

May 2015

Environmental Assessment and Finding of No Significant Impact

G-3273 CONSTRAINT RELAXATION/S-356 FIELD TEST AND S-357N OPERATIONAL STRATEGY



Miami-Dade County, Florida



**US Army Corps
of Engineers®**
Jacksonville District



DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
701 San Marco Boulevard
JACKSONVILLE, FLORIDA 32207-8175

REPLY TO
ATTENTION OF

FINDING OF NO SIGNIFICANT IMPACT

**G-3273 CONSTRAINT RELAXATION/S-356 FIELD TEST AND S-357N
OPERATIONAL STRATEGY
MIAMI-DADE COUNTY, FLORIDA**

I have reviewed the Environmental Assessment (EA) for the Proposed Action. This Finding incorporates by reference all discussions and conclusions contained in the EA enclosed hereto. Based on information analyzed in the EA, reflecting pertinent information obtained from agencies having jurisdiction by law and/or special expertise, I conclude that the Proposed Action will not significantly affect the quality of the human environment and does not require an Environmental Impact Statement. Reasons for this conclusion are in summary:

- a. Operations in the project area are currently governed by the Water Conservation Areas, Everglades National Park (ENP), ENP to South Dade Conveyance System Water Control Plan. The U.S. Army Corps of Engineers (Corps), Jacksonville District, is initiating the Gage-3273 (G-3273) and Pump Station 356 (S-356) operations field test to raise the current operational stage constraint for inflow into Northeast Shark River Slough (NESRS) at the G-3273 gage, and operate the S-356 pump station for control of seepage into the L-31N Canal. The purpose of this field test is to evaluate relaxing the existing G-3273 stage constraint to enable increased water deliveries from Water Conservation Area 3A to ENP through NESRS for the benefit of natural resources. The field test will also implement a testing protocol to assist in defining operating criteria for the new 8.5 Square Mile Area S-357N water control structure following completion of construction. The testing protocol for S-357N will be an iterative approach consisting of 4 to 5 weeks of gate changes during the wet season. The S-357N gate changes will be meant to test the hydrologic response of the system to minor adjustments in operations at S-357N. During Increment 1, S-331 will be operated consistent with the current Water Control Plan.
- b. The field test will be the first increment in a series of three related, sequential efforts that will result in a comprehensive integrated water control plan, referred to as the Combined Operating Plan, for the operation of the water management infrastructure connected to the Modified Water Deliveries to ENP and Canal 111 South Dade Projects. The field test will maintain the current operating limit constraint of 7.5 feet National Geodetic Vertical Datum (of 1929NGVD) in the L-29 Canal, while relaxing the G-3273 stage constraint and utilizing S-356 for control of seepage into the L-31N Canal. It is anticipated that during the field

test, the combined flows to NESRS through S-333 and S-356 will be more than what would have otherwise been discharged through S-333 under current operations. No changes to water supply operations are proposed. Field test duration is planned for approximately two years, with a minimum duration of one year. The Increment 1 field test will initiate when hydrologic conditions allow for relaxation of G-3273 above 6.8 feet NGVD consistent with the objectives of this field test. The field test may be implemented as early as June 2015.

- c. The Proposed Action is in full compliance with the Endangered Species Act and the Fish and Wildlife Coordination Act. The Proposed Action would not adversely affect protected species. Measures have been incorporated into the Monitoring Plan to avoid or minimize adverse effects to any listed endangered, threatened, or species of special concern that may be present. The Corps agrees to maintain open and cooperative communication with the U.S. Fish and Wildlife Service and Florida Fish and Wildlife Conservation Commission during field test operations.
- d. The Corps is coordinating a consistency determination pursuant to the Coastal Zone Management Act through the circulation of this EA. The Corps has determined that the Proposed Action is consistent to the maximum extent practicable with the enforceable policies of Florida's approved Coastal Zone Management Program.
- e. The Proposed Action has been coordinated with the Florida State Historic Preservation Officer in accordance with the National Historic Preservation Act and consideration given under the National Environmental Policy Act. It is anticipated that the Proposed Action will not adversely affect historic properties eligible or potential eligible for the National Register of Historic Places.
- f. The Proposed Action will not adversely affect water quality and will be in compliance with the appropriate conditions in the Everglades Forever Act Permit (File No. 0246512-10) and consistent with the Clean Water Act. Measures have been incorporated into the Monitoring Plan for purposes of water quality.
- g. The Proposed Action will maintain the authorized purposes of the Central and Southern Florida Project, which include to provide flood control, water supply for municipal, industrial, and agricultural uses, prevention of saltwater intrusion, water supply for ENP, and protection of fish and wildlife.

In view of the above and the attached EA, and after consideration of public and agency comments received on the project, I conclude that the Proposed Action would not result in a significant effect on the human environment. This Finding of No Significant Impact incorporates by reference all discussions and conclusions contained in the EA enclosed herewith.



Alan M. Dodd
Colonel, U.S. Army
District Commander

27 May 2015
Date

**ENVIRONMENTAL ASSESSMENT
ON
G-3273 CONSTRAINT RELAXATION/S-356 FIELD TEST AND S-357N
OPERATIONAL STRATEGY
MIAMI-DADE COUNTY, FLORIDA**

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**ENVIRONMENTAL ASSESSMENT
ON
G-3273 CONSTRAINT RELAXATION/S-356 FIELD TEST AND S-357N
OPERATIONAL STRATEGY**

MIAMI-DADE COUNTY, FLORIDA

1.0 PROJECT PURPOSE AND NEED

1.1 PROJECT AUTHORITY

The Everglades National Park (ENP) Protection and Expansion Act, (Public Law [PL] 101-229, Section 104, 16 U.S.C. Part 410r-5 *et seq.*, December 1989), authorized the Secretary of the Army to undertake certain actions to improve water deliveries from the Central & Southern Florida (C&SF) Project to the ENP.

Section 104 (a) (1)-(3) of the Act directed the U.S. Army Corps of Engineers (Corps) to address restoration of water deliveries and natural hydrological conditions. The Act states:

Upon completion of a final report by the Chief of the Army Corps of Engineers, the Secretary of the Army, in consultation with the Secretary, is authorized and directed to construct modifications to the Central and Southern Florida Project to improve water deliveries into the park and shall, to the extent practicable, take steps to restore the natural hydrological conditions within the park.

