting nutrient polluted waters through the C&SF Project to the detriment of Arthur R. Marshall Loxahatchee National Wildlife Refuge (WCA No. 1) and the ENP and

by failing to enforce its environmental laws against the sources of pollution. The Corps was involved as a plaintiff in the lawsuit. In full recognition that ENP and the Refuge are unique and irreplaceable natural resources, and in order to settle the lawsuit, the Federal and State parties agreed in July 1991 to cooperate in a commitment to restore and maintain the quality of water delivered to ENP and the Refuge.

Florida's Marjorie Stoneman Douglas Everglades Protection Act went into effect 1 July 1991 with the purpose of facilitating the Surface Water Improvement and Management (SWIM) process by providing a funding mechanism to implement Everglades SWIM plan strategies and other projects necessary to meet Everglades water quality requirements. The Act requires SFWMD to apply to the Florida Department of Environmental Protection for 5-year interim permits for its structures in the Everglades Protection Area, which should include recommended ambient concentration levels and discharge limitations for phosphorus necessary to meet state water quality standards, proposed interim concentration levels, and strategies to achieve compliance including the development of a regulatory program to improve water quality before it enters the stormwater management systems.

a. **General**. Regulations for water quality are a function of the State of Florida. SFWMD, acting on behalf of the state, petitions the Corps for changes in flood control and navigation regulations where it sees that water quality benefits may be achieved in the project area without significant loss of benefits for the project's authorized purposes. House Document 90-369 did not make recommendations specifically for water quality control, but rather water quality control is a vital function in proper water resource management and would be incorporated in operational procedures as may be dictated by results of continuing investigations in this area in cooperation with affected State and Federal agencies.

The water management decision-making process for determining the actual WCA No. 3A releases to be implemented at the S-12s and S-333 (S-334) should include consideration of water quality. The Rainfall Plan target flows, status of water quality loadings, available conveyance capacity of the ENP-SDCS, weather forecasts, historical water quality loadings, and the WCA No. 3A Interim Regulation Schedule Part C may result in an inability to make WCA No. 3A releases to NESRS (Column 2 operations).

b. **Everglades National Park**. Senate Document 91-895 pointed out that while PL 91-282 was designed to assure an adequate supply of water to ENP, in order to preserve ENP's unique ecosystem, it is important that consideration be given to the quality of the water delivered. The Corps and the NPS were to reach an early agreement on measures to assure that the water

delivered to ENP was of sufficient purity to prevent ecological damage or deterioration of ENP's environment. This led to the Memorandum of Agreement (MOA), signed 4 December 1979 and updated in 1984, among the Corps of Engineers, SFWMD, and NPS for the purpose of protecting the quality of water entering ENP. The numerical water quality criteria for inflows into the ENP outlined within the MOA has been superseded by the Settlement Agreement, case no. 88-1886-CIV-HOEVELER criteria. A specific paragraph in the MOA states that should a clear and present danger to the Park be present the parties shall take such measures as may be necessary to improve the water being delivered to the Park. As stated previously, proposed water management operations resulting from water quality consideration would be conducted after coordination with the SFWMD.

c. **Lake Okeechobee.** The Interim Action Plan (IAP) and the Lake Okeechobee Operating Permit (LOOP) are discussed in Volume 3, Master Water Control Manual for Lake Okeechobee and Everglades Agricultural Area. The IAP is important relative to the WCAs as it changed the volume of water entering WCA No. 2A and WCA No. 3A. Water that was originally designed to be pumped to Lake Okeechobee via S-2 and S-3 is diverted south to WCA No. 2A and WCA No. 3A.

7-09. Fish and Wildlife.

a. **General**. Preservation of fish and wildlife is an authorized project purpose. WCA No. 1 is designated as the Arthur R. Marshall (ARM) Loxahatchee National Wildlife Refuge. WCA Nos. 2 and 3 are public hunting and fishing areas; they comprise the Florida Fish and Wildlife Conservation Commission Everglades Wildlife Management Area. The effects of the regulation schedules on fish, wildlife and vegetation in the WCAs were and are important considerations in determining regulation schedule shapes and ranges. The minimum canal stages in the WCAs were established to help reduce adverse impacts on fish and wildlife resources. The WCAs preserve a wetland environment for Everglades plant and wildlife species.

In 2010, FWS, along with species experts, developed a Multi-Species Transition Strategy (MSTS) for WCA No. 3A that was based upon the best available science. The MSTS is the foundation for Part B of the WCA No. 3A Interim Regulation Schedule (Figure 7-5B) and provides guidance for WCA No. 3A stage and recession rate based upon the needs of multiple species and their habitats.

b. **Protected Species and Their Habitat**. Twenty-four federally-listed threatened and endangered species are either known to exist or potentially exist within the area (WCAs, ENP, coastal areas) including the Florida panther, Florida manatee, CSSS, Everglade snail kite, wood stork, American alligator, American crocodile, and Eastern indigo snake. In addition, designated critical habitat also occurs in the area including:

marl prairie areas in ENP and the East Everglades for the CSSS; all of WCA No. 3A, all of WCA No. 1, and portions of Shark River Slough for the Everglade snail kite; coastal areas along Florida Bay for the American crocodile; and coastal areas around ENP for the Florida manatee.

c. **Deer and Furbearing Animals**. During periods of high water levels resident deer and other furbearing animals in WCA No. 3A can be negatively affected to the point of population reduction. As water levels rise, deer and other furbearing animals tend to congregate on areas of high ground. As water levels continue to rise the areas of high ground become more limited. The longer that high water levels persist, the more likely that competition for foraging, general physical condition, and increased susceptibility to parasitism and disease of animals becomes a concern. The FWS or Florida Fish and Wildlife Conservation Commission (FWCC) monitor and provide important information when there is concern that high water levels could negatively affect either deer or other furbearing animals.

7-10. **Navigation**.

a. **General**. There are no authorized project features for navigation within the WCAs. There is much recreational boating in the WCAs and associated project canals. The minimum stages for the conservation pools in the WCAs help reduce adverse impacts on recreational boating during drought periods. S-341 (Buttonwood Plug) located in the Buttonwood Canal in ENP is equipped with a small boat transfer hoist.

b. **Access to Cultural Areas Downstream of S-12A**. To provide the Miccosukee Tribe of Indians of Florida (Miccosukee Tribe) access to cultural areas when the Rainfall Plan results in S-12 target flows, S-12A may release up to 100 cfs during periods of time when the structure would have otherwise remained closed. From 1 November through 14 July, the Corps must request consultation with FWS to avoid impacts on CSSS subpopulation A. During the 1 November through 14 July time period, the duration of this release would not exceed five consecutive days. The initial release would be managed as a field test to determine any potential effects associated with the release on CSSS-A. If no adverse impacts occur, subsequent releases would be coordinated and monitored appropriately.

During the decision making process to determine implementation or non-implementation of Miccosukee Tribe requested S-12A up to 100 cfs release, hydro-meteorological data such as but not limited to NP-205 water elevation, rainfall, and rainfall forecasts will be utilized. Other pertinent details related to this decision making process from the U.S. Fish and

Wildlife Service Biological Opinion for Everglades Restoration Transition Plan (See Appendix F).

During implementation of the S-12A up to 100 cfs release for access to Miccosukee Tribe cultural areas, data such as but not limited to NP-205 and area rainfall will be monitored. If NP-205 is observed to increase or anticipated to increase above 5.7 feet, S-12A will be closed. A new water level gage installed between S-12A and NP-205 will also provide additional hydrologic information including, but not limited to, effectiveness of S-12A releases that provide access to cultural areas and S-12A releases to avoid impact on CSSS-A.

7-11. **Drought Contingency Plan**. The Drought Contingency Plan for WCAs, ENP, and ENP-SDCS can be found in Appendix B of this MWCM. SFWMD's Water Supply Plan represents the majority of the water management related contents of the Drought Contingency Plan and can be found using the following link:

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

7-12. **Prevention of Saltwater Intrusion**. Low coastal elevations over highly porous formations, combined with extensive groundwater use, require critical management of water levels to control saltwater intrusion. Water supply releases can be made from the WCAs, or transferred from Lake Okeechobee, to the coastal areas to prevent saltwater intrusion and recharge the surficial aquifer. Inland movement of saltwater in tidal canals and streams is basically a function of the relative densities of freshwater and saltwater, the rates of freshwater discharge, and tidal action. The coastal spillways prevent a saltwater wedge from moving up the canals, and maintain sufficient freshwater head to prevent saltwater intrusion in the aquifer.

7-13. **Deviation from Normal Regulation**. The Water Management Section is responsible for handling deviation requests and transmitting them through the District Commander to the Division Engineer for final decision. The District Commander is occasionally requested to deviate from the normal regulation of the water conservation areas and canals. Prior approval for a deviation is required from the South Atlantic Division (SAD) except as noted below. Deviation requests usually fall into the following categories:

a. **Emergencies**. Examples of some emergencies that can be expected to occur at a project are: drowning and other accidents, failure of operation facilities, chemical spills, treatment plant failures, and other temporary pollution problems. Water control actions necessary to abate the problem are taken immediately unless such action would create equal or worse conditions. The Jacksonville District Office (SAJ) shall

be informed as soon as practicable. SAJ must inform their division office (South Atlantic Division, SAD) as soon as practicable. SAJ must prepare written confirmation of the deviation and description of the cause and furnish it to the SAD water control manager. SAD may develop forms to facilitate the reporting of emergency deviations.

b. **Unplanned Minor Deviations**. There are unplanned instances that create a temporary need for minor deviation from the normal regulation plan, although they are not considered emergencies. Construction accounts for the major portion of these instances and typical examples include utility stream crossings, bridge work, and major construction contracts. Deviations 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 must be given to upstream watershed conditions, potential flood threat, conditions of the lake, and alternative measures that can be taken. In the interest of maintaining good public relations, requests generally are complied with providing there are no foreseen adverse effects on the overall regulation of the project (or projects) for the authorized purposes. Approval for these minor deviations will normally be obtained from SAD by telephone. Written confirmation explaining the deviation and its cause will be furnished to SAD.

c. **Planned Deviations**. Each condition should be analyzed on its own merits. Sufficient data on flood potential, lake and watershed conditions, possible alternative measures, benefits to be expected, and probable effects on other authorized and useful purposes, together with SAJ recommendation, will be presented by letter or telefacsimile to SAD for review and approval.

Tables

Table 7-1

Interim Operational Procedure for Restricted Rain-Driven Water Deliveries to Everglades National Park via Northeast Shark River Slough (Rainfall Plan)

Background.
A series of experimental water deliveries to Everglades National Park (ENP) began in 1984 to temporarily set aside the Minimum Delivery Schedule of water to ENP and to begin a series of field experiments to test proposed management plans for making water deliveries to Shark River Slough (SRS). In 1985, a 2-year test of the Rainfall Plan to develop a water management plan for determining the amount, timing, and distribution of flow from WCA-3A to Shark River Slough was initiated. The goal of the Rainfall Plan is to provide environmental benefit to ENP by returning the hydrology of SRS to a condition compatible with the natural environment of ENP. In formulating the Rainfall Plan, it was believed that there were three critical objectives: (1) To base the amount and timing of water deliveries to SRS on recent weather conditions (rainfall and evaporation) upstream of the slough (i.e., in WCA-3A), (2) To moderate the sudden changes in flow that were caused by strict adherence to the WCA No. 3A Regulation schedule, and (3) To redistribute flow across the entire slough (i.e., to restore flow to the eastern flow section to North East Shark River Slough).

Introduction.
This table provides the Interim Operational Procedure for Restricted Rain-Driven Water Deliveries to ENP via NESRS, better known as the Rainfall Plan. In addition, the Rainfall Plan includes incorporating the 8.5 Square Mile Area (SMA) Project Interim Operating Criteria.

(1) Timing and Volume of Water Deliveries to Shark River Slough (SRS). Water deliveries will be computed and operations adjusted, weekly, if necessary, based on the sum of two components; a rainfall response component and a Water Conservation Area (WCA) No. 3A regulatory component.

(a) Rainfall response component. Weekly means of rainfall, evaporation, and total flow across U.S. Highway 41 (Tamiami Trail) for the period from 1941 through 1952 are used in the following equation.

QRES = QM + (CQ x QL) + (CR1 x RE1-2) + (CR2 x RE3-6) + (CR3 x RE7-10)

where

QRES = computed rainfall response component based on the regression equation in cubic feet per second (cfs)

QM = mean discharge for current week

QL = deviation from mean discharge for previous week

RE1-2 = deviation from mean rainfall for previous 2 weeks - 80 percent of deviation from mean evaporation for previous 2 weeks

RE3-6 = same as above for previous third through sixth weeks

RE7-10 = same as above for previous seventh through tenth weeks

CQ = lagged flow coefficient = .907

CR1, CR2, CR3 = lagged rainfall excess coefficients

The lagged rainfall excess coefficients are varied depending on whether the rainfall excess terms are positive or negative as shown below.

Rainfall Coefficients

	Negative Rainfall Excess Term	Positive Rainfall Excess Term
CR1	52.22	70.58
CR2	-4.24	9.49
CR3	-3.41	9.18

(b) WCA No. 3A Regulatory Component. When the 3-station average (Sites 63, 64, 65) water level in WCA No. 3A rises above Zone E (see the WCA No. 3A Interim Regulation Schedule on ***Figure 7-5***), a supplemental regulatory component is added to the rainfall response component. The goal is to provide 45 percent of the total Regulatory Component water deliveries to SRS through the S-12s and 55 percent of the total through S-333 on a weekly basis. The regulatory component is computed by multiplying the distance (in feet) the WCA No. 3A

water level is above Zone E/E1 by 2,500 cubic feet per second (cfs)/foot from 1 January through 30 June and by 5,000 cfs/foot from 1 July through 31 December.

(2) Location of Rainfall Component Water Deliveries to Shark River Slough. The goal is to provide 45 percent of the total Rainfall Component water deliveries to SRS through the S-12s and 55 percent of the total through S-333. However, there may be dry season conditions or unseasonably dry conditions when ENP recommends that the percent distribution is not limited to 45 and 55 percent, respectively.

(3) WCA No. 3A Interim Regulation Schedule. The operation of WCA No. 3A will be in accordance with the attached zoned regulation schedule and WCA No. 3A operational guidelines (***Figures 7-5A, 7-5B, and 7-5C, and Table 7-5)***.

(4) Constraints. Target flow through the S-12s and S-333 will be computed based on the rain driven water delivery method described above. Water management operations will be subject to the following conditions.

(a) L-31N Borrow Canal North of S-331 (8.5 SMA Interim Operating Criteria). Resulting from the 2011 8.5 SMA Project EA FONSI, Las Palmas water level gage LPG2, located near the western boundary of the Rocky Glades residential area, will be monitored to indicate appropriate operations of the L-31N borrow canal system. Discharges through S-331 can be made if the S-331 tailwater stage is below 6.0 feet, NGVD and the S-176 headwater stage is below 5.5 feet, NGVD. If either of those water levels of S-331 and S-176 were exceeded, discharges at S-331 would be terminated until the S-176 headwater stage recedes to 5.0 feet, NGVD. S-331 discharges would be terminated when the S-176 headwater stage is between 5.0 and 5.5 feet, NGVD if heavy rainfall is forecasted.

(1) If the level at LPG2 is less than 5.5 feet, NGVD there will be complete flexibility in operating the L-31N borrow canal system within the design limits specified by the U.S. Army Corps of Engineers (USACE).

(2) If the level at LPG2 is between 5.5 and less than 6.0 feet, NGVD, the average daily water level upstream of S-331 will be maintained between 4.5 to 5.0 feet, NGVD, if permitted by downstream conditions.

(3) If the level at LPG2 is at or above 6.0

feet, NGVD and S-357 constraints are not limiting the ability of maintaining C-357 average-daily water level below 6.2 feet, NGVD, the average daily water level upstream of S-331 will be maintained between 4.5 to 5.0 feet, NGVD, until the water level at LPG2 recedes below 5.7 feet, NGVD, if permitted by downstream conditions.

(4) If the level at LPG2 is at or above 6.0 feet, NGVD and S-357 constraints are limiting the ability of maintaining C-357 average-daily water level below 6.2 feet, NGVD, the average daily water level upstream of S-331 will be maintained between 4.0 to 4.5 feet, NGVD, until the water level at LPG2 recedes below 5.7 feet, NGVD, if permitted by downstream conditions.

(b) L-31N Borrow Canal South of S-331. Follow Columns 1 and 2 of the WCA-3/ENP/South Dade Conveyance System (SDCS) Operational Guidance Table (***Table 7-5)*** for water management operations at S-331 tailwater, S-332B headwater, S-332C headwater, S-332D headwater, and S-176 headwater.

(c) L-29 Borrow Canal East of S-333. S-333 discharges will be limited based on four criteria; water levels in the L-29 borrow canal, water levels at well G-3273, S-334 inability to match S-333 discharges, and headwater stage at S-331 as well as S-176, as described below.

(1) S-333 discharges would be limited to avoid causing the downstream water levels to exceed 7.5 feet, NGVD (due to Florida Department of Transportation [FDOT] constraint).

(2) When water levels at G-3273 have been above 6.8 feet, NGVD for 24 hours, S-333 will be closed.

(3) S-333 will be closed until the water level at G-3273 has stopped rising and is below 6.8 feet, NGVD if the following conditions occur:

(a) The water level at G-3273 has risen above 6.5 feet, NGVD for 48 hours; and

(b) The water level at G-3273 has risen in the last 24 hours at a rate that would cause it to exceed 6.8 feet, NGVD, within the next 24 hours.

(4) If G-3273 is above 6.8 feet, NGVD, S-333

will be closed if S-334 is unavailable to open to match S-333 discharges.

(5) If the headwater stage at S-176 exceeds 4.5 feet, NGVD for more than 24 hours or the S-331 headwater stage exceeds its target level for more than 24 hours, discharges at S-333 will be reduced, if necessary, to avoid causing water levels in the L-29 borrow canal from exceeding 7.25 feet, NGVD until stages at S-331 and S-176 have been maintained at the appropriate levels for 24 hours.

Table 7-3

Optimum Water Control and Design Elevations

			Headwater Elevation (Feet, NGVD) Auto Gate Operation			Flood Control Design (40% SPF)		
	Canal	**Table 7-5 Column**	**Open**	**Optimum**	**Closed**	**HW ft**	**TW ft**	**Discharge cfs**
S-175	L-31(W)	1 and 2	Closed*			5.0	4.5	500
S-176[1,4]	C-111	1	5.0	---	4.75	6.0	5.5	630
		2	4.9	---	4.7			
S-174	C-111	1 and 2	Closed					
	L-31(W)	1 and 2	Closed					
S-177[4]	C-111	1 and 2	4.2	---	3.6	4.3	3.7	1400
S-18C[2,4]	C-111	1	2.6	---	2.3	2.6	2.1	2100
	C-111	2	2.25	---	2.0			
S-197[3,4]	C-111	---	Closed*			1.4	0.6	2400

*Manually Operated Structures

Notes:

1. S-331 and S-173 function as a divide structure between C-111 and the L-31(N) Borrow Canal. During flood periods S-173 and S-331 can discharge into C-111 on a secondary basis (when canal capacity in C-111 is available).

2. S-18C gate operations are remotely controlled to maintain an optimum range between 2.0 and 2.6 ft. above the structure while making minimum monthly water releases to ENP as follows:

Month	Acre-Feet		Month	Acre-Feet
January	1,540		July	510
February	630		August	860
March	290		September	2,690
April	110		October	4,630
May	110		November	4,060
June	340		December	2,230

3. S-197 is closed except for the conditions described in Table 7-4.

4. Automatic gate operations are meant to manage canal water levels in accordance with Table 7-5 WCA-3, ENP, and ENP-SDCS Operational Guidance.

5. The design of the ENP-SDCS was based on a 1-in-10 year drought condition.

Note: All elevations are in feet NGVD 1929 unless otherwise stated. Revised April 2012

Table 7-4

S-197 Operating Criteria

The structure is closed except for the conditions described below:

Open Culverts: Opening of S-197 culverts will begin when water levels exceed specified levels at the referenced structures:

- S-177 HW > 4.10 after gates have been opened full**
  Or S-18C HW > 2.80; open 3 culverts
- S-177 HW > 4.20 for 24 hours or S-18C HW > 3.10; open a total of 7 culverts
- S-177 HW > 4.30 of S-18C HW > 3.30; open a total of 13 culverts

** Due to discharge capacity of S-177, headwater stage levels upstream of the structure may decline abruptly once the structure is opened. Culverts at S-197 will remain closed until S-177 has been completely opened. This lag time will allow the canal levels to equalize and provide an opportunity for flood waters to first discharge through the C-111 gaps. After S-177 gates have been fully opened and canal stage level continues to exceed the flood control criteria, culverts at S-197 will be opened according to the criteria above.

Close Culverts: Closing of the culverts at S-197 will begin after all of the following conditions have been met:

1. When headwater canal stage (stage upstream of the structure) at S-176 has declined below 5.2 feet, NGVD, and headwater stage at S-177 has declined below 4.2 feet, NGVD. Note: Stage level above 5.2 feet and 4.2 feet, NGVD, respectively, at these structures trigger mandatory flood control releases. A declining trend in water levels below this stage would indicate the peak of the storm event has passed.

2. Position of the storm has moved away from the basin.

3. Once conditions 1 and 2 above have been met, only the number of S-197 culverts required to match the residual discharge volume flowing through S-176 will be open. This will prevent unnecessary over-drainage of the panhandle region by restricting the amount discharged through S-197 to equal the amount of inflow from the upper basin. All culverts will be closed once S-177 headwater stage declined below 4.1 feet, NGVD, and the above conditions are satisfied.

Table 7-5

Water Conservation Area No. 3, Everglades National Park, and ENP-South Dade Conveyance System Operational Guidance

Structure/ Operational Component	Column 1: No WCA-3A Regulatory Releases to SDCS or SRS	Column 2: WCA-3A Releases to SDCS	WCA-3A Ecological Intent (defined at bottom of Table)
Note: Column 1 is the desired column to send releases to ENP. Column 2 would be used when constraints (such as but not limited to L-29, G-3273, or capacity in the SDCS) and considerations (such as but not limit to anticipated rainfall events, water quality, and other ecological benefits) exist. Transition to or from columns will be based on both current and anticipated conditions.			
WCA-3A Interim Regulation Schedule	WCA-3A Interim Regulation Schedule shown on ***Figure 7-5A, Figure 7-5B,*** **and** ***Figure 7-5C.*** **When in Zone A** S-12s, S-333, S-343A&B, and S-344 subject to conditions below, otherwise, S-12s open full, S-151 make discharges to the East Coast and ENP-SDCS as needed and make maximum allowable discharge when WCA-3B stage (Site 71) is below 8.5 feet, NGVD. S-343A&B and S-344, if non-nesting season (15 July through 31 October), make maximum allowable discharge if downstream conditions permit. **When in Zone D** S-12s, S-333, S-343A&B, and S-344 subject to conditions below, otherwise, S-12s discharge Rainfall Plan target flow for S-12s. If S-333 is closed or discharging less than 28 percent of computed flow for SRS, S-12 must discharge at least 73 percent and up to 100 percent of the computed flow for SRS, if capacity is available. S-333 make water supply discharges to the East Coast and ENP-SDCS as needed, discharge Rainfall Plan target flow for S-333 when permitted by downstream conditions. S-151 makes water supply discharges to the East Coast and ENP-SDCS as needed. S-343A&B and S-344 normally closed in this Zone unless water is needed for environmental reasons. **When in Zone E** S-12s, S-333, S-151, S-343A&B, and S-344 subject to conditions below, otherwise, S-12s discharge Rainfall Plan target flow for S-12s. S-333 make water supply discharges to the East Coast and ENP-SDCS as needed, discharge Rainfall Plan target flow for S-333 when permitted by downstream conditions. S-151 makes water supply discharges to the East Coast and	WCA-3A Interim Regulation Schedule shown on ***Figure 7-5A, Figure 7-5B,*** **and** ***Figure 7-5C.*** **When in Zone A** S-12s, S-333, S-343A&B, and S-344 subject to conditions below, otherwise, S-12s open full, S-151 make discharges to the East Coast and ENP-SDCS as needed and make maximum allowable discharge when WCA-3B stage (Site 71) is below 8.5 feet, NGVD. S-343A&B and S-344, if non-nesting season (15 July through 31 October), make maximum allowable discharge if downstream conditions permit. **When in Zone D** S-12s, S-333, S-343A&B, and S-344 subject to conditions below, otherwise, S-12s discharge Rainfall Plan target flow for S-12s. If S-333 is closed or discharging less than 28 percent of computed flow for SRS, S-12 must discharge at least 73 percent and up to 100 percent of the computed flow for SRS, if capacity is available. S-333 make water supply discharges to the East Coast and ENP-SDCS as needed, discharge Rainfall Plan target flow for S-333 when permitted by downstream conditions. S-151 makes water supply discharges to the East Coast and ENP-SDCS as needed and make up to maximum allowable discharge when WCA-3B stage (Site 71) is below 8.5 feet, NGVD. S-343A&B and S-344 normally closed in this Zone unless water is needed for environmental reasons. **When in Zone E** S-12s, S-333, S-151, S-343A&B, and S-344 subject to conditions below, otherwise, S-12s discharge Rainfall Plan target flow for S-12s. S-333 make water supply discharges to the East Coast and ENP-SDCS as needed, discharge Rainfall Plan target flow for S-333 when permitted by downstream conditions. S-151 makes water supply discharges to the East Coast and	These operations are recommended to support the following performance measures: A, B, E, F, G, H, I

Structure/ Operational Component	Column 1: No WCA-3A Regulatory Releases to SDCS or SRS	Column 2: WCA-3A Releases to SDCS	WCA-3A Ecological Intent (defined at bottom of Table)
	ENP-SDCS as needed. S-343A&B and S-344 normally closed in this Zone unless water is needed for environmental reasons. The L-67A Borrow Canal stage (S-333 headwater) should not be drawn down below 7.5 feet, NGVD unless water is supplied from another source. **When in Zone E1**, make up to maximum practicable releases at S-12C, S-12D, S-142, S-151, S-31, S-337, S-335, S-333, S-355 A/B, and S-334 when permitted by downstream conditions. S-12s, S-333, S-151, S-343A&B, and S-344 subject to conditions below, otherwise, S-12s discharge Rainfall Plan target flow for S-12s. Revert to Zone E rules if the FWS has determined that nesting for the CSSS-A has ended, or if the headwater at S-333 falls below 8.25 feet, NGVD.	ENP-SDCS as needed. S-343A&B and S-344 normally closed in this Zone unless water is needed for environmental reasons. The L-67A Borrow Canal stage (S-333 headwater) should not be drawn down below 7.5 feet, NGVD unless water is supplied from another source. **When in Zone E1**, make up to maximum practicable releases at S-12C, S-12D, S-142, S-151, S-31, S-337, S-335, S-333, S-355 A/B, and S-334 when permitted by downstream conditions. S-12s, S-333, S-151, S-343A&B, and S-344 subject to conditions below, otherwise, S-12s discharge Rainfall Plan target flow for S-12s. Revert to Zone E rules if the FWS has determined that nesting for the CSSS-A has ended, or if the headwater at S-333 falls below 8.25 feet, NGVD.	
Rainfall Plan	Rainfall Plan located in Table 7-1. S-12s/S-333 pre-emptive/proactive releases to better manage high stages in WCA-3A. S-12s and/or S-333 release up to projected WCA-3A inflow based upon system water management operations and/or rainfall to create storage in WCA-3A for expected inflow. Regulatory component of the Rainfall Plan determined by multiplying the distance (in feet) the WCA-3A water level is above Zone E/E1 by 2,500 cfs from 1 January through 30 June and by 5,000 cfs from 1 July through 31 December. Calculate Modified Rainfall Plan to gather comparison and historical information.		Ability to match inflow with S-12s and/or S-333 releases intended to avoid damaging high water levels in WCA-3A. This Modified Rainfall Plan calculation and comparison with Rainfall Plan in Annex A is recommended in order to identify and keep a record of the difference in the Rainfall Plan in Table 7-1 versus the Modified Rainfall Plan, to aid future Rainfall Plan studies.
Pre-Storm/ Storm/and Storm Recovery Operations for the SDCS prior to the 2011 8.5 SMA Project EA FONSI	Pre-Storm/Storm/and Storm Recovery Operations for the SDCS in Table 7-6.		

Structure/ Operational Component	Column 1: No WCA-3A Regulatory Releases to SDCS or SRS	Column 2: WCA-3A Releases to SDCS	WCA-3A Ecological Intent (defined at bottom of Table)
Pre-Storm/ Storm/and Storm Recovery Operations for the SDCS resulting from the 2011 8.5 SMA Project EA FONSI	Pre-Storm/Storm/and Storm Recovery Operations for the SDCS in Table 7-6, which references Angel's Well, will be revised to reference LPG1 and LPG2 not Angel's Well.		
S-343 A/B and S-344	Closed from 1 November through 14 July independent of WCA-3A levels.		
S-12 A/B/C/D	S-12A closed from 1 November through 14 July; S-12B closed from 1 January through 14 July; S-12C no closure period. S-12D no closure period. S-12A closed from 1 November through 14 July, S-12B closed from 1 January through 14 July subject to below unless FWS has determined that nesting season for the CSSS-A has ended. WCA-3A water levels may require the opening of S-12A and/or S-12B during the period from 1 November through 14 July (additional NEPA documentation) to avoid unacceptable risk of failure of WCA-3A levees and/or outlet structures. **S-12A Year-round**: To provide access to cultural areas, when Rainfall Plan results in S-12 target flows, S-12A up to 100 cfs release. **S-12A Cultural Access Release:** S-12A up to 100 cfs release available when Rainfall Plan results in S-12 target flows. From 1 November through 14 July, USACE must request informal consultation with FWS to avoid impacts on CSSS-A. During this time, the duration of this release will not exceed five consecutive days. S-12A up to 100 cfs release may only occur when WCA-3A 3-gage average (WCA-3AVG - Sites 63, 64, 65) is greater than 8.4 feet, NGVD. During S-12A up to 100 cfs release, data such as but not limited to NP-205 and area rainfall will be monitored with NP-205 increase or anticipated increase above 5.7 feet, NGVD resulting in closing of S-12A. **S-12C/D Year-round**: S-12C and/or S-12D release up to WCA-3A Regulation Schedule (Zone A maximum) or Rainfall Plan (target flow). **S-12s Flow Distribution:** S-12 opening sequence to meet Target Flows is from east (S-12D) to west (S-12A); S-12s flow distributions would not be limited to the historical percentage distribution of flow from the S-12s (10 percent at S-12A, 20 percent at S-12B, 30 percent at S-12C, 40 percent at S-12D). **S-12A/B/C/D Headwater greater than 11.0 feet, NGVD:** Open an amount only enough to stop overtopping of gates.	These operations are recommended to support the following performance measures: **S-12C/D Year-round**: A, B, E, F, G, H, I **S-12s Flow Distribution:** Due to the position of S-12D near the center of SRS, S-12D should generally pass the most water, with less water passed to the west.

Structure/ Operational Component	Column 1: No WCA-3A Regulatory Releases to SDCS or SRS	Column 2: WCA-3A Releases to SDCS	WCA-3A Ecological Intent (defined at bottom of Table)
	DOI Sandbag culverts under Tram Road by February 1 if necessary.		
S-333: G-3273 less than or equal to 6.8 feet, NGVD	Rainfall Plan target flow for S-333 (to NESRS). When WCA-3A is in Zone E1 or Zone A, maximum practicable through S-333 to NESRS. Note: If FDOT has no roadway subbase concerns S-333 will be closed when the tailwater is above 9.0 feet, NGVD. However, when FDOT has roadway subbase concerns, S-333 will be closed when the tailwater is above 7.5 feet, NGVD. However, upon completion of the Tamiami Trail Bridge Modification these concerns may no longer exist.	Rainfall Plan target flow for S-333 (to NESRS), plus as much of the remaining Rainfall Plan target flow that the S-12s cannot discharge to be passed through S-334 and subject to capacity constraints, which are 1,350 cfs at S-333, L-29 maximum stage limit, and canal stage limits downstream of S-334. When WCA-3A is in Zone E1 or Zone A, maximum practicable through S-333 to NESRS. Note: If FDOT has no roadway subbase concerns S-333 will be closed when the tailwater is above 9.0 feet, NGVD. However, when FDOT has roadway subbase concerns, S-333 will be closed when the tailwater is above 7.5 feet, NGVD. However, upon completion of the Tamiami Trail Bridge Modification these concerns may no longer exist.	
S-333: G-3273 greater than 6.8 feet, NGVD	Closed	Match S-333 with S-334 flows.	
L-29 Borrow Canal	9.0* feet, NGVD * In order to raise the L-29 Borrow Canal above 7.5 feet, NGVD additional NEPA would need to be completed. Note: Refer to S-333 operations which address FDOT roadway subbase concerns.		
S-355A and S-355B	Follow the same constraints as S-333. Open whenever gradient allows southerly flow.		
S-337	Water supply	Regulatory releases pursuant to WCA-3A Interim Regulation Schedule.	
S-151	Water supply	Regulatory releases pursuant to WCA-3A Interim Regulation Schedule.	
S-335	Water supply The intent is to limit the volume of water passed at S-335 to pre-ISOP conditions and not use S-332B, S-332C, or S-332D or other triggers to pass additional flows. Note: It is recognized that under these conditions operations of S-335 would be infrequent.	When making regulatory releases through S-151, limit S-335 outflows to not exceed inflows from the S-151/S-337 path. Use S-333/S-334 before S-151/S-337/ S-335	
S-334	Water supply	Pass all or partial S-333 flows depending on stage at G-3273.	