Such modifications shall be based upon the findings of the Secretary's experimental program authorized in Section 1302 of the 1984 Supplemental Appropriations Act (97 Stat. 1292) and generally as set forth in a General Design Memorandum to be prepared by the Jacksonville District entitled "Modified Water Deliveries to Everglades National Park". The Draft of such Memorandum and the Final Memorandum, as prepared by the Jacksonville District, shall be submitted as promptly as practicable to the Committee on Energy and Natural Resources and the Committee on Environment and Public Works of the United States Senate and the Committee on Interior and Insular Affairs and the Committee on Public Works and Transportation of the United States House of Representatives.

Construction of project modifications authorized in this subsection and flood protection systems authorized in subsections (c) and (d) are justified by the environmental benefits to be derived by the Everglades ecosystem in general and by the park in particular and shall not require further economic justification.

The PL for the Modified Water Deliveries (MWD) Project (PL 101-229) was amended as PL 108-7 (Appropriations Act, 2003). This authorization bill identified Alternative 6D (the Selected Alternative in the July 2000 General Reevaluation Report [GRR] and Final Supplemental Environmental Impact Statement [EIS] for 8.5 Square Mile Area [8.5 SMA]) as the plan to be built, authorized relocation of residents, and other provisions (USACE 2000). Tamiami Trail Modifications are described in the Final Limited Reevaluation Report and Environmental Assessment (EA) (USACE 2008).

1.2 PROJECT LOCATION

The MWD Project is a modification of the C&SF Project. Features of the MWD Project are located in Miami-Dade County, including portions of ENP and adjacent areas (**Figure 1-1**). The 1992 MWD General Design Memorandum (GDM) and Final EIS defines the project boundary as Shark River Slough (SRS) and that portion of the C&SF Project north of structure 331 (S-331) to include Water Conservation Area 3 (WCA 3).

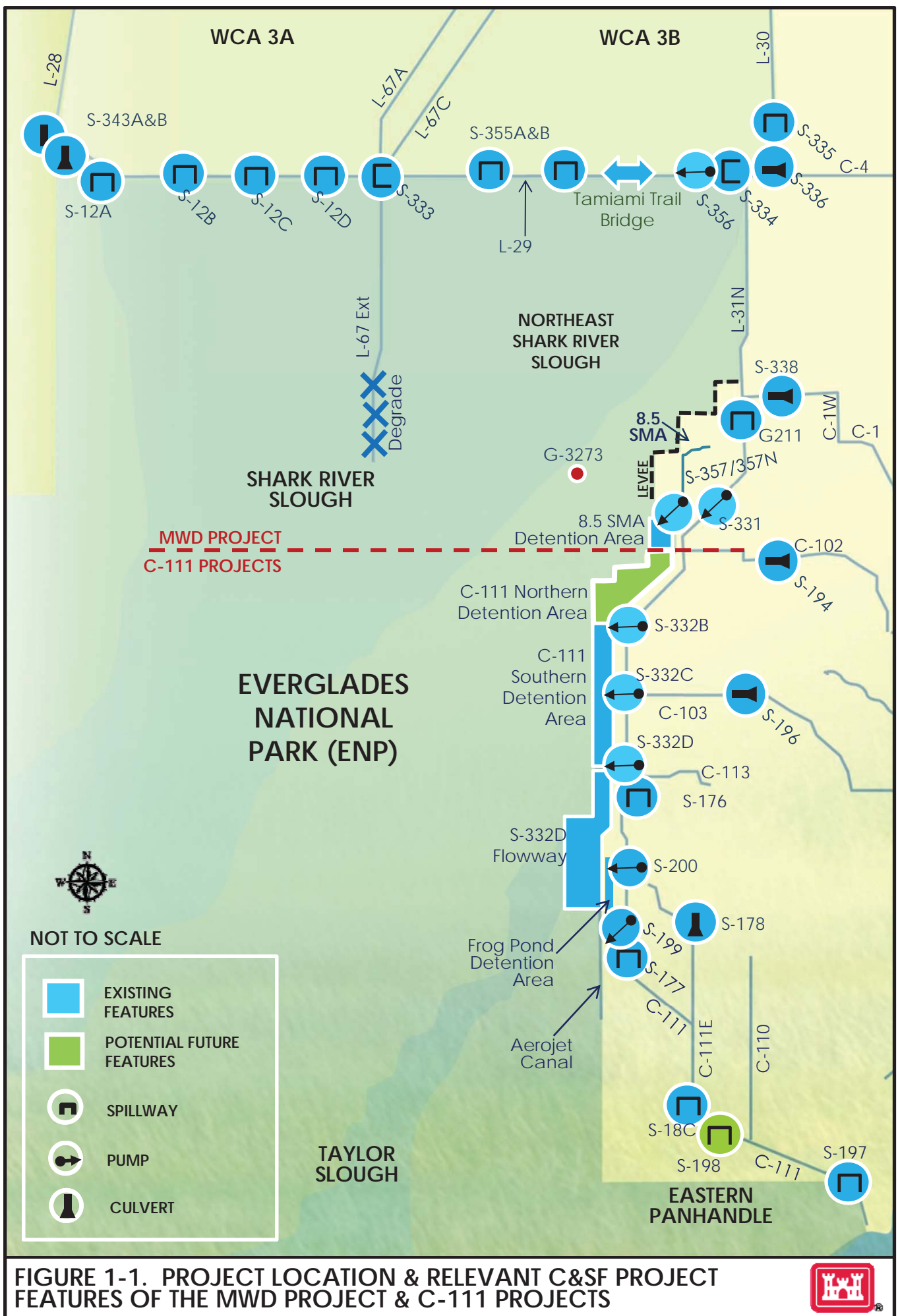


FIGURE 1-1. PROJECT LOCATION & RELEVANT C&SF PROJECT FEATURES OF THE MWD PROJECT & C-111 PROJECTS



1.3 PROJECT BACKGROUND

The C&SF Project currently functions and was originally authorized to function as a multi-purpose water management system. The Congressionally-authorized purposes of the C&SF Project include flood control, agricultural irrigation, municipal and industrial water supply, preservation of fish and wildlife, water supply to ENP, preservation of ENP, prevention of saltwater intrusion, drainage and water control, groundwater recharge, recreation, and navigation.

The MWD Project includes modifications to the C&SF Project to provide a system of water deliveries to ENP across the full width of the historic SRS flow-way and consists of four main components: (1) conveyance and seepage control features to facilitate flow through the system from WCA 3A to WCA 3B and to limit seepage eastward from WCA 3B and ENP; (2) modifications to Tamiami Trail to facilitate flow under the road to SRS; (3) flood mitigation for the developed East Everglades area (also referred to as the 8.5 SMA); and (4) project implementation support, which includes monitoring and operational changes. The MWD GDM and Final EIS (USACE 1992) includes a discussion of the location, capacity, and environmental impacts for the proposed structural modifications, which included structures S-345A, B and C; S-349A, B and C; S-355A and B; S-334 modification, removal of the L-67 Extension Levee and borrow canal filling; and a levee and canal system for flood mitigation in 8.5 SMA. The levee and canal system included two pumping stations, S-356 and S-357 (**Figure 1-1**).

The 8.5 SMA features were constructed to provide flood mitigation to the privately-owned lands in the Las Palmas Community located east of ENP, in order to prevent impacts from higher stages within Northeast Shark River Slough (NESRS) resulting from the implementation of MWD. A GRR and Final Supplemental EIS for the 8.5 SMA were completed in July 2000 (USACE 2000). The GRR recommended Alternative 6D, consisting of a perimeter levee (Levee 357W [L-357W]), internal levees, an interior seepage collection canal (C-357), a new pump station (S-357), and a detention area that would discharge into the proposed C-111 South Dade Northern Detention Area (NDA), as part of the C-111 South Dade Project (**Figure 1-1**). A design refinement for the 8.5 SMA and EA were completed in August of 2012 (USACE 2012a). An operational test conducted in 2009 indicated that the S-357 pump station and other 8.5 SMA features may not adequately mitigate the southwest corner of the 8.5 SMA. To ensure utilization of the S-357 pump station at maximum design capacity following completion of the NDA, new hydrologic modeling identified an additional east-west seepage collection canal (C-358) was needed to properly mitigate groundwater stages in the southwest corner (east of L-357W). A gated control structure (S-357N), currently planned to be constructed by April 2016, will connect the C-358 seepage collection canal to the existing C-357 Canal, upstream of S-357. Construction of the 8.5 SMA features, as described in the July 2000 GRR and Final Supplemental EIS was completed in 2008 prior to completion of the proposed full build-out of the C-111 South Dade NDA.

Much of the MWD Project has been completed, including the 8.5 SMA Project, construction of S-355A and B, S-333 and S-334 modifications, S-356, Tiger Tail camp raising, removal of four miles of the L-67 Extension Levee, and Tamiami Trail modifications. However, some features originally included in the 1992 MWD GDM and Final EIS, including features to provide hydrologic connectivity between WCA 3A and WCA 3B and complete degradation of the L-67

Extension Levee and adjacent canal, have not been completed for various reasons, including operational (water levels) constraints within WCA 3B, lowered MWD maximum operational stages for the L-29 Canal (9.7 feet NGVD was assumed with the 1992 MWD GDM and Final EIS), and potential water quality concerns. The Corps continues to work with Department of Interior (DOI) on evaluating, based on a technical analysis, whether the constructed features and the features currently under construction satisfy the goals of the statute.

The C-111 South Dade Project is part of the C&SF Project authorized by Section 203 of the Flood Control Act of 1948, Public Law 80-858, as modified by Section 203 of the Flood Control Act of 1968, Public Law 90-483. The C-111 South Dade Integrated GRR and EIS were published in May 1994 (USACE 1994). This report described a plan to construct five pump stations and a levee-bounded retention/detention area to be built west of the L-31N Canal, between the 8.5 SMA and the Frog Pond Area (south of S-332D), to control seepage out of ENP and reduce damaging freshwater discharges to Manatee Bay/Barnes Sound while maintaining flood protection to agricultural lands east of C-111 Canal (**Figure 1-1**). The 1994 GRR plan also proposed a spreader canal, plugs in the C-109 and C-110 Canals, and degradation of the spoil mound south of the C-111 Canal to provide overland flow into the ENP Eastern Panhandle towards northeast Florida Bay. The existing configuration of these structural features are described in detail in the 2006 Interim Operational Plan (IOP) for Protection of the Cape Sable Seaside Sparrow (CSSS) Final Supplemental EIS (USACE 2006) and the 2012 EA for the expansion of the C-111 South Dade NDA (USACE 2012b).

Constructed features of the C-111 South Dade Project include the retention/detention area (also referred to as the Southern Detention Area, or SDA); the southern portion of the NDA (S-332B NDA); and pump stations S-332B, S-332C and S-332D. The remaining features of the C-111 South Dade Project currently planned to be constructed are: Contract 8, the NDA which will link the C-111 South Dade Project to the MWD Project 8.5 SMA detention area; and Contract 9, which includes but is not limited to additional plugging of the L-31W Canal, Richmond Drive renovations, and modification of the outlet weirs (S-360E and S-360W) for the 8.5 SMA detention area. The proposed C-111 NDA will be created by extending the existing L-315 north levee (NDA western perimeter levee) and realigning and extending the L-316 levee (NDA eastern perimeter levee), with both levees connected to the 8.5 SMA detention area perimeter levees. L-318 (an earthen flowway berm) would also be constructed within the interior of both the NDA and SDA, with the intention of creating a narrow interior flow-way to maintain the hydraulic ridge during periods of limited water availability. Following completion of the C-111 South Dade NDA and modification of the outlet weirs for the 8.5 SMA detention area, the 8.5 SMA detention area will discharge directly into the NDA; these features are currently scheduled for completion in Fiscal Year 2017, concurrent with the planned duration of the Increment 1 field test.

The WRDA of 2000 Section 601(b)(1)(A) approved the Comprehensive Everglades Restoration Plan (CERP) as a framework for modifications to the C&SF Project that are needed to restore, preserve, and protect the south Florida ecosystem while providing for other water-related needs of the region, including water supply and flood protection. The C-111 Spreader Canal Western Project is one of the projects that make up the CERP. The C-111 Spreader Canal Western Project Final Integrated Project Implementation Report (PIR) and EIS were published in January

2011 (USACE 2011a). The project was authorized in the Water Resources Reform and Development Act (WRRDA) of 2014. The C-111 Spreader Canal Western Project is located in southern Miami-Dade County, in an area bounded by ENP, the Florida City-Homestead area, and Manatee Bay. Components of the project include construction of a six-mile hydraulic ridge between Taylor Slough and the C-111 Canal to reduce seepage loss from Taylor Slough and its headwaters. Implementation of the project will improve the quantity, timing and distribution of water delivered to Florida Bay via Taylor Slough; improve hydroperiods and hydropatterns in the Southern Glades and Model Lands; and return coastal salinities to historical recorded conditions through the redistribution of water that is currently discharged to the Atlantic Ocean and Gulf of Mexico. The hydraulic ridge will be created by constructing a 590 acre above ground detention area in the Frog Pond area (south of S-332D) and by installing two 225 cubic feet per second (cfs) pump stations (S-199 and S-200), and integrating other C-111 Spreader Canal Western Project features (**Figure 1-1**). The project will also begin restoration of the Southern Glades and Model Lands with an operable structure in the lower C-111 Canal (S-198), incremental operational changes to increase stages upstream of the S-18C structure, a plug at S-20 A, operational changes at the S-20 structure, and construction of earthen plugs at the C-110 Canal.