Structure/ Operational Component	Column 1: No WCA-3A Regulatory Releases to SDCS or SRS	Column 2: WCA-3A Releases to SDCS	WCA-3A Ecological Intent (defined at bottom of Table)
S-338	Open 5.8 feet, NGVD Close 5.5 feet, NGVD	Open 5.8 feet, NGVD Close 5.4 feet, NGVD	
G-211	Open 6.0 feet, NGVD Close 5.5 feet, NGVD Note: If S-331 pumping is limited and the G-211 tailwater rises above 5.3 feet, NGVD then close G-211.	Open 5.7 feet, NGVD Close 5.3 feet, NGVD Note: If S-331 pumping is limited and the G-211 tailwater rises above 5.3 feet, NGVD then close G-211.	
S-331 resulting from the 2011 8.5 SMA Project EA FONSI	"High Range": When LPG2 is less than 5.5 feet, NGVD, the "high range" applies and S-331 headwater will have no limit. "Intermediate Range": When LPG2 is between 5.5 and less than 6.0 feet, NGVD, the "intermediate range" applies and S-331 average-daily headwater will be maintained between 4.5 and 5.0 feet, NGVD to the extent allowable by downstream conditions. "Low Range": When LPG2 is at or above 6.0 feet, NGVD and S-357 constraints are limiting the ability of maintaining C-357 average-daily water level below 6.2 feet, NGVD, the "low range" applies and S-331 average-daily headwater will be maintained between 4.0 and 4.5 feet, NGVD to the extent allowable by downstream conditions and for a minimum of 24 hours. "Low Range Adjustment": When LPG2 is at or above 6.0 feet, NGVD and S-357 constraints are not limiting the ability of maintaining C-357 average-daily water level below 6.2 feet, NGVD, the "low range adjustment" applies and S-331 average-daily headwater will be maintained between 4.5 and 5.0 feet, NGVD to the extent allowable by downstream conditions. Additional Operating Information: 1. When operating near range limits operations may be adjusted to the nearest range without reaching the range. This allows a transition to the next projected range or to avoid rapid changes in operating ranges. 2. S-331 "Low Range" may be used instead of the "Low Range Adjustment" to further the understanding of the hydrology and hydraulics of the 8.5 SMA conditions during ideal or acceptable meteorological and climate conditions, in order to provide data to help define a long-term solution to issues related to the S-357 pump station or during times of construction. 3. If the USACE determines the use of the "Low Range" instead of the "Low Range Adjustment" reduces or prevents undesirable seepage effects within the flood mitigation area due to S-357 operations, then the "Low Range" will be used instead of the "Low Range Adjustment" until the undesirable seepage effects from S-357 are modified by other operational or structural changes. 4. Evaluation to use the "Low Range Adjustment" instead of the "Low Range" should be done on a daily basis. 5. The operational ranges may be changed immediately in response to the trigger stage. Note: If S-331 tailwater is above 6.0 feet, NGVD or the S-176 headwater is above 5.5 feet, NGVD then no pumping at S-331. Under normal conditions, pumping at S-331 should be limited to two pumps or less.		
S-357	S-357 will be operated to maintain an average-daily water level in C-357 at LPC1 or S-357 headwater between 5.7 to 6.2 feet, NGVD. Note: DELTA is defined as the north to south groundwater gradient between Angel's Well water level and LPG1's water level. DELTA equals (Angel's Well water level) minus (LPG1's water level). On Criteria:		

Structure/ Operational Component	Column 1: No WCA-3A Regulatory Releases to SDCS or SRS	Column 2: WCA-3A Releases to SDCS	WCA-3A Ecological Intent (defined at bottom of Table)
	When C-357 measured at LPC1 or S-357 headwater is at or above 5.7 feet, NGVD, S-357 may be operated with pump constraints. Off Criteria: 1. When C-357 measured at LPC1 or S-357 headwater is below 5.7 feet, NGVD. 2. When DELTA is less than 0.1 feet, then S-357 will remain off for a minimum of 24 hours and until DELTA is equal to or larger than 0.2 feet 3. When Las Palmas Detention Cell Gage 1 (LPDC1) is above 10 feet, NGVD. Pumping Constraints: C1: If DELTA is equal to or larger than 0.2 feet then S-357 can be operated up to maximum capacity. C2: If (DELTA is between 0.1 feet and 0.2 feet) then S-357 is limited to a maximum of 250 acre-feet per day. C3: If (DELTA is less than 0.1 feet) then S-357 will remain off for a minimum of 24 hours and until DELTA is equal to or larger than 0.2 feet. Additional Operating Information: 1. S-357 pumps will be turned off to prevent overflow of the detention cell. 2. These criteria do not preclude the exercising of pumps or the testing of repairs, provided that the pumps are run individually and that the run time does not exceed two hours per pump per month. 3. These criteria will not preclude field tests of S-357 to further the understanding of the hydrology and hydraulics of the 8.5 SMA conditions during ideal or acceptable meteorological and climate conditions. 4. If the USACE determines that detrimental seepage is occurring into the 8.5 SMA due to operations of S-357 then additional S-357 pumping constraints may be added including suspending S-331 “Low Range Adjustment”. 5. Operations of S-357 may be suspended during times of construction. 6. Under normal conditions, the intent is to limit the pumping capacity of S-357 to 250 acre feet per day.		
S-332B	Pumped up to 575 cfs* On 5.0 feet, NGVD Off 4.7 feet, NGVD *Pump to capacity if limiting conditions within the Sparrow habitat are not exceeded. There will be no overflow into ENP. Note: There are two 125-cfs pumps and one 75-cfs pump directed to the Southern Detention Area. The remaining two 125-cfs pumps are directed to the north seepage reservoir.	Pumped up to 575 cfs* On 4.8 feet, NGVD Off 4.5 feet, NGVD *Pump to capacity if limiting conditions within the Sparrow habitat are not exceeded. There will be no overflow into ENP. Note: There are two 125-cfs pumps and one 75-cfs pump directed to the Southern Detention Area. The remaining two 125-cfs pumps are directed to the north seepage reservoir.	
S-332B North Seepage Reservoir	The north reservoir is a 240-acre reservoir located to the north of the pump station with a weir discharging to the east. This seepage reservoir will have a normal maximum water depth of 2.0 feet. This 2.0 feet depth corresponds to 8.8 feet, NGVD at S-332B (North) tailwater. However, if USACE determines that a flood emergency exists similar to an event like the “No Name” storm, the depth of water would be increased to 4.0 feet, when possible.		

Structure/ Operational Component	Column 1: No WCA-3A Regulatory Releases to SDCS or SRS	Column 2: WCA-3A Releases to SDCS	WCA-3A Ecological Intent (defined at bottom of Table)
Northern Detention Area	The future Northern Detention Area (NDA) is planned to contain the 8.5 Square Mile Area (SMA) Detention Cell, S-332B North Seepage Reservoir, and the area connecting the two. This seepage reservoir will have a normal maximum water depth of 2.0 feet. However, if the USACE determines that a flood emergency exists similar to an event like the "No Name" storm, the depth of water would be increased to 4.0 feet, when possible.		
Southern Detention Area	The Southern Detention Area (SDA) is the result of combining the S-332B West Seepage Reservoir, the S-332C Seepage Reservoir, and the S-332B/C Connector and raising the western levee of the previous reservoirs. It is very unlikely that there will be overflow from the SDA. This seepage reservoir will have a normal maximum water depth of 2.0 feet. However, if USACE determines that a flood emergency exists similar to an event like the "No Name" storm, the depth of water would be increased to 4.0 feet, when possible.		
S-332C	Pumped up to 575 cfs* On 5.0 feet, NGVD Off 4.7 feet, NGVD *Pump to capacity unless habitat conditions are not being achieved within the Rocky Glades. There will be no overflow into ENP.	Pumped up to 575 cfs* On 4.8 feet, NGVD Off 4.5 feet, NGVD *Pump to capacity unless habitat conditions are not being achieved within the Rocky Glades. There will be no overflow into ENP.	
S-332D	Pump up to 500 cfs from 15 July (or the end of the breeding season, as confirmed by FWS) through 30 November; 325 cfs from 1 December through 31 January; and 250 cfs from 1 February through 14 July. On 4.85 feet, NGVD Off 4.65 feet, NGVD	Pump up to 500 cfs from 15 July (or the end of the breeding season, as confirmed by FWS) through 30 November; 325 cfs from 1 December through 31 January; and 250 cfs from 1 February through 14 July. On 4.7 feet, NGVD Off 4.5 feet, NGVD	
S-332DX1	Open when stage difference between RG4 and NTS18 exceeds 1.0 foot and CR2 stage is higher than NTS18 stage (Gage locations shown on ***Figure 7-7***). RG4 and CR2 typically have higher water levels than NTS18. Utilize RG4 water level gage located in northern portion of the SDA, NTS18 water level gage located in southern portion of the SDA, and CR2 water level gage located in ENP west of the SDA. Close when stage difference between RG4 and NTS18 is less than 0.25 feet or NTS18 stage is 0.75 feet greater than CR2 stage. ENP may make a recommendation to USACE to adjust the open/close criteria by + or – 0.5 feet.		
Frog Pond Seepage Reservoir (S-332D Detention Area)	810 acres with overflow into Taylor Slough This seepage reservoir will have a normal maximum water depth of 2.0 feet. However, if USACE determines that a flood emergency exists similar to an event like the "No Name" storm, the depth of water would be increased to a maximum of 4.0 feet. However, a depth of 4.0 feet in the Frog Pond is not possible at this time due to the constraint of the S-332D pump station outlet elevation.		
S-194	Open 5.5 feet, NGVD Close 4.8 feet, NGVD	Operated to maximize flood control discharges to coast Open 4.9 feet, NGVD Close 4.5 feet, NGVD	
S-196	Open 5.5 feet, NGVD	Operated to maximize flood control discharges to coast	

Note: All elevations are in feet NGVD 1929 unless otherwise stated. Revised April 2012

Structure/ Operational Component	Column 1: No WCA-3A Regulatory Releases to SDCS or SRS	Column 2: WCA-3A Releases to SDCS	WCA-3A Ecological Intent (defined at bottom of Table)
	Close 4.8 feet, NGVD	Open 4.9 feet, NGVD Close 4.5 feet, NGVD	
S-176	Open 5.0 feet, NGVD Close 4.75 feet, NGVD	Open 4.9 feet, NGVD Close 4.7 feet, NGVD	
S-177	Open 4.2 feet, NGVD (see S-197 open) Close 3.6 feet, NGVD		
S-18C	Open 2.6 feet, NGVD Close 2.3 feet, NGVD	Open 2.25 feet, NGVD Close 2.0 feet, NGVD	
S-197	If S-177 headwater is greater than 4.1 feet, NGVD or S-18C headwater is greater than 2.8 feet, NGVD, open 3 culverts. If S-177 headwater is greater than 4.2 feet, NGVD for 24 hours or S-18C headwater is greater than 3.1 feet, NGVD; open 4 more culverts for a total of 7 culverts open. If S-177 headwater is greater than 4.3 feet, NGVD or S-18C headwater is greater than 3.3 feet, NGVD, then open 6 more culverts for a total of 13 culverts open. Close gates when all the following conditions are met: 1. S-176 headwater is less than 5.2 feet, NGVD and S-177 headwater is less than 4.2 feet, NGVD. 2. Storm has moved away from the basin 3. After Conditions 1 and 2 are met, keep the number of S-197 culverts open necessary only to match residual flow through S-176. All culverts should be closed if S-177 headwater is less than 4.1 feet, NGVD after all conditions are satisfied.		
S-356	When conditions permit (i.e., G-3273 and L-29 constraints), discharges from S-356 will go into L-29. Pumping will be limited to the amount of seepage into L-31N in the reach between S-335 and G-211. A technical team will evaluate pumping limits and operations. The pumps will be operated accordingly.	When conditions permit (i.e., no S-334 regulatory releases and G-3273 and L-29 constraints), discharges from S-356 will go into L-29. Pumping will be limited to the amount of seepage into L-31N in the reach between S-335 and G-211. A technical team will evaluate pumping limits and operations. The pumps will be operated accordingly.	
S-346	Normally, this structure can be open when S-12D is open and is closed when all S-12 structures are closed. S-346 can be open to increase the capacity of S-12D.		
S-174	Closed.		
S-175	Closed.		
S-332	Inoperable.		
Note: SDCS pre-storm drawdown water management operations to be implemented consistent with IOP 2006 Pre-Storm / Storm / and Storm Recovery Operations for SDCS and is contained in Table 7-6. Water management operations for other than named events: SFWMD will monitor antecedent conditions, groundwater levels, canal levels, and rainfall. If these conditions indicate a strong likelihood of flooding, SFWMD will make a recommendation to USACE to initiate pre-storm operations. USACE will review the data, advise ENP and FWS of the conditions, consult with the Miccosukee Tribe of Indians of Florida, and make a decision whether to implement pre-storm drawdown or otherwise alter system wide operations from those contained in the table.			
Note: The Chairman of the Miccosukee Tribe of Indians of Florida or his designated representatives will monitor the conditions in WCA-3A and other tribal lands and predicted rainfall. If the Tribe determines these conditions indicate jeopardy to the health or safety of the Tribe, the Chairman or his designated representative will make a recommendation to USACE to change the operations of the S-12 structures or other parts of the system. USACE will review the data and advise appropriate agencies of the conditions, and the District Commander will personally consult with the Chairman or his designated representative prior to making a decision whether to implement changes to the S-12 operations.			
Note: Ecological Intent and/or Performance Measures			

Structure/ Operational Component	Column 1: No WCA-3A Regulatory Releases to SDCS or SRS	Column 2: WCA-3A Releases to SDCS	WCA-3A Ecological Intent (defined at bottom of Table)
Cape Sable Seaside Sparrow Performance Measure A. NP-205 (CSSS-A): Provide a minimum of 60 consecutive days at NP-205 below 6.0 feet, NGVD beginning no later than March 15. Ecological Targets 1. NP-205 (CSSS-A): Strive to reach a water level of less than or equal to 7.0 feet, NGVD at NP-205 by December 31 for nesting season water levels to reach 6.0 feet, NGVD by mid-March. 2. CSSS: Strive to maintain a hydroperiod between 90 and 210 days (three to seven months) per year throughout sparrow habitat to maintain marl prairie vegetation.			
Everglade Snail Kite/Apple Snail (Note: All stages for WCA-3A are WCA-3A 3-gage average of Sites 63, 64, 65) Performance Measures B. WCA-3A: For snail kites, strive to reach waters levels between 9.8 and 10.3 feet, NGVD by December 31, and between 8.8 and 9.3 feet, NGVD between May 1 and June 1. C. WCA-3A: For apple snails, strive to reach water levels between 9.7 and 10.3 feet, NGVD by December 31 and between 8.7 and 9.7 feet, NGVD between May 1 and June 1. D. WCA-3A (Dry Season Recession Rate): Strive to maintain a recession rate of 0.05 feet per week from January 1 to June 1 (or onset of the wet season). This equates to a stage difference of approximately 1.0 feet between January and the dry season low. E. WCA-3A (Wet Season Rate of Rise): Manage for a monthly rate of rise less than 0 .25 feet per week to avoid drowning of apple snail egg clusters. Ecological Target 3. WCA-3A (Dry Years): Strive to maintain optimal snail kite foraging habitat by allowing water levels to fall below ground surface level between one in four and one in five years (208 to 260 weeks average flood duration) between May 1 and June 1 to promote regenerations of marsh vegetation. Do not allow water levels below ground surface for more than four to six weeks to minimize adverse effects on apple snail survival.			
Wood Stork/Wading Birds (Note: All stages for WCA-3A are WCA-3A 3-gage average of Sites 63, 64, 65) **Performance Measures** F. WCA-3A (Dry Season Recession Rate): Strive to maintain a recession rate of 0.07 feet per week, with an optimal range of 0.06 to 0.07 feet per week, from January 1 to June 1. G. WCA-3A (Dry Season): Strive to maintain areas of appropriate foraging depths (5 to 25 cm) within the Core Foraging Area (18.6 mile radius, CFA) of any active wood stork colony. H. WCA-3A (Dry Season): Strive to maintain areas of appropriate foraging depths (5 to 15 cm) within the Core Foraging Area (seven to nine mile radius) of any active white ibis or snowy egret colony.			
Tree Islands (Note: All stages for WCA-3A are WCA-3A 3-gage average of Sites 63, 64, 65) **Performance Measures** I. WCA-3A: For tree islands, strive to keep high water peaks less than 10.8 feet, NGVD, not to exceed 10.8 feet, NGVD for more than 60 days per year, and reach water levels less than 10.3 feet, NGVD by December 31.			

Table 7-6

Pre-Storm / Storm / and Storm Recovery Operations for the South Dade Conveyance System

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

The hurricane season is from June through November. When there are tropical depressions, tropical storms, and/or hurricanes in the Atlantic/Caribbean Basin, the National Hurricane Center (NHC) issue tropical cyclone public advisories, forecast advisories, forecast discussions, and strike probability forecasts* every 6 hours. It should be noted that the large bands of heavy rain associated with a tropical storms and hurricanes often extend considerable distance beyond the areas of tropical or hurricane force wind.

* {For the period 1989-1998, the average location error by forecast period was 55 statute miles at 12 hours, 102 miles at 24 hours, 147 miles at 36 hours, 164 miles at 48 hours and 278 miles at 72 hours. The strike probability forecast indicate the statistical chance that the tropical cyclone center will pass within 75 statute miles of a specified location within 3 days of the initial forecast time. The maximum strike forecast probabilities are 10 to 15 percent at 72 hours, 20 to 25 percent at 48 hours, 25 to 35 percent at 36 hours, 40 to 50 percent at 24 hours, and 75 to 85 percent at 12 hours.}

The SFWMD employs meteorologists who evaluate each tropical event and prepare average forecast errors using NHC forecast tracking maps. The average forecast error means when the Hydrometeorological Prediction Center (HPC) or NHC has forecasted a specific track and the cyclone could end up anywhere in that “swath” within the next 72 hours with around a

60 percent confidence level. The average forecast error swath is based on the 10-year average of forecast errors.

The SFWMD Operations Control Division has defined operational procedures to be implemented depending on the timing or amount of advance warning prior to the onset of tropical storm force winds. USACE also has defined in the Master Water Control Manual for each part of the C&SF Project a water control plan with instructions for pre-storm operations for structures around Lake Okeechobee and the Water Conservation Areas (WCAs). The SFWMD operational procedures are termed "Conditions"; the specific operating procedures for these conditions will be described in further detail in this document. Conditions are briefly summarized as follows:

- Condition 4, 72 to 48 hours prior to the impact of tropical storm force winds, is earliest level of preparation when the system is evaluated and initial adjustments made to operations depending on the forecast and nature of the storm. Coordinate with USACE and local drainage districts
- Condition 3, 48 to 24 hours prior to the impact of tropical storm force winds, continue pre-storm operations and coordination with USACE and local drainage districts.
- Condition 2, 24 to12 hours prior to the impact of tropical storm force winds, bring telemetry-controlled sites to final pre-storm configuration, establish alternate emergency control station if necessary.

The remaining levels of preparation are Condition 1, 12 to 0 hours prior to the impact of tropical storm force winds; during the event; and recovery after the event. It is important to note that some storm form close to land and make landfall with less than 48 hours of advance warning (no Condition 4).

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

During the Cape Sable seaside sparrow (CSSS) nesting season, March 1 through July 14, or until nesting success, as defined in the Fish and Wildlife Service (FWS) November 2010 Final Biological Opinion (BO), has been met, pumping at S-332D is limited to 250 cubic feet per second (500 acre feet per day). This constraint on pumping may limit the ability to implement pre-storm operations.

Notification and Briefing Process

The Executive level will be briefed prior to initiation of pre-storm operations. This may occur prior to 72 hours or as soon as the average error forecast swath shows south Florida to be likely to be in the path of a storm. Obtaining Executive level approval is important in order to demonstrate to interested parties, such as the FWS and the National Park Service (NPS), that operations were not arbitrary or capricious and that possible impacts to the sparrow or to the natural system were considered; however, in order to maintain the multi-purpose functioning of the C&SF Project, flood control operations were necessary.

1. **Conditions 4 and 3 (24 to 72 Hours Prior to Storm Conditions)**

Based on the Executive level orders, up to 72 hours in advance of a storm forecast.

Drawdown Implementation

Between 24 and 72 hours before forecasted tropical storm conditions in Miami-Dade, the following target water levels are set for the SDCS. The initiation of the pre-storm drawdown criteria will be triggered when Miami-Dade County is within the average error forecast swath as developed by the NHC. These pre-storm drawdown levels are not less than the level at which water supply deliveries are made during dry periods, that is 1.5 feet below optimum canal levels, except the reach north of G-211, which is 1.0 foot below current, normal operating levels. These levels are target levels and may not be attainable.

Table 7-6(1)

Canal	Reach	Target Level for Draw-Down (feet, NGVD)
L-31(N)	G-211 to S-331	4.0*
L-31(N)	S-331 to S-176	4.0
L-31(W)	S-174 to S-175	No target
C-111	S-176 to S-177	3.0
C-111	S-177 to S-18C	2.0
C-111	S-18C to S-197	No change**

*If the water surface elevation measured at 8.5 SMA LPG1 or LPG2 is 5.5 feet, NGVD or below, then 4.0 would be the target; otherwise, 3.5 feet, NGVD at the headwater of S-331 will be the target.
**Operation as specified in the SFWMD structure book for S-197

Sequence for Achieving Target Levels
In an effort to achieve the specified drawdown targets, a sequence of operational actions is recommended as described in ***Table 7-6 (2)***. The goal is achieve one target before preceding the next sequence, however, it may not be possible to achieve the target level and operations will proceed as based on the best available information at the time. If practical with the existing conditions and time available the L-31(N) reach from S-331/S-173 to S-176 will be lowered using only S-332BN, S-332BW, S-332C, and S-332D.

Table 7-6(2)

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

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

S-332B (S-332B North and S-332B West)
Operational criteria are developed to meet the reasonable and prudent alternative (RPA) requirements. The criteria take into

account pre-storm and storm operations, except emergency deviations that must always be dealt with on a case-by-case basis. S-332B (See Table 7-5) is a part of the C&SF Project, which is multipurpose in scope. While S-332B allows flexibility to operate the C&SF Project to better meet the needs of the CSSS it may also be used for meeting other project purposes such as flood control.

Table 7-6(3)

Rising Water Level (ft)	Discharge (cfs)	Falling Water Level (ft)	Rated Discharge (cfs)
4.7	75*	5.0	450
4.9	200**	4.9	325
5.0	325	4.8	200**
5.1	450	4.7	75*
5.2	575	4.2	0

* Start with 125-cfs pump if 75-cfs pump is not operational

** This will cause overflow of the weir in the retention area

During pre-storm operations, the criteria for operation of S-332B will be the same as under normal operations (See Table 7-5), however, the notification procedure is to take place prior to changes in the upstream or downstream structural operations. Refer to the notification and briefing process section of this document regarding briefing the Executive level prior to initiating pre-storm operations.

S-332C

S-332C (See Table 7-5) will be used in a similar manner as S-332B.

S-197

No change is suggested in the operational criteria for this structure during Condition 4. The operational criteria is defined in Table 7-4 and the SFWMD structure book for S-197.

2. Condition 2 and 1 (12 to 24 Hours Prior to Forecast arrival of tropical storm force winds).

Continue operations as in Condition 4 and 3, but with the following considerations:

Table 7-6(4)

Structure	Status
S-331	Secure. Do not operate during storm.
S-332B	Secure. Personnel move to S-332D office area during storm.
S-332D	Continue pumping. Office area is hardened.
S-175	Keep closed
S-197	Consideration to be given to open 3 gates

S-332B
Pumps are secured for safety reasons. Personnel should move to S-332D for protection from tropical storm force winds, and to await resumption of operations at S-332B.

S-332C
S-332C (See Table 7-5) will be used in a similar manner as S-332B.

S-197
Operation of this structure requires mobilization of field personnel and equipment to operate the gates. It is not safe to operate this structure during storm conditions. Consequently, depending on conditions, three gates may be opened at Condition 1.

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

Operations during Recovery consist of: 1) Maximizing discharges at water control structures to minimize flooding and 2) make the transition back to operational regime in place prior to the storm.

Operations may also be returned to levels prior to implementing pre-storm operations as soon as the Miami-Dade County is no longer within the average forecast error swath.

Plan for Worst Case: Recovery will be necessary if storm conditions result in significant rainfall in the Miami-Dade County area. The target for operations would be to return to operational regime in place prior to the storm. However, use of water control structures (e.g., S-175, S-332B) under emergency

flood control mode will begin or continue until recovery is complete. The following operations are suggested to continue to operate in emergency flood control mode:

Table 7-6(5)

Structure	Status
S-331	Pump when downstream conditions allow
S-332D	Continue to pump
S-175	Use of this structure would be on a case by case basis with concurrence from the Department of Interior.
S-197	Open depending on conditions
S-332B	Resume pumping according to proposed operational criteria, weir may overflow

Sequence for Achieving Normal Operating Ranges

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

4. Back to Normal Mode (Operational regime in place prior to the storm)

The following conditions must be met before ceasing emergency flood control mode and resuming normal mode:

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

Once these conditions are met, the normal mode, as defined by operational regime in place prior to the storm, may be resumed. Emergency use of certain water control structures, such as S-175, S-332B, and S-332C would cease.

This document may be modified depending on additional information, as it becomes available.

Operations for other than named events

SFWMD will monitor antecedent conditions, groundwater levels, canal levels and rainfall. If these conditions indicate a strong likelihood of flooding, SFWMD will make a recommendation to USACE to initiate pre-storm operations. USACE will review the data, advise ENP, FWS of the conditions, consult with the Miccosukee Tribe of Indians of Florida and make a decision whether to implement pre-storm drawdown or otherwise alter system wide operations from those contained in the table.

Tribal Communication

In addition, the Chairman of the Miccosukee Tribe of Indians of Florida or his designated representatives will monitor the conditions in WCA No. 3A and other tribal lands and predicted rainfall. If the Tribe determines these conditions indicate jeopardy to the health or safety of the Tribe, the Chairman will make a recommendation to USACE to change the operations of the S-12 structures. USACE will review the data, advise appropriate agencies of the conditions, and the District Commander will personally consult with the Chairman prior to making a decision whether to implement changes to the S-12 operations.

Table 7-7

Historical Transitioning Between IOP Columns 1 and 2
(Text below is from 2006 FSEIS IOP for Protection of the CSSS which included CSSS-A closure period for S-12C which is no longer applicable.)

IOP (Alternative 7R) was implemented in June 2002. The following pages provide a description of WCA-3A operations and results that occurred from that time to the present.

WCA-3A Accounting for Column 1 to Column 2 Transition – Actual Operational Data

For management of water levels in WCA-3A, the regulatory outlets are S-12A, S-12B, S-12C, S-12D, S-343A, S-343B, S-344, S-333, S-151, and minimally, S-142.

The IOP was implemented in June 2002 and requires that the S-12A, S-343A, S-343B, and S-344 structures be closed on November 1 each year, regardless of water levels within WCA-3A. Closure of S-12B follows on January 1 and S-12C on February 1. There is no requirement to close S-12D. All structures may be re-opened on July 15. Consequently, IOP has three modes of operation: Column 1, Column 2, and water supply.

Column 1 is the condition when regulatory releases from WCA-3A can be met by normal operation of the WCA-3A regulatory outlets. Column 2 is the condition when regulatory releases from WCA-3A are made via S-333 to L-29 and L-31(N), the SDCS. This mode generally requires the use of pumping stations S-331, S-332B, S-332C, and S-332D. Water supply is the condition when structures in the SDCS reach a trigger level that indicates water supply is required.

An interagency meeting was held on October 22, 2002 to discuss issues related to implementation of the IOP. The meeting was facilitated by Analee Mayes, a Florida-based facilitator under contract to the IECR. The following information was documented from that meeting.

1. The determination of the extent to which IOP operations cause water to be retained in WCA-3A beyond that expected during the pre-ISOP schedule for WCA-3A is computed on the basis of flow volumes through the S-12 structures.

2. Column 2 operations will be used to offset or mitigate for adverse effects on WCA-3A related to actions taken to protect CSSS subpopulation A. Column 2 operations will generally occur when any S-12 structure is closed in order to protect the CSSS. If necessary, Column 2 operations may continue past re-opening of the S-12s to mitigate for adverse effects on WCA-3A resulting from an IOP change in the closure of the S-12s.

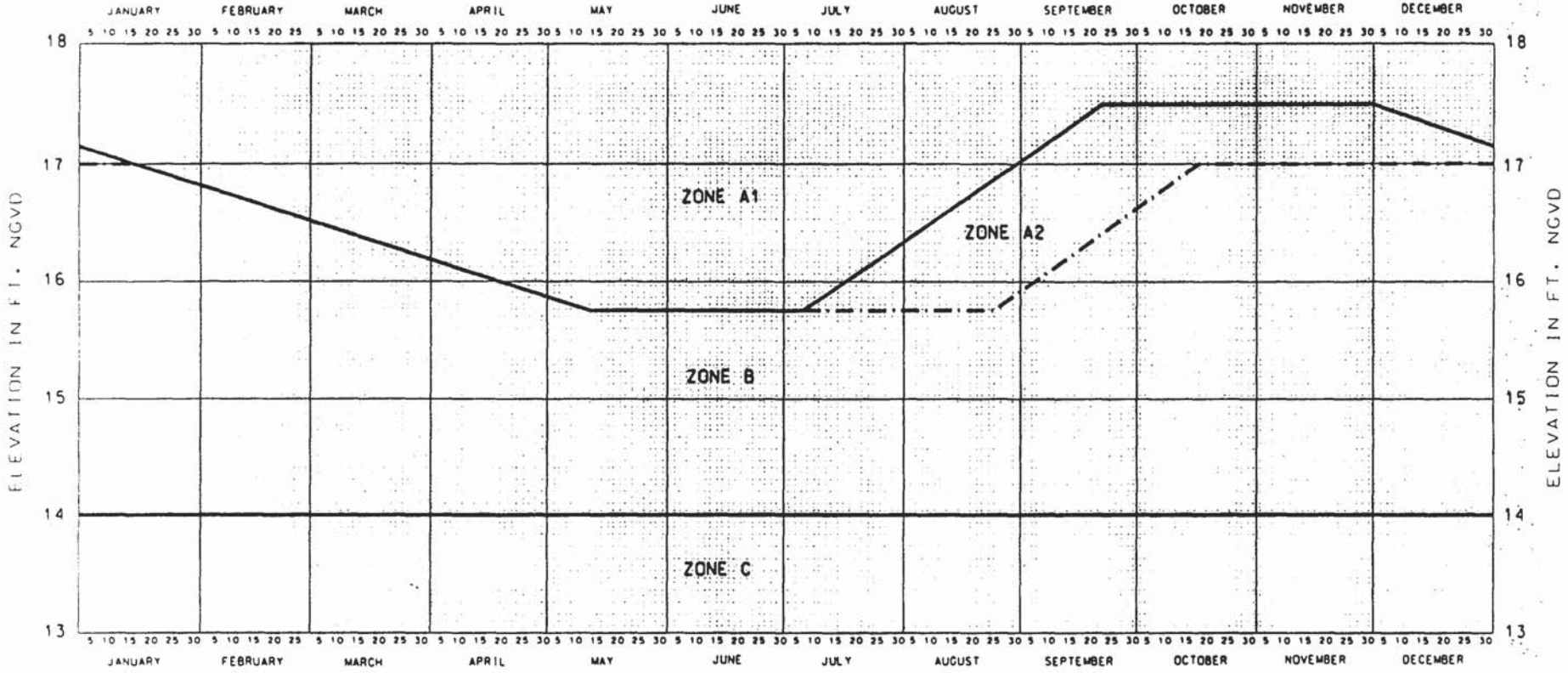
3. At the beginning of the wet season, which generally spans from late May to late October, Column 2 operations may continue long enough past re-opening of the S-12s to release the volume of water that would have been released, according to the regulatory schedule, had the S-12s been allowed to be open. It is understood that other means available will be used to lower water levels in WCA-3A and that the reduction in WCA-3A water levels using S-333/S-334 will be accomplished as quickly as possible, allowing a change back to Column 1 as quickly as possible, based on the S-334 tailwater and G-3273 criteria. Likewise, at the beginning of the dry season, which generally spans from November to late May, Column 1 operations may continue until the capacity of the S-12s that remain open is insufficient to handle the regulatory releases from WCA-3A.

4. While operating in Column 2 mode, S-333 flows will be diverted to NESRS as much as possible based on the G-3273 constraint.

5. In keeping track of the extent to which IOP operations might cause water levels in WCA-3A to be higher than normal, the “bank account” will zero-out on November 1.

6. The transition into Zone E1 in the regulation schedule for WCA-3A will be gradual, as opposed to the abrupt curve shown on the schedule in the IOP EIS.

Figures



ZONE	RELEASES
A1	UP TO MAXIMUM AT S-10 (AND S-39 WHEN AGREED BETWEEN CORPS AND SFWMD). WATER SUPPLY RELEASES AS NEEDED.
A2	S-10 RELEASES BASED ON CORPS FORECASTS. WATER SUPPLY RELEASES AS NEEDED. IF LAKE OKEECHOBEE STAGE IS ABOVE WCA-1 STAGE OR NO MORE THAN ONE FOOT BELOW WCA-1 STAGE, THEN WATER SUPPLY RELEASES FROM WCA-1 MUST BE PRECEEDED BY AN EQUIVALENT VOLUME OF INFLOW.
B	WATER SUPPLY AS NEEDED. IF LAKE OKEECHOBEE STAGE IS ABOVE WCA-1 STAGE OR NO MORE THAN ONE FOOT BELOW WCA-1 STAGE, THEN WATER SUPPLY RELEASES FROM WCA-1 MUST BE PRECEEDED BY AN EQUIVALENT VOLUME OF INFLOW.
C	NO NET RELEASES FROM WCA-1. ANY WATER SUPPLY RELEASES MUST BE PRECEEDED BY AN EQUIVALENT VOLUME OF INFLOW.

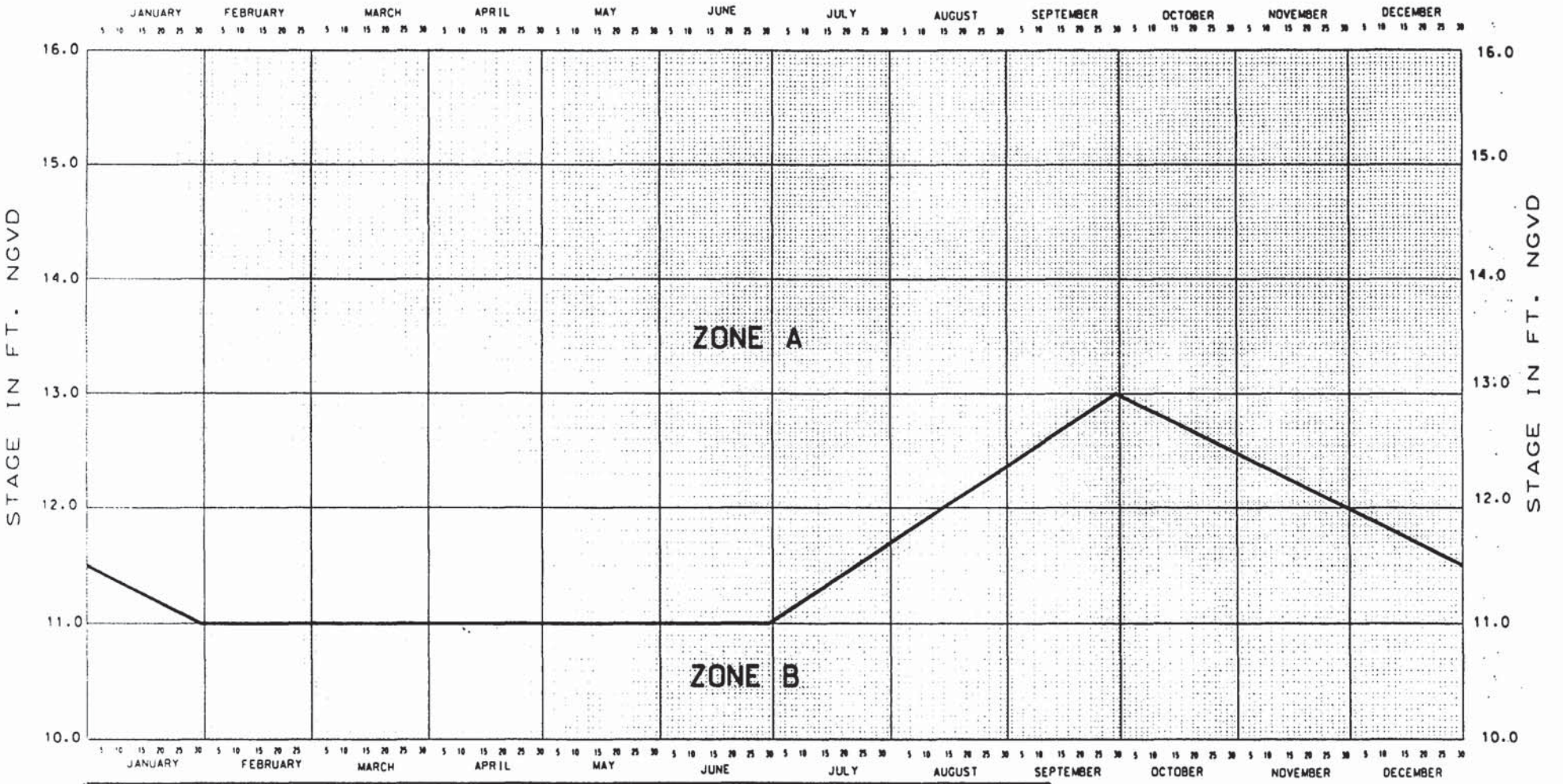
DATES	USE GAGE	CONDITIONS
1 JAN - 30 JUN	1-8 CANAL	ALL
1 JUL - 31 DEC	1-8 CANAL	EXCEPT AS NOTED BELOW
	AVG. 1-7, 1-8T, 1-9	DURING RISING STAGES WHEN CANAL STAGE EXCEEDS AVERAGE.