The South Florida Water Management District (SFWMD) has implemented features of the C-111 Spreader Canal Western Project under the State Expedited Construction program (*i.e.* Accelerate Everglades Restoration Project [Acceler8]) for the purpose of expediting design and construction of a number of critical restoration projects consistent with the CERP. A Department of Army permit (SAJ-2005-9856 [IP-AAZ]) was issued to the SFWMD on October 14, 2009 for the construction and operation of the project. Initial construction of the C-111 Spreader Canal Western Project was completed in January 2012 with completion of the Frog Pond Detention Area, partial Aerojet Canal features, plugs in the C-110 Canal, and a plug at S-20A. Construction of the remaining two southern weirs along the Aerojet Canal began in November 2014 and will be completed in early 2015. Construction of a new water control structure in the lower C-111 Canal (*i.e.* S-198, which would be located south of S-18C) and incremental increases in the open/close stage triggers at S-18C have not yet been implemented. Steps will be taken in the future to incorporate the project into the federally authorized C&SF Project once the project's consistency with the 2014 WRRDA authorized project has been documented and approved by the Corps, and a Project Partnership Agreement with the SFWMD has been executed. Concurrent with the Increment 1 field test, the SFWMD will continue to operate their expedited C-111 Spreader Canal Western Project, and the SFWMD will continue to monitor the impacts of the project and ensure protection of privately-owned lands in the vicinity of the C-111 Spreader Canal Western Project.

Operations in the project area are currently governed by the WCAs, ENP and the ENP to SDCS Water Control Plan (USACE 2012c). The Corps, Jacksonville District, is initiating the Gage-3273 (G-3273) and S-356 operations field test to raise the current operational stage constraint for inflows to NESRS at G-3273 gage, and operate the S-356 pump station for control of seepage into the L-31N Canal. The field test will also implement a testing protocol to assist in defining operating criteria for the new 8.5 SMA S-357N water control structure following completion of construction. The MWD Increment 1 field test will be the first increment in a series of three related, sequential efforts that will result in a comprehensive integrated water control plan,

referred to as the Combined Operating Plan (COP), for the operation of the water management infrastructure associated with the MWD and C-111 South Dade Projects.

The incremental approach to the development of the COP will 1) allow interim benefits towards restoration of the natural systems, 2) reduce uncertainty of operating the components of the MWD and C-111 South Dade Projects, and 3) provide information to complete the COP efficiently. The increments include conducting field tests for existing structures, developing operating criteria for existing and planned structures, and ultimately updating the WCAs-ENP-SDCS Water Control Plan (USACE 2012c).

The first increment will maintain the current 7.5 feet National Geodetic Vertical Datum of 1929 (NGVD) maximum operating limit in the L-29 Canal. Hydrologic modeling is not planned to support development of operational criteria for the first increment of the field test. Information and operational criteria identified from the field test (Increment 1) will be used to develop an expanded set of operations and monitoring criteria for a subsequent operational field test (Increment 2) that will raise the maximum operating limit in the L-29 Canal level above 7.5 feet NGVD, up to a maximum of 8.5 feet NGVD, as outlined in the 1992 MWD GDM and Final EIS (USACE 1992). Operational changes based on Increment 1 are planned to be incorporated into the 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c) prior to implementing the operational strategy for Increment 2 as appropriate. The third increment is development of the COP that incorporates constructed features of the MWD and C-111 South Dade Projects into the WCAs-ENP-SDCS Water Control Plan (USACE 2012c). Increment 3, development of the COP, will be informed by the Increment 1 and Increment 2 field tests.

1.4 PROJECT NEED OR OPPORTUNITY

The overarching project need is to increase the availability of S-333 for water deliveries from WCA 3A to ENP through NESRS for the benefit of natural resources. A small incremental step toward achieving that goal is to reduce the number of times S-333 discharges are limited by the existing G-3273 stage constraint of 6.8 feet NGVD. G-3273 lies within eastern ENP, approximately 2.5 miles west of the 8.5 SMA (**Figure 1-1**). The G-3273 constraint of 6.8 feet NGVD was originally established as a flood protection measure. A stage of 6.8 feet NGVD at this gage has been used since 1985 as a trigger to cease S-333 discharges from flowing south into NESRS as a protective measure for residential areas to the east, particularly the 8.5 SMA. Since many of the MWD features have been built, including the seepage collection canals, pump station and protective levee around the 8.5 SMA and the Tamiami Trail roadway modifications, there are more opportunities to begin relaxation of the G-3273 constraint and associated increased water deliveries from WCA 3A into NESRS.

The releases from S-333 are part of a regulation schedule for WCA 3A and are typically dependent on the Rainfall Formula for Rain-Driven Water Deliveries to ENP via NESRS (collectively referred to as the Rainfall Plan) outlined in the 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c). This Rainfall Plan consists of a rainfall-based (non-regulatory) component and a supplemental regulatory component that specifies the amount of water to be delivered to ENP in weekly volumes through the S-333 and S-12s. Currently, the normal target flow distribution is 55% through S-333 into NESRS and 45% through the S-12s into ENP west of the L-67 Extension Levee; however, during the dry season, non-regulatory target flows may

be increased to 80% through S-333 and 20% through the S-12 structures. Releases through the S-333 are limited by the constraint at G-3273 under the 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c). Therefore, when G-3273 is below 6.8 feet NGVD, 55% of wet season and 80% of dry season Rainfall Plan target flow is released into NESRS. However, when G-3273 is above 6.8 feet NGVD, the delivery of a net inflow of water to NESRS by S-333 is discontinued. Under this condition, S-334 may be used to pass all or partial S-333 flows to the SDSCS, although water from WCA 3A will bypass NESRS. When S-333 is closed and partial flows cannot be passed through S-334, the volume of flow that could not be delivered at S-333 shifts to the S-12s. In this manner, the G-3273 constraint limits the volume of water entering NESRS. The proposed modification to the G-3273 constraint is anticipated to reduce the number of times that S-333 discharge to NESRS is restricted and increase the number of times the maximum (*i.e.* 55% of wet season or 80% of dry season) Rainfall Plan deliveries from WCA 3 through S-333 into NESRS are achieved. Additional details regarding regional water management are provided in **Section 3.6**.

The 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c) does not contain water management operating criteria for the planned spillway (S-357N) located in the 8.5 SMA upstream of S-357, at the intersection of C-357 and the newly constructed seepage collection canal (C-358) (**Figure 1-1**). The 2012 Design Refinement for the 8.5 SMA EA did not address water management operating criteria for S-357N or C-358 and stated that all gates would be in the closed position until a new operational protocol is developed for the MWD Project (USACE 2012a). Interim water management operating criteria for the planned 8.5 SMA gated culvert S-357N will be implemented in conjunction with Increment 1, including potential operational adjustments if the C-111 South Dade NDA and SDA are available during the field test.

Information obtained from Increment 1 is planned to be codified within the 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c). In addition, information obtained through Increment 1 will be used to support development of a second field test (Increment 2) and subsequent consideration of future incremental modifications to the WCAs-ENP-SDCS Water Control Plan (USACE 2012c).

1.5 AGENCY GOALS AND OBJECTIVES

The objectives of Increment 1 are defined below:

- A. Improve hydrological conditions in NESRS through the relaxation of the G-3273 stage criteria to increase water deliveries from WCA 3A to NESRS, while maintaining other C&SF Project authorized purposes.
- B. Use the S-356 pump station to manage seepage from NESRS to the L-31N Canal resulting from the relaxation of the G-3273 stage constraint on S-333, in conjunction with increased flows through the S-333 spillway to NESRS via the L-29 Canal.
- C. Improve hydrological conditions in NESRS by maximizing the flexibility and efficiency of the existing infrastructure, including use of seepage management (e.g., S-356) to complement inflows to NESRS from WCA 3A.

- D. Gather and analyze infrastructure performance, ecologic, hydrologic and water quality data sufficient to support Increment 2, resulting in the following:
- i. Data gathering sufficient to support water quality certification
 - ii. Refined operational criteria for the MWD and C-111 South Dade Projects
 - iii. Updates to the 2012 Water Control Plan

1.6 OPERATIONAL CONSTRAINTS

The following operational constraints apply to the Increment 1:

- A. L-29 Canal maximum operating limit of 7.5 feet NGVD, pending future acquisition of real estate interests along Tamiami Trail and additional National Environmental Policy Act (NEPA) documentation
- B. Maintain the authorized purposes of the C&SF Project and subsequent modifications to include:
- i. MWD Project
 - ii. C-111 South Dade Project
 - iii. CERP
- C. No reduction in current flood protection
- D. Maintain the current multi-species objectives of the 2012 Water Control Plan and comply with the requirements of the applicable biological opinion from the U.S. Fish and Wildlife Service (USFWS), to include the Everglades Restoration Transition Plan (ERTP) and the CERP C-111 Spreader Canal Western Project

1.7 RELATED ENVIRONMENTAL DOCUMENTS

The Corps has documented a number of environmental documents relevant to the Proposed Action:

- *General Design Memorandum and Environmental Impact Statement, Modified Water Deliveries to Everglades National Park*, U.S. Army Corps of Engineers, Jacksonville District, June 1992
- *C-111, Central and Southern Florida Project for Flood Control and Other Purposes, Final General Reevaluation Report and Environmental Impact Statement*, U.S. Army Corps of Engineers, Jacksonville District 1994
- *1998 Emergency Deviation from Test 7 of the Environmental Program of Water Deliveries to Everglades National Park to Protect the Cape Sable Seaside Sparrow, Central and Southern Florida Project for Flood Control and Other Purposes, Final Environmental Assessment*, U.S. Army Corps of Engineers, Jacksonville District, 1999
- *Jeopardy and Adverse Modification Biological Opinion on the Modified Water Delivery to Everglades National Park Experimental Program to Everglades National Park and*

Canal-111 South Dade Projects, U.S. Fish and Wildlife Service, Vero Beach, Florida 1999

- *General Reevaluation Report and Final Supplemental Environmental Impact Statement, 8.5 Square Mile Area*, U.S. Army Corps of Engineers, Jacksonville District, July 2000
- *Central and Southern Florida Project for Flood Control and Other Purposes, Interim Structural and Operational Plan, Emergency Deviation from Test 7 of the Experimental Program of Water Deliveries to Everglades National Park for Protection of the Cape Sable Seaside Sparrow Final Environmental Assessment*, U.S. Army Corps of Engineers, Jacksonville District, 2000
- *Interim Operating Plan for the Protection of the Cape Sable Seaside Sparrow Final Supplemental Environmental Impact Statement*, U.S. Army Corps of Engineers, Jacksonville District, 2002
- *Biological Opinion, Final Interim Operating Plan*, U.S. Fish and Wildlife Service, Vero Beach, Florida, November 17, 2006
- *Interim Operational Plan for the Protection of the Cape Sable Seaside Sparrow Final Supplemental Environmental Impact Statement*, U.S. Army Corps of Engineers, Jacksonville District, December 2006
- *C-111 Engineering Documentation Report*, U.S. Army Corps of Engineers, Jacksonville District, May 2007
- *Draft Environmental Assessment; Design Modifications for the Canal 111 Project*, U.S. Army Corps of Engineers, Jacksonville District, June 2007
- *Modified Water Deliveries to Everglades National Park Tamiami Trail Modifications Final Limited Reevaluation Report and Environmental Assessment*, U.S. Army Corps of Engineers, Jacksonville District, June 2008
- *Draft Environmental Assessment; Proposed Interim Operating Criteria for 8.5 Square Mile Area Project*, U.S. Army Corps of Engineers, Jacksonville District, November 2008
- *Revised Draft Environmental Assessment; Proposed Interim Operating Criteria for 8.5 Square Mile Area Project*, U.S. Army Corps of Engineers, Jacksonville District, April 2009
- *Canal-111 Spreader Canal Project Implementation Report*, U.S. Army Corps of Engineers, Jacksonville District, 2009
- *Biological Opinion, Canal-111 Spreader Canal*, U.S. Fish and Wildlife Service, Vero Beach, Florida, August 25, 2009
- *Biological Opinion, Everglades Restoration Transition Plan*, U.S. Fish and Wildlife Service, Vero Beach, Florida, November 17, 2010
- *Central and Southern Florida Project Comprehensive Everglades Restoration Plan C-111 Spreader Canal Western Project Final Integrated Project Implementation Report and Environmental Impact Statement*, U.S. Army Corps of Engineers, Jacksonville District, January 2011
- *Environmental Assessment; Proposed Interim Operation Criteria for 8.5 Square Mile Area Project*, U.S. Army Corps of Engineers, Jacksonville District, June 2011
- *Environmental Assessment; Design Refinement for the 8.5 Square Mile Area*, U.S. Army Corps of Engineers, Jacksonville District, August 2012

- *Environmental Assessment for Expansion of C-111 Detention Area and Associated Features South Miami-Dade County*, U.S. Army Corps of Engineers, Jacksonville District, May 2012
- *Everglades Restoration Transition Plan Final Environmental Impact Statement*, U.S. Army Corps of Engineers, Jacksonville District, October 19, 2012

Information contained within the previous NEPA documents listed above, as well as others described later, is incorporated by reference into this EA.