CENTRAL AND SOUTHERN FLORIDA
INTERIM REGULATION SCHEDULE

WATER CONSERVATION AREA NO. 1

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
DATED: 03 MAY 1995

FIGURE 7-1



ZONE	RELEASES THROUGH OUTLETS AS INDICATED
A	UP TO MAXIMUM CAPACITY AT S-11; MAXIMUM CAPACITY AT S-144, 145, & 146; MAXIMUM PRACTICABLE AT S-143 & S-38 WHEN REQUESTED BY THE CORPS OF ENGINEERS BUT NOT TO EXCEED 11.0 FT., NGVD, IN POOL 2B. L-35B & L-38 BORROW CANALS SHOULD NOT BE DRAWN DOWN BELOW 10.5 FT., NGVD.
B	WATER SUPPLY. L-35B & L-38 BORROW CANAL SHOULD NOT BE DRAWN DOWN BELOW 10.5 FT., NGVD, UNLESS WATER IS SUPPLIED FROM ANOTHER SOURCE.

INDICATOR GAGES FOR REGULATION WILL BE AS FOLLOWS:

DATE	USE GAGE	CONDITIONS
JAN - 31 JAN	2-17	IF 2-17 STAGE RECEDES TO 11.5 FEET, NGVD SWITCH TO S-118 HEADWATER GAGE.
FEB - 30 JUN	S-118	ALL
- 31 DEC	2-17	ALL

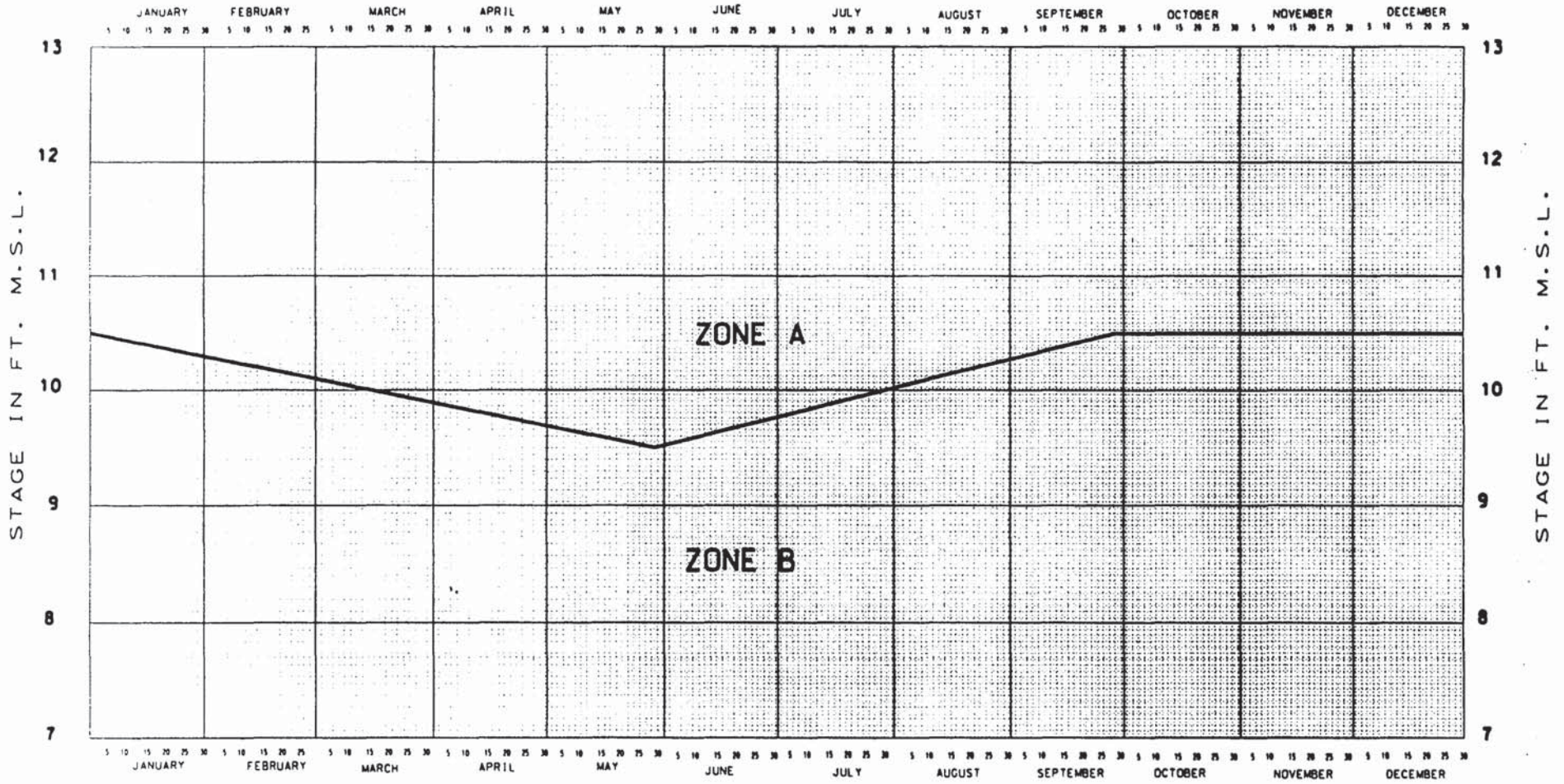
CENTRAL AND SOUTHERN FLORIDA
INTERIM REGULATION SCHEDULE

WATER CONSERVATION AREA NO. 2A

DEPARTMENT OF THE ARMY, JACKSONVILLE DISTRICT
CORPS OF ENGINEERS, JACKSONVILLE, FLORIDA

PROPOSED 3/28/88
COORDINATED 6/21/89

FIGURE 7-2



ZONE	RELEASES
A	Up to max. capacity at S-12. Max. practicable capacity at S-151 and S-31 when requested by Corps of Engineers in emergencies.
A & B	To supply project demands and ENP water supply only when agreed to between F.C.D. and Corps.

Note:

During droughts, an optimum floor level will be agreed upon for ecological purposes below which no releases from storage are permitted.

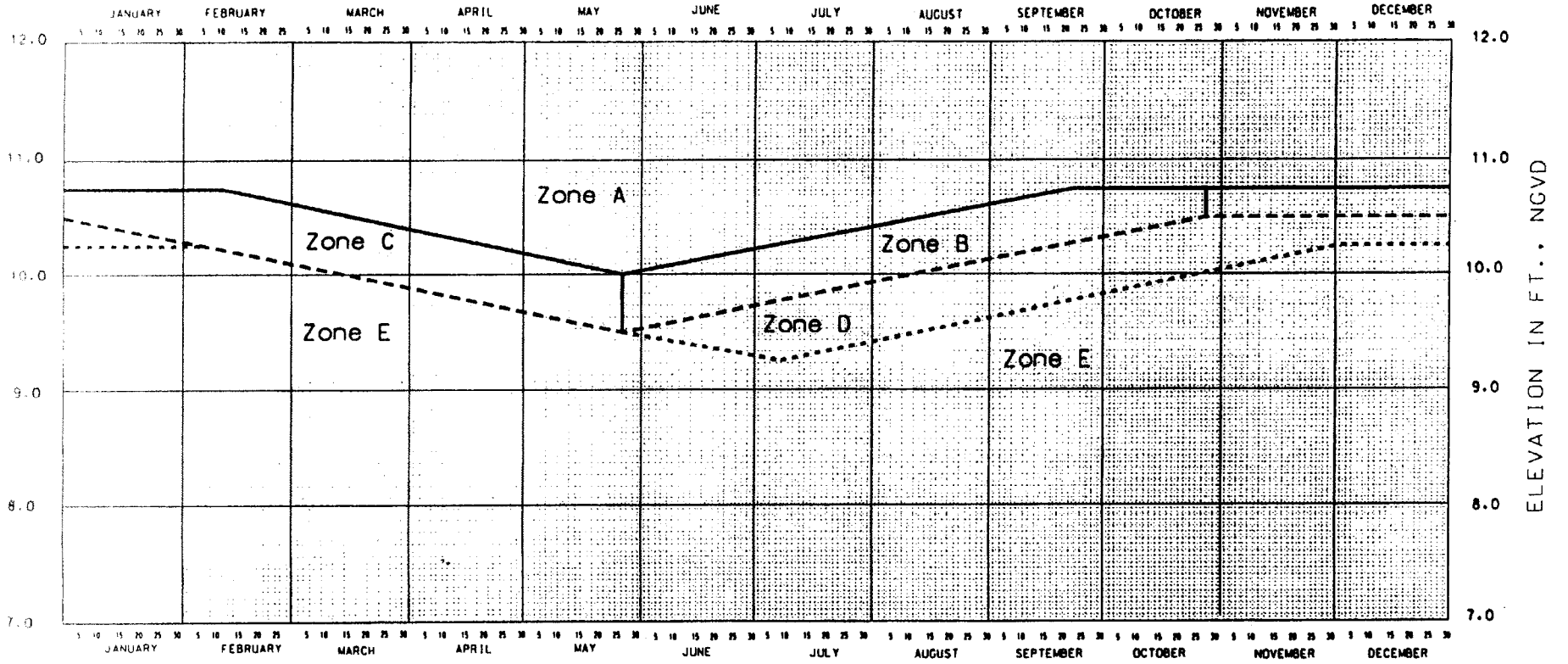
CENTRAL AND SOUTHERN FLORIDA
REGULATION SCHEDULE

WATER CONSERVATION AREA NO. 3A

DEPARTMENT OF THE ARMY, JACKSONVILLE DISTRICT
CORPS OF ENGINEERS, JACKSONVILLE, FLORIDA

AUGUST 1960

FIGURE 7-3



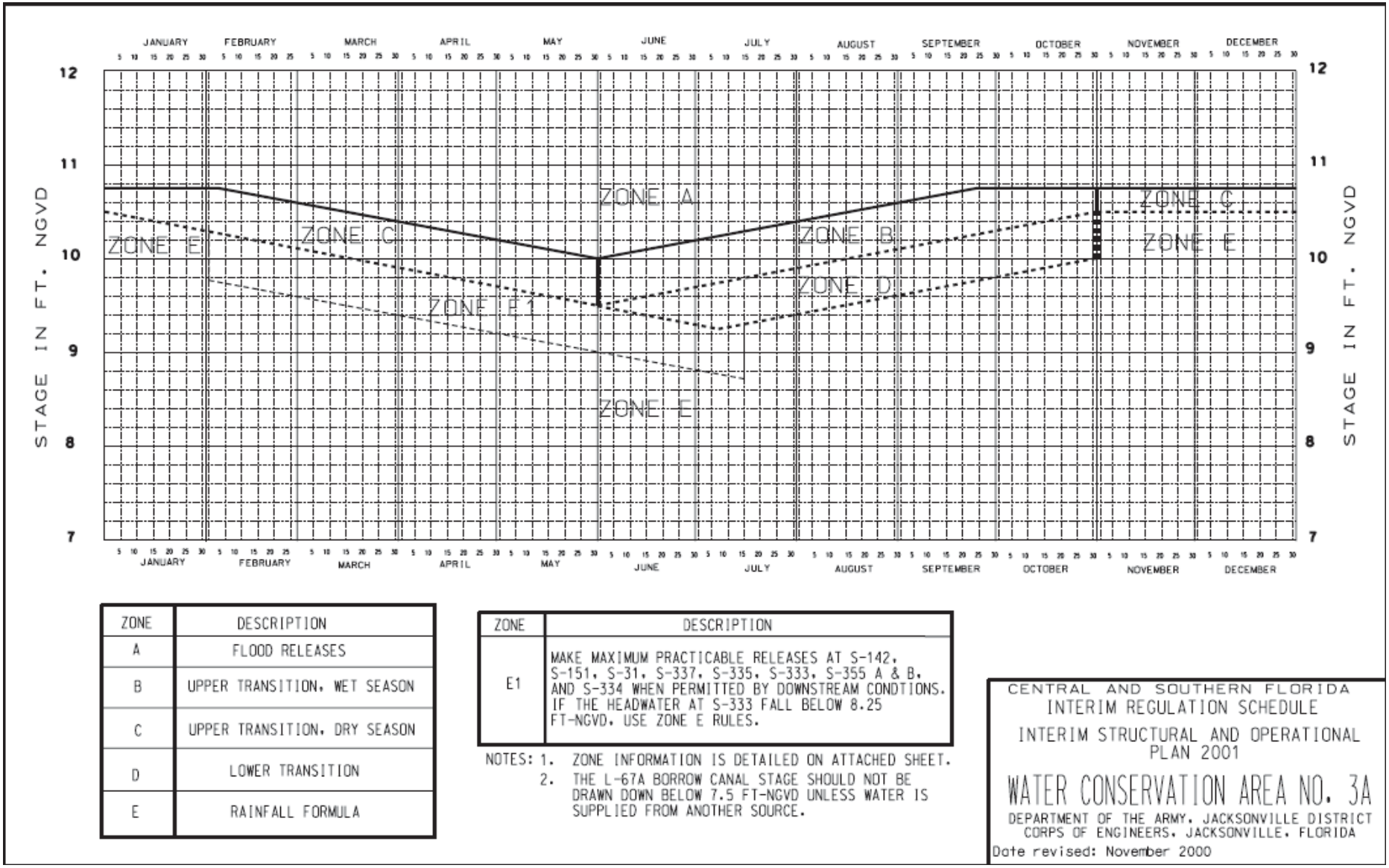
ZONE A	FLOOD RELEASES
ZONE B	UPPER TRANSITION, WET SEASON
ZONE C	UPPER TRANSITION, DRY SEASON
ZONE D	LOWER TRANSITION
ZONE E	RAINFALL FORMULA ONLY

CENTRAL AND SOUTHERN FLORIDA
MODIFIED WATER DELIVERIES TO
EVERGLADES NATIONAL PARK, FLORIDA
WATER CONSERVATION AREA NO. 3A
REGULATION SCHEDULE
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
JUNE 1985

FIGURE 7-4

	WCA-3A OPERATIONAL GUIDELINES	
	S-12s	S-333
ZONE A	Open full.	Maximum allowable discharge.
ZONE B	S-333 Open; Discharge 45% of computed flow. S-333 Closed; Discharge at least 73% of computed flow (up to 100% if desired by ENP).	Discharge up to 55% of computed flow when permitted by this agreement.
ZONE C	S-333 Open; Discharge 45% of computed flow. S-333 Closed; Discharge 45% of computed flow plus all or part of S-333's amount if desired by ENP.	Same as Zone B.
Zone D	S-333 Open; Discharge 45% of computed flow. S-333 Closed; Discharge 45% of computed flow plus all or part of S-333's amount if desired by ENP.	Same as Zone B.
Zone E	Discharge 45% of computed flow whether S-333 is open or closed.	Same as Zone B.

FIGURE 7-4A



ZONE	DESCRIPTION
A	FLOOD RELEASES
B	UPPER TRANSITION, WET SEASON
C	UPPER TRANSITION, DRY SEASON
D	LOWER TRANSITION
E	RAINFALL FORMULA

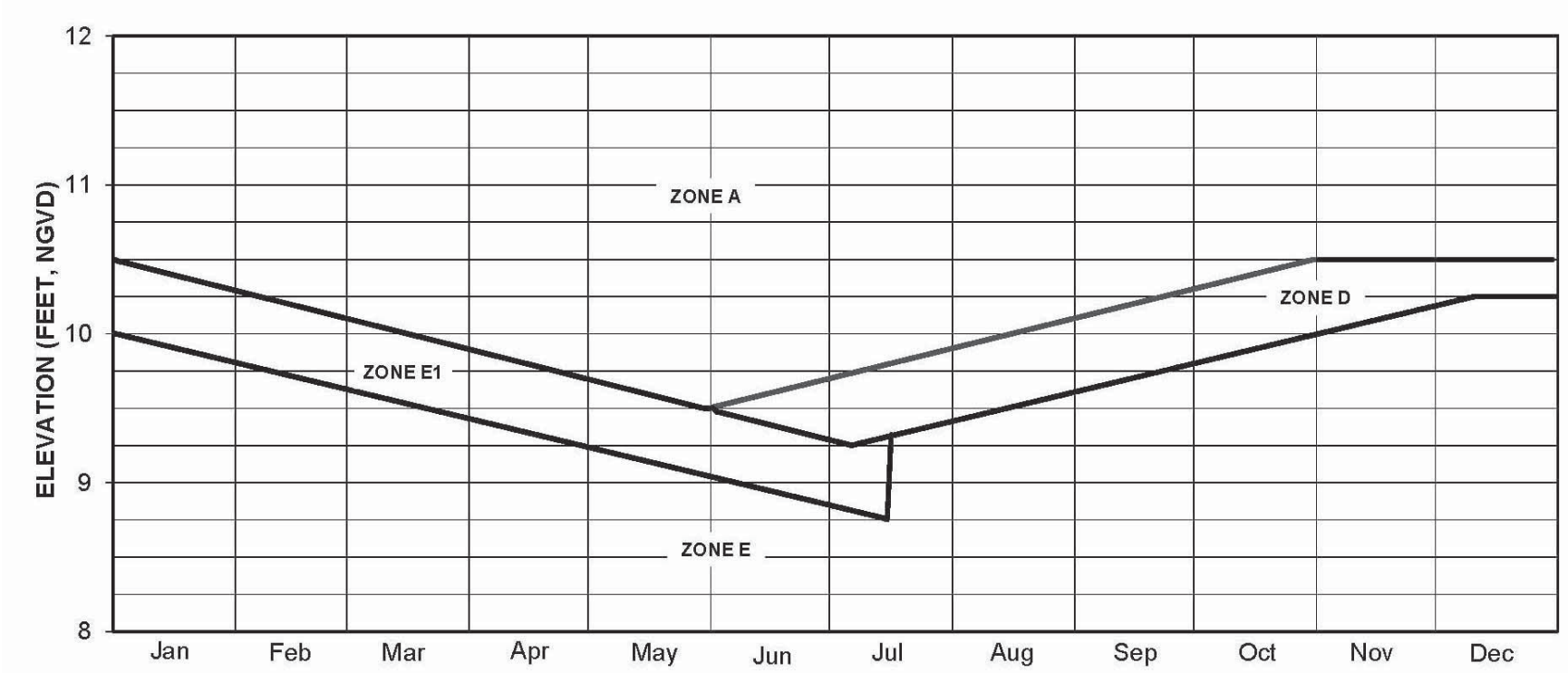
ZONE	DESCRIPTION
E1	MAKE MAXIMUM PRACTICABLE RELEASES AT S-142, S-151, S-31, S-337, S-335, S-333, S-355 A & B, AND S-334 WHEN PERMITTED BY DOWNSTREAM CONDTIONS. IF THE HEADWATER AT S-333 FALL BELOW 8.25 FT-NGVD, USE ZONE E RULES.

NOTES: 1. ZONE INFORMATION IS DETAILED ON ATTACHED SHEET.
2. THE L-67A BORROW CANAL STAGE SHOULD NOT BE DRAWN DOWN BELOW 7.5 FT-NGVD UNLESS WATER IS SUPPLIED FROM ANOTHER SOURCE.

CENTRAL AND SOUTHERN FLORIDA
INTERIM REGULATION SCHEDULE
INTERIM STRUCTURAL AND OPERATIONAL PLAN 2001
WATER CONSERVATION AREA NO. 3A
DEPARTMENT OF THE ARMY, JACKSONVILLE DISTRICT
CORPS OF ENGINEERS, JACKSONVILLE, FLORIDA
Date revised: November 2000

FIGURE 7-4B: WATER CONSERVATION AREA 3A INTERIM OPERATIONAL PLAN REGULATION SCHEDULE 2000

Note: All elevations are in feet NGVD 1929 unless otherwise stated. Revised April 2012



Notes: **Zones B and C do not exist.** Use 3-gage average elevation (Sites 63, 64, and 65). If 3-gage average is in Zone D from 1 June through 14 July, Zone E1 operating criteria may be utilized.

Zone A: Up to maximum releases at S-12A, S-12B, S-12C, S-12D, S-333, S-334, S-343A, S-343B, S-344, and S-151 subject to attached Part C and WCA-3A, ENP, and ENP-SDCS Water Control Plan.

Zones D, E: Goal is to release 45% and 55% at S-12s and S-333, respectively, of the computed flow for Shark River Slough, subject to attached Part C and WCA-3A, ENP, and ENP-SDCS Water Control Plan.

Zone E1: Up to maximum releases at S-12C, S-12D, S-142, S-151, S-31, S-337, S-335, S-333, S-355A, S-355B and S-334 subject to attached Part C and WCA-3A, ENP, and ENP-SDCS Water Control Plan. The goal of Zone E1 is to address the reduction of WCA-3A releases due to CSSS-A structure closure periods.

CENTRAL AND SOUTHERN FLORIDA PROJECT

WATER CONSERVATION AREA NO. 3A
INTERIM REGULATION SCHEDULE

PART A

DATED: March 2012
US ARMY ENGINEER DISTRICT
JACKSONVILLE, FLORIDA

FIGURE 7-5A: WATER CONSERVATION AREA NO. 3A INTERIM REGULATION SCHEDULE PART A

Note: All elevations are in feet NGVD 1929 unless otherwise stated. Revised April 2012

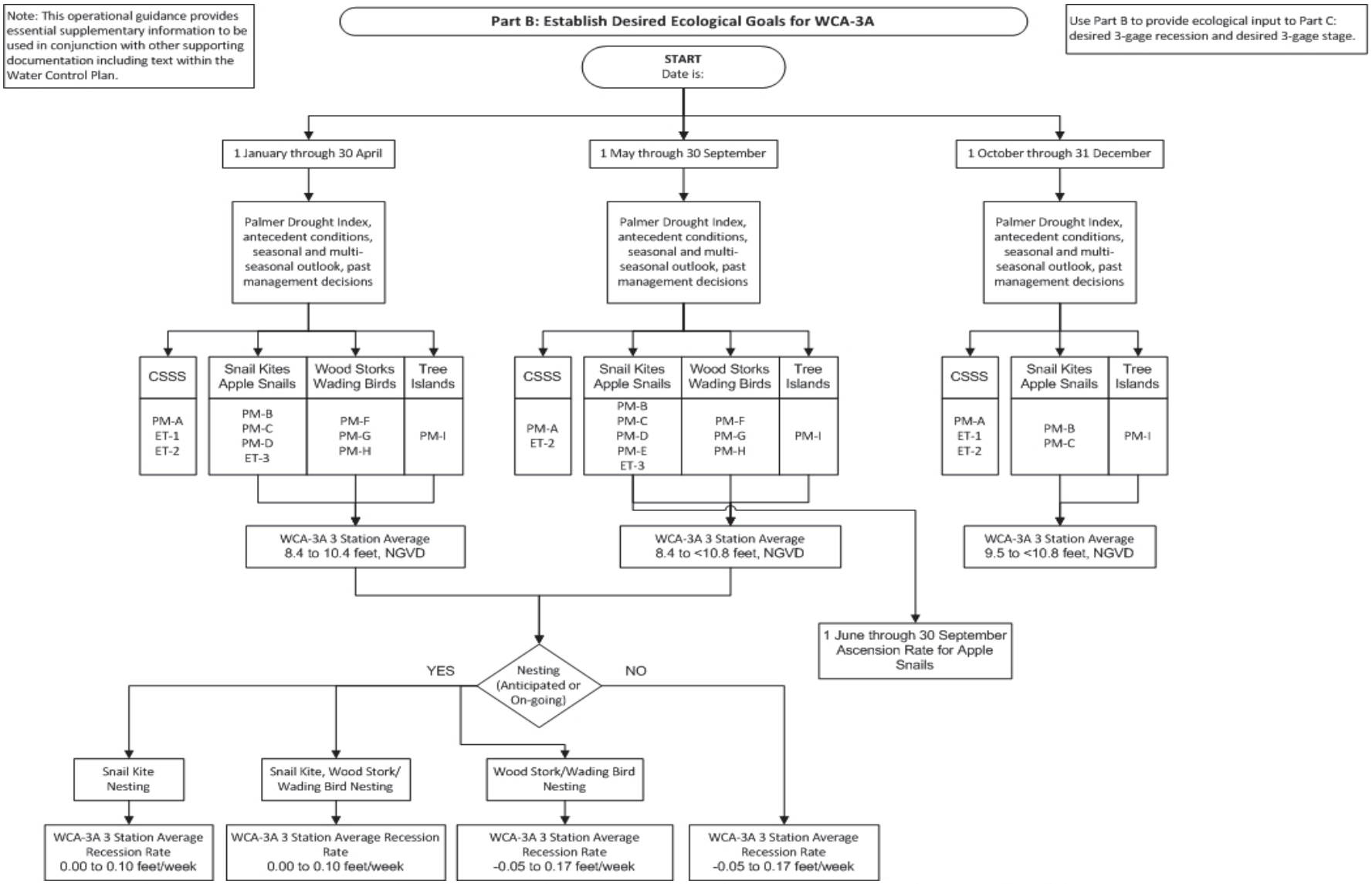


FIGURE 7-5B: WATER CONSERVATION AREA NO. 3A INTERIM REGULATION SCHEDULE PART B

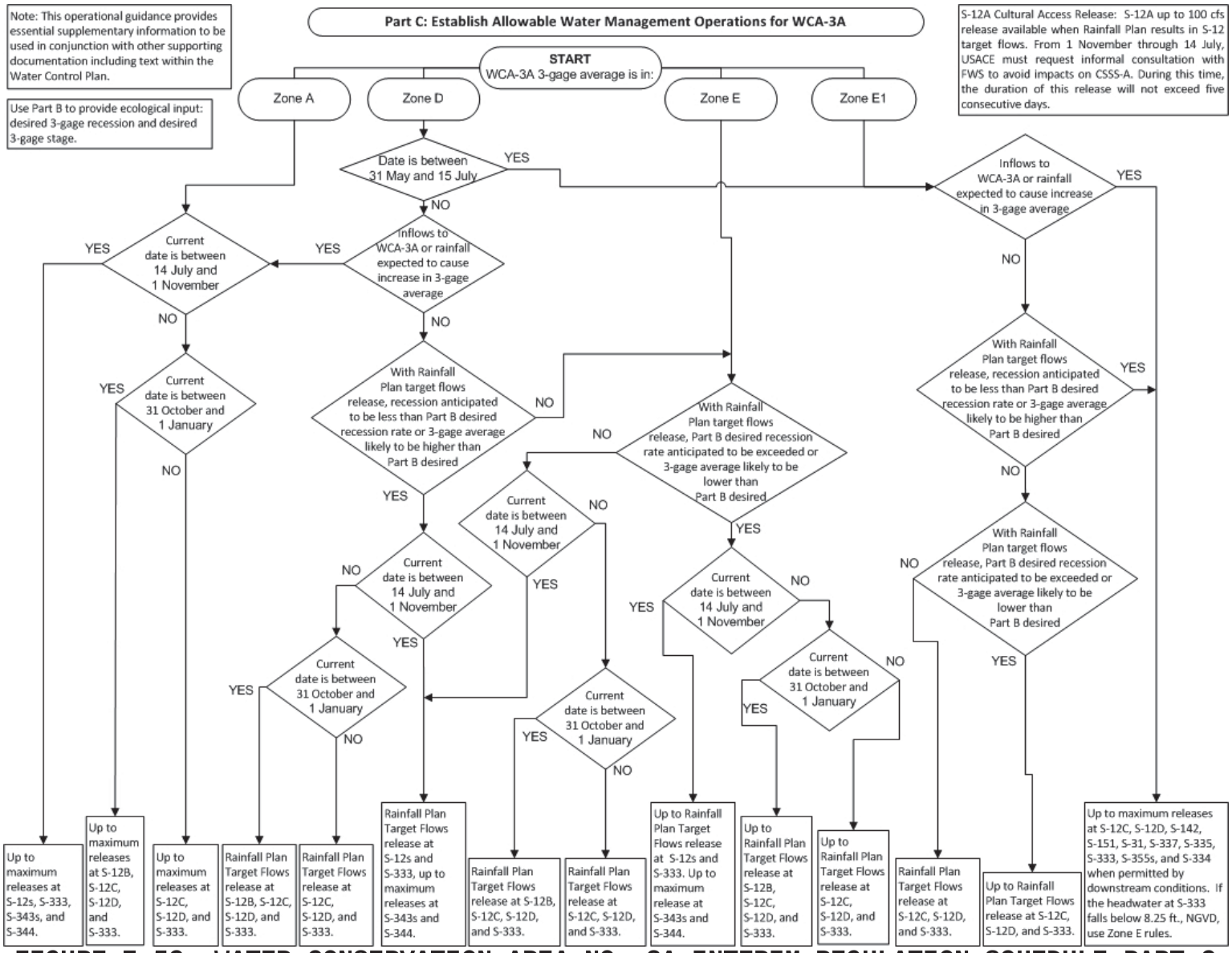
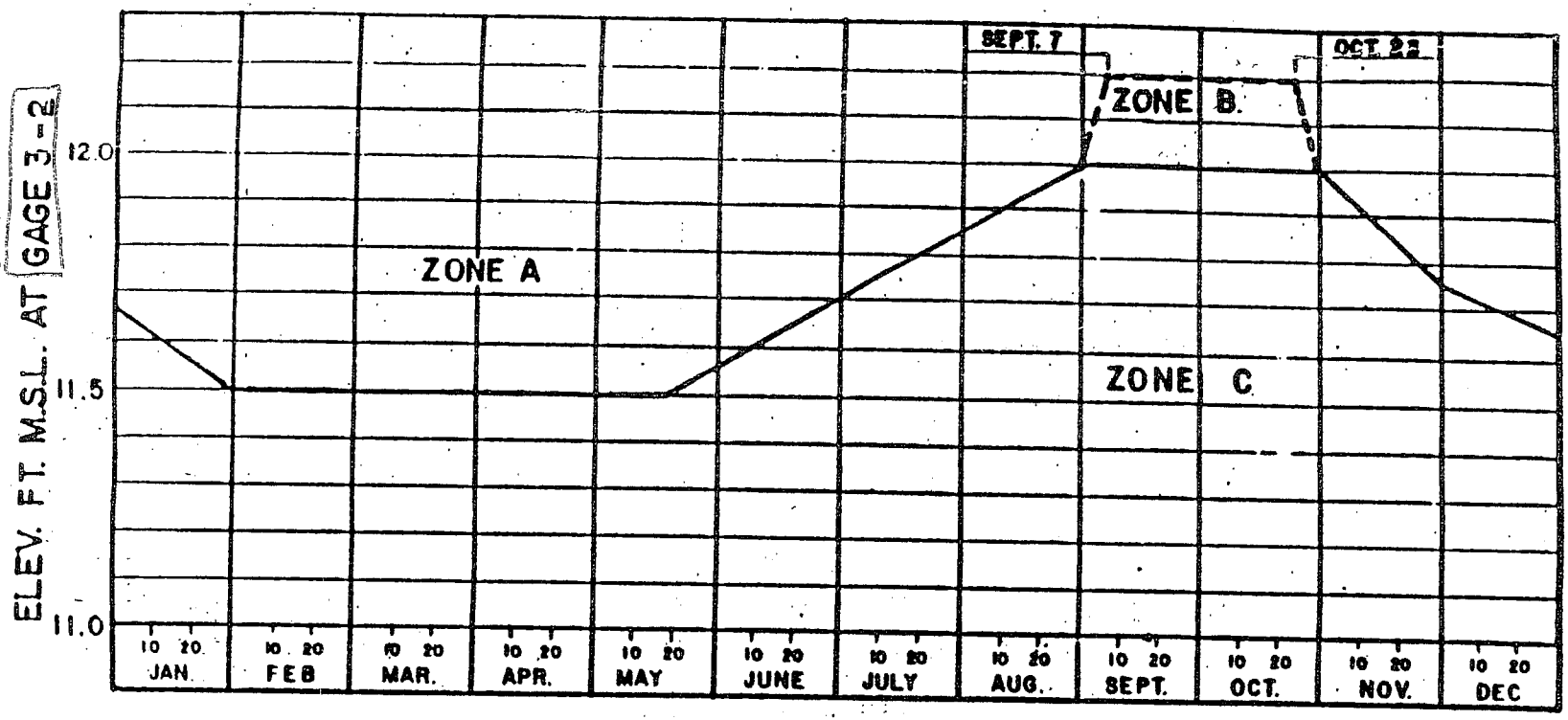


FIGURE 7-5C: WATER CONSERVATION AREA NO. 3A INTERIM REGULATION SCHEDULE PART C



respectively.

STRUCTURE OPERATION

ZONE	S-340	S-339
A	*OPEN AFTER 7 DAYS IN ZONE	OPEN IF S-8 PUMPING OF 18,000 ACRE FT. OR MORE EXPECTED NEXT 14 DAYS AND S-340 OPEN.
B	OPEN AFTER 30 TO 14 DAYS AS * THE ELEVATION VARIES FROM 12.0 TO 12.2 ~~RESPECTFULLY~~.	
C	CLOSE AFTER .25 FT BELOW SCHEDULE UNLESS TRANSFERING WATER FROM S-8 TO DADE COUNTY OR E.N.P.	

(*) CONSECUTIVE DAYS IN ZONES A AND B ARE ADDITIVE.

CENTRAL AND SOUTHERN FLORIDA

CANAL 123 STRUCTURES 339 AND 340

OPERATIONS SCHEDULE

SCALES AS SHOWN

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

DATED SEPT. 1977

FIGURE 7-6

FIGURE 7-7: LOCATION OF GAGES FOR S-332DX1 WATER MANAGEMENT OPERATIONS

b. WCA No. 1. The area receives inflow via Pumping Stations 5A and 6. These pumping stations are designed to remove 3/4 of an inch of agricultural area runoff from their respective drainage areas per day. S-5A pumps water from the West Palm Beach Canal and has a design capacity of 4,800 cubic feet per second (cfs). S-6 pumps water from the Hillsboro canal and has a design capacity of 2,925 cfs. Pumping should begin when canal stages exceed 11.5 - 12.0 feet, NGVD. The area also infrequently receives inflow by gravity from S-5A(S) which is a two-bay gated spillway with a design capacity of 2,000 cfs. The main outlets from WCA No. 1 are S-10 A, C, and D. Water can also be discharged to the east into the Hillsboro Canal through S-39. This is a single bay gated spillway with a design capacity of 800 cfs. S-5A(S) can be used to discharge water from WCA No. 1 to L-8 Borrow Canal and the West Palm Beach Canal.