1.8 DECISIONS TO BE MADE

This EA will evaluate whether to modify the G-3273 constraint, and if so, evaluate alternatives to accomplish that goal. The No Action Alternative and other reasonable alternatives will be studied in detail to determine the Preferred Alternative. The adoption of the Preferred Alternative for the field test is the primary decision that must be made.

1.9 SCOPING AND ISSUES

A letter soliciting comments was distributed for this action to request assistance in identifying issues and resources to be considered during the scoping process. Copies of this letter were mailed to Federal and state agencies, tribal representatives, and members of the general public on June 30, 2014. A list of recipients is provided in **Section 6.3**. Comments were accepted through July 14, 2014 and are briefly summarized below. Further information can be found in **Appendix D**.

- Florida Power and Light (FPL) presented concerns regarding potential impacts to property within NESRS as a result of increased flooding and/or storage of water resulting from the field test. Reference was made to the need to complete the congressionally authorized land exchange by which the Federal government would obtain the required property rights to increase flowage of water over FPL's lands.
- The Florida Department of Agriculture and Consumer Services (FDACS) requested that operational changes to the C-111 Canal structures, including S-18C and S-197, be included as part of the field test. FDACS stated that the agricultural economy in Miami-Dade County has been repeatedly harmed by elevated water levels that adversely impact growers due to the lack of operational integration between the WCAs, ENP and SDGS.
- The National Parks Conservation Association (NPCA) is in support of the goal of the MWD Project to reestablish a natural flow of water to NESRS and is pleased that the Corps is moving forward with the field test.
- The Florida Fish and Wildlife Conservation Commission (FWC) remains supportive of the Corps effort to reduce high water levels in the WCAs and increase flows to NESRS. Prior guidance for managing water levels in the Everglades and Francis S. Taylor Wildlife Management Area was provided.
- The SFWMD is supportive in the development of a water control plan that will reduce prolonged high water events in WCA 3A and ensure that the necessary water is delivered to ENP, while at the same time providing continued protection of agricultural and urban areas in southern Miami-Dade County. However, concerns were presented regarding the amount of time it will take to arrive at the final Water Control Plan for the MWD and C-

111 South Dade Projects. The SFWMD requested that additional operational flexibility is afforded during the 2014 wet season, including changes to the operation of the S-197 and a short duration pump test of S-356.

- Representatives from Miami-Dade County Department of Public Works and Waste Management fully support Everglades restoration efforts, but presented concerns regarding changes to maximum canal stage limits without additional mitigation to maintain baseline levels of service for flood protection.
- The Florida Department of Environmental Protection (FDEP) requested that previous regulatory comments on prior proposals for G-3273 relaxation and S-356 pump station testing be included in developing the scope of the field test, as applicable. The FDEP expects to work diligently with the Corps to address issues throughout the planning process.

Additional comments were received during the formulation of alternative plans. Representatives from Audubon Florida, Clean Water Action, the Everglades Foundation, NPCA, Sierra Club, and the Tropical Audubon Society provided concerns regarding inclusion of operations within the field test that would lower water levels at S-18C or allow releases from S-197. In a letter dated November 17, 2014 (**Appendix D**), representatives from the above mentioned groups objected to operational elements that would reverse the phased implementation of the C-111 Spreader Canal Western Project. Their letter stated that proposals that lower water levels in the C-111 Canal and divert water to Biscayne Bay decrease benefits of an important restoration project fast-tracked by the SFWMD and recently authorized by Congress, and potentially do environmental damage.

1.10 PERMITS, LICENSES, AND ENTITLEMENTS

Information regarding the Increment 1 field test has been submitted to the FDEP per specific condition 18 of the Comprehensive Everglades Restoration Plan Regulation Act (CERPRA) permit number 0246512-10. FDEP has issued testing approval for Increment 1 testing operations associated with the S-356 pump station. The Proposed Action requires a Coastal Zone Management Act (CZMA) consistency determination (**Appendix B**). All required permits and/or modifications to existing permits would be acquired prior to implementation of the field test to satisfy the requirement for water quality certification under the Clean Water Act. The permits/authorizations/permit modifications currently expected to be needed to support this test are listed below.

1. Modification to File No. 0306639-002, S-197 Control Structure Project, Environmental Resource Permit, SFWMD permit
2. Modification to File No. 0246512-010 or otherwise a modification to the most current permit that will soon be File No. 0246512-003, Modified Water Deliveries to the Everglades National Park Project, CERPRA permit, Corps permit
3. Modification to File No. 0317442-002, 8.5 SMA S-357 Pump Station Project, CERPRA permit, SFWMD permit
4. New Permit File No. 0246512-008, C-111 South Dade Project, Contract 8 Phase, CERPRA permit, Corps permit

2.0 ALTERNATIVES

2.1 DESCRIPTION OF ALTERNATIVES

Each of the following alternatives described below were considered and evaluated as the field test was developed. Alternatives differ based on: (1) the degree of relaxation of the G-3273 stage constraint; (2) use of Column 2 operations as defined in the 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c); and (3) inclusion of operational changes to C-111 Canal structures S-197 (triggers at S-18C Headwater [HW] or S-178 Tailwater [TW]). A summary description of the alternatives is provided in **Table 2-1**. Alternatives B, C, and D are identified as conceptual alternatives; these alternatives were identified as being potentially viable pending further refinement.

The field test will maintain the current operating limit constraint of 7.5 feet NGVD in the L-29 Canal, while relaxing the G-3273 stage constraint and utilizing S-356 for control of seepage to the L-31N Canal. It is anticipated that during the field test, the combined flows to NESRS through S-333 and S-356 will be more than what would have otherwise been discharged through S-333 under current operations. Additionally, it is expected that during implementation of water management operations associated with the field test, under typical hydro-meteorological conditions, the combined flows through S-173 and S-331 to the C-111 Basin will be less than what would have been discharged through these features currently. Field test water management operations may result in increased seepage to the L-31N Canal south of the S-331 pump station, prior to the construction and operation of the C-111 South Dade Project NDA. No changes to water supply operations are proposed. S-355A and S-355B may also be utilized to discharge to the L-29 Canal as indicated under current operations and other future associated permit requirements, if available for use.

The field test will also implement a testing protocol to assist in defining operating criteria for the new 8.5 SMA S-357N water control structure following completion of construction. The testing protocol is the same for each of the Action Alternatives listed below. The testing protocol for S-357N during the field test is designed to establish the operating criteria for S-357N. A newly installed staff gage at the western end of C-358 will be observed during S-357 pumping. The testing protocol for S-357N will be an iterative approach consisting of 4 to 5 weeks of gate changes during the wet season. The S-357N gate changes will be meant to test the hydrologic response of the system to minor adjustments in operations at S-357N. Operational limits for the test phase are further defined in **Appendix A**.

Field test duration is planned for approximately two years, with a minimum duration of one year. The Increment 1 field test will initiate when hydrologic conditions allow for relaxation of G-3273 above 6.8 feet NGVD consistent with the objectives of this field test. The field test may be implemented as early as June 2015. If the 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c) is not updated prior to the conclusion of the field test period, operations will revert to ERTTP in accordance with the 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c).

There are three distinct modes of water management operations specified in the WCAs-ENP-SDCS Water Control Plan (USACE 2012c): Column 1, Column 2, and water supply. As defined in the 2002 IOP for the Protection of the CSSS (IOP 2002 and IOP Supplement 2006) and

retained through the 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c), Column 1 is the condition when regulatory releases from WCA 3A can be met by normal operation of the WCA 3A regulatory outlets (S-12s, S-333, S-344, S-343s, S-151). Column 2 is the condition when regulatory releases from WCA 3A are made via S-333 to the L-29 Canal and via S-334 to the L-31N Canal and the SDCS. Column 2 operations generally require the use of pumping stations S-331, S-332B, S-332C, and S-332D. During Column 2 operations, the control stages along the L-31N Canal are also lowered to minimize potential flood impacts to the SDCS and also to provide the necessary downstream gradient for the S-334 releases to reach S-332B, S-332C, and S-332D pump stations. Column 2 operations were initially established under IOP 2002 to offset or mitigate for potential adverse effects on WCA 3A related to actions taken to protect CSSS sub-population A within western ENP, including seasonal closure of the S-12A, S-12B, and S-12C regulatory outlets under IOP. Under historical IOP and ERTTP operations, the Column 2 mode of operations has also been used as an additional water management tool for WCA 3A high water conditions.

The 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c), which includes the operational guidance for the ERTTP, modified the WCA 3A Regulation Schedule from IOP, including the lowering of the top zone (Zone A) of the Regulation Schedule, the expansion of Zone E1, and removal of the seasonal closure of S-12C. These changes were expected to reduce the need for S-334 releases from WCA 3A to the SDCS during Column 2 operations. Relaxation of the G-3273 constraint under the field test is expected to further decrease reliance on Column 2 (S-334) operations as a water management tool for WCA 3A. Alternatives considered under the field test have been developed to incorporate additional limitations on the conditions under which Column 2 operations discharging WCA 3A releases through S-334 to the SDCS may be used. Operational modifications to Column 2 operations are included under Alternatives C through G.

A letter soliciting comments was distributed for this action to request assistance in identifying issues and resources to be considered during the scoping process. During the comment period and planning stages of the project, FDACS and the SFWMD requested inclusion of operational changes to the C-111 Canal structures, including S-18C and S-197, within the field test due to their concerns over water levels experienced within agricultural lands located east of ENP (**Section 1.9** and **Appendix D**). Since not all flood mitigation and seepage management features envisioned in the MWD and C-111 South Dade Projects are constructed, the field test Action Alternatives include consideration of additional water management operating criteria for features of the SDCS. Operational changes to S-197 proposed by the SFWMD and FDACS are included under Alternatives E and G.

Increased flood control releases from S-18C and S-197 were included within Alternatives E and G to mitigate for potential risks to flood protection for areas within South Miami-Dade County which may be affected during the field test by changes to the basin inflows from the S-331 pump station and increased seepage to the L-31N Canal south of the S-331 pump station, prior to the construction and operation of the C-111 South Dade Project NDA. The proposed monitoring plans for surface water hydrology and ground water hydrology will provide data to analyze the net effects within the L-31N Basin (south of S-331 and north of S-176) and the C-111 Basin (south of S-176) from changes to the basin inflows from the S-331 pump station and increased

seepage to the L-31N Canal south of S-331, including the capability of the S-332B/C/D pump stations and the C-111 South Dade SDA to manage potential additional flows into the L-31N Canal under certain operational conditions. Operating criteria for S-197 will be reassessed once construction of the C-111 South Dade NDA is constructed and operable, and/or upon completion of the Increment 1 field test. It is the intention of the Corps that the operating criteria for S-197 will revert to the current 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c) once all features of the C-111 South Dade and MWD Projects are constructed and operational, if supported by the analysis of the data collected during the field test.

TABLE 2-1. ALTERNATIVE DESCRIPTIONS

ALTERNATIVE	G-3273 STAGE CONSTRAINT	C&SF OPERATIONAL CHANGES	COLUMN 2 OPERATIONS
A	NO	NO	Column 2 Operations to manage WCA 3A during S-12 Seasonal Closure Period and high water as conducted under IOP/ERTP
B	Calendar Based Restrictions	S-333, S-334, S-356, S-357N	Same as A
C	Relaxed up to 7.5 Feet NGVD; No Calendar Based Restrictions	Same as B	Column 2 Operations to manage WCA 3A during S-12 Seasonal Closure Period
D	Same as C	Same as B	No Column 2 Operations at S-334
E	Same as C	S-333, S-334, S-356, S-357N, S-197	Limited Column 2 Operations during S-12 Seasonal Closure Period and conditional extension to August 15th
F	Same as C	Same as B	Same as E
G	Same as C	Same as E*	Same as E

*Alternative G differs from Alternative E based on the trigger location used to define opening criteria for S-197 discharges and reduced IOP/ERTP Level 1 S-197 opening from 800 cfs to 500 cfs.

2.1.1 Alternative A: No Action Alternative

The No Action Alternative would continue current C&SF water management operations as defined in the 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c). The G-3273 constraint would remain at 6.8 feet NGVD. Column 2 operations would continue to be used to manage WCA 3A during the S-12 seasonal closure period (01 November through 14 July) and high water as conducted under IOP/ERTP. The 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c) does not contain water management operating criteria for S-357N. S-357N would not be operational under the No Action Alternative. S-197 would continue to operate as defined in the 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c).