WCA No. 1 is regulated by Structure 10, which consists of three spillways; S-10A, S-10C, and S-10D. The design capacity of S-10 is 14,800 cfs under Standard Project Flood stages. The SFWMD has constructed and operates S-10E, which consists of three 6-foot diameter gated culverts, as an additional outlet from WCA No. 1 into WCA No. 2A. The regulation schedule is shown on Figure 7-1. When the WCA No. 1 stage is in Zone A, releases may

FIGURE 7-8: WCAS NO. 1 AND NO. 2 OVERALL PLAN FROM 1996 WCAS WCP

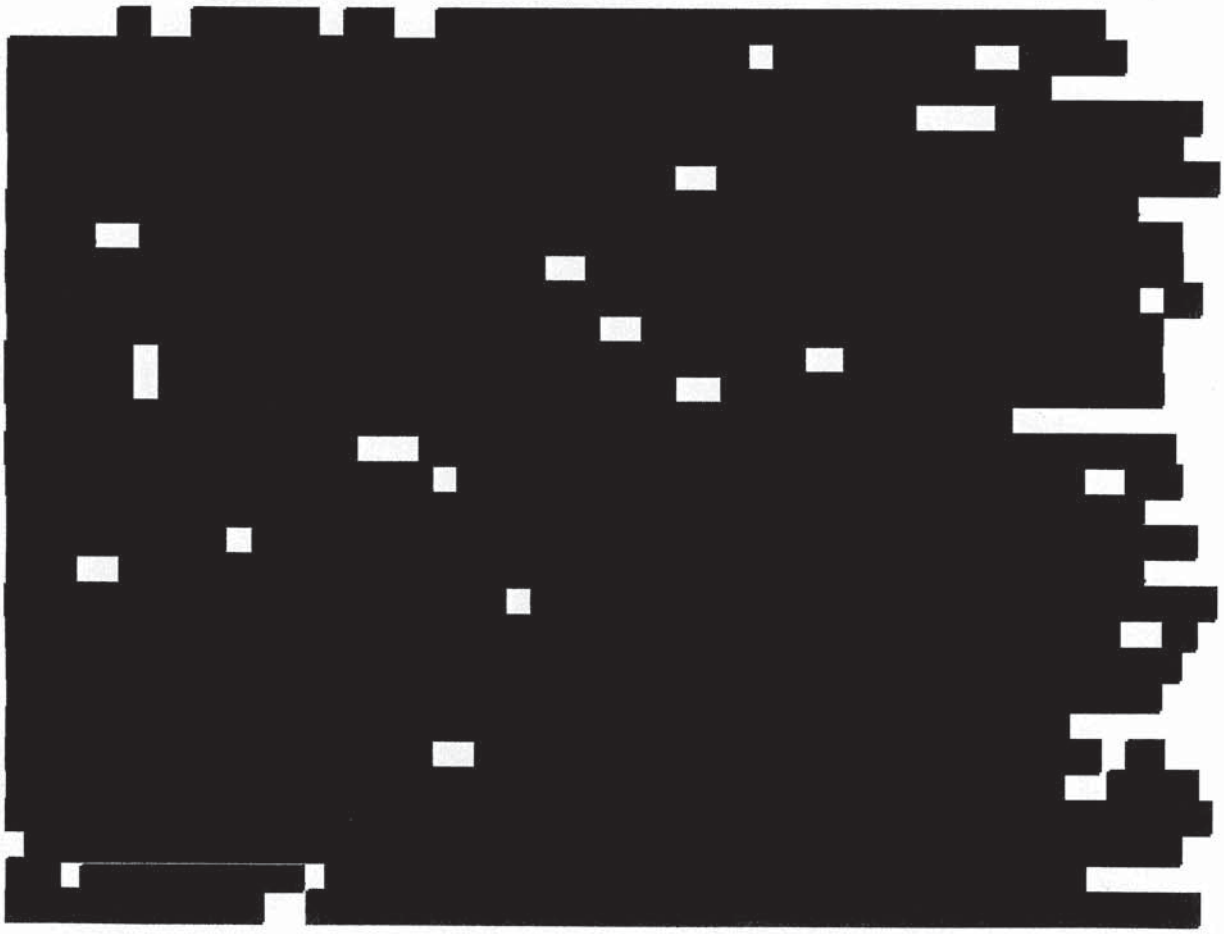
be made up to the maximum at S-10 and S-39 when agreed to by the Corps and SFWMD. In Zone B, discharges are made up to the maximum at S-10 based on 30-day forecast. If the WCA No. 1 stage exceeds 14.0 feet, NGVD, during 1 March through 30 May, elevation 14.0 feet is forgone for the year. In that case the dashed line defining Zone B is the regulation schedule for that year. Water levels are allowed to rise in Zone B if the WCA No. 1 stage was 14.0 feet, NGVD, or below for at least 30 days. When WCA No. 1 stage is in Zone C only releases for water supply are made. Regulatory releases from WCA No. 1 through S-39 and S-5A(S), up to the maximum practicable, may be made when agreed to by the Corps and SFWMD. From 1 January through 30 June the indicator gage for regulation is 1-8C. During 1 July through 31 December the 1-8C gage is used as the indicator gage, except during rising stages when the canal stage exceeds the average of the 1-7, 1-8T, and 1-9 gages. In that case, the average interior stage (gages 1-7, 1-8T, 1-9) is used as the indicator stage. S-10 has no required minimum low flow discharge. During droughts a minimum elevation in the borrow canals of ~~11.0~~ feet, NGVD, will be 14.0 ft NGVD observed. Below this elevation no further releases will be permitted from the area unless a supply of water from another storage area is transferred to WCA No. 1. Experience has shown that it is difficult to draw water out of the interior of WCA No. 1 when the stage is below 15.5 feet, NGVD.

c. WCA No. 2A. In addition to S-10, the area receives inflow from Pumping Station 7. This station pumps water from the North New River Canal, and has a design capacity of 2,490 cfs. Pumping begins when the canal level exceeds 11.5 - 12.0 feet, NGVD, unless the water level in WCA No. 2A is low enough to allow gravity flow from the canal through the spillway at S-7; or the water level in WCA No. 3A is low enough to permit gravity flow through S-150 into WCA No. 3A. The main outlets from WCA No. 2A are S-11A, B, and C. Water can be transferred into WCA No. 2B through S-144, 145, and 146. These structures each have design capacity of 210 cfs each. S-143, with a design capacity of 500 cfs, discharges to the east into the North New River Canal. S-38, with a design capacity of 500 cfs, discharges into C-14.

WCA No. 2A is regulated by Structure 11, which consists of three spillways; S-11A, S-11B, and S-11C. The design capacity of the three structures is 16,600 cfs under SPF stages. The regulation schedule is shown on Figure 7-2. When the WCA No. 2A stage is in Zone A, releases are made up to maximum capacity at S-11; maximum capacity at S-144, S-145, and S-146; and maximum practicable at S-143 and S-38 when requested by the Corps of Engineers. The L-35(B) and L-38 Borrow Canals should not be drawndown below 10.5 feet, NGVD. Releases to WCA No. 2B from S-144, 145, and 146 are to be terminated if the WCA No. 2B stage (measured at gage 99) exceeds 11.0 feet, NGVD. In Zone B only releases for water supply are made. From 1 January through 31

January, the 2-17 gage is the indicator gage for regulation; however, if the 2-17 stage recedes to 11.5 feet, NGVD, the indicator gage becomes the S-11B Headwater gage. From 1 February through 30 June the S-11B Headwater gage is the indicator gage for regulation. Then from 1 July through 31 December the 2-17 gage is the indicator gage for regulation. S-11 has no required minimum low flow discharge. During droughts a minimum elevation in the borrow canals of 10.5 feet, NGVD, will be observed. Below this elevation no further releases will be permitted from the area unless a supply of water from another storage area is transferred to WCA No. 2A.

d. <u>WCA No. 2B</u>. Regulatory discharges from WCA No. 2B are made via S-141. The six-bay spillway structure controls the water level in WCA No. 2B, and permits releases from the area to the North New River Canal. Whenever the pool elevation in WCA No. 2B exceeds 11.0 feet, NGVD, S-141 will be operated for flood releases through S-34 if canal capacity is available. A regulation schedule is not utilized for WCA No. 2B due to high rates of seepage from the area.



Appendix A

Structure Descriptions

STRUCTURE 9A (S-9A)

Location. Pump station S-9A is located at the western terminus of the C-11 borrow canal in the alignment of Levee 37, approximately 0.5 miles west of U.S. Highway 27, just north of and directly adjacent to the S-9 Pump Station in Broward County. The structure is positioned immediately east of Water Conservation Area 3A (WCA-3A).

Description. This structure is a four unit pumping station with a design capacity of 500 cfs. It is equipped with two 175 cfs diesel engines driven pumps, and two 75 cfs electric motor driven pumps and a trash rack system.

Purpose. The purpose of pump station S-9A is to improve the quality and timing of stormwater discharges from the Western C-11 basin into WCA-3A by back pumping seepage lost from WCA-3A back into WCA-3A at the same approximate rate it enters the canal. The use of the S-9A reduces the operational dependency placed on the larger S-9 Pumping Station.

Operation. The structure is remotely operated to maintain optimum headwater stages in the C-11 borrow canal. Additional operational guidance for S-9A is based on best professional judgment of operating personnel; taking field condition factors into consideration such as existing water levels within the C-11 borrow canal, rainfall and seasonality.

DISCHARGE CHARACTERISTICS

Design Discharge Rate (combined):	500 cfs

DESCRIPTION OF STRUCTURE

Number of Pumps:	4
Motor Size:	
2-75-cfs electric pumps:	250 hp
2- 175-cfs diesel pumps:	650 hp
Design Headwater elevation:	3.0 feet NGVD
Design Tailwater elevation:	10.5 feet NGVD
Nominal pump operating speed:	
Electric:	rpm
Diesel 175-cfs:	1800 rpm
Motor Speed:	
Electric:	588 rpm
Diesel:	1800 rpm
Pump Manufacturer (diesel only)	Caterpillar
Model Number (diesel only)	3412C

POWER SOURCE

Prime Movers	Commercial electricity
	Commercial Diesel

STATION POWER

Normal	Commercial electricity
Emergency Electrical	generator backup

HYDRAULIC AND HYDROLOGIC MEASUREMENTS

Stilling wells and staff gages located at upstream and downstream of structure.

ACCESS: Access to S-9A is from the C-11 canal right-of-way via Griffin Road.

STRUCTURE 174 (S-174)

Location. S-174 is located in the northern end of the L-31(W) borrow canal, approximately 5 miles west of Homestead.

Description. Structure 174 is a 1-bay, reinforced concrete, U-shaped spillway with an automatically controlled vertical-lift gate. The gate has two manual slide gates, over one and one-half-feet-high, which provide overflow and water control above elevation 4.5 ft, NGVD to minimize vertical-lift gate movement. The structure has an operating platform and a service bridge. S-174 has sheet-pile wingwalls protected by riprap on the side slopes of the canal.

Purpose. Prior to construction of S-332B, S-332C, and S-332D; this structure, together with S-176, maintained a desirable water control stage upstream in the L-31(N) borrow canal. It passed the design flood (40 percent of the SPF) without exceeding the upstream flood design stage, and restricted downstream flood stages and discharge velocities to non-damaging levels. It also passed the required flows (up to 500 cfs) to Taylor Slough in ENP. It now no longer performs its original purpose.

Regulation. Closed.

STRUCTURE 175 (S-175)

Location. Structure 175 is located in the Levee 31 West borrow canal adjacent to the east boundary of the ENP approximately one and one-quarter miles north of S.R. 27.

Description. S-175 is a gated, three barrel, 84-inch CMP culvert with reinforced concrete headwalls and manually-operated slide gates.

Purpose. Prior to removal of L-31(W) near S-332, this structure maintained optimum upstream water control stages in the L-31(W) borrow canal. It passed the design flood (40 percent of the SPF) without exceeding the upstream flood design stage, and restricted downstream flood stages and channel velocities to non-damaging levels. S-175 also prevents salt water intrusion into the canal. S-175 is no longer operated for flood control purposes.

Regulation. Closed.

STRUCTURE 332DX1 (S-332DX1)

Location. Structure 322DX1 is located approximately 28 miles southwest of Miami, approximately 6 miles west of Krome Avenue, and approximately 5.5 miles north of State Road 9336 (Ingraham Highway), in Levee 31W, west of the S-332D pump station.

Description. S-332DX1 is a 4 Barrel corrugated aluminum pipe (CAP) structure. The barrels are 174 feet long and are gated with vertical lift gates in the middle of the barrel along the alignment of the L-31(W) levee. The structure is designed to pass a combined total of 250 cfs. Flow can pass either way through the structure. Forward flow is defined as the flow passing from the Frog Pond High Head Cell (HCC) to the C-111 Southern Detention Area (SDA). Reverse flow would have flow flowing from the SDA to the HHC.

Purpose. The purpose of S-332DX1 is to improve the ability of the C-111 SDA to create a hydraulic ridge by allowing water conveyance to the north from the Frog Pond HHC into the C-111 SDA. This assists in improving ENP hydrology in accordance with the 2006 Interim Operating Plan (IOP).

Operation. Flow can potentially occur in both directions (North or South) through the S-332DX1 with the notable limitation that water levels in the SDA must be higher than the crest elevation of the weir that separates the FPHHC from the rest of the Frog Pond Detention Area to flow further south. Only flow from South to North through S-332DX1 may be allowed under normal conditions.

DISCHARGE CHARACTERISTICS

Design Discharge Rate (combined):	250 cfs

DESCRIPTION OF STRUCTURE

Optimal Design Head	
Design HW	8.50 ft (HHC)
Design TW	8.00 ft (SDA)
Maximum Stages	
Max HW (forward)	8.60 ft (HHC)
Max TW	10.00 ft (SDA)
Minimum Stages	
Min HW	4.50 ft (HHC)
Min TW	4.50 ft (SDA)
Gate Seating Head*	
Max HW	10.00 ft
Min TW	0.67 ft

Unseating Head

Min HW	10.00 ft
Max TW	0.67 ft

Culvert Data

Material	Corrugated Aluminum
No. in Set	4
Diameter	60 in
Length	173 ft
Invert--HW	1.00 ft
Invert--TW	1.00 ft
Nat Grade	6 ft
Nat Wat Table**	4.5 to 6.0 ft

Gate Data

Gate Type	Vertical Slide
Top-of-Gate Ht	9.00 ft
Protection Elev	9.00 ft

HYDRAULIC AND HYDROLOGIC MEASUREMENTS

Stilling wells and staff gages located at upstream and downstream of structure.

STRUCTURE 346 (S-346)

Location. Structure 346 is located in the borrow canal of the L-67 Extension just south of U.S. Highway 41/Tamiami Trail.

Description. S-346 is a double-barreled, 72 inch, corrugated metal pipe culvert with riser pipes. Control is affected by stop logs in risers in each culvert.

Purpose. S-346 increases the proportion of overland flow with respect to canal flow from the S12D discharge into the Everglades National Park (ENP). S-346 can be open to increase the capacity of S-12D.

Regulation. It is operated in conjunction with the S-12 structures. Normally, this structure can be open when S-12D is open and is closed when all S-12 structures are closed.

Structure 346
Hydraulic Design Data

Location	
L-67 Extension	
Design Conditions	
Discharge (cfs)	165
Type	Controlled Submerged
Headwater Elevation (ft.)	6.2
Tailwater Elevation (ft.)	6.0
Culvert	
Type	Corrugated Metal Pipe
Number of Barrels	2
Size (dia., inches)	72
Net Length (ft.)	
Invert Elevation (ft.)	0.0
Gates	
Type of Control	Stop Logs in Risers
Number	2
Size (dia., inches)	96
Protection Grade Elevation (ft.)	12.0
Operating Platform Elevation (ft.)	12.0
Dewatering Capabilities	No
Discharge capacity per culvert (with all boards removed):	184(H)^(1/2) cfs

STRUCTURE 355A (S-355A)

Location. S-355A is located in levee 29 (L-29), north of both the L-29 borrow canal and US Highway 41 (Tamiami Trail).

Description. S-355A is a single bay, reinforced concrete ogee weir spillway with vertical lift slide gate controls.

Purpose. S-355A was designed to provide control of water levels in WCA-3B by discharging water from WCA-3B to Northeast Shark River Slough via the L-29 borrow canal. Florida Department of Transportation (FDOT) culverts under Tamiami Trail between S-333 and S-334 allow L-29 water to be conveyed from the L-29 borrow canal to Northeast Shark River Slough. Future Tamiami Trail bridge segments are planned (Tamiami Trail Bridge Modification Project) to replace culverts and improve conveyance under Tamiami Trail.

Operation. S-355A will be opened only when southerly flow from WCA-3B to the L-29 Borrow Canal is possible. S-355A will be closed when there is a threat of reverse flow (from the L-29 Borrow Canal to WCA-3B) through the structure. S-355A is operated to maintain water levels in WCA-3B at desirable levels and/or to convey inflows from WCA-3A to the L-29 Borrow Canal. If the FDOT has no roadway subbase concerns, S-355A will be closed when the S-333 tailwater is above 9.0 feet, NGVD. However, when FDOT has roadbase concerns, S-355A will be closed when the S-333 tailwater is above 7.5 feet, NGVD. However, upon completion of the Tamiami Trail Bridge Modification Project these concerns may no longer exist.

Structure 355A

Hydraulic Design Data

Location	Levee 29
Design Conditions	
Gate/Stilling Basin Design	
Discharge (cfs)	1000
Headwater Elevation (ft.)	9.2
Tailwater Elevation (ft.)	8.9
S.P.F. Condition	
Discharge (cfs)	1000
Headwater Elevation (ft.)	10.0
Tailwater Elevation (ft.)	9.7
Crest	
Shape	Ogee
Elevation	1.8
Design Head (Hd)(ft.)	7.4
Net Length (ft.)	8.9
Gates	
Number	2
Width x Height (ft.)	20x8.4
Clearance Elevation	10.2
Instrumentation	
Headwater recorder & staff gage	30-feet upstream
Tailwater recorder & staff gage	30-feet downstream
Gate position recorders	at structure
Stilling Basin	
Elevation	0.0
Length	20
Endsill Elevation	0.75
Baffle Block Elevation	1.0
Rows of Baffle Blocks	1
Training Wall Elevation	8.9
Channel Section	
Upstream Bottom Width (ft.)	60
Upstream Bottom Width Elevation	0.0
Upstream Side Slopes	1 on 3
Downstream Bottom Width (ft.)	Existing
Upstream Bottom Width Elevation	Existing
Upstream Side Slopes	Existing
Upstream Riprap	
Length (ft.)	10.0
Protection Elevation	12.0
Downstream Riprap	
Length (ft.)	10.0
Protection Elevation	11.0

Note: All elevations are in feet NGVD 1929 unless otherwise stated. Revised April 2012

STRUCTURE 355B (S-355B)

Location. S-355B is located in levee 29 (L-29), north of both the L-29 borrow canal and US Highway 41 (Tamiami Trail).

Description. S-355B is a single bay, reinforced concrete ogee weir spillway with vertical lift slide gate controls.

Purpose. S-355B was designed to provide control of water levels in WCA-3B by discharging water from WCA-3B to Northeast Shark River Slough via the L-29 borrow canal. Florida Department of Transportation (FDOT) culverts under Tamiami Trail between S-333 and S-334 allow L-29 water to be conveyed from the L-29 borrow canal to Northeast Shark River Slough. Future Tamiami Trail bridge segments are planned (Tamiami Trail Bridge Modification Project) to replace culverts and improve conveyance under Tamiami Trail.

Operation. S-355B will be opened only when southerly flow from WCA-3B to the L-29 Borrow Canal is possible. S-355B will be closed when there is a threat of reverse flow (from the L-29 Borrow Canal to WCA-3B) through the structure. S-355B is operated to maintain water levels in WCA-3B at desirable levels and/or to convey inflows from WCA-3A to the L-29 Borrow Canal. If the FDOT has no roadway subbase concerns, S-355B will be closed when the S-333 tailwater is above 9.0 feet, NGVD. However, when FDOT has roadbase concerns, S-355B will be closed when the S-333 tailwater is above 7.5 feet, NGVD. However, upon completion of the Tamiami Trail Bridge Modification Project these concerns may no longer exist.

Structure 355B

Hydraulic Design Data

Location	Levee 29
Design Conditions	
Gate/Stilling Basin Design	
Discharge (cfs)	1000
Headwater Elevation (ft.)	9.2
Tailwater Elevation (ft.)	8.9
S.P.F. Condition	
Discharge (cfs)	1000
Headwater Elevation (ft.)	10.0
Tailwater Elevation (ft.)	9.7
Crest	
Shape	Ogee
Elevation	1.8
Design Head (Hd)(ft.)	7.4
Net Length (ft.)	8.9
Gates	
Number	2
Width x Height (ft.)	20x8.4
Clearance Elevation	10.2
Instrumentation	
Headwater recorder & staff gage	30-feet upstream
Tailwater recorder & staff gage	30-feet downstream
Gate position recorders	at structure
Stilling Basin	
Elevation	0.0
Length	20
Endsill Elevation	0.75
Baffle Block Elevation	1.0
Rows of Baffle Blocks	1
Training Wall Elevation	8.9
Channel Section	
Upstream Bottom Width (ft.)	60
Upstream Bottom Width Elevation	0.0
Upstream Side Slopes	1 on 3
Downstream Bottom Width (ft.)	Existing
Upstream Bottom Width Elevation	Existing
Upstream Side Slopes	Existing
Upstream Riprap	
Length (ft.)	10.0
Protection Elevation	12.0
Downstream Riprap	
Length (ft.)	10.0
Protection Elevation	11.0

Note: All elevations are in feet NGVD 1929 unless otherwise stated. Revised April 2012

STRUCTURE 357 (S-357)

Location. The S-357 pump station is located approximately 20 miles southwest of Miami, approximately 3 miles west of Krome Avenue, and approximately 300 feet south of SW 168th Street (Richmond Drive) between SW 205th and SW 206th Avenues.

Description. The S-357 pump station has a capacity of 575 cubic feet per second (cfs), consisting of 4 diesel driven pumps (125 cfs each) and one electric driven pump (75 cfs). The four diesel driven vertical axial flow pumps have a discharge capacity of 56,100 gallons per min (125 cfs) against a total head corresponding to a static head of 15.5 feet, and are capable of constant speed operation from a static head of 15.5 feet down to and including a static head of 6.0 feet with water surface in intake sump ranging from elevation 0.0 feet to elevation 9.5 feet. The electric motor driven pump has a discharge capacity of 33,665 gallons per min (75 cfs) against total head corresponding to a static head of 14.5 feet, and are capable of constant speed operation from a static head of 14.5 feet down to and including a static head of 5 feet with water surface in intake sump ranging from elevation 0.0 feet to elevation 9.5 feet.

The station occupies a footprint approximately 50 feet by 100 feet in plan with an operating finish floor elevation of 18.5 feet and upstream service bridge elevation of 10.0 feet. The seepage canal transitions from a bottom width of 30 feet at elevation of negative 8.5 feet approximately 175 feet upstream of the pump station to a bottom width of 65 feet at elevation negative 12.0 at the beginning of the upstream apron. The S-357 pump station discharges into a settling pond with a concrete apron at elevation 1.0 foot. From the settling pond the flow will transition back to natural grade where the water will flow via an approximately 320 feet wide above ground flow-way to the Detention Cell (DC). Following completion of the C-111 Northern Detention Area (NDA) construction, discharges from the DC into the NDA will be allowed.

Purpose. S-357 will maintain water stages within the interior seepage canal to provide for flood damage reduction (flood mitigation) in the 8.5 SMA and to preserve hydroperiods within the Everglades. The seepage canal and S-357 are designed to work together to maintain water levels within the area interior of the outer perimeter levee. The objective is to control the water level in the seepage collection canal to maintain the groundwater levels within the area interior of the perimeter levee at the same levels as existed prior to the implementation of the MWD project.

Operation. Prior to the completion of the C-111 NDA, the 8.5 SMA pump station and general area will be operated as follows:

The S-357 pump station will turn on when the stilling well water level reaches elevation 6.2 feet. The pump will turn off when the stilling well water level is lower than elevation 5.7 feet. The pump station will pump as required to maintain this upstream canal stage and prevent surface water discharge from the DC. The pumping discharge rate will be reduced or shutdown completely to prevent an overflow event during these interim operations.

DISCHARGE CHARACTERISTICS

Design Discharge Rate (combined):	575 cfs

DESCRIPTION OF STRUCTURE

Number of Pumps:	5
Motor Size:	
1-75-cfs electric pumps:	75 hp
4-125-cfs diesel pumps:	500 hp
Intake Water Surface Elevations	
Maximum Pumping	9.5 ft
Maximum Non-Pumping	7.0 ft
Normal Pumping	5.0 ft to 6.5 ft
Start Pumping	6.2 ft
Normal Drawdown Pumping	5.7 ft
Minimum Pumping	0.0 ft
Minimum Non-Pumping	0.0 ft
Discharge Water Surface Elevations	
Maximum Pumping	11.0 ft
Normal Pumping	6.0 ft to 9.0 ft
Minimum Pumping	5.0 ft
Minimum Non-Pumping	5.0 ft
Channels & Approaches	
Channel Bottom Width	30 ft
Side Slopes	1V:1H 1V:3H above Miami Oolite (Near surface)
Intake Channel Invert	-8.5 ft
Discharge Pond Invert	1.0 ft

POWER SOURCE

Prime Movers	Commercial electricity Commercial Diesel

STATION POWER

Normal	Commercial electricity
Emergency Electrical	generator backup

HYDRAULIC AND HYDROLOGIC MEASUREMENTS

Stilling wells and staff gages located at upstream and downstream of structure.

ACCESS: Access to S-357 pump station is to the south, off of Richmond Drive.

Appendix F

USFWS Biological Opinion for Everglades Restoration Transition Plan Pertinent Information

United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960

November 17, 2010

Colonel Al Pantano
District Commander
U.S. Army Corps of Engineers
701 San Marco Boulevard, Room 372
Jacksonville, Florida 32207-8175

Service Consultation Code: 41420-2011-F-0024
Date Received: October 15, 2010
Formal Consultation Initiation Date: October 15, 2010
Project: Everglades Restoration Transition Plan, Phase 1

Dear Colonel Pantano:

This document transmits the U.S. Fish and Wildlife Service's (Service) Biological Opinion for the continuation of the Interim Operational Plan (IOP) and the proposed Everglades Restoration Transition Plan, Phase 1 (hereafter referred to as ERTP-1). This Biological Opinion is in accordance with section 7 of the Endangered Species Act of 1973, as amended (87 Stat. 884; 16 U.S.C. 1531 *et seq.*). The U.S. Army Corps of Engineers (Corps) completed a Biological Assessment (BA) for ERTP-1 which was received at the Service's South Florida Ecological Services Office on October 15, 2010. ERTP-1 will replace the Interim Operational Plan for the Protection of the Cape Sable seaside sparrow (IOP). This document evaluates the potential effects of ERTP-1 on the Everglade snail kite (*Rostrhamus sociabilis plumbeus*) and its designated critical habitat, the Cape Sable seaside sparrow (*Ammodramus maritimus mirabilis*) and its designated critical habitat, and the wood stork (*Mycteria americana*). This Biological Opinion also transmits the Service's concurrence on the Corps' determination that the ERTP-1 "may affect, but is not likely to adversely affect" the Florida panther (*Puma concolori coryi*), American crocodile (*Crocodylus acutus*), eastern indigo snake (*Drymarchon corias couperi*), deltoid spurge (*Chamaesyce deltoidea* spp. *deltoidea*), Garber's spurge (*Chamaesyce garberi*), Small's milkpea (*Galactia smallii*), and tiny polygala (*Polygala smallii*). The project site is located within Water Conservation Area-3A and Everglades National Park (ENP) in Broward, Miami-Dade, and Monroe Counties, Florida.

This Biological Opinion analyzes the continuation of the IOP as well as the potential effects of proposed operations for the ERTP-1, including proposed changes to the WCA-3A regulation schedule for human health and safety as described in the Corps' September 9, 2010 Water Resources Engineering Branch Memorandum. The Biological Opinion is based on information and the proposed action as described and analyzed in the Corps' BA dated October 15, 2010, and

the Corps' forthcoming draft Environmental Impact Statement (early 2011), which includes a draft Operations Manual, meetings, telephone conversations, email, and other sources of information. A complete administrative record of this consultation is on file at the Service's South Florida Ecological Services Office (SFESO) in Vero Beach, Florida.

Following the interim period during which the IOP remains in place, ERTP-1 will be implemented. ERTP-1 is a modification of the IOP with additional operational flexibilities to provide hydrological improvements primarily in WCA-3A, while maintaining conditions south of Tamiami Trail, until full implementation of the Combined Operational Plan (COP) and ultimately the CERP. ERTP-1 is intended to serve as a transition between IOP and COP. However, it should be understood that at the present time there are limited opportunities within the existing C&SF Project infrastructure to realize anticipated Everglades restoration benefits, such as reconnecting WCA-3A, WCA-3B, and NESRS. Therefore, ERTP-1 is expected to result in small but ecologically meaningful hydrologic improvements in WCA-3A until such time that the historic flow way is re-established.

As of the date of this Biological Opinion, the Corps has initiated, but not completed, compliance with the National Environmental Policy Act (NEPA) related to the implementing ERTP-1. Completion of the Corps' NEPA process by the signing of a Record of Decision (ROD) is not anticipated until summer of 2011. Thus, this Biological Opinion evaluates the continuation of the IOP from this date to the signing of the ROD, and the implementation of ERTP-1, through January 1, 2016. Accordingly, the Service recognizes that certain aspects of this Biological Opinion cannot be fully implemented by the Corps until its NEPA process is complete. Specifically, changes in the Water Conservation Area (WCA)-3A Regulation Schedule, installation of seasonal culvert plugs in the Shark Valley Tram Road and in the Old Tamiami Trail near S-12B, and changes in operation of the S-12C structure, will not be required until the signing of the ROD and ERTP-1 is authorized. However, other reasonable and prudent measures, and terms and conditions of this Biological Opinion, including establishment of the periodic scientist calls and the utilization of new information presented in this Biological Opinion (such as the Multi-Species Transition Strategy), can begin immediately. Effective the date this Biological Opinion is signed, the incidental take protections for the Everglade snail kite, the Cape Sable seaside sparrow, and the wood stork, as described in this Biological Opinion, are authorized for the period continuing the IOP to the signing of the ERTP-1 ROD, and during the implementation of ERTP-1 through January 1, 2016.

Thank you for your cooperation and effort in protecting fish and wildlife resources. If you have any questions regarding this Biological Opinion, please contact Dr. Todd Hopkins at 772-562-3909, extension 316, or via email at Todd_Hopkins@fws.gov.

Sincerely yours,

Paul Souza
Field Supervisor
South Florida Ecological Services Office

cc: electronic copy only
Corps, Jacksonville, Florida (Rebecca Griffith, Eric Bush, Eric Summa, Susan Connor, Donna George)
Corps, West Palm Beach, Florida (Kim Taplin, Lt Col. Kinard)
DEP, Tallahassee, Florida (Greg Knecht)
District, West Palm Beach (Carol Wehle, Ken Ammon, Lisa Cannon)
ENP, Homestead, Florida (Dan Kimball, Bob Johnson, Carol Mitchell)
FWC, Tallahassee, Florida (Mary Ann Poole)
FWC, West Palm Beach, Florida (Chuck Collins, Joe Walsh)
Service, Atlanta, Georgia (David Flemming, Dave Horning)
SOL/DOI, Atlanta, Georgia (Michael Stevens)

September 2010) were associated with the CERP (5,279 acres in Picayune Strand). The purpose of these CERP impacts was to facilitate ecosystem restoration and enhance habitat within this area. An additional 358 acres of non-CERP wetland impacts were associated with the construction of wetland mitigation banks during the same timeframe. The result is a total of 5,637 acres of wetland impacts which could be considered beneficial to the species based on their purpose as wetland habitat enhancement projects. The remaining 9,812 acres of wetlands that were lost to development includes over 6,000 acres of wetlands permitted for rock mining in Miami-Dade County during 2010. This averages out to approximately 1,635 acres per year throughout the four counties listed in Table 17. Using this average rate of wetland loss, and the assumption that an additional 20 percent of privately-owned wetlands would not be subject to Corps regulatory review, approximately 327 acres of wetlands impacts per year would not require a CWA Section 404 wetland permit. Extrapolating this loss annual rate forward for the 5-year period of operations for the current action would equal 8,175 acres of wetlands potentially filled without Corps regulatory review within the wood stork action area. The core foraging area for the wood stork colonies in the action area is 542,080 acres. Thus, a loss of 8,175 acres equals a spatial loss of 1.5 percent of the core forging area. Although these wetlands may be affected by non-federally reviewed actions and the productivity as foraging prey base for wood storks may be may be affected, we believe based on the status of the species discussed previously and the status of the species in the action area, the loss or reduction of foraging value to the wood storks associated with these systems is not significant (1.5 percent).

CONCLUSION

After reviewing the current status of the CSSS and its designated critical habitat, Everglade snail kite and its designated critical habitat, and the wood stork; the environmental baseline for these species and their designated critical habitats within the action area; the effects of the proposed ERTP-1, the interim period when the IOP remains in place, and the cumulative effects, it is the Service's biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the CSSS, Everglade snail kite, or wood stork, and is not likely to destroy or adversely modify CSSS or Everglade snail kite designated critical habitat.

Cape Sable Seaside Sparrow and its Designated Critical Habitat

The operation of the IOP during the interim period until ERTP-1 is implemented and subsequent implementation of ERTP-1 through January 1, 2016. is expected to remain consistent with previous operational plans and the RPA in the Service's 1999 Biological Opinion. Accordingly, we anticipate reduced water levels during sparrow nesting season to a level that will allow sparrow pairs to complete one or two successful clutches in most years. This level of nesting is sufficient to maintain Subpopulation A for the next 5 years or until such time additional CERP projects can be brought on-line which will shift flows to the east away from Subpopulation A. Rainfall events are expected to continue to affect the hydrologic conditions within subpopulation A during the nesting season, but IOP protections, and ERTP-1 protections including S-12 A and B closures, Shark Valley Tram Road culvert plugs, and periodic scientist calls, are sufficient to minimize the detrimental effects of these rainfall events on sparrow reproduction over the period of ERTP-1 operations.

The operations of ERTP-1, like IOP before it, are also expected to maintain hydrologic conditions to support suitable sparrow habitat within portions of Subpopulation A that are

sufficient to maintain the subpopulation. Large increases in the number of sparrows within Subpopulation A or large improvements in the condition of habitat in the area are not expected to occur under ERTP-1, or the period when the IOP remains in place. However, the operation of the IOP and ERTP-1 is designed to avoid jeopardizing the CSSS, and is anticipated to sustain Subpopulation A, which is necessary for overall population health. Some improvements to hydrologic conditions within sparrow subpopulations C and F are expected to result in improved habitat conditions and possibly larger numbers of sparrows. There are few effects of the IOP and ERTP-1expected on other sparrow subpopulations. In total, the impacts from the IOP and subsequently ERTP-1 through January 1, 2016 are not anticipated to appreciably reduce the likelihood of survival of the CSSS.

No construction activities are anticipated with ERTP-1, since most of the structural features have already been constructed under IOP, so there will be no direct impacts due to construction to sparrow critical habitat. Improvements in habitat conditions within limited areas of critical habitat in sparrow Subpopulations C and F are likely to continue under ERTP-1. No other effects to critical habitat are expected.

Everglade Snail Kite and its Designated Critical Habitat

ERTP-1 operations pose fewer impacts to the snail kite, apple snail, and their habitat as those under IOP. However, the impact from continuing the IOP until ERTP-1 is implemented will be moderated using the opetrational flexibility informed by adaptive management strategies identified through the periodic scientist calls. ERTP-proposed modifications to IOP regulations and the WCA-3A Regulation Schedule were designed to reduce water levels within WCA-3A, avoid extreme high and low water conditions, and provide for a more gradual, and thus favorable, recession rate during the snail kite's breeding season. However, these potential improvements are not expected to be sufficient to prevent continued habitat degradation or to entirely eliminate negative impacts to snail kite and apple snail productivity in all years. Thus, ERTP-1 operations may result in continued habitat degradation within WCA-3A, which has been one of the most significant areas of kite habitat within the past 30 years. In addition, ERTP-1 operations may result in reduced nest success of kites within WCA-3A, reduced foraging habitat suitability, and reduced abundance of the kite's primary prey. These impacts may limit population growth in WCA-3A and possibly cause further reductions in the overall kite population. However, because snail kites are long-lived, have high rates of adult survival, and continue to successfully nest in other portions of their range in southern Florida, these impacts are not anticipated to appreciably reduce the likelihood of survival and recovery of the species in the wild during the next 5 years. Degradation of designated critical habitat within WCA-3A may continue under ERTP-1 in some years, but this is reversible with improved hydrologic conditions which are anticipated after full implementation of the COP (currently scheduled to be completed in 2013). No permanent loss of critical habitat is expected.

Wood Stork

Recent population estimates indicate the stork population has reached its highest level since it was listed as endangered in 1984. Approximately 1,279 wood stork pairs nested within their breeding range in the southeastern United States in 2006. The number of colonies also continues to rise, and over 80 nesting colonies were reported in 2006 throughout the southeastern

United States (Service 2007), which is the highest to date in any 1 year. In 2009, wood storks produced approximately 6,452 nests in south Florida alone (Cook and Kobza 2009).

Impacts to wood stork foraging and nesting are likely to occur under the continuation of the IOP or ERTP-1 resulting in reduced foraging habitat suitability and increased potential risk of depredation for some stork colonies. These effects are not expected to appreciably reduce the likelihood of survival and recovery of the species in the wild.

After reviewing the status of the wood stork, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the implementation of the IOP and ERTP-1, as proposed, is not likely to jeopardize the continued existence of the wood stork. No critical habitat has been designated for this species; therefore, none will be affected.

INCIDENTAL TAKE STATEMENT

Sections 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without a special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns such as breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns, which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are nondiscretionary, and must be undertaken by the Corps so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the terms and conditions or (2) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. To monitor the impact of incidental take, the Corps shall report the progress of the action and its impact on the species to the Service as specified in the incidental take statement.

AMOUNT OR EXTENT OF TAKE

Cape Sable Seaside Sparrow

The Service anticipates incidental take of CSSSs will be difficult to detect. As a result of a court ordered review of the 2006 IOP ITS, the Service concluded that the standardized method used to estimate population abundance (known as the extensive survey method) was insufficient to

predict the number of sparrows that would be incidentally taken as a result of this action or to track incidental take of individual sparrows. Our reasons for this conclusion were as follows:

Since the discovery of the species in 1918, numerous researchers have written about the difficulty in finding individuals, not only due to the secretive nature of the species, but also due to the remote wilderness habitat the species occupies (Howell 1919, 1932; Nicholson 1928; Anderson 1942; Sprunt 1954; Stimson 1956, 1968; Woolfenden 1956; Werner 1975; Kushlan and Bass 1983; Lockwood et al. 1997; Pimm et al. 2002). The sparrow's reclusive habits and general inaccessibility of its preferred habitat have long discouraged critical comprehensive life history studies (Lockwood et al. 1997). In fact, seasoned observers typically have difficulty "seeing" individuals and usually rely on the chirping sound of singing adult males defending their breeding territory and vocalizing to attract females to determine presence or absence in an area. This, in turn, spurs more intensive investigation that sometimes results in seeing individuals and locating nests. In addition, the sparrow's distribution is patchy and temporally dynamic (Pimm et al. 2002).

The extensive survey method to estimate sparrow populations uses a helicopter to drop observers at remote sites within sparrow habitat who then record the number of sparrows seen or heard. To estimate the number of sparrows from the number observed (seen or heard), a correction factor is used. Kushlan and Bass (1983) were the first to develop and use a correction factor for their sparrow observations and it is still used today. A value of 15.87 (rounded to 16.0) is used based on the range at which observers can detect the sparrow's distinctive song, and on the assumption that each singing male is accompanied by one female. An individual male sparrow's territory is roughly 5 acres in size and the correction factor of 16 assumes that observers will count all birds within 656 ft of the observation station. Therefore, the correction factor of 16 is based on the fraction of total area sampled and detection probability, such that the area sampled multiplied by the detection probability equals 1/16 (Pimm et al. 2002; Walters et al. 2000). For that reason, one singing male heard or one individual seen is corrected to equate to a total of 16 individuals. This assumes statistically that an additional 15 individuals were also present in the area sampled, but due to the factors governing the probability of detection, were not seen or heard during the time of observation. It has been statistically determined that under good survey conditions, the chance or probability of detection is better than 60 percent using this method. The correction factor methodology has been the subject of two external reviews. The most recent review (1999/2000) was conducted as a result of a recommendation by the American Ornithologists' Union (AOU) external peer review committee. The outcome of the second review resulted in a determination by the AOU committee that the methodology employed is a reliable and accurate measure of abundance (Walters et al. 2000). However, this is not to say that it is a reliable method to track and count individual sparrows, rather it provides a reliable trend in population estimates comparable over time.

Intensive ground surveys for sparrows were started during the 2006 nesting season in subpopulations C, D, and F in order to better understand population dynamics within these small units. The main goals of this research were to determine if and how these small subpopulations are recovering from reduction in numbers, the capability of these birds to disperse to other subpopulations, and to assess the accuracy of the annual helicopter surveys used to estimate the total sparrow population size (Lockwood et al. 2006). Information gained from these surveys included territory size, fecundity, nest success and survival rates through mark recapture. The researchers concluded the use of adaptive line transects did not produce enough sparrow

detections to estimate density or abundance in these small populations; it did, however, prove useful in finding previously un-recorded sparrow breeding locations. The researchers noted "several logistical issues with conducting adaptive transect surveys for sparrows" given their rarity, whether or not they "cluster" and their "plastic" behavior. Although it is thought that this survey method more accurately counts sparrows within small subpopulations it is still prone to the same problems affecting the helicopter surveys in that not every adult, egg, nestling and/or juvenile may be accounted for and changes in the total number of birds observed in any given subpopulation cannot be directly attributed to perturbations in habitat suitability due to the project versus other environmental factors. Therefore, this method does not afford the Service the enhanced ability to assess incidental take in terms of individual sparrows. Specifically, then, the Service concluded it is impractical to find, count, and monitor the reproductive success of each individual sparrow in a subpopulation or throughout its range.

Although the existing survey methodology is insufficient to track or identify all individual sparrows incidentally taken as a specific result of the proposed action, it is still suitable for establishing incidental take thresholds that when exceeded would trigger reinitiation of consultation. The Service evaluated the mean total population estimate and one standard deviation for the years 2001-2009 which represents the timeframe under which operations for the protection of the CSSS have been implemented. Though the range of population estimates over this time frame have varied slightly due to many factors, including water management, the Service determined that the mean population estimate over this time frame (2001 to 2010) has been relatively stable and may be a reasonable incidental take trigger; that is, if the total annual population estimate falls below one standard deviation from the mean in the years from 2001 to 2009, reinitiation of consultation should be triggered. The Service chose to use one standard deviation rather than simply using the lowest estimate on record because it is more protective and accounts for the natural variation inherent in these population estimates. In addition, the Service chose to use the total population estimate as a trigger for several reasons: (1) some of the smaller subpopulations are so small that it would be difficult to establish a meaningful trigger when actual bird counts range, for example, between 0 to 3 for subpopulations F and D; (2) sparrows are known to migrate between subpopulations, thus supporting the overall population; (3) some of the subpopulations may benefit from ERTP-1; and (4) jeopardy is evaluated at the species-level.

The mean population estimate for the period 2001 through 2009 was 3,145 sparrows with a standard deviation of 230 (Table 2). Therefore, if annual population estimates fall below 2,915 sparrows (the mean minus one standard deviation) reinitiation of consultation must occur.

Because survey results are not instantaneous, such that it may take several months to analyze the data and conclude a population estimate in any 1 year, the Service has also identified the following hydrologic parameters that should be monitored to indicate if incidental take of sparrows is exceeded by the proposed action. These parameters, if exceeded, would indicate that effects of the action were greater than anticipated in this Biological Opinion, indicating a potential exceedence of incidental take.

Incidental take in the form of harm is anticipated to occur to individual sparrow eggs or nestlings as a result of high water levels during the breeding season. CSSSs build their nests near the ground surface at an average height of only 16 cm (6 inches) between the soil surface and the base of the nest. Accordingly, they are especially vulnerable to flooding caused by rising water

levels due to rainfall or water management actions. Therefore during the breeding season, the monitoring of water levels within occupied sparrow habitat is an additional measure of incidental take of sparrow eggs and young not yet capable of flight. We do not anticipate the loss of adult sparrows since the water levels in question are not known to directly harm adult sparrows.

Therefore, in addition to the incidental take provisions cited above for the estimated total population of sparrows, the following levels of incidental take as described in hydrologic terms also apply in the eastern and western subpopulations. If any level of incidental take, either by total population estimate or by hydrologic parameters in a single subpopulation, are exceeded, reinitiation of consultation would be required.

Eastern Marl Prairies

Operation of the S-332 structures may result in flooding of sparrow nests that occur within 0.6 mile of the S-332 Detention Areas, either because of increased water levels resulting from seepage or from overflow from the detention areas directly into sparrow habitat within ENP. This will result in loss of the contents of all nests within 0.6 mile of S-332. Operation of the detention areas that raise water levels from a groundwater condition to a surface water condition beyond 0.6 mile from the detention areas prior to June 1 will result in incidental take that is not exempted in this Biological Opinion. In addition, operations that raise surface water levels beyond 0.6 mile from the detention areas will exceed incidental take.

Western Marl Prairie

Information from various sources identifies different amounts of potential and available habitat, in the western marl prairies. To date, there is still limited detailed information about the condition and susceptibility to flooding within all portions of this area. Consequently, we used figures for habitat available that were presented in the Service's 1999 Biological Opinion.

The Service anticipates that a maximum of 66 square-miles of potential and historic sparrow habitat may be subject to flooding during the nesting season near Subpopulation A due to water releases. This area corresponds to 60 percent of potential sparrow habitat within the area of Subpopulation A. Any adult birds that have territories within the 66 square-miles would be impacted by water levels too high to allow breeding or by lower fecundity associated with nest abandonment. Likewise, injury or death to juvenile sparrows or eggs could result from pump discharges that raise the water level above existing nests.

Currently an estimated 110 square-miles (70,400 acres) of potential sparrow habitat are available in the western marl prairies. Although not all 110 square-miles (70,400 acres) may actually be suitable for nesting, the habitat that is suitable for the sparrow is contained within this acreage. ERTP-1, and the during the period when the IOP remains in place, would result in a minimum of 44 square-miles (28,160 acres, or 40 percent of the total) of potential nesting habitat that is not flooded and available for sparrow nesting for at least 60 continuous days from March 1 through July 15 in 8 out of every 10 years. Or, if more than 66 square-miles (42,240 acres) of habitat are unavailable for nesting (fewer than 60 consecutive days with water levels below ground surface at NP-205) due to water releases in 2 consecutive years, then incidental take will be exceeded. The periodic scientist calls will be used to assess why the 60 day window was or was not met in

the first year and prepare an action plan if necessary to avoid consecutive years with reduced nesting availability.

ERTP-1, and during the period when the IOP remains in place, operations allow water releases into Subpopulation A beginning on July 15 of each year. Because sparrows may nest through August, release of water through the S-12 structures is expected to increase the rate of nest failure for any nests that are active on July 15. In most years, water levels are already high within Subpopulation A by July 15, likely causing reduced nesting activity and low nest success rates during this period due to increased depredation rates (Figure 35). However, we expect that water releases will cause increases in water depths that may result in injury to or death to the few, if any, sparrow eggs or nestlings that are active on or after July 15. The effect of this incidental take would be evaluated through the population estimate.

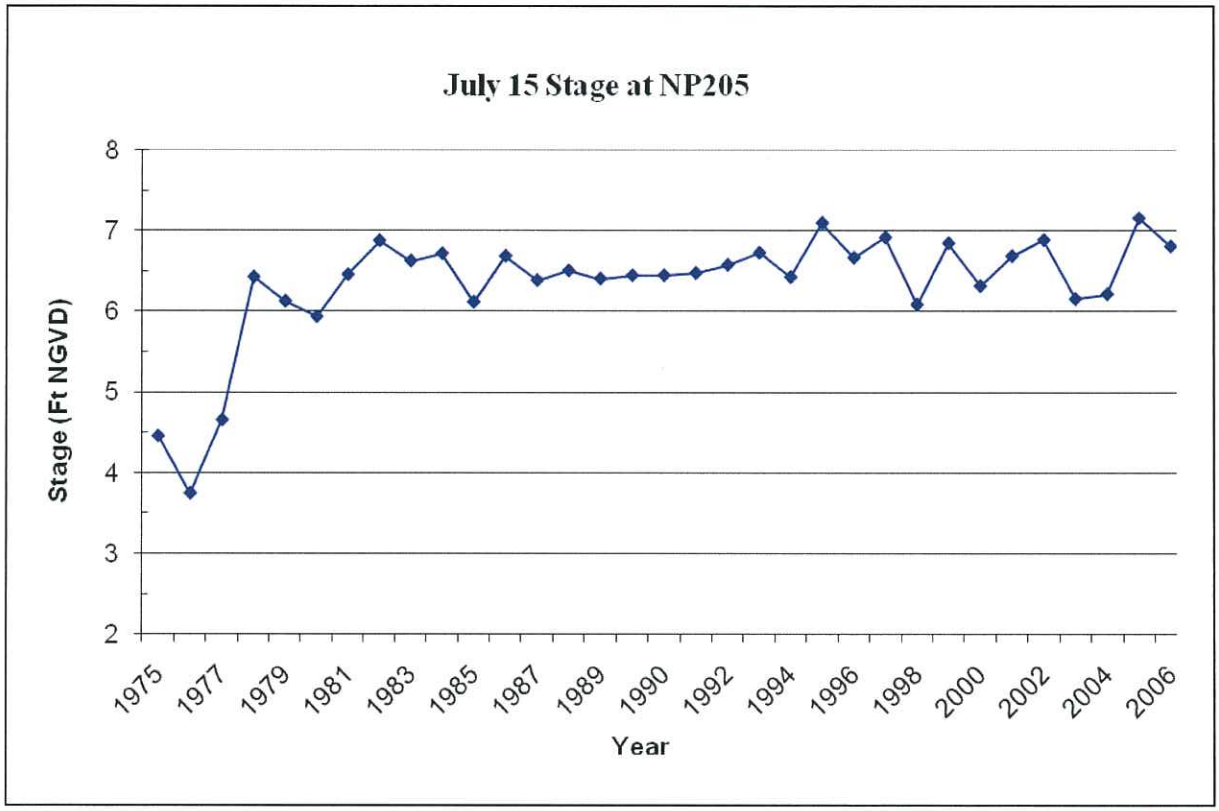


Figure 35. Daily stage on July 15 at NP205 for the years 1975 through 2006. Note that in a majority of the years stages are above 6.0-ft NGVD which represents minimal available breeding habitat for sparrows.

The level of incidental take provided for in this ITS is consistent with the protections provided in the RPA of the Service's 1999 Biological Opinion and will allow for a self-sustaining sparrow population.

Everglade Snail Kite

After a careful review of existing information, the Service has determined (1) it is impractical to quantify the number of individual snail kites that may be incidentally taken as a result of the

indirect effects of water management operations on habitat, as no direct lethal effects are anticipated; (2) it would be impractical to discern the number of individual snail kites that were incidentally taken as a result of habitat impacts from other demographic and environmental parameters that will be occurring at the same time as the action, even if it were practical to monitor each individual snail kite; and, (3) current methodologies for tracking population trends are insufficient to document the incidental taking of individual snail kites or their reproductive success from a specific action in a subset of the range of the species. The reasons for these conclusions are based on the biology and ecology of the species as described in the "Species/ Critical Habitat Description" section of this Biological Opinion, the key aspects of which are briefly outlined below.

The snail kite is a wide-ranging species which occupies expansive marsh habitat (Beissinger and Takekawa 1983; Sykes 1984; Rodgers et al. 1988; Bennets and Kitchens 1992; Rumbold and Mihalik 1994; Sykes et al. 1995) as well as a network of habitats that include smaller, widely dispersed wetlands (Bennetts and Kitchens 1997). WCA-3A contains 319,078 acres of designated critical habitat which represents 37.9 percent of the total listed critical habitat. Snail kites are periodically nomadic, likely in response to changing hydrologic conditions throughout their range (Sykes 1979; Martin et al. 2006). As a result, the range-wide distribution of snail kite nesting fluctuates among years. Therefore, a reduction in the number of snail kites in WCA-3A in 1 year would not necessarily indicate a loss of snail kites due to the action since those unaccounted for snail kites could be elsewhere in the larger system.

The range-wide population of snail kites is estimated using the super population method (Dreitz et al. 2002). These population estimates and the estimates of demographic parameters such as dispersal and mortality are generated using mark-recapture methods that rely upon detection probabilities. Detection probabilities for snail kites have ranged from 0.15 (or 15 percent of birds counted) to 0.45 from 1998 to 2005. Since snail kite population estimates are the result of modeling predictions and do not represent actual individual snail kites observed, the loss of an individual snail kite from a subset of their range from the effects of this action would not be discernable within the error margin of the estimated population. Thus, current methods designed to monitor range-wide population estimates over time are unsuitable for tracking individual snail kites. The proposed action is not expected to affect adult survival, but is anticipated to affect nest success and juvenile survival (recruitment), which may be reflected in the results of this monitoring and evaluation effort, but the ability to track recruitment (*i.e.*, all nests within the project area) from a subset of the range is not possible.

Although we are unable to quantify incidental take of individual snail kites as a result of the proposed action, hydrologic variables such as the timing and magnitude of high water and the rate of water level recession directly affect snail kite reproductive success and habitat suitability, including density and availability of apple snails, and can be measured. At present, potential water quality impacts is considered an indirect effect on snail kite habitat suitability. Overall, we have established the following measures of incidental take.

High Water Levels

High stages in WCA-3A will indirectly affect snail kites by reducing the abundance, growth, and reproduction of apple snails, the primary prey of the snail kite (Darby et al. 2005). Furthermore, high stages, if prolonged, will affect woody vegetation that kites use for nesting and perch-

hunting (Kitchens et al. 2002). It is clear that peak high water levels in southern WCA-3A (as indicated by gauge 3A-28) have increased in frequency and duration since 1992 (Figure 36). Test iterations 1-6 of the Experimental Water Deliveries to ENP were taking place during this time period which when coupled with above average rainfall (Figure 17), may have contributed to the rise in stages starting around 1992. According to gauge 3A-28, the percent of time stage exceeded 10.5-ft NGVD in southern WCA-3A prior to 1992 was approximately 7.6 percent (3 out of 39 years) with relatively short duration of 30 days or less. However, between 1992 and 2009 the frequency at which stage rose above 10.5-ft was 72.2 percent (13 of 18 years) with an average duration of 66.2 days. It is not clear to what extent water management operations affected water levels in this area, as compared to climatic events such as hurricanes, droughts, and tropical storms.

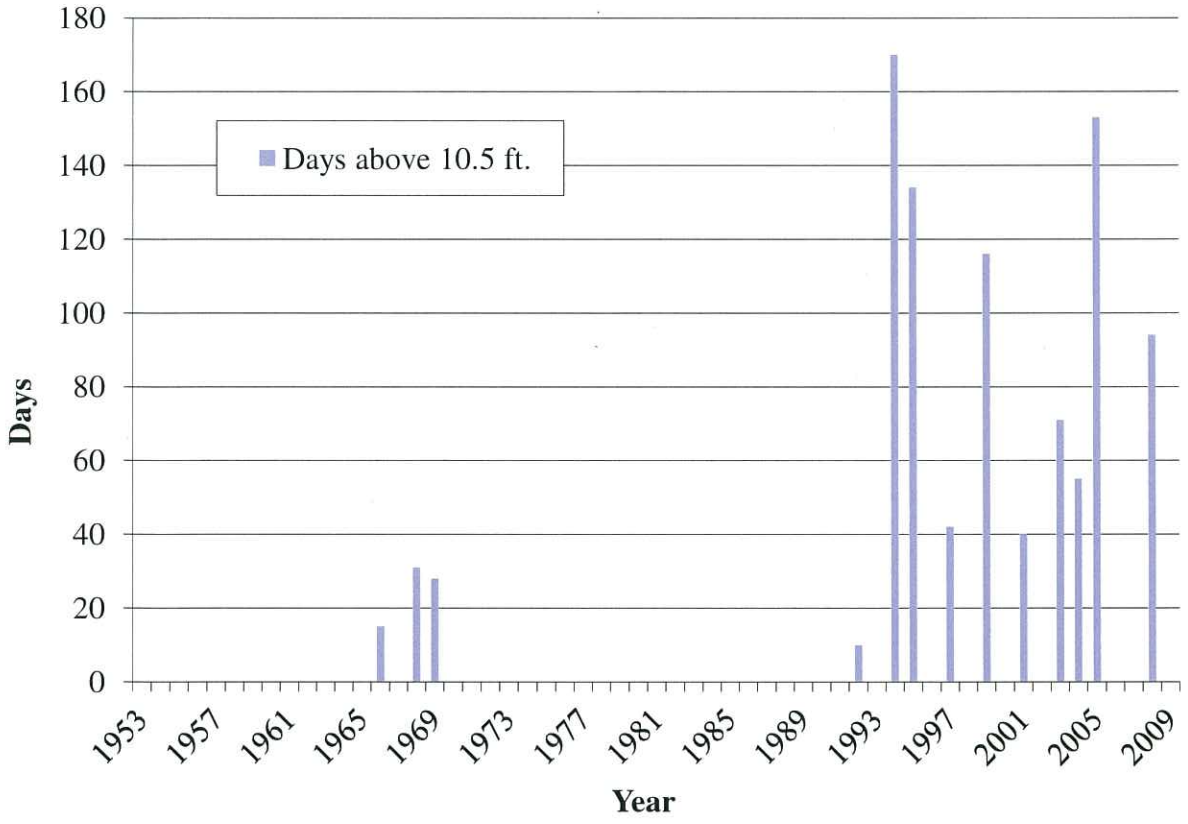


Figure 36. Frequency and duration of stages above 10.5 ft NGVD at gauge 3A-28 (also known as Site 65) located in southern WCA-3A from 1953 to 2009. Note the sustained increase in stages starting around 1992.

The effects of high water in WCA-3A were anticipated to continue under IOP until the completion of the Combined Structural and Operational Plan which includes the MWD and C-111 Projects. It was anticipated that once these projects were complete and a percentage of flow would be shifted from the west to the east (WCA-3A to WCA-3B), stages would be reduced and suitable snail kite habitat would improve in the southern portions of WCA-3A. These projects, however, are not yet fully completed. To address the potential for continued effects of prolonged high water under IOP, the Service identified a high water threshold in its

2006 amended ITS, concluding that if water levels rose above 10.5-ft NGVD at the 3AS3W1 gauge for 80 consecutive days in 3 consecutive years, incidental take would be exceeded. This exceedance criterion was based on the following information:

The 10.5-ft NGVD threshold, when exceeded for greater than 3 months, is believed to have negative impacts on snail kite nesting and foraging substrate and the vegetation mosaic most suitable for apple snail reproduction, which is the primary food source for snail kites (Kushlan 1990; Bennets et al. 1998; Mooij et al. 2002). Dr. Wiley Kitchens, in his 2006 Annual Report to the Service, states:

> Several researchers (*e.g.,* Mooij et al. in review; Kitchens et al. 2002; Darby et al. 2005) have raised their concerns about potentially adverse effects of flooding in WCA3A. In recent years water levels in WCA3A have been maintained at alarmingly high levels (in part due to recent hurricanes) for the period September to January. We suggest that water levels in WCA3A should be maintained around Zone E regulation for the period September to January (more specifically, water stages at 3AS3W1 should not go above 10.5 ft for any prolonged period of time (>3 months)) in order to mitigate negative effects of prolonged hydroperiod (or/and greater water depth) on vegetation communities and apple snail production (Kitchens et al. in prep and Darby et al. 2005) [pg 19].

To further refine this parameter, field studies on Everglades vegetation communities suggest that the habitat suitable for kites and apple snails would not change substantially after just a single year with conditions above 10.5-ft NGVD for more than 3 months. Rather, these plant species, and the Everglades ecosystem in general, have adapted to environmental fluctuations of wet and dry periods; therefore, it is more likely that it would take at least 3 consecutive years of these high water conditions to significantly alter the habitat (Nott et al. 1998, Armentano et al. 2006; Ross et al. 2006).

The Service compared the gauge Dr. Kitchen references in his report (3AS3W1) and the 3A-28 gauge which has a longer period of record and is included in the 3AVG which the Corps uses to regulate water levels in WCA-3A. A comparison of daily stage values at these gauges indicated that the water level surface across 3A in the area of these two gauges is relatively flat and that the only variable that affects water depth at a constant stage is the GSE. This comparison has been repeated to include additional gauges (W2 and Site 64) relevant to areas of kite nesting in WCA-3A (Table 14). Based on this information, a stage of 10.5 ft NGVD at the 3AS3W1 gauge would translate into water depths in excess of 2.5-ft in southwest WCA-3A, including the primary area used by nesting kites in most years since 1996 (Figure 24). In our 2006 amended ITS, the Service concluded that water depths of 2.5 ft or more, when held for ≥80 days in 3 consecutive years, would most likely result in a significant loss of snail kite foraging and nesting habitat, as well as loss of habitat suitable for apple snail reproduction. The intent of this high water threshold was to prevent extended and frequent periods of high water during the wet season, and to reduce the degree of ponding which occurs in the southern end and along the L-67A levee in eastern WCA-3A.

While this high water threshold was not violated during the years of IOP, habitat degradation has continued to occur. In addition, snail populations have been significantly impacted by relatively high water levels during the dry (breeding) season. In 2002 and 2003, Darby et al. (2005) found

high snail densities (*e.g.*, > 1.0 snail per m^2) at sampled sites in southern WCA-3A. In 2004, they documented an 80 percent reduction in snail densities at these same sites. This dramatic decline followed a wet spring during 2003, in which water depths remained above 1.3 to 2.0 ft during the peak snail reproductive season (April-June) and snail egg cluster production was both delayed and reduced (Darby et al. 2005). Relatively low snail densities (0.02 to 0.40 snails per m^2) continued at sampled sites into 2005-2007 (Darby et al. 2009). Sampling conducted at a subset of these sites in 2010 indicates that snail densities remain low (0.06 to 0.08 snails per m^2) and recovery following the 2003 high water year will be slow (Darby 2010). Because habitat structure changed very little, if at all, during the short time of this study, these results suggest that short-term periods of high water can have a negative effect on both snail egg cluster production and snail density (Darby et al. 2009). Based on these and other observations and analyses, researchers recommend dry season water depths of > 10 cm (below which snails generally stop moving and reproducing) but < 40 cm to maximize apple snail egg cluster production, which contributes to increased snail density the following year.

Recent analyses of snail kite productivity in WCA-3A have also indicated negative effects of prolonged high water levels on kite nest success and juvenile survival (Cattau et al. 2008; Service 2010d). Based on these analyses, researchers recommend that water levels should begin receding in October and November and fall to a 3AVG of between 9.8 and 10.3 ft NGVD by January. This recommendation is supported by the model results which suggest that increasing water levels during the pre-nesting season (October 1 to December 31) corresponds to decreasing kite nest success. In addition, increased amplitude (the difference in stage between pre-nesting and dry season low water levels, and thus partially driven by higher water levels in the wet season) was associated with decreased juvenile kite survival (Cattau et al. 2008). Water levels between 9.8 and 10.3 ft NGVD on January 1, coupled with a slow recession rate (0.05 ft per week, as described below), should provide favorable conditions in southwest WCA-3A for optimal snail kite nest success during the peak kite breeding season (March-June). Higher water conditions during the pre-breeding season can act as an ecological trap in which kites build nests at higher GSEs and are then left "high and dry" when water level recedes (Sykes et al. 1995; Cattau et al. 2008). Under such conditions, nesting adult kites and juveniles fledged from these nests may suffer from reduced foraging opportunities, especially when low water levels cause snails to stop moving and become unavailable to foraging kites, resulting in both decreased nest success and lower juvenile survival rates.

These water level recommendations for the apple snail and snail kite have been incorporated into the Service's MSTS (Appendix D). The Service initiated development of the MSTS in April 2008 in response to declining snail kite productivity in WCA-3A. The MSTS uses the best available science to focus on improving hydrologic conditions in WCA-3A by identifying ranges of suitable water levels or depths during the wet season, dry season, and in between (January, "pre-breeding"), and recommended rates of changes between high and low water levels between these time periods. While the MSTS does not discuss incidental take, the recommendations and the supporting science do suggest water levels above which adverse impacts are likely to occur. The information presented above and in the MSTS represents both new science and a synthesis of longer-term data sets. For instance, although apple snail sampling prior to 2006 indicated decreased snail productivity and densities in WCA-3A in 2003 and 2004, respectively, it was not known at that time that the effects would be as long-lasting, nor that kite nesting (numbers of active nests and nest success) in WCA-3A would decrease so dramatically. Based on our comprehensive review of the best available science, the Service has determined that two high

water criteria should be included in the ITS for ERTP-1, and the period when the IOP remains in place: (1) prolonged high water during the wet season; and (2) high water during the dry (breeding) season. These two criteria are discussed below:

Prolonged High Stages

The current draft of the MSTS (July 1, 2010) contains recommendations for pre-breeding water levels and the timing of recessions, but it does not contain a recommendation specific to snail kite nesting or foraging habitat to address a high water threshold during the wet season. However, this aspect of the MSTS is still under investigation, and the MSTS will be revised if such a threshold is identified. Despite this, to be conservative for the species, the Service will retain the previous exceedance criteria of 10.5 ft NGVD at the 3AS3W1 gauge. Because adverse impacts have continued under IOP, despite the 2006 high water threshold being met, we are also reconsidering the specified duration and frequency (*i.e.*, 80 days in 3 consecutive years).

In our consideration, the Service reviewed stage data for gauge 3AS3W1 for its period of record (2000 to present) and for gauge 3A-28 from 1992 to present (Table 14). Our review indicates that the average difference in stage between these two gauges was approximately 0.13 ft, based on daily stage data from 2000 to present. Pre-2000 water levels at the location of 3AS3W1 can be generally inferred by looking at 3A-28 stages (*i.e.*, if the stage at 3A-28 was > 10.4 ft, than it is highly probable that the location of gauge 3AS3W1 would have been >10.5 ft). Based on our review, water levels at 3AS3W1 exceeded 10.5 ft during 14 of the last 18 years. During these 14 years, water levels > 10.5 ft for 80 days or more occurred during 6 years – 1994, 1995, 1999, 2003, 2005, and 2008 (Table 14), only two of which were consecutive (1994 and 1995). Additionally, water levels exceeding 10.5 ft for somewhat shorter durations (> 60 but < 80 days) occurred in 2004, resulting in a 3-year period of relatively high, extended wet season water levels in southwest WCA-3A (2003-2005; Table 15). During these years, Darby et al. (2005) documented the dramatic decline in snail densities at sample sites in WCA-3A as discussed above. These high water levels likely resulted in immediate adverse impacts to apple snail reproduction in 2003 and, potentially, long-term adverse impacts to wet prairie habitat from 2003 to 2005. Such long-term impacts to habitat may, in part, explain the continued low densities of snails found by Darby et al. from 2005 to 2007 despite apparently suitable dry season water depths in central and southern WCA-3A during those years. This could also explain the slower than expected recovery of snails in WCA-3A. Wet prairie habitat not only serves as prime habitat for snail reproduction, but also as prime foraging habitat for kites due to higher snail densities and availability in wet prairie (as compared to open water sloughs, or dense sawgrass or emergent communities) (Darby 2008). In addition to observed changes in snail productivity and densities, data also indicate a decrease in snail kite nest success after 2004, from an average of 37 percent nest success during 1996 to 2004 to an average of 10 percent during 2006 to 2009 (note there was no kite nesting in WCA-3A during 2001, 2005, or 2008) (Table 3). This drop in nest success could reflect negative impacts to the kite's foraging opportunities – due to decreased snail density, availability, or a combination of both – or to nesting habitat, or both.

While it is commonly observed that wet prairie habitat requires periodic dry downs during the spring for plant regeneration, it has also been documented that Everglades wet prairies occur in areas with typically lower wet season water depths (relative to sloughs). Based on management observations, Dineen (1974) recommended a "wet prairie" regulation schedule for WCA-2A that included a wet season high water level of 12.5 ft; using the average GSE in WCA-2A (10.5 ft

NGVD), this equates to a wet season water depth of approximately 2.0 ft. No duration was recommended, but the regulation schedule reflects a high water peak occurring at the end of October and immediately receding. Goodrick (1974) reported on wet season water depths during 1963-1972 at both a wet prairie site (near gauge Site-62, north of Alligator Alley) and a slough site (near gauge 3A-28) in WCA-3A. He found that October water depths in the wet prairie site never exceeded 2.3 ft, compared to slough water depths which exceeded 2.5 ft approximately 40 percent of the time. These observations suggest that water depths > 2.5 ft are more conducive to slough vegetation (*Nymphaea* and submerged species), and that such wet season water levels have the potential to contribute to the conversion of wet prairies to slough. Maintaining water levels at such depths for prolonged periods of time would serve to increase the potential for this to occur. In addition, increasing the frequency of this occurrence in consecutive years could also increase the likelihood of wet prairie degradation and conversion. Recent research indicates that shifts from one vegetation type to another may occur in a relatively short time frame (1 to 4 years) following hydrological alteration (Armentano et al. 2006; Zweig 2008; Zweig and Kitchens 2008; Sah et al. 2008).

Based on the actual hydrologic data during 2003 to 2005 and the information discussed above, the Service concludes that if water levels rise above 10.5 ft NGVD at the 3AS3W1 gauge for 60 consecutive days in 2 consecutive years as a result of ERTP operations, or during the period when the IOP remains in place, incidental take will be exceeded. In addition, if water levels rise above 10.5 ft NGVD at the 3AS3W1 gauge for 60 consecutive days in any single year, the Corps will conduct a restrospective review to determine the potential cause(s) of the high water and will share this information with the Service. Such information will help determine if the high water was due to ERTP operations, climatic conditions, or possibly a combination of both. Analyses of this type are also important to implementing the adaptive management strategy which is an integral part of ERTP.

Duration of wet season high water levels may also be correlated to snail kite and apple snail reproductive success in that it affects the likelihood of meeting the recommended January 1 water levels which are described in the MSTS and incorporated into ERTP PM-B and C as discussed above. Our review of stage data for gauge 3AS3W1 indicates that, during years when the wet season stage exceeds 10.5 ft and remains above this threshold past late November, January 1 water levels as measured by the 3AVG are higher than those recommended for snail kites and apples snails. Since 2000, the average day that water levels at 3AS3W1 first exceed 10.5 ft is September 16, with a range of August 25 to September 30. Thus, applying the 60-day high water maximum duration should allow 3AS3W1 stage to fall below the high water threshold by late November, thereby resulting in improved (lower) water levels on January 1 and acceptable hydrologic conditions for nesting kites and their prey.

High Water in the Dry Season

As discussed above, recent research has revealed the adverse effects of high water during the dry, or breeding, season on apple snail reproduction and growth, and the subsequent effects these factors can have on nesting kites and their young. Unlike the effects of high water (> 10.5 ft) during the wet season (indirect effects through habitat degradation), relatively high water during the dry season acts to directly reduce snail egg cluster production (overall and per-capita) and juvenile snail growth. As was observed in 2003 and 2004, high water during the dry season can reduce or prevent apple snail egg cluster production, resulting in a subsequent-year decrease in

apple snail abundance and density. Due to their short life-span (1-1.5 years), apple snails have only a single breeding season to reproduce. Depending on the amount of lost productivity and the initial population size, a single year of high water during the dry season can result in long-term impacts to apple snail populations in a given area. Thus, repeated occurrences of high water levels during the dry season can result in decreased numbers of snail kite nest initiations, nest success, and juvenile survival in an area, as has been observed in WCA-3A in recent years. Based on this information, the Service determines that incidental take will occur when water depths during the months of peak apple snail reproduction (April, May, and June) remain above approximately 40 cm.

These recommended water depths were also incorporated into the Service's MSTS, which identified an "apple snail window" of 15-40 cm from May 1-31. Because it takes into account the needs of multiple species which utilize the entirety of WCA-3A, the MSTS uses the 3AVG for applying recommended water levels. Due to the variability in GSE which occurs throughout WCA-3A, translating a given 3AVG stage to water depth at a specific location or set of locations is not straight-forward. For this reason the Service has determined it is more appropriate to apply these water level criteria to the area most frequently used by kites and where adverse impacts to snail populations should be avoided or minimized. Based on the areas where kites have nested most frequently, this would be in southwest WCA-3A and to a lesser degree central WCA-3A (Figure 24). For this reason, and to be consistent with the incidental take criteria for wet season high water, above, the Service has concluded that gauge 3AS3W1 is appropriate for evaluations of dry season water depths in WCA-3A.

To determine the criteria for exceedance of incidental take, we reviewed water depths at gauges in WCA-3A from 1992 to the present, focusing on water levels during the dry season and specifically the year 2003. Suitable water levels, identified as water depths > 10 cm but $\leq$ 40 cm are most important to attain from April to June, so our review focused on this time period. Water depths at four gauges (3AS3W1, W2, 3A-28, and Site 64) and the 3AVG were calculated using daily mean stage and GSE data from the EDEN. We calculated GSEs using the averages of measurements taken in wet prairie habitat (for gauge W2) or the average of measurements taken in the both slough and ridge/sawgrass/emergent marsh (*i.e.*, an average of the averages) to represent the transition zone where wet prairie typically occurs. We examined average monthly maximum and minimum water depths to identify potential thresholds related to when target water levels (*i.e.*, > 10 cm but $\leq$ 40 cm) were achieved, compared average water depths across WCA-3A gauges, and then related our findings to stage at 3AS3W1.

Using these methods, and considering the known effect of high water levels on apple snail productivity in WCA-3A during 2003, we concluded that adverse impacts to apple snail productivity in southern WCA-3A (*i.e.*, near gauge 3A-28) is likely to occur when water levels in the transition zone do not go below 40 cm prior to mid-April. This is what happened in 2003, when water depths at 3A-28 stayed above 40 cm until late April and then hovered near this water level until the rainy season began in mid-June. Our comparison of average water depths between gauges indicates that this water depth translates to transition zone (wet prairie) water depths of approximately 25 cm at gauge 3AS3W1; the 3AS3W1 stage at this water depth is approximately 9.2 ft NGVD. Our comparison also indicates that differences in stages, and thus calculated water depths, between these gauges is not a one-to-one relationship, most likely due to a combination of the effects of microtopography, water flow dynamics, and ponding effects due to impoundment. For instance, a 10 cm increase in average water depth at 3A-28, from 40 to

50 cm, translates to an increase of only 7 cm (from 25 to 32 cm) average water depth at 3AS3W1 (3AS3W1 stage = 9.4 ft NGVD). Thus, increases in stage or water depth at gauge 3AS3W1 will result in increases of higher magnitudes at gauge 3A-28, and this relationship also appears to hold true for gauge W2, around which a large proportion of kite nesting in WCA-3A occurs (Figure 24). As discussed above, the Service has determined it is important to apply the high water criteria to those areas in WCA-3A which are most frequently used by kites and where adverse impacts to snail populations should be avoided or minimized. Based on this information, the Service concludes that incidental take will be exceeded when maximum water levels exceed 9.2 ft NGVD at 3AS3W1 on or after April 15 in two consecutive years as a result of ERTP operations, or during the period when the IOP remains in place. If water levels exceed this threshold in any single year, the Corps will conduct a restrospective review to determine the potential cause(s) of the high water, and will coordinate with the Service to apply adaptive management in an attempt to avoid high water conditions during future dry seasons.

Rapid Recession Rates and Amplitude

Rapid recession rates during the breeding season can result in decreased nest success (through increased predation or decreased forage availability) and decreased juvenile survival (due to decreased forage availability). The primary ecological driver for this is related to higher water conditions during the pre-breeding season (*e.g.,* early January) which encourage kites to build nests at higher GSEs. Under rapid recession rates, these locations are then left "high and dry" when water level recedes, reducing the availability of apple snails for nesting adult kites and juveniles fledged from these nests. Nest success analyses performed by Cattau et al. (2008) suggest that increasing recession rate (difference between stage on January 1 and the dry season minimum stage, divided by the number of days between these) had a significant negative effect on snail kite nest success. Based on the regression analysis, a recession rate of 0.05 ft per week was associated with a nest success slightly above 50 percent, with faster recession rates associated with lower nest success. A recession rate recommendation of 0.05 ft per week from January 1 to May 31 (or the onset of the wet season, defined here as a sustained increase in water levels associated with increased rainfall frequency) was included in the MSTS in an effort to maximize kite nest success and promote apple snail egg cluster production, which benefits from slowly receding water levels. This rate equates to a stage difference (*i.e.,* amplitude) of approximately 1.0 ft between January and the dry season low. These recommendations were incorporated into ERTP-1 PM-D as discussed above.

The Service anticipates that take in the form of injury or death of snail kite nestlings and eggs due to abandonment and death of juvenile snail kites may result from rapid dry-season recession rates and subsequent large amplitudes during the nesting season. It is difficult to estimate the number of eggs, nestlings, and juveniles that will be impacted for the reasons described earlier in this section. Rapid dry-season recession rates and large amplitudes have occurred under IOP and are expected to continue under ERTP-1, thus increasing the risk of nest failure through increased predation or decreased foraging opportunities in areas where snail kites initiated nesting under high water levels. The Service's 2006 amended ITS concluded that incidental take in the form of harm would occur when water levels within southern WCA-3A (as measured at gauge 3A-28) receded by more than 1.0 ft during the period from February 1 to May 1 each year, and that the level of incidental take anticipated would be exceeded if stages in WCA-3A recede by more than 1.7 ft from February 1 through May 1 in any year. The best available science indicates that a smaller amplitude is more appropriate, and that this amplitude be evaluated beginning January 1

and extending through the dry season (typically considered to end May 31). The Service has determined that incidental take will occur when recession rates are faster than 0.05 ft per week from January 1 to May 31, and when amplitude exceeds 1.0 ft during this time.

To determine incidental take exceedance criteria, we considered the estimated effect on nest success as suggested by the results of Cattau et al. (2008). Increasing the recession rate from 0.05 to 0.08 ft per week decreases nest success by approximately 10 percent (to just under 45 percent). Due to the recent large declines in the snail kite population as discussed in the Status of the Species section, it is our determination that this decrease represents a maximum allowable amount of impact to snail kite nest success in WCA-3A. The overall effect of decreased nest success in WCA-3A will differ by the number of kites nesting there in a given year, but a 10 percent decrease in a single year should not result in significant adverse impacts to the snail kite population. In addition, this recession rate threshold is lower than the threshold identified in the 2006 IOP amended ITS which translated to be an average weekly recession of 0.13 ft per week.

When this weekly recession rate threshold is applied as an average throughout the dry season (January 1 to May 31), it equates to a breeding season amplitude threshold of approximately 1.7 ft (0.08 ft per week for 21.4 weeks), or 0.34 ft per 30 days. Because recession rate, and thus amplitude, can vary from gauge to gauge within WCA-3A, it is important to consider where this criteria is measured to ensure that effects to nesting kites are correctly captured and evaluated. As shown in Figure 24, nesting locations within WCA-3A vary from year to year, most likely in response to water levels present at the time of nest initiation. Thus, the Service has determined that the amplitude threshold is best evaluated using a "floating gauge" approach in which recession amplitude will be measured at the gauge(s) closest to where kites are nesting in a given year. The gauge(s) will be identified by the Service at the beginning of each nesting season based on observations of snail kite breeding behavior and nesting locations, as reported by the Everglade snail kite survey crew. Limited survey reports are generally available by mid-January; in most years, general kite nesting locations are fairly well-known by March. We anticipate that, during years with typical weather, the gauge identified at this time would be applicable for the rest of the dry season. During atypical years (*e.g.*, those with extreme low temperatures or unseasonable rainfall during late winter and early spring), nesting locations may change throughout the nesting season, usually as a result of renesting which occurs later in the season (sometimes after early-season nest failures) and under different hydrologic or foraging conditions than what existed in January or February. In these instances, a different or additional gauge may be identified for assessing amplitude. Based on historic kite nesting locations, the list of potential (and most probable) gauges includes 3AS3W1, W2, 3A-28 (Site-65), and Site-64. In summary, the Service concludes that incidental take will be exceeded if stages in WCA-3A, as measured by the gauge(s) closest to active kite nesting (assessed by the Service as described above), recede by (1) more than 1.7 ft from January 1 through May 31 or the onset of the wet season, whichever is sooner, or (2) more than 0.34 ft within any 30-day period, in 2 consecutive years as a result of ERTP operations, or the period when the IOP remains in place. In addition, if either of these amplitude thresholds are exceeded in any single year, the Corps will conduct a retrospective review to determine the potential cause(s) of the rapid recession and how future operations can avoid exceeding these thresholds.

Snail kite exceedance criteria during the interim period with the IOP in place, and the implementation of ERTP-1 are summarized in Table 18.

Table 18. Summary of ERTP and the interim IOP period, ITS and exceedance criteria for the Everglade snail kite.

RECESSION
Dry Season Amplitude Timing: January 1 – May 31 (or onset of wet season, whichever is sooner) Trigger: stage difference > 1.7 ft as measured at gauge(s) closest to kite nesting, as determined by the Service Frequency: 2 consecutive years* **Monthly Amplitude** Timing: moving 30-day window within the dry season Trigger: stage difference > 0.34 ft as measured at gauge(s) closest to kite nesting, as determined by the Service Frequency: 2 consecutive years*
DRY SEASON HIGH WATER
Timing: by April 15 Trigger Value: stage > 9.2 ft NGVD at gauge 3AS3W1 Frequency: 2 consecutive years*
WET SEASON HIGH WATER
Timing: June 1 – December 31 Trigger: stage > 10.5 ft at gauge 3AS3W1 for 60 days Frequency: 2 consecutive years*

* For all exceedance criteria, if the trigger is reached in any single year the Corps is to conduct a review of water management operations that may have contributed to the hydrologic condition(s) of concern and provide this report to the Service.

Wood Stork

The 2006 ITS contained an estimated number of wood storks that would be incidentally taken. This estimate was included to provide a relative scope of anticipated impacts, although it was acknowledged that "it is difficult to estimate incidental take." Given the inability to quantify the number of individuals to be incidentally taken (see below), we provide the following revised ITS without reference to an estimated number of wood storks to be incidentally taken as a result of the action and, therefore, provide a hydrologic parameter that is readily measurable as a means to establish a reinitiation "trigger."

Although wood storks nest colonially and often in the same site for many years, the ability to count individual wood storks and their young and attribute any changes from year-to-year as an effect of the action is complicated by many factors. First, wood stork colonies are censused as estimates and do not reflect actual counts, not all wood storks return to the same colony every year even if the colonial site is used again (Kushlan and Frohring 1986), nesting sites may be abandoned if water levels recede too far (Rodgers et al. 1996) or there is disturbance to the site and the colony or individual birds may re-nest elsewhere (Ogden 1991, Borkhataria et al. 2004; Crozier and Cook 2004). In addition, new wood stork colonies are often discovered which may

represent a shift from historic colonies due to environmental conditions or establishment of a new colony (Meyer and Frederick 2004).

The annual hydrologic pattern in south Florida is annually consistent, with water levels rising during the wet season (June to November), then receding gradually during the dry season (December to May). Wood storks nest during the dry season and rely on the drying wetlands to concentrate prey items for optimal foraging. Once the wetland has dried to where water levels are near the ground surface, the area is no longer suitable for wood stork foraging and will not be suitable again until water levels rise and the area is repopulated with fish. Wood storks prefer calm water, approximately 2 to 16 inches deep and free of dense vegetation for foraging (Coulter and Bryan 1993). More recently, Beerens and Cook (2010) defined a foraging depth range of -0.31 to 1.34 ft (-9.33 to 41.26 cm) for wood storks feeding in WCA-3A.

As such, there is a general progression in the suitability of wetlands for wood stork foraging based on their hydroperiods and the distance of the wetlands from the nest. Short hydroperiod wetlands are used early in the nesting season, the mid-range hydroperiod sites are used during the middle of the nesting season, and the longest hydroperiod areas (typically slough habitat) are used later in the nesting season. Adult wood storks feed farthest from the nesting site prior to laying eggs, forage in wetlands closer to the colony site during incubation and early stages of raising the young, and then farther away again, when the young are able to fly.

ERTP-, and the imterim period when the IOP remains in place, may affect hydrologic conditions within areas occupied by wood storks, although it will be difficult to distinguish these effects from other environmental factors, such as drought and heavy rains. ERTP-1, and the interim IOP period may influence wetland hydroperiods causing changes in foraging suitability for wood storks. If ERTP-1 and the interim IOP period contribute to reduced depth and hydroperiod during the preceding wet season, such effects generally result in reduced densities of wood stork prey. Additionally, if increased hydroperiod and water depth occurs during the nesting season, such effects generally result in decreased productivity and abundance of prey. Therefore, the Service anticipates incidental take in the form of harm, from reductions in foraging habitat suitability, may result in injury or death of a limited number of wood storks (eggs or nestlings) each year based on slight changes to foraging habitat suitability, as predicted by hydrologic modeling, that is expected to occur under ERTP-1 or the interim IOP period operations. Examples of this could include water level manipulations of several inches in and around the colonies which could make it more difficult for wood storks to forage and provide for young as well as increase the availability of wood stork nests to predators. In some years, conditions for wood storks may actually be favorable under operations. The Service does not anticipate widespread abandonment or nest failures as a result of ERTP-1 or the interim IOP operations.

In summary, incidental take will be exceeded ERTP-1 or the interim IOP period results in a water depth greater than 16 inches (41 cm) from January 1 through May 31 over 78 percent of the surface area within the core foraging area of any active wood stork colony for 2 consecutive years. A water depth greater than 16 inches (41 cm) as measured by the 3A-4 or 3A-28 gauges during the nesting season across 847 square miles (220,400 hectares) of the core foraging area would lower the suitability of foraging habitat (Figure 4) to the point where wood storks ability to forage would be severely impaired and most likely result in widespread abandonment of nests and fledglings within the affected colony (Gawlik et al. 2004, J.M. Beerens, FAU, personal communication 2010).

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of incidental take is not likely to result in jeopardy to the CSSS, Everglade snail kite, or wood stork, or destruction or adverse modification of critical habitat for the CSSS and Everglade snail kite either during the interim period from IOP to ERTP-1, or during the implementation of ERTP-1 or during the interim when the IOP remains in place.

Effective the date this Biological Opinion is signed, the incidental take protections for the Everglade snail kite, CSSS, and wood stork as described in this Biological Opinion are authorized through January 1, 2016.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize impacts of incidental take of CSSSs, Everglade snail kites, and wood storks.

1. Use operational flexibility during the continuation phase of the IOP and during the implementation of the ERTP-1 to minimize impacts related to hydrology. During periods when water regulations are not restricted by constraints, the Corps will work with the Service and other partners to identify operations that minimize detrimental impacts or reduce the future risk of detrimental impacts to the CSSS, Everglade snail kite, wood stork or their habitats.

2. Obtain further information about the effects of ERTP-1 and develop appropriate measures to further minimize impacts to CSSSs, Everglade snail kites, and wood storks.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the Corps must comply with the following terms and conditions, which implement the reasonable and prudent measures, described above and outline required reporting/monitoring requirements. These terms and conditions are nondiscretionary.

1. The Corps will initiate the planning process to begin field testing and relaxing or removing the existing G-3273 gauge constraint of 6.8 ft NGVD which governs wet season utilization of S-333.

2. If fire occurs within CSSS subpopulation A habitat, the Corps will coordinate with the Service and seek a deviation from the WCA-3A regulation schedule to ameliorate impacts to CSSS habitat, as necessary.

3. The Corps will conduct Periodic Scientist Calls, as outlined in the Description of the Proposed Action section of this Biological Opinion, to coordinate and discuss operations that will minimize impacts to federally listed species and their habitats as well as other species and habitats (*i.e.,* state listed species and tree islands) of concern. As part of the newly established Periodic Scientist Call process, the Corps will investigate and discuss when

appropriate whether current constraints can be adjusted, such as the G-3273 gauge constraint governing S-333 operations, to allow further minimization of impacts to sparrows, snail kites, wood storks and their habitats, within WCA-3A and ENP respectively. The Corps will produce an annual assessment of the input received (the process), actions taken and the hydrologic effects of those actions (the outcomes) in partnership with participating agencies and scientists.

4. Obtain further information about the effects of the continuation of the IOP and the implementation of the ERTP-1 and develop appropriate measures to further minimize impacts. In order to assure the effects of these actions do not exceed the level of impacts anticipated in this Biological Opinion, obtain information on:

   a. The annual status of CSSSs and Everglade snail kites populations in the action area;
   b. Determine annually the number of Everglade snail kites and wood storks initiating nesting in the action area and the success rate of those nesting efforts each year;
   c. Impacts of hydrologic changes caused by the action on the CSSS, Everglade snail kite, and wood storks and their habitat;
   d. The effects of operational changes at specific structures related to these actions and their operations (Table 1) on hydrology in the habitats occupied by the CSSS, Everglade snail kite, and wood stork; and
   e. Any vegetative shifts that may occur due to the action within southern WCA 3A and downstream of S-12D where kites may be foraging or nesting.

Upon locating a dead, injured, or sick specimen of any threatened or endangered species, initial notification must be made to the nearest Service Law Enforcement Office (U.S. Fish and Wildlife Service; 9549 Koger Boulevard, Suite 111; St. Petersburg, Florida 33702; 727-570-5398). Secondary notification should be made to the Florida Fish and Wildlife Conservation Commission; South Region, 3900 Drane Field Road, Lakeland, Florida, 33811-1299; 1-800-282-8002. Care should be taken in handling sick or injured specimens to ensure effective treatment and care or in the handling of dead specimens to preserve biological material in the best possible state for later analysis as to the cause of death. In conjunction with the care of sick or injured specimens or preservation of biological materials from a dead animal, the finder has the responsibility to carry out instructions provided by Law Enforcement to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.

The Service will not refer the incidental take of any migratory bird or bald eagle for prosecution under the Migratory Bird Treaty Act of 1918m as amended (16USC Section 703-712), or the Bald and Golden Eagle Protection Act of 1940, as amended (16 USC Section 668-668d), if such take is in compliance with the terms and conditions specified herein.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to further minimize or avoid adverse effects of a proposed action on federally listed species or critical habitat, to help implement recovery plans, or to develop information.

1. Continue to monitor the series of existing hydrological gauges and coordinate on the possible addition of new gauges (e.g., in ENP's western marl prairie, and between the NP205 gage and the S-12A structure) to measure hydrologic impacts within the ERTP-1 project area.

2. In cooperation with the Service and other parties, continue to explore ways to increase the outlet capacity of WCA-3A and WCA-3B via the S-333 and S-355 structures, as authorized and envisioned as part of the MWD and CERP projects to benefit listed species.

3. In cooperation with the Service and collaborating researchers, provide technical assistance when available to develop methods to restore marl prairie vegetation that has been impacted by high water levels.

4. In cooperation with the Service, collaborating researchers and other partners, investigate expanding the spatial scope and the species and habitats covered by the MSTS to for WCA-3B and southward to NESRS and the C-111 Basin.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the action outlined in the Corps' BA on ERTP-1. As provided in 50 CFR Section 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this Opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this Opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960

March 2, 2012

Colonel Al Pantano
District Commander
U.S. Army Corps of Engineers
701 San Marco Boulevard, Room 372
Jacksonville, Florida 32207-8175

Service Consultation Code: 41420-2011-F-0024-R001
Consultation Reinitiation Date: January 24, 2011
Project: Everglades Restoration Transition Plan, Phase 1
Counties: Broward, Miami-Dade, and Monroe

Dear Colonel Pantano:

The U.S. Fish and Wildlife Service (Service) received your verbal request on January 24, 2011, to reinitiate formal consultation on the Everglades Restoration Transition Plan, Phase 1 (hereafter referred to as ERTP-1). Since the request was received, the Service has worked extensively with the U.S. Army Corps of Engineers (Corps), Miccosukee Tribe of Indians (Tribe), and Everglades National Park (ENP) to define an S-12A operational field test that will provide the Tribe with access to their cultural areas while not adversely affecting the Cape Sable seaside sparrow (*Ammodramus maritimus mirabilis*) (CSSS). The enclosed amendment to the November 17, 2010, ERTP-1 Biological Opinion is provided in accordance with section 7 of the Endangered Species Act of 1973, as amended (87 Stat. 884; 16 U.S.C. 1531 *et seq.*). The project site is located within Water Conservation Area 3A (WCA-3A) and ENP in Broward, Miami-Dade, and Monroe Counties, Florida.

The purpose of this amendment is to: (1) include provisions for occasional water releases from WCA-3A up to 100 cubic feet per second (cfs) through the S-12A structure when the Rainfall Plan results in S-12 target flows to ENP; (2) provide clarifying details on blocking east-to-west flows underneath Shark Valley Tram Road and in the Old Tamiami Trail borrow canal; (3) provide revised text and graphs for Everglade snail kites (*Rostrhamus sociabilis plumbeus*); and (4) revise the incidental take statement for wood storks (*Mycteria americana*). The Service's original 2010 ERTP-1 Biological Opinion did not analyze the Corps' proposed action to provide "releases up to 100 cfs through S-12A (when Rainfall Plan results in S-12 target flows) for the purpose of providing the Tribe with access to cultural areas" as briefly described in the Corps' Final Environmental Impact Statement (FEIS) issued in December 2011. In addition, the 2010 ERTP-1 Biological Opinion did not analyze the hydrologic effects of plugging the Shark Valley Tram Road culverts and the old Tamiami Trail Borrow Canal between S-12B and S-12C. This amendment analyzes the proposed actions described above and also contains a

revised methodology for determining exceedence of incidental take for wood storks as well as revised graphics and text correcting minor errors regarding snail kites and the recent drought years. The Corps has determined that the operation of S-12A up to 100 cfs release will not adversely affect Cape Sable seaside sparrows in subpopulation A (CSSS-A). The Service does not concur with this determination and has submitted its own hydrologic analysis of the proposed field test of the 100 cfs release from S-12A. Aside from these modifications, all other determinations, analyses and terms and conditions for the threatened or endangered species in the project area remain the same as stated in the 2010 ERTP-1 Biological Opinion.

This amended Biological Opinion contains three sections arranged in the following order:

1. S-12A up to 100 cfs flow analysis of hydrologic effects on CSSS-A. This section follows normal Biological Opinion formatting and contains subheadings for various sections of the Biological Opinion. This section is intended to be in addition to the CSSS sections of the 2010 ERTP-1 Biological Opinion.
2. Revised graphics and brief discussion regarding snail kites. This section contains no additional information, beyond that found in the original Biological Opinion, regarding snail kites and does not change the conclusions drawn in the 2010 ERTP-1 Biological Opinion.
3. Revised incidental take threshold for the wood stork. This section slightly changes the trigger gauges and time of year when wood stork incidental take analysis is conducted. This section is meant to replace the original incidental take statement for wood storks found in the 2010 ERTP-1 Biological Opinion.

As of the date of this amended Biological Opinion, the Corps has initiated, but not completed, compliance with the National Environmental Policy Act (NEPA) related to the implementation of ERTP-1. Completion of the Corps' NEPA process by the signing of a Record of Decision is not anticipated until March 2012. Accordingly, the Service recognizes that certain aspects of both the 2010 and this amended Biological Opinion cannot be fully implemented by the Corps until its NEPA process is complete.

Consultation History

The following information is appended to the Consultation History section of the 2010 ERTP-1 Biological Opinion.

On November 17, 2010, the Service issued a non-jeopardy Biological Opinion for ERTP-1. The 2010 ERTP-1 Biological Opinion did not analyze the Corps proposed action to provide "releases up to 100 cfs through S-12A (when Rainfall Plan results in S-12 target flows) for the purpose of providing the Miccosukee Tribe of Indians (Tribe) with access to their cultural areas" (Corps 2011). The Service, Corps, Tribe and ENP have had discussions regarding the proposed action which resulted in refining the parameters for such releases to achieve the Corps goal of providing cultural access for the Tribe while not adversely affecting the Cape Sable seaside sparrow. The Service received informal comments as well as formal comments from ENP on the Service's draft amendment to the proposed action on February 14, 2011. The Service also received informal comments as well as formal comments from the Tribe on August 3, 2011. Furthermore,

the Service has been receiving comments and clarifications from the Corps since January 2011, including the latest analysis, *Draft up to 100 cfs S-12A release analysis*, received by this office on January 3, 2012.

In addition, the 2010 ERTP-1 Biological Opinion did not analyze plugging the Tram Road culverts or the old Tamiami Trail borrow canal between S-12B and S-12C since this proposed action was not included in the modeling of alternatives. According to the Corps' FEIS (pages 4-28 and 4-29), the Shark Valley Tram Road is not included within the South Florida Water Management Model (SFWMM). Currently available data is unable to provide a more robust analysis of the potential effects of inclusion of the plugs within the FEIS, since the analysis would require utilization of a higher resolution hydrologic modeling tool than the SFWMM. An appropriately-scaled hydrologic model would require data on microtopography and would require field test data to be properly calibrated. Despite the data limitations, ENP submitted its analysis on plugging the Tram Road culverts and the old Tamiami Trail borrow canal to the Service on July 18, 2011.

For a complete consultation history on ERTP-1, please refer to the 2010 Biological Opinion.

DESCRIPTION OF THE PROPOSED ACTION

This section will describe the details of the proposal to allow releases from S-12A (FEIS, page 4-69) as well as the hydrologic effects of plugging the Shark Valley Tram Road culverts and the old Tamiami Trail Borrow Canal between S-12B and S-12C. All other aspects of the proposed ERTP-1 project description remain as described in the 2010 ERTP-1 Biological Opinion.

As stated in the 2010 ERTP-1 Biological Opinion, if additional phases of ERTP are not implemented or the Combined Operations Plan (COP) is not implemented by January 1, 2016, the 2010 ERTP-1 Biological Opinion, including this amendment, will expire. Recent discussion by the action agencies indicate that the next increment of operations may take on a different form or name than COP. If so, ERTP-1 will transition into that newly defined operational plan on or before January 1, 2016. All reference to COP in this amendment as well as in the Final BO dated November 17, 2010, should be taken to mean the next increment of operations.

Proposed releases up to 100 cfs through the S-12A structure

The Corps has proposed an operational field test of water releases up to 100 cfs through the S-12A structure when the Rainfall Plan results in S-12 target flows. The purpose of the up to 100 cfs release through S-12A is to provide the Tribe occasional airboat access to cultural areas within northwestern ENP during times of low water conditions, between November 1 and July 15, when S-12A is normally closed for the protection of CSSS-A.

It is our understanding that the Tribe currently has access to undisclosed tree islands south of S-12A during a majority of the wet season via airboat and the dry season via swamp buggy. The most recent request by the Tribe concerns using up to 100 cfs releases from S-12A to maintain a narrow margin of access by airboat during the normally short transitional time between the wet

and dry seasons when there is still enough water in the airboat trails for safe navigation. It has been documented that airboats began appearing in the swamps and marshes of Florida in the 1930s. Airboats are capable of operating in high water, low water, grassy plains, mucky and muddy swamps and even on dry ground.

The stage monitoring well NP-205 is the station used to monitor meteorological, hydrological, and water management actions for CSSS-A and the western marl prairie within ENP (Figure 1). The major vegetation community of NP-205 is wet prairie with an average ground surface elevation of 6.01 feet National Geodetic Verdatum Datum of 1929 (NGVD) according to the Everglades Depth Estimation Network (EDEN). NP-205 is also located over the western extent of the Biscayne aquifer. The Biscayne aquifer is a carbonate-rock aquifer, lying very close to the ground surface, where groundwater moves with the hydraulic water gradient from areas of recharge (ridge) to areas of discharge (trough). This area is locally influenced by rainfall, water management actions, seepage from WCA-3A as well as by groundwater and rainfall from other nearby areas within the system.

Operation of the S-12A structure during the dry season (November through May) is not recommended due to ecological concerns to CSSS-A. The potential for adverse effects to CSSS-A and the seasonal closure of S-12A for the protection of the CSSS is documented in the Interim Operating Plan (IOP) Biological Opinions dated 2002 and 2006 and in the 2010 ERTP-1 Biological Opinion. However, the Corps has requested a field test of up to 100 cfs release from S-12A for a maximum of five consecutive 24-hour periods. This test will only occur during a low water period of the dry season to allow airboat access for Tribal cultural purposes.

The Corps submitted its analysis of the S-12A up to 100 cfs releases to the Service on January 3, 2012. According to their analysis, operation of the S-12A up to 100 cfs release for Tribal access to cultural areas and area rainfall will be monitored using data recorded by NP-205 and the new water level gauge installed between S-12A and NP-205. The intent of the new gauge is to provide additional hydrologic information including, but not limited to, the effectiveness of S-12A up to 100 cfs releases that provide access to cultural areas as well as to avoid adverse effects to CSSS-A. The Corps suggests if NP-205 is observed to increase or is anticipated to increase above 5.9 feet NGVD, S-12A will be closed.

Proposed culvert plugs to prevent the westward flow of water when operating the S-12C structure

Under ERTP-1, the seasonal requirements to close the S-12C structure will be removed. Removal of the S-12C seasonal closure is recommended during the transition to Everglades restoration to better achieve the ERTP-1 objective of managing water levels within WCA-3A for the protection of multiple species and their habitats while also providing additional outlet capacity to address high water concerns within WCA-3A.

The proposed action is to block flow through approximately 100 culverts underneath the Shark Valley Tram Road using inflatable air bladders or plugs year-round as well as blocking the westward flow of water in the old Tamiami Trail borrow canal (Figure 1). The effect of

plugging the Tram Road culverts as well as blocking the old Tamiami Trail borrow canal would be to prevent westward flow of water from S-12C into the western marl prairies and CSSS-A. Hydrologic conditions in the study area will be closely monitored by ENP.

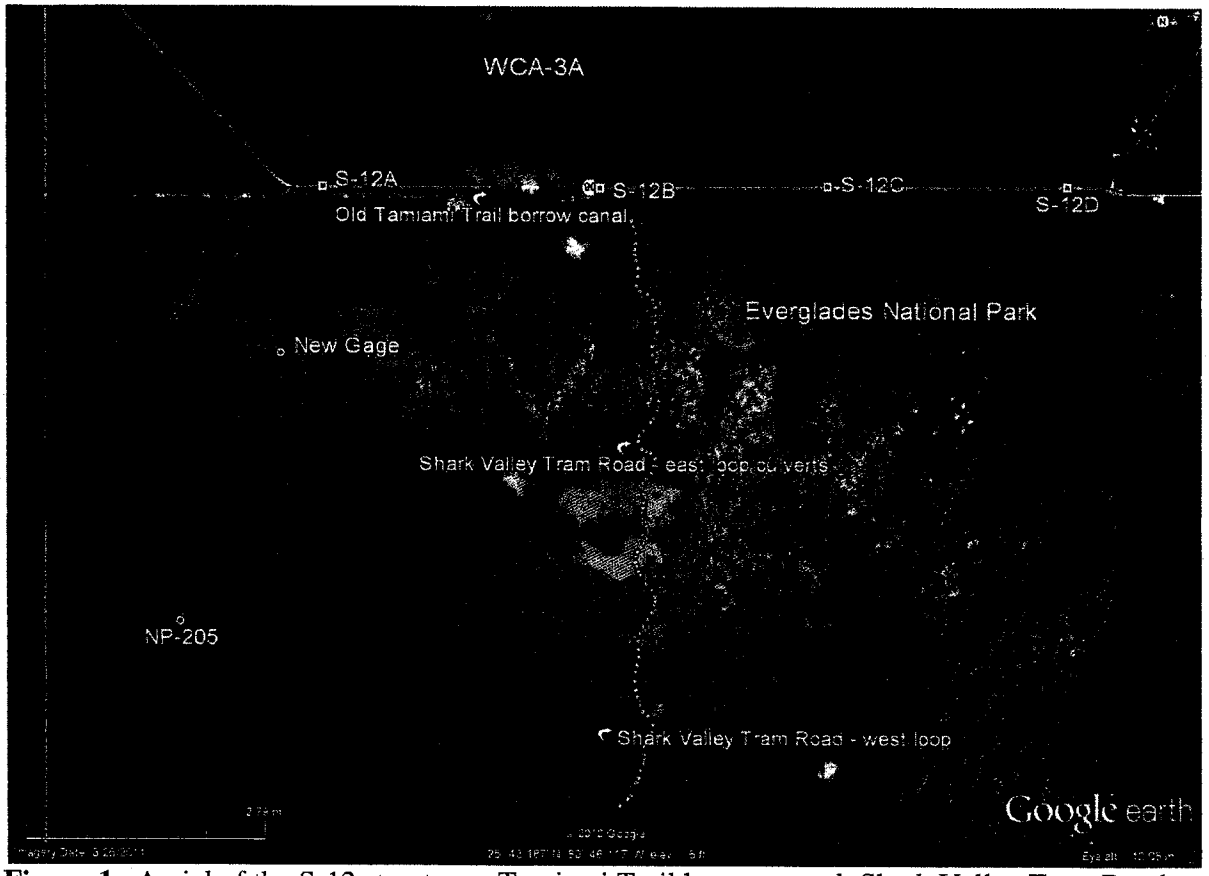


Figure 1. Aerial of the S-12 structures, Tamiami Trail borrow canal, Shark Valley Tram Road, NP-205 gauge and the new gauge installed between S-12A and NP-205.

EFFECTS OF THE ACTION

This section includes an analysis of the direct and indirect effects of the proposed action and its interrelated and interdependent activities on CSSS and its designated critical habitat, Everglade snail kite and its designated critical habitat, and wood stork.

Cape Sable seaside sparrow

The following information and analyses on CSSS-A are added to the "Effects of the Action" section in the 2010 ERTP-1 Biological Opinion.

Factors to be considered

Climate

The IOP years were used in this analysis due to the cool-to-warm phase transition of the Atlantic Multidecadal Oscillation (AMO) in the mid-1990s. The cool phase from the mid-1960s to the mid-1990s was an overall drier regime in Florida. After the mid-1990s, Florida has experienced a wetter regime with sporadic droughts due to La Nina events (see Figure 2). The IOP years were also used to illustrate operational differences between IOP and ERTP-1.

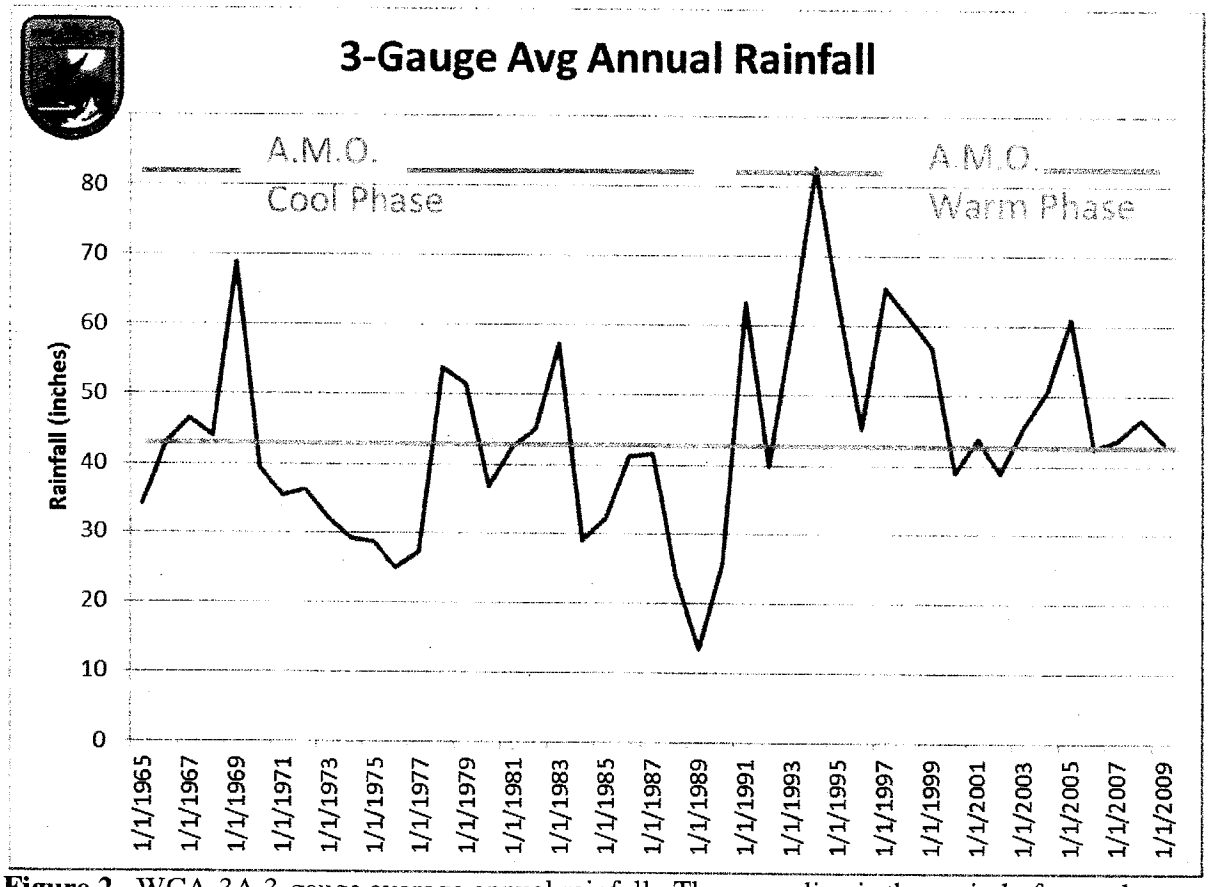


Figure 2. WCA-3A 3-gauge average annual rainfall. The green line is the period of record (1965-2009) average annual rainfall. The blue line is the individual yearly rainfall totals.

Analysis for effects of the action

The following hydrological analyses were conducted by the Service to develop the criteria necessary to avoid adverse effects to CSSS-A from the proposed action.

Direct Effects - Direct effects are those effects that are caused by implementation of the proposed actions at the time of construction. The potential effects of these proposed actions on

CSSS-A will be completely hydrologic since the only structural or physical aspects of the proposal will be (1) the installation of a water monitoring gauge which has been installed outside of the breeding season to avoid any potential disturbance to nesting CSSS-A and (2) the installation of culvert plugs underneath Shark Valley Tram Road and in the Old Tamiami Trail borrow canal prior to the nesting season for CSSS-A.

Managed water releases through the S-12A, B, C, and D structures and the S-343A and B structures have a direct effect on the hydrologic condition within CSSS-A, which is located immediately downstream from these structures. The structures have varying effects on the hydrology in CSSS-A habitat; however, the individual effects of each structure on hydrologic conditions in the area have not been well corroborated through field measurements. The S-12A structure probably has the greatest direct influence on hydrologic conditions within CSSS-A due to its location close to and immediately upstream from CSSS-A, followed by S-12B, C, and D to a lesser extent.

Proposed releases up to 100 cfs through the S-12A structure

An analysis of rainfall sensitivity of NP-205 was performed to obtain a relationship of ground water and surface water responses to 1 inch of rainfall (Table 1). Groundwater conditions respond rapidly to direct rainfall, local regional rainfall, and regional groundwater fluctuations from the surrounding area. This analysis was submitted to the Corps in May 2010.

Table 1. NP-205 stage responses at varying groundwater depths to one inch of rainfall during the IOP years of 2002-2008.

NP-205 Stage NGVD29	Stage Rise with 1 Inch Rain	Porosity of Aquifer Layer
5.2 feet to near surface	2.5 to 5 inches	20 to 40% void
4 to 5.2 feet	5 to 10 inches	10 to 20% void
up to 4 feet	10 to 17 inches	6 to 10% void

Although 1-inch rainfall events occur more frequently during the wet season, they still occur during the dry season. Rainfall effects at NP-205 are not only experienced at the gauge itself, but also from surrounding areas and upstream events. Figure 3 is a graph from the water year 2010-2011. Relatively small rainfall events occurred from mid-January to the end of January 2011 at NP-205, but heavier rains that lasted for most of the day on January 14 occurred to the north of NP-205 across northern portions of ENP to Tamiami Trail. A sharp increase in water levels was noted that lasted for a couple of weeks.

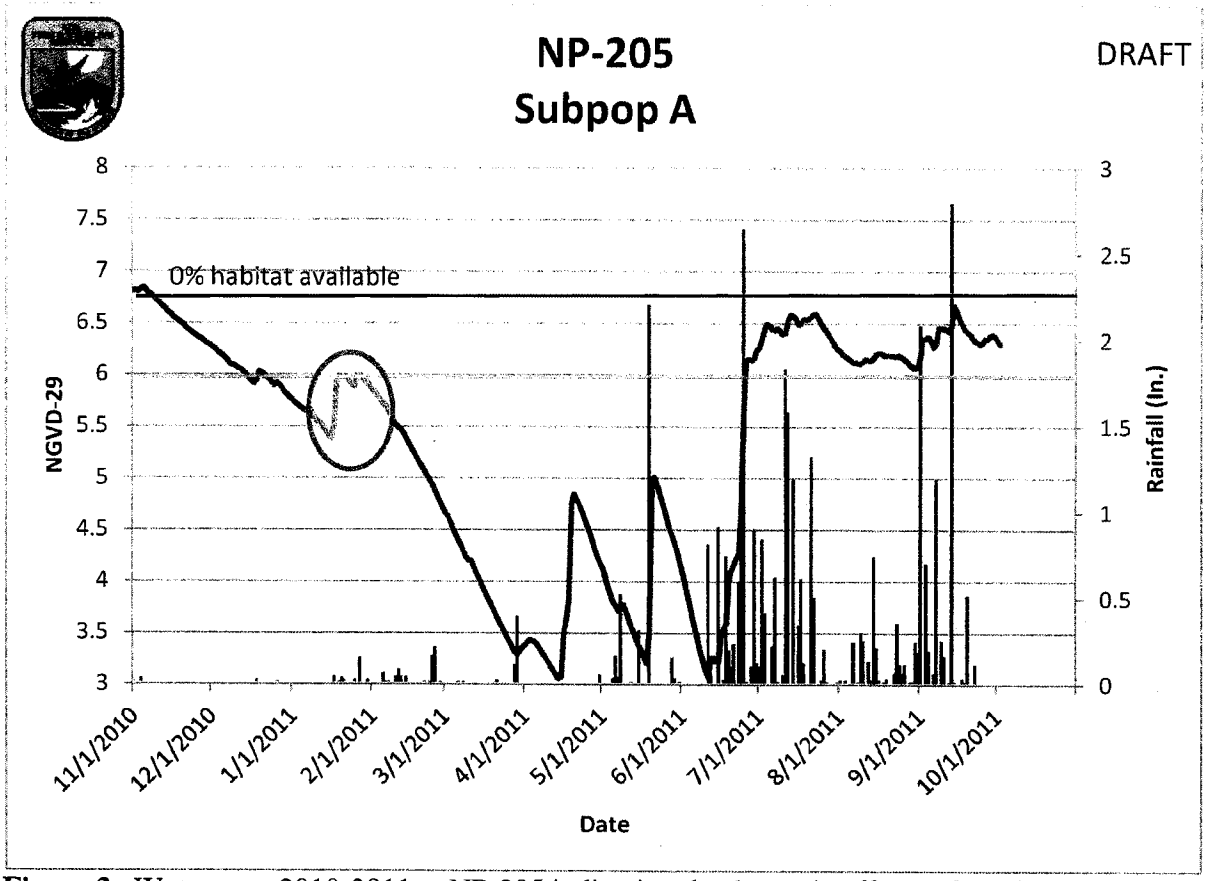


Figure 3. Water year 2010-2011 at NP-205 indicating the dramatic effects of rainfall from around the area on groundwater level increases. Water stage levels are indicated by the blue line. Daily rainfall amounts are the green bars. The horizontal orange line near 6 feet NGVD is the average ground surface elevation. The red line is the water depth where no habitat remains for the sparrow above that depth.

Other analyses of NP-205, including recession rates and the effects of opening and closing S-12A on the gauge itself, were also provided by the Service to the Corps in May 2010. These analyses have demonstrated that water releases from S-12A have an effect on NP-205 and tend to have a 4 to 7-day resident (lag) time from gate operation changes to water depth effects at NP-205 (see Figure 4).

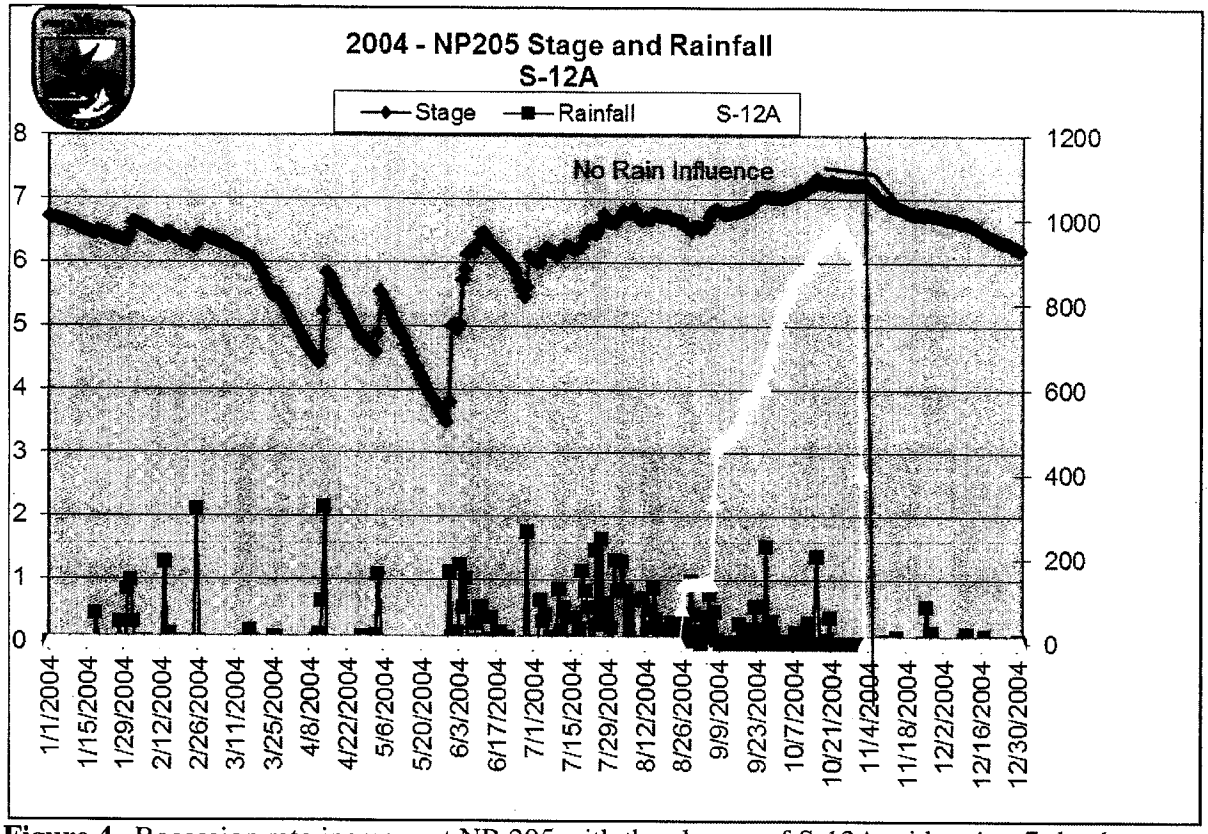


Figure 4. Recession rate increase at NP-205 with the closure of S-12A with a 4 to 7-day lag time. There were no rainfall influences at the gauge and S-12B remained open until early December 2004.

In order to provide a reasonable review of historic interactions between a S-12A release and the downstream effect at NP205, certain antecedent environmental conditions must be present. These conditions are:

- dry season time period (November-May);
- the water year is not an extreme year (a statistical outlier);
- NP-205 is in a groundwater condition; and
- no rainfall influence in the area for at least the previous 5 days.

In reviewing data from the Corps' *Draft up to 100 cfs S-12A release analysis*, the current year back to the 1970s, there was one instance during the spring of 1980 when the conditions above were met. While water management actions, timing, water year, and groundwater conditions at NP-205 were appropriately related, the S-12A opening on Day 1 was 138 cfs. However, releases increased to 385 cfs on Day 2 and remained near 400 cfs for 23 days. Thus, it is understood that this analysis includes releases equal to four times the amount of the proposed up to 100 cfs.

Also, a significant rain event occurred at NP-FMB on March 2, 1980, with 1.58 inches of rain. Whether this rain occurred directly on NP-205 is unknown. Rapid stage increases at NP-205 could have occurred from water management actions in combination with groundwater effects

from upstream or direct rainfall. NP-205 was at 5.9 feet NGVD when releases began and the water level at NP-205 rose above ground level quickly. Figure 5 illustrates this ascension influenced by S-12A releases, local rainfall, and area groundwater fluctuations to water levels at NP-205 and the western marl prairie.

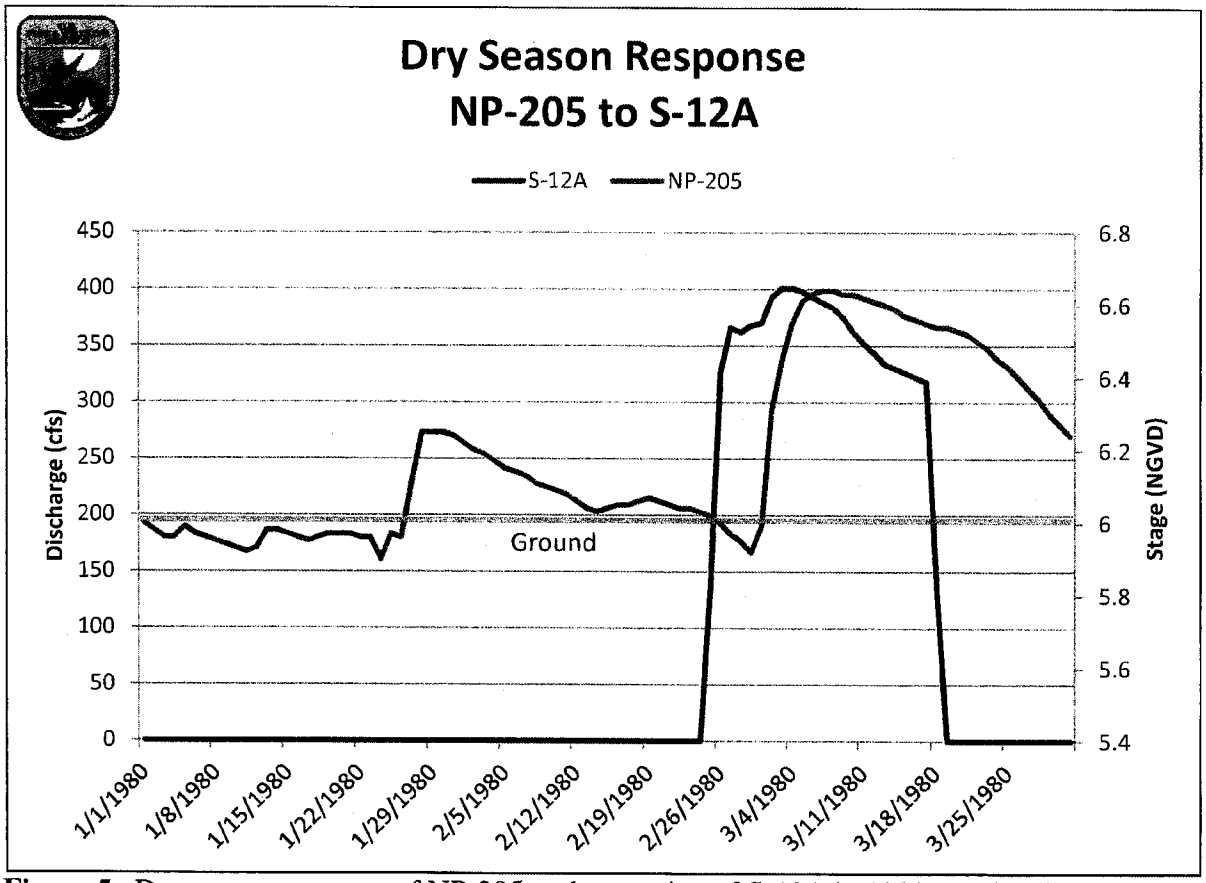


Figure 5. Dry season response of NP-205 to the opening of S-12A in 1980. A significant rain event occurred at NP-FMB on March 2, 1980, with 1.58 inches.

The 1-inch rainfall sensitivity analysis of NP-205 indicates 5.2 feet NGVD is the stage level at which S-12A should open and testing begin (Table 1). Should the stage rise to 5.7 feet NGVD during the 5-day test, the S-12 A should be closed immediately. Figure 6 below illustrates that groundwater levels reach or fall below 5.2 feet NGVD during 15 out of the last 16 years. Thus, the frequency of experiencing an elevation of 5.2 feet NGVD or below during the dry season will not hinder the ability to perform the S-12A release test.

In summary, the Service concludes that the analyses above are sufficient to preclude adverse effects on nesting and habitat suitability within CSSS-A. An operational test ranging from 5.2 to 5.7 feet NGVD will be protective of CSSS-A while providing an opportunity to conduct the test. This test range and operational guidance are delineated in the Terms and Conditions section of this amendment. Should monitoring demonstrate our assumptions or analyses are false, releases

will need to cease until a review of the operational guidance is conducted and adjusted to preclude adverse effects to CSSS-A.

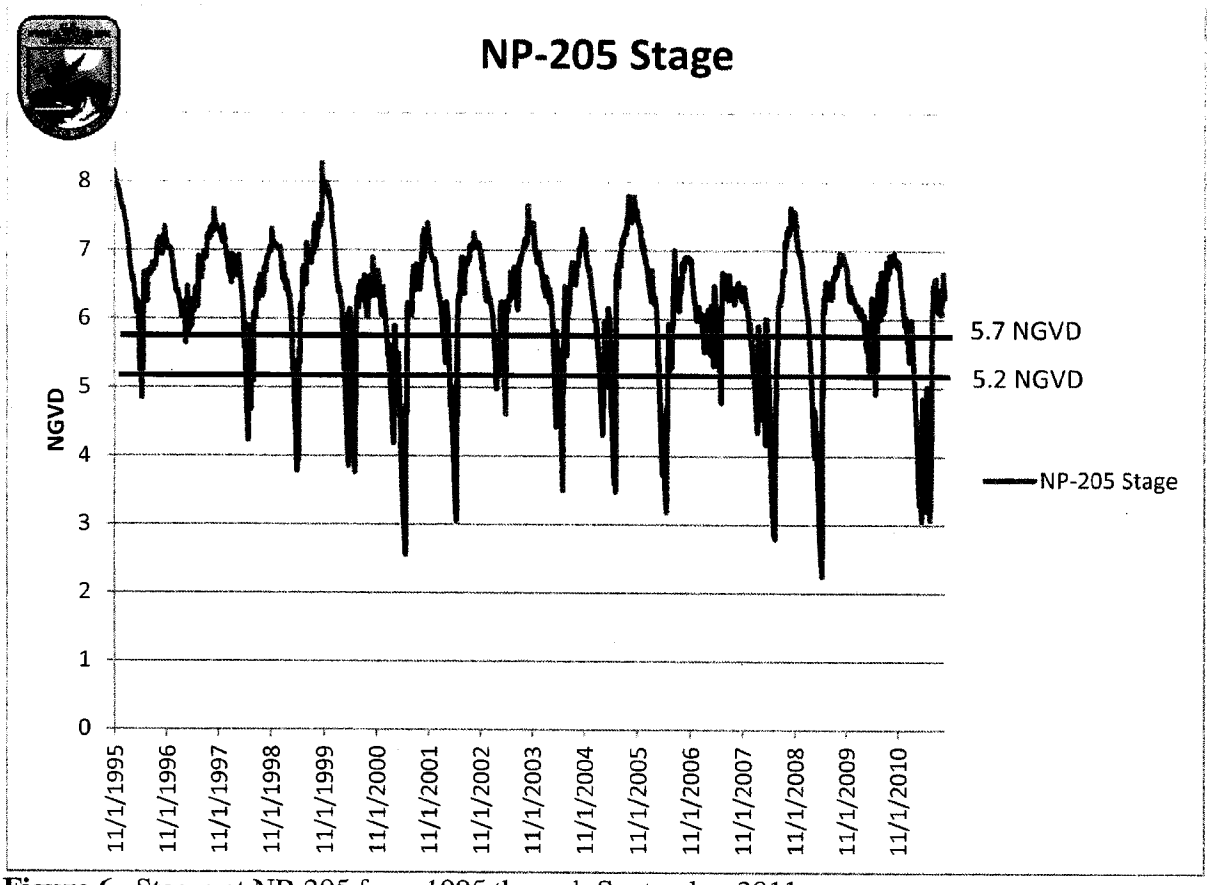


Figure 6. Stages at NP-205 from 1995 through September 2011.

Proposed culvert plugs to prevent the westward flow of water when operating the S-12C structure

To prevent the westward flow of water from S-12C into the western marl prairies containing CSSS-A, inflatable plugs have been proposed to be inserted into approximately 100 culverts underneath the eastern loop of Shark Valley Tram Road within ENP. A hydrologic analysis by ENP has shown that these culvert plugs will help to maintain shorter hydroperiods within the western marl prairies by preventing S-12C flows from passing under the Tram Road and redirecting them to the south around CSSS-A habitat (FEIS, Appendix I).

An additional source of westward water flow was identified by DOI and other members of the Project Development Team as occurring in the old Tamiami Trail borrow canal. To prevent the flow of water in the borrow canal associated with the old Tamiami Trail road, ENP may elect to install, monitor and maintain a removable plug in the borrow canal between S-12C and S-12B. According to ENP's analysis of the borrow canal flows: (1) with S-12B open, 8 percent of the

flow goes west; (2) with S-12C open, 16 percent of the flow goes west; (3) with S-12C/D open, 10 percent of the flow goes west; and (4) when all of the S-12s are open, there are no significant flows westward.

Under ERTP-1, the only time we would be concerned about westward flows would be when S-12C/D are open and 10 percent of flow is moving west. Referring to the example in ENP's analysis (FEIS, Appendix I, Figure 6), S-12C released 462 cfs and S-12D released 978 cfs, on February 8, 1980, for a total release of 1,440 cfs. Ten percent of this flow or 144 cfs, as indicated in ENP's anaylsis, would move westward beyond S-12C. As concluded in their analysis, installation of a temporary culvert plug would prevent this flow from moving west and potentially affecting water levels in CSSS-A as measured at NP-205.

The Corps included discussion of the old Tamiami Trail borrow canal plugs into the final array of ERTP alternatives in order to further protect hydroperiods within the western marl prairies. Installation and maintenance of the plugs in the borrow canal would be the responsibility of ENP. If ENP, in coordination with the Service, decides they want to install these removable plugs, doing so is compatible with the preferred alternative in Appendix I of the FEIS.

The temporary plugs for the Tram Road have been purchased and will be operated and maintained by ENP. The Service and ENP have agreed to work cooperatively to provide the necessary resources to ensure that the plugs are in place to allow the Corps to operate the S-12C structure as described in the ERTP Operational Guidance (FEIS, Appendix A-3).

The Service concurs with the findings in ENP's analysis that installation of culvert plugs in both the Tram Road and old Tamiami Trail borrow canal will have the highest probablility of improving habitat conditions in CSSS-A.

Indirect Effects - Indirect effects are those that are caused by or result from the proposed action, are later in time, and are reasonably certain to occur. The duration of these proposed actions are expected to last until implementation of either COP or other future operational plan, but not to exceed the January 1, 2016, expiration of the 2010 ERTP-1 Biological Opinion. The only potential indirect effect identified for the proposed actions is the potential for increased nutrient loading into CSSS-A by a redistribution of flows through the S-12 structures. In the Corps' FEIS, it was determined that no additional exceedences of the 1995 Settlement Agreement (FEIS, page 4-40) were anticipated as a result of implementing ERTP-1 (Alternative 9E1). Because this action would not release any additional flows than those allowed under ERTP-1 (flows would simply be redirected from S-12D to S-12A), there are no anticipated changes in water quality than those analyzed in the Corps' FEIS. As a result, the Service does not anticipate any changes in CSSS-A habitat conditions as a result of water quality.

CONCLUSION

The following conclusion on CSSS-A is appended to the "Conclusion" section of the 2010 ERTP-1 Biological Opinion.

The Service has reviewed the current status of the CSSS, the environmental baseline for this species within the action area, and the effects of the proposed releases through the S-12A for Tribal cultural purposes, and the cumulative effects, it is the Service's biological opinion that the actions, as proposed above, are not likely to jeopardize the continued existence of the CSSS. Furthermore, all Performance Measures in ERTP-1 will continue to be met and would not be affected by the addition of these proposed actions; therefore, the Service's biological opinion is that the action of ERTP-1 and the proposed actions evaluated in this amendment are not likely to jeopardize the continued existence of the Cape Sable seaside sparrow.

The conclusion for all other species and designated critical habitats remain the same as described in the Service's 2010 ERTP-1 Biological Opinion.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the Corps must comply with the following terms and conditions, which implement the reasonable and prudent measures described in the 2010 ERTP-1 Biological Opinion and outline the operational guidance required to conduct a test for S-12A up to 100 cfs releases from November 1 through July 14. These terms and conditions are nondiscretionary.

The Terms and Conditions below replaces "Term and Condition 3." in the 2010 ERTP-1 Biological Opinion.

3. The Corps will conduct Periodic Scientists Calls, as outlined in the Description of the Proposed Action section of this Biological Opinion and iin the FEIS. The purpose of the Periodic Scientists Calls is for the Corps to gather scientific input for the management of WCA-3A. The Periodic Scientists Calls provide opportunities for agency and Tribal participants to discuss and provide input on ongoing, anticipated, and desired conditions in WCA-3A such as, but not limited to, hydrologic, ecological, and multiple species conditions. This includes providing desired conditions to minimize potential effects to federally-listed species and their habitats, including reducing risks associated with low water levels and droughts. As part of the newly established Periodic Scientists Call process, the Corps will investigate and discuss, when appropriate, whether current constraints can be adjusted, such as the G-3273 gauge constraint governing S-333 operations, to implement additional measures to minimize potential effects to sparrows, snail kites, wood storks and their habitats within WCA-3A and ENP. Such investigations and discussions should consider and present feasible options available (including possible deviations) to agency and Tribal participants that would be required to, or which may help to, achieve seasonal ecological goals (*e.g.*, obtaining a temporary deviation to a regulation schedule). The Corps will produce an annual assessment of the input received (the process), actions taken and the hydrologic effects of those actions (the outcomes) in partnership with participating agencies and scientists.

The Terms and Conditions below are added to the "Terms and Conditions" in the 2010 ERTP-1 Biological Opinion.

5. To monitor conditions in the northern area of airboat trails, ENP recently installed a new gauge between S-12A and NP-205 to provide additional hydrologic information. The new gauge was installed outside of the sparrow nesting season to avoid unintentional disturbance to nesting sparrows. To date, data from this gauge is provisional at best with the lack of QA/QC or an established ground surface elevation. Before this gauge can be used reliably, the Service recommends (1) a process for real-time data acquisition be completed; (2) a ground surface elevation be established; (3) a period of baseline data needs to be collected; and (4) an initial QA/QC with a correlation be established between NP-205 and the new gauge.

6. Due to the potential effects of S-12A releases as well as local and area rainfall on NP-205 and the western marl prairie, a requested S-12A field test will only be implemented when (1) there is no rainfall expected and (2) when the water levels are at or below 5.2 feet NGVD at NP-205. This elevation allows for unexpected rainfall effects during the test, while not affecting the marl prairie ecosystem or disrupting sparrow nesting. If, during the test, water levels rise to 5.7 feet NGVD at NP-205, the Corps should close S-12A immediately to allow continued water level increases expected for the next 4 to7-day lag period. If closure of S-12A is necessary, the Corps will expedite the closure of S-12A to occur as soon as possible. This expedited closure of S-12A closure addresses unexpected rainfall effects during the test, while not affecting the marl prairie ecosystem or disrupting sparrow nesting. To avoid manpower scheduling limitations associated with weekends and holidays, the Corps should schedule a S-12A field test to begin on a Monday. Operating S-12A in this manner will minimize the potential for adverse effects on CSSS-A.

7. Consecutive or multiple tests of up to 100 cfs releases from S-12A are not recommended due to cumulative effects on hydrology and the marl prairie. To avoid cumulative water level increases from multiple tests, any subsequent test should not occur until water levels are at the same level they were prior to the initial test. Table 2 shows the average daily recession rates for NP-205 during the dry season from November through May without effects from rainfall or water management influences. Recession rates vary depending on month, wind, solar, clouds, humidity, area rainfall conditions and water management. Thus, recession rates during the test period will be calculated from the week prior to the test at NP-205 and include averages from area gauges during the test week. Lag times in water released from S-12A reaching NP-205 will also be considered in timing of S-12A gate closures during the test.

Table 2. Average daily recession rates for NP-205 without rainfall or water management influences. These values were derived from years 2002-2008.

Month	Average Daily Recession Rate (ft.)
November	0.02'
December	0.02'
January	0.03'
February	0.04'
March	0.04'
April	0.05'
May	0.07'

8. Prior to the Corps initiating informal consultation with the Service on the S-12A up to 100 cfs release proposal, both agencies will discuss use of and become familiar with potential rainfall forecast tools to be utilized in association with the proposed S-12A release.

9. The Corps would notify the Service of a proposed release, whereby the Service would review on a case-by-case basis each proposal and respond to the Corps within 3 working days to satisfy the section 7 consultation criteria listed below have been met, thereby allowing the release to proceed or that the release is denied. The conditions upon which the Service may deny a release include, but are not limited to, (1) the antecedent conditions, past performances of releases and whether the criteria listed below would likely not be met; (2) if there is a "build up" from cumulative releases on the stage of the marl prairie in CSSS-A; (3) there is a potential threat of storms outside the scope of which the below criteria were established; (4) if other unanticipated conditions exist that threaten CSSS-A such as unexpected rainfall, fire, and predation; or (5) past releases failed to meet the stated objectives and those same set of conditions exist for the proposed release, such as NP-205 water level, rainfall, and the correlation between NP-205 and a new water level gauge. Operational Guidance in which all criteria must be met to allow a release:
   a. S-12A up to 100 cfs release may only be requested by the Miccosukee Tribe of Indians when they cannot access cultural areas within ENP.
   b. During the period from November 1 through July 14, no more than 100 cfs per 24-hour period will be released from S-12A when the Rainfall Plan results in S-12 target flows.
   c. The duration of any S-12A up to 100 cfs release will not exceed five consecutive 24-hour periods and ongoing releases will cease earlier if the Tribe notifies the Corps that access to cultural areas is no longer needed.
   d. During the period from November 1 through July 14, rainfall forecasts for the regional area both upstream and downstream of S-12A will be considered prior to implementation of a requested S-12A up to 100 cfs release and may result in not implementing a requested S-12A up to 100 cfs release.
   e. During the period from November 1 through July 14, a requested S-12A up to 100 cfs release may only occur if the stage at NP-205 is below 5.2 feet NGVD to allow for "lag effects" of rising water and the potential for a 1-inch rainstorm which when combined with existing stage should prevent water levels from reaching ground level.

f. During the period from November 1 through July 14, when a S-12A up to 100 cfs release is ongoing, conditions such as, but not limimted to, the new gauge (between S-12A and NP-205) stage, NP-205 stage, area rainfall, and area rainfall forecasts will be monitored and, if the stage at NP-205 reaches or is anticipated to reach 5.7 feet NGVD, S-12A will be closed.

g. To avoid cumulative water level increases from multiple releases during the period from November 1 through July 14, any subsequent S-12A up to 100 cfs release should not occur until the water level at NP-205 returns to the same level it was prior to the initial test (refer to Term and Condition 7 above). Along with requirements in Term and Condition 7, data from the new gauge above NP-205 may be incorporated into the test after ground truthing, QA/QC and a baseline of data for correlation has been developed (discussed in the hydrologic analysis). The Corps and Service would agree upon and use best available information to determine lag time and recession rates.

10. The Corp agrees to provide monitoring reports to the Service after which the Service has 30 days to review the report and submit a response. The report should include the following:
    a. Date of request;
    b. Date and time of the start of the S-12A up to 100 cfs release;
    c. Date and time of the end of the S-12A up to 100 cfs release;
    d. The total volume (acre-feet) and discharge rate (cfs) released for each 24-hour period;
    e. The water level at NP-205 and at the new gauge at the start of the S-12A up to 100 cfs release, then on an hourly basis during release, then daily until the stage at NP-205 returns to the same level it was prior to the initial test;
    f. The amount of hourly rainfall each 24 hour period during the release and for the period of time until the stage at NP-205 returns to the same level it was prior to the initial test; and
    g. Any other information known to have influenced CSSS-A such as wild fires or other events.

The criteria in the Terms and Conditions above are sufficient to preclude adverse effects to nesting and habitat conditions within CSSS-A. Should monitoring demonstrate our assumptions or analyses are inaccurate, test releases will cease until a review of the criteria is conducted and adjusted to preclude adverse effects to CSSS-A.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to further minimize or avoid adverse effects of a proposed action on federally listed species or critical habitat, to help implement recovery plans, or to develop information.

The Conservation Recommendation below is added to the "Conservation Recommendations" in the 2010 ERTP-1 Biological Opinion.

5. The S-12 gates are manually operated which is a concern when conducting time-sensitive operational releases. Water levels can rise rapidly in this area due to rainfall or nearby structure operations. It would be beneficial if the S-12 structures could be electronically operated should the need quickly arise to close the gates. Currently, the Corps operates the structures in a time consuming manner by scheduling personnel to physically travel to the location and manually adjust the gates.

Revised text and graphs for Everglade snail kite

The following information and analyses on the Everglade snail kite are appended to the "Effects of the Action" section in the 2010 ERTP-1 Biological Opinion. The following figures (Figures 25, 26, 27, 28, 30, 31, 32, and 33) have been revised and replace those figures provided in the 2010 ERTP-1 Biological Opinion. With the exception of Figures 27 and 30, these revisions are minor and simply resolve decimal rounding issues. Figures 27 and 30 have been redone to correct an error in the formula used to calculate category percentages. Despite these changes, the relative differences between IOP and ERTP-1 are still minor and do not substantially change our analysis of project effects.

In our evaluation of the potential high water effects on apple snail reproduction, we compared the LORS (IOP) and 9E1 (ERTP-1) model runs using PM-C. The revised results still suggest that ERTP-1 operations may result in slightly lower maximum water levels during the dry season when compared to IOP, as indicated by a slight decrease in the frequency that 3AVG stages are above the recommended ranges for apple snails (for 1965-2000, 2.7 percent less often under Run 9E1; no differences for the 1990-2000 time period) (Figure 27). While this still represents an improvement over IOP model results, the difference between the two models is now smaller, and dry season water level improvements (within the apple snail recommended range) are entirely due to reduction of water levels above the recommended range with no improvements to low water conditions (Figure 27).

Similarly, our comparison of revised PM-B results still suggest that ERTP-1 dry season water levels would fall within the snail kite recommended range more often (by 5.6 percent during 1965-2000 and 18.1 percent during 1990-2000) than under IOP, and this improvement is entirely related to reduction in water levels above the recommended range (Figure 30). However, revised results for 1965-2000 also suggest a slight increase (2.8 percent) in frequency of water levels below the recommended range; no differences were observed for the 1990-2000 time period.

Taken with our original evaluation of ET-3 results, which suggest slight increases in dry down frequency and duration in southern and central WCA-3A under ERTP-1 (Figure 31), model results suggest minimal dry season high water improvements for snail kites, apple snails, and their habitat, but also slightly higher risk of low water conditions during the dry season than under our original analysis. In addition, since the 2010 ERTP-1 Biological Opinion was written, Florida has been experiencing a 2-year drought (Oct 2010-present); 2012 will be the fifth year of

drought in the last 12 years, and the second occurrence of consecutive year droughts during that time. This represents a higher frequency of drought than previously anticipated or considered in our analyses. While part of our original evaluation included a subset of years (1990-2000) within the period of record based on the current and expected (next 5-10 years) climate regime, it is apparent that additional climate factors (relating to the El Nino Southern Oscillation) are causing increased frequency and intensity of weather extremes, such as the consecutive La Nina events in 2010-2011 and 2011-2012. Snail kites are adversely impacted by these extremes, and are less resilient to such events given their reduced population size. Since 2000, population estimates for the snail kite have declined precipitously coincident with drought years. Because the immediate effect of drought on the population cannot be seen until the following year, any effects of the current drought will not be evident until 2012 and 2013 population estimates are available. Another significant reduction in the snail kite population would be a major concern for the short- and long-term health of the species, and could result in the population losing its capacity to persist or recover.

This updated information suggests caution should be used when implementing the ERTP-1 schedule. In particular, while expanding Zone E-1 backward to January allows for increased flexibility to reduce wet season high water conditions, it could have the inadvertent effect of lowering water levels too much, especially during or preceding drought years. In addition, ERTP-1 does not have the needed flexibility to retain water during such years - such an improvement will be required in future operational plans in order to realize the needed improvements to kite nesting conditions in WCA-3A. Such improvements may include modifications to the Rainfall Plan and/or regulatory releases to increase the Corps' ability to retain or release water under appropriate environmental scenarios to benefit both WCA-3A and downstream ecosystems.

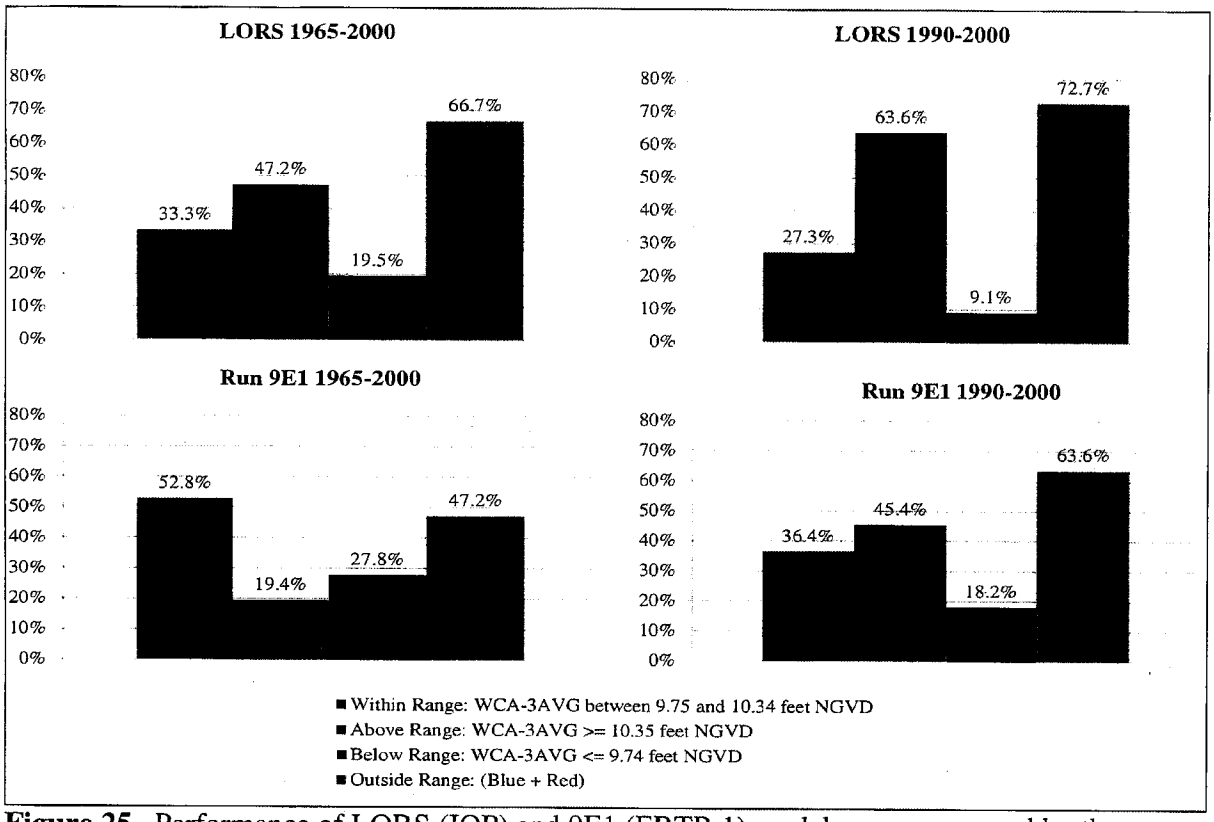


Figure 25. Performance of LORS (IOP) and 9E1 (ERTP-1) model runs as assessed by the percentage of years during which the stage on December 31 (3AVG) is within the recommended range for snail kites.

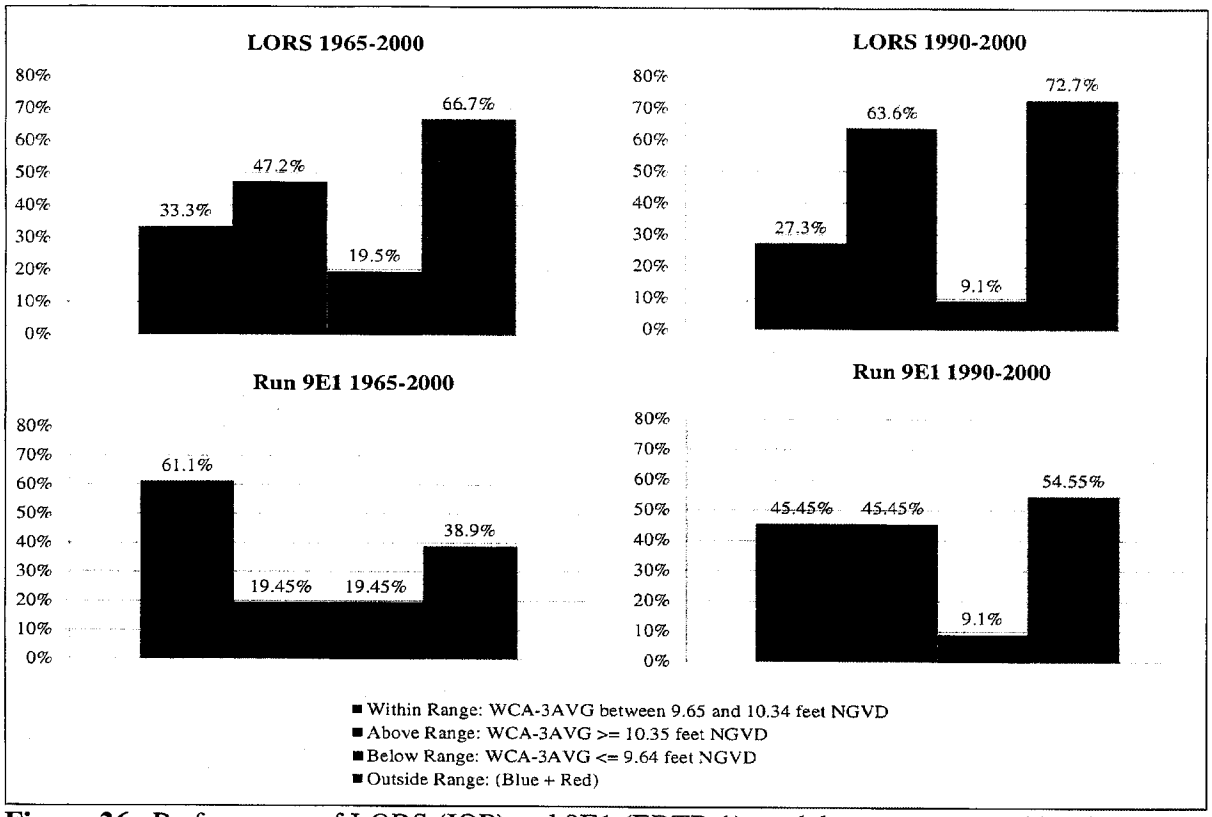


Figure 26. Performance of LORS (IOP) and 9E1 (ERTP-1) model runs as assessed by the percentage of years during which the stage on December 31, as measured by the 3AVG, is within the recommended range for apple snails.

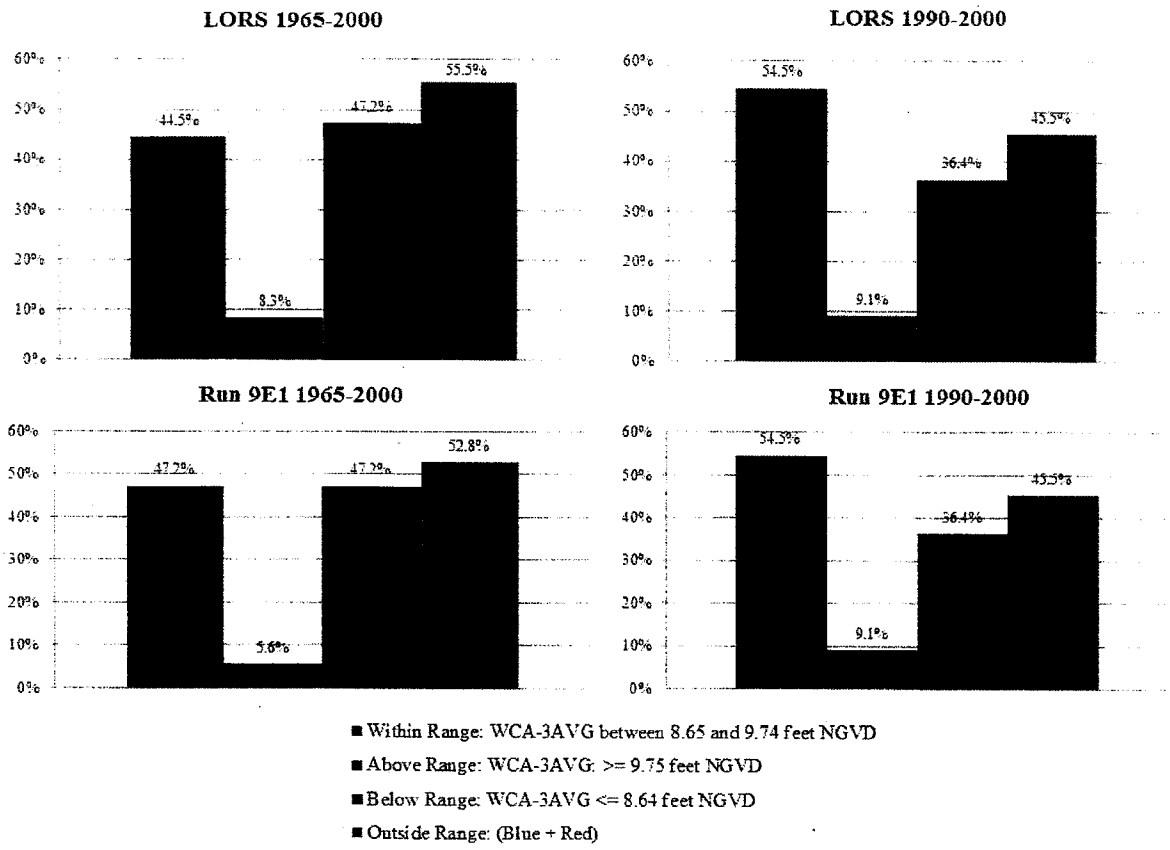


Figure 27. Performance of LORS (IOP) and 9E1 (ERTP-1) model runs as assessed by the percentage of years during which the stage between May 1 and June 1, as measured by the 3AVG, is within the recommended range for apple snails.

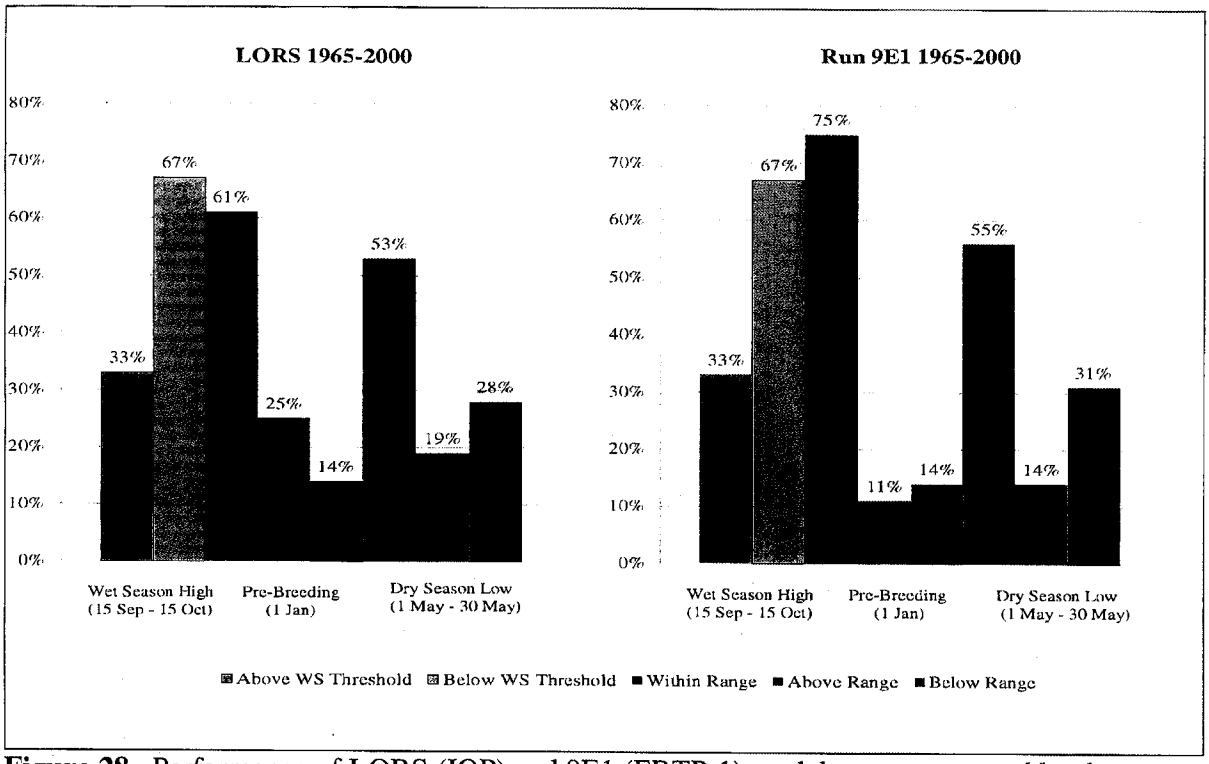


Figure 28. Performance of LORS (IOP) and 9E1 (ERTP-1) model runs as assessed by the percentage of years in which WCA-3A water levels, as measured by the 3AVG, are above or below the wet season threshold and within, above, or below the pre-breeding and dry season ranges recommended in MSTS.

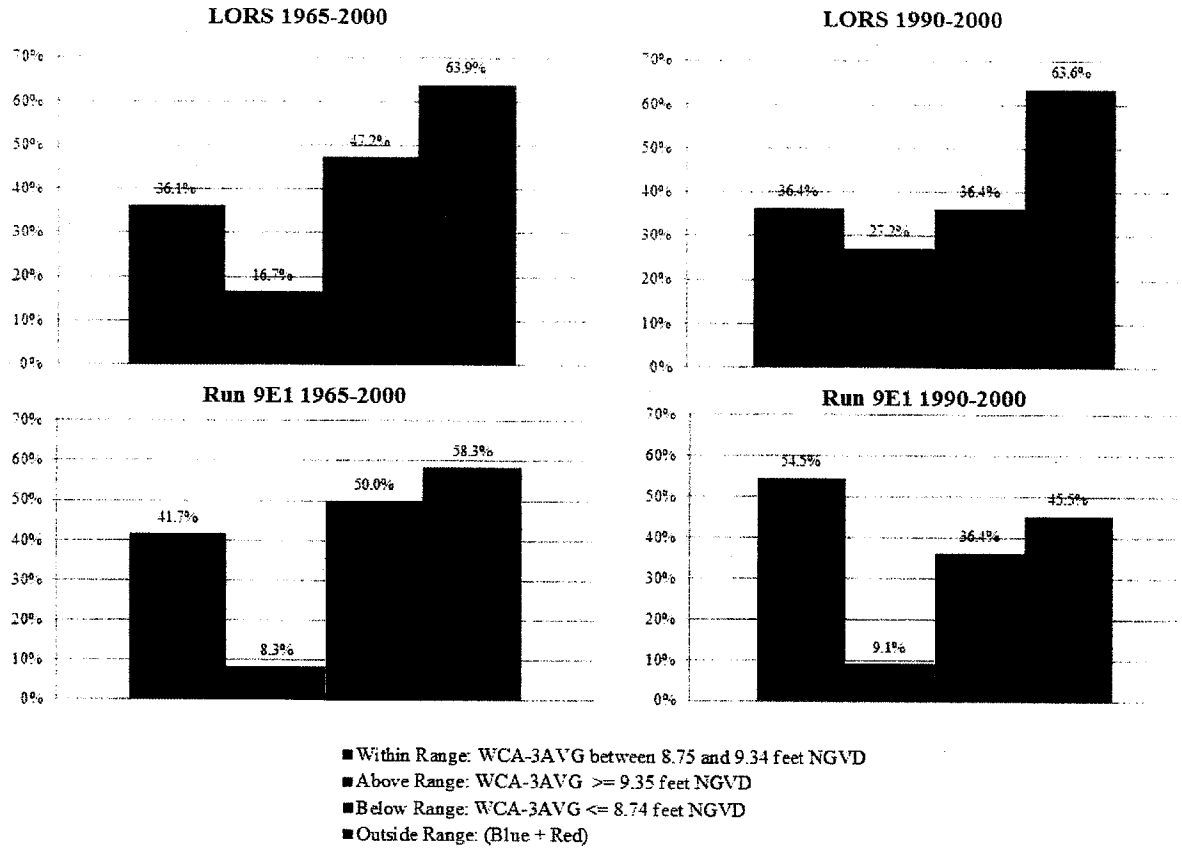


Figure 30. Performance of LORS (IOP) and 9E1 (ERTP-1) model runs as assessed by the percentage of years during which the stage between May 1 and June 1, as measured by 3AVG, is within the recommended range for snail kites.

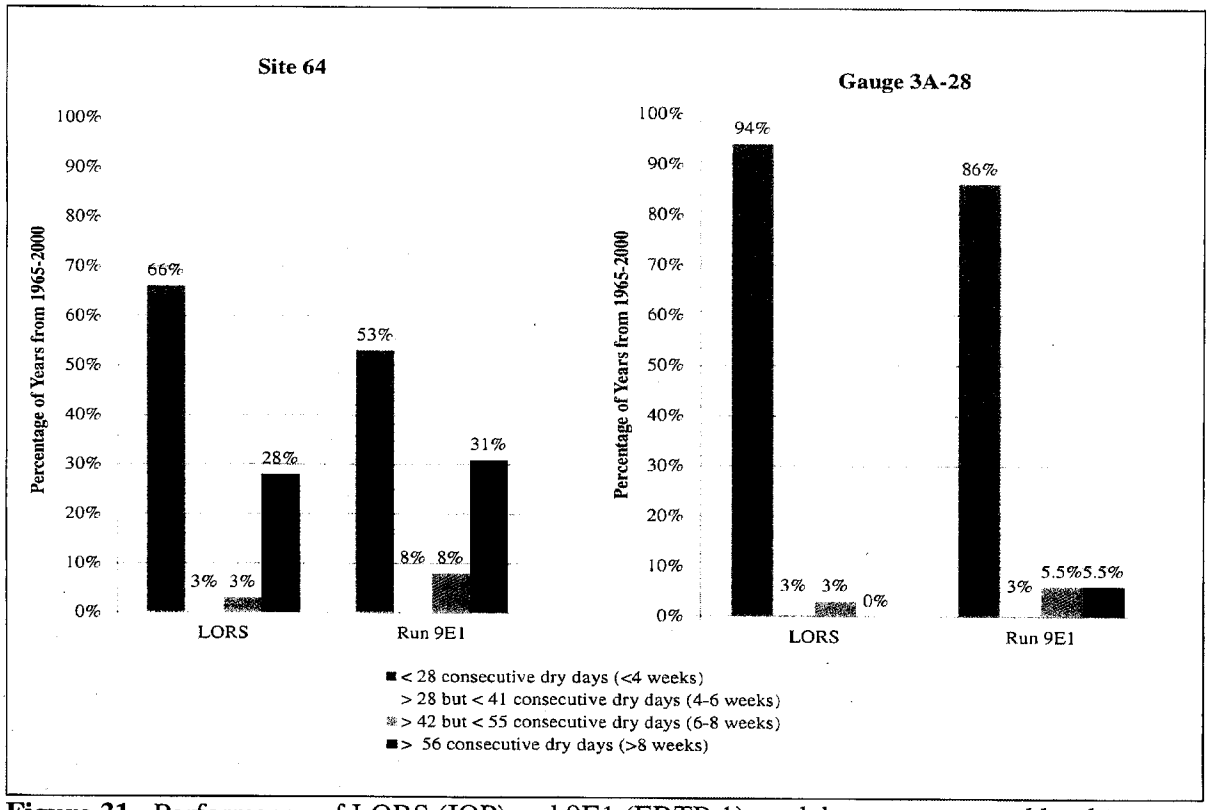


Figure 31. Performance of LORS (IOP) and 9E1 (ERTP-1) model runs as assessed by the number of consecutive dry days at gauges 3A-4 and 3A-28 (also known as Sites 64 and 65, respectively) from 1965 to 2000.

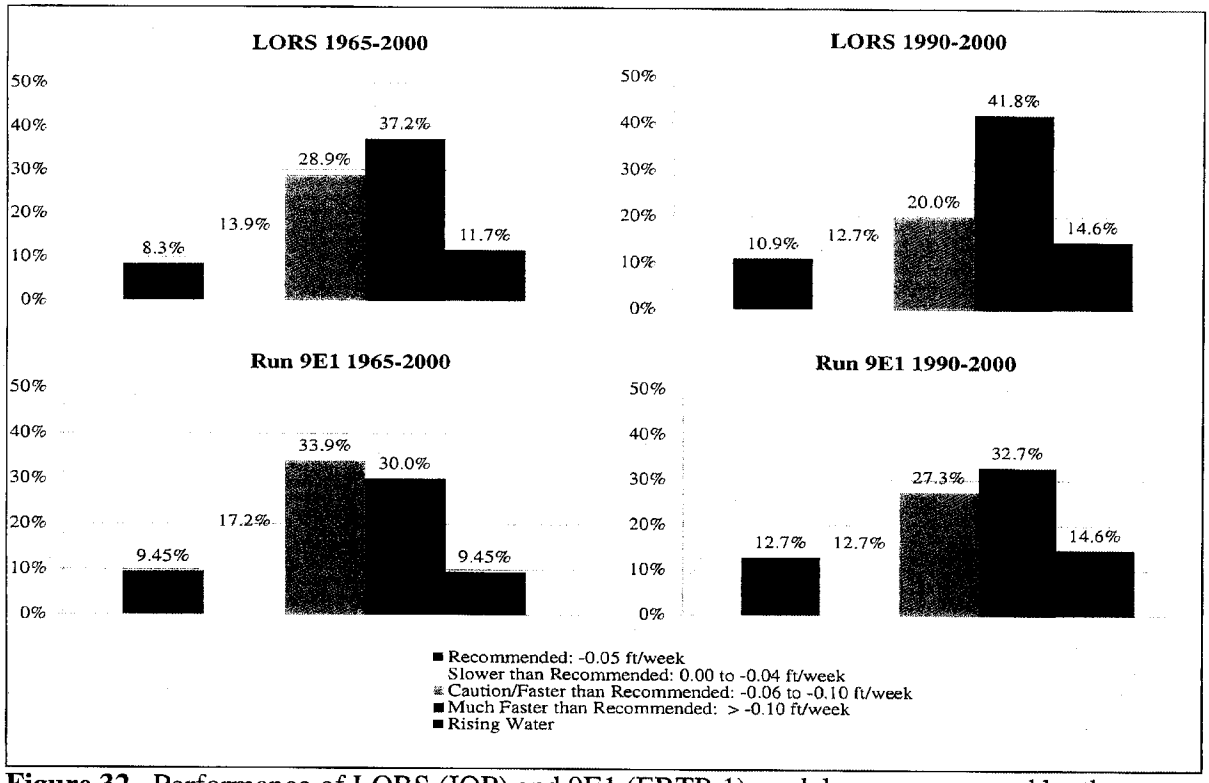


Figure 32. Performance of LORS (IOP) and 9E1 (ERTP-1) model runs as assessed by the percentage of months during which the average weekly recession rate between January 1 and June 1, as measured by the 3AVG, is within the recommended range for snail kites. Recession rate was determined by first calculating a weekly average, and then averaging the weekly rate for an entire month.

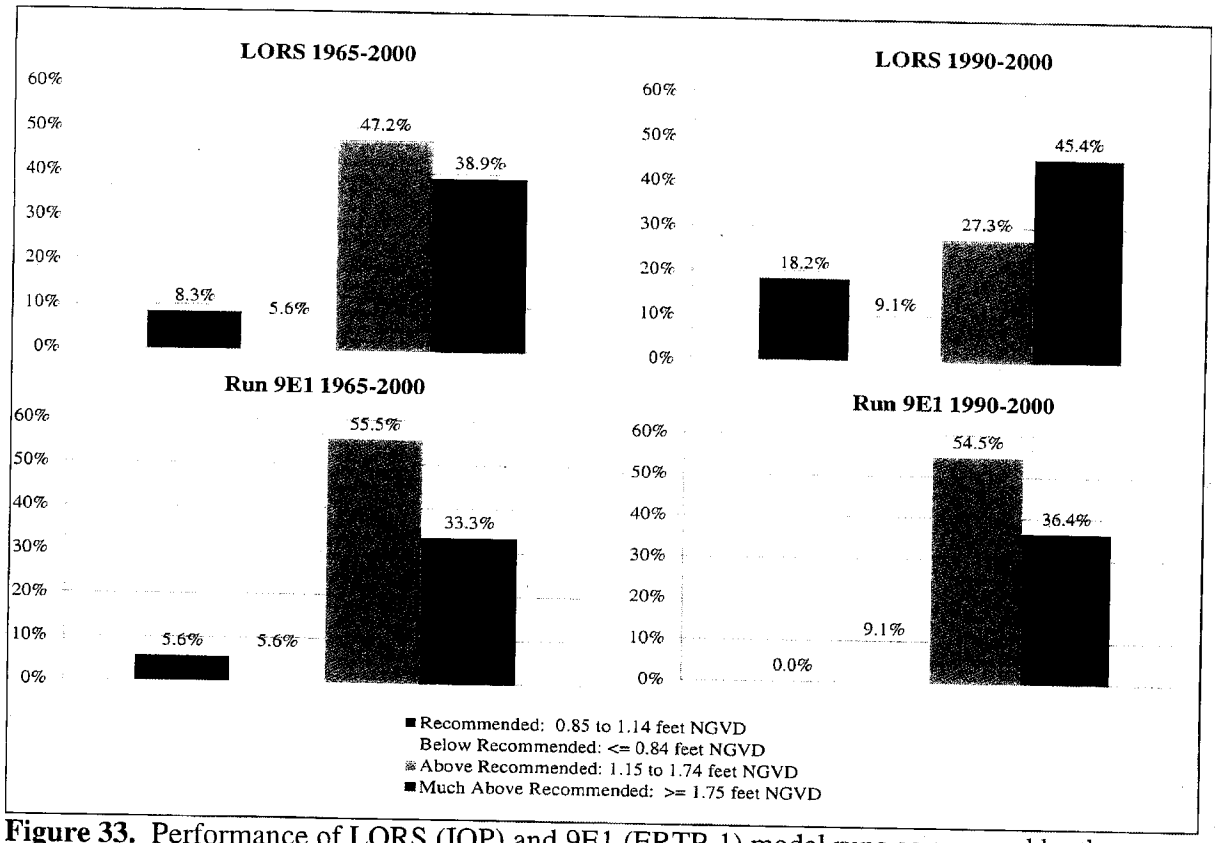


Figure 33. Performance of LORS (IOP) and 9E1 (ERTP-1) model runs as assessed by the percentage of years when the difference in stage between January 1 and the dry season minimum water level, as measured by the 3AVG, is within the recommended range for snail kites.

REVISED INCIDENTAL TAKE STATEMENT FOR WOOD STORK

The following section replaces the Incidental Take Statement for wood storks in the 2010 ERTP-1 Biological Opinion.

The Incidental Take Statement for wood storks in the Service's 2010 ERTP-1 Biological Opinion stated that incidental take will be exceeded if ERTP-1 or the interim IOP period results in a water depth greater than 16 inches (41 cm) as measured by the 3A-4 or 3A-28 gauges from January 1 through May 31 over 78 percent of the surface area within the core foraging area of any active wood stork colony for two consecutive years. While monitoring water levels between January 1 and March 1, 2011, the water depth measured at the 3A-28 gauge (located in southern WCA-3A) exceeded the 16-inch (41 cm) threshold identified by Beerens and Cook (2010) as the upper limit for foraging wood storks. This caused the Service to re-evaluate the thresholds for incidental take and the appropriateness of evaluating them at just the 3A-28 gauge.

Hydrologic conditions for 2011 are much drier than in previous years with the current drought expected to continue into the wet season (June-October). If the water level is exceeding 16 inches (41 cm) at the 3A-28 gauge during a dry year, it is reasonable to assume that it will also

exceed this depth in normal and wet years even with lowering of the WCA-3A Regulation Schedule by 0.25 feet under ERTP. Also, the topography and water flow dynamics across WCA-3A allow water to pond in southern 3A; thus, the water depth is likely to exceed 16 inches (41 cm) as measured by the 3A-28 gauge during most of the dry season (November-May). In addition, these reported conditions are inconsistent with known observations of wood stork use in the area. Therefore, the Service concluded that using the 3A-4 or 3A-28 gauge to measure water depths greater than 16 inches (41 cm) during the nesting season for wood storks is an incorrect application of the methodology developed to determine the exceedence of incidental take.

Beerens and Cook (2010) developed wood stork-related water management recommendations for the 2010 ERTP-1 Biological Opinion (Service 2010, Appendix B). They identified a water level for the 3-gauge average stage that provides wood stork foraging habitat during the breeding season (January 1-May 31). In addition, Beerens and Cook (2010) used presence-absence observations of foraging wood storks from systematic reconnaissance flights (conducted by the District during 2000 through 2009) in conjunction with the daily water depth (recorded by EDEN) in WCA-3A to determine the site-specific optimal water depths used by wood storks over the last 10 years. From this, they calculated the maximum water depth for foraging as 41 cm (16 inches) according to the average of the following USGS gauges in WCA-3A: Sites 63, 64 and 65. These three gauges are the same as the 3A-3, 3A-4 and 3A-28 gauges, respectively. More recently, Beerens' (FAU, personal communication 2011) review of the average water depth in WCA-3A (based on the 3-gauge average from sites 63, 64 and 65) was less than 16 inches in seven of the ten years during the period 2000 through 2009. This 16-inch water depth was reached from mid-February to mid-March.

Thus, the Incidental Take Statement for wood storks is revised as follows:

> Incidental take will be exceeded if operations from implementing ERTP-1, or the interim IOP period, results in a water depth greater than 16 inches (41 cm) from March 1 through May 31 throughout WCA-3A for two consecutive years as measured by the 3-gauge average (based upon a ground surface elevation of 8.34 feet NGVD) at gauges 3A-3, 3A-4 and 3A-28.

A water depth greater than 16 inches (41 cm) across WCA-3A during the nesting season would lower the suitability of foraging habitat to the point where wood storks ability to forage would be severely impaired and most likely result in widespread abandonment of nests and fledglings within the affected colony (Gawlik et al. 2004; J.M. Beerens, FAU, personal communication 2010, 2011).

Thank you for your cooperation and effort in protecting fish and wildlife resources. If the amount or extent of incidental take is exceeded, modifications are made to the project, additional information involving potential effects to listed species becomes available, or if a new species is listed, reinitiation of formal consultation is required. If you have any questions regarding this amended Biological Opinion, please contact me at 772-469-4285, or via email at Larry_Williams@fws.gov.

Sincerely yours,

Larry Williams
Field Supervisor
South Florida Ecological Services Office

cc: electronic copy only
Corps, Jacksonville, Florida (Stu Applebaum, Eric Bush, Eric Summa, Donna George)
Corps, West Palm Beach, Florida (Kim Taplin, Lt Col Kinard)
DEP, Tallahassee, Florida (Greg Knecht)
District, West Palm Beach, Florida (Melissa Meeker, Ernie Barnett, Lisa Cannon)
ENP, Homestead, Florida (Dan Kimball, Bob Johnson, Carol Mitchell)
FWC, Tallahassee, Florida (Conservation Planning Services)
FWC, West Palm Beach, Florida (Chuck Collins)
Service, Atlanta, Georgia (Leo Miranda, Dave Horning)
SOL/DOI, Atlanta, Georgia (Michael Stevens)

LITERATURE CITED

Beerens, J.M. 2010. Personal communication, Florida Atlantic University. E-mail to the U.S. Fish and Wildlife Service dated November 1, 2010. South Florida Ecological Services Office; Vero Beach, Florida.

Beerens, J.M. 2011. Personal communication, Florida Atlantic University. E-mail to the U.S. Fish and Wildlife Service dated May 3, 2011. South Florida Ecological Services Office; Vero Beach, Florida.

Beerens, J.M. and M.I. Cook. 2010. Using wood stork distribution data to develop water management guidelines. South Florida Water Management District-Everglades Division; West Palm Beach, Florida.

Gawlik, D.E., G. Crozier, and K.C. Tarboton. 2004. Chapter 8: Wading bird habitat suitability index. Pages 111-127 *in* K.C. Tarboton, M.M. Irizarry-Ortiz, D.P. Loucks, S.M. Davis, and J.T. Obeysekera (eds), Habitat suitability indices for evaluation water management alternatives. Technical Report, South Florida Water Management District, West Palm Beach, Florida.