2.1.2 Alternative B: Incremental Relaxation of G-3273 Constraint

The 2012 WCAs-ENP-SDCS Water Control Plan will continue to govern water management operations during the field test period under Alternative B with the exception of operating criteria for S-333, S-334, S-356, and S-357N. The G-3273 stage constraint will be modified to include calendar based restrictions based on rainfall events throughout the year. For this alternative, releases from S-334 will continue to include both water supply deliveries to the SDCS and Column 2 operations under the 2012 WCAs-ENP-SDCS Water Control Plan. Column 2 operations would continue to be used to manage WCA 3A during the S-12 seasonal

closure period and high water as conducted under IOP/ERTP. G-3273 criteria will be implemented as shown in **TABLE 2-2**, and the S-356 pump station may be used to manage stages in the L-31N Canal when the stage at G-3273 exceeds 6.8 feet NGVD and is below the monthly criteria in **TABLE 2-2**. S-197 would continue to operate as defined in the 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c). Operational criteria for S-357N are the same as that described in **Section 2.1** and **Appendix A**.

TABLE 2-2. G-3273 TARGETED CRITERIA FOR ALTERNATIVE B*

January	February	March	April	May	June	July	August	September	October	November	December
7.2	7.2	7.0	7.0	6.9	6.9	7.0	7.1	7.3	7.5	7.4	7.3

* Elevations are in feet NGVD of 1929.

2.1.3 Alternative C: Relaxation of G-3273 Constraint up to 7.5 Feet NGVD

Similar to Alternative B, the 2012 WCAs-ENP-SDCS Water Control Plan will continue to govern water management operations during the field test period under Alternative C with the exception of operating criteria for S-333, S-334, S-356, and S-357N. The G-3273 stage constraint will be relaxed up to 7.5 feet NGVD. Calendar based restrictions, as included under Alternative B, would not be implemented. For this alternative, releases from S-334 will continue to include both water supply deliveries to the SDCS and Column 2 operations under the 2012 WCAs-ENP-SDCS Water Control Plan. Column 2 operations would continue to be used to manage WCA 3A during the S-12 seasonal closure period. However, different from Alternative A and Alternative B, Column 2 operations would not be used to manage high water outside of the S-12 seasonal closure period. G-3273 criteria will be implemented as shown in **Table 2-3** and the S-356 pump station may be used to manage stages in the L-31N Canal when the stage at G-3273 exceeds 6.8 feet NGVD and is below the monthly criteria in **Table 2-3**. S-197 would continue to operate as defined in the 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c). Operational criteria for S-357N are the same as that described in **Section 2.1** and **Appendix A**.

TABLE 2-3. G-3273 TARGETED CRITERIA FOR ALTERNATIVE C*

January	February	March	April	May	June	July	August	September	October	November	December
7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5

* Elevations are in feet NGVD of 1929.

2.1.4 Alternative D: Relaxation of G-3273 Constraint and Removal of Column 2 Operations at S-334

The 2012 WCAs-ENP-SDCS Water Control Plan will continue to govern water management operations during the field test period under Alternative D with the exception of operating criteria for S-333, S-334, S-356, and S-357N. The G-3273 stage constraint will be relaxed up to 7.5 feet NGVD. Calendar based restrictions, as included under Alternative B, would not be implemented. For this Alternative, releases from S-334 will be limited to dry season water supply deliveries to Taylor Slough, the L-31N and C-111 Canals. The L-31N Canal will be

maintained at the same levels as those intended in the 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c), including both Column 1 and Column 2 operational criteria; however, S-334 would not be operated to discharge regulatory releases from WCA 3A at S-333 to the SDCS under any conditions. G-3273 criteria will be implemented as shown in **Table 2-4**. S-197 would continue to operate as defined in the 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c). Operational criteria for S-357N are the same as that described in **Section 2.1** and **Appendix A**.

TABLE 2-4. G-3273 TARGET CRITERIA FOR ALTERNATIVE D*

January	February	March	April	May	June	July	August	September	October	November	December
7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5

* Elevations are in feet NGVD of 1929.

2.1.5 Alternative G: Relaxation of G-3273 Constraint and Operational Criteria Changes at S-197 (Trigger S-178 TW)

The 2012 WCAs-ENP-SDCS Water Control Plan, including the WCA 3A Regulation Schedule, Rainfall Plan, and Interim Operating Criteria for the 8.5 SMA Project will continue to govern water management operations during the field test period under Alternative G with the exception of operating criteria for S-333, S-334, S-356, S-197, and S-357N. The G-3273 stage constraint will be relaxed up to 7.5 feet NGVD. Both S-333 and S-356 releases to the L-29 Canal will be subject to this constraint. Calendar based restrictions, as included under Alternative B, would not be implemented. Operational criteria for S-357N are the same as that described in **Section 2.1** and **Appendix A**.

For this field test, releases from S-334 will continue to include both water supply deliveries to the SDCS and Column 2 operations under the 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c). Column 2 operations at S-334 would continue to be used to manage WCA 3A during the S-12 seasonal closure period and under limited conditions, Column 2 operations may be used outside of the S-12 seasonal closure period up until August 15th as described in **Appendix A**. Column 2 operations at S-334 would not be used to manage high water between August 16th and October 31st, as may be periodically conducted under IOP/ERTP. The SDCS canals may be operated using Column 2 open/close criteria when the WCA 3A stage is above the Increment 1 Action Line as described in **Figure 2-1** and **Appendix A** (S-356 is off under this condition) and S-333 discharges to NESRS are maximized, to mitigate for potential flood impacts in SDCS that may result from increased stages within NESRS and concurrent restrictions on S-356 pump operation.

The 6.8 feet NGVD water level at G-3273 and the WCA 3A stage level (as measured using the average of monitoring gauges 63, 64, and 65, which is also referenced as the WCA 3A three gage average stage) will be utilized to define the priority of releases from S-333 and S-356 to the L-29 Canal and NESRS as described in **Table 2-6** below. In addition, the Increment 1 Action Line as shown in **Figure 2-1** and **Appendix A** is a seasonally varying WCA 3A water level (10.0 to 10.75 feet NGVD) which will also serve to define the S-333 and S-356 releases to the L-29

Canal and NESRS. Water management operations for the C&SF system are further defined in **Appendix A** and **Table 2-6**.

Additional detail is being provided for the operational criteria used to define the additional S-197 discharges within the main body of this EA, for purposes of comparison to Alternative E below. Alternative G is consistent with Alternative E, in that additional S-197 discharges would only occur under conditions when the WCA 3A stage is above the Increment 1 Action Line (**Figure 2-1** and **Appendix A**) and S-18C is fully open. Under these conditions, operational criteria used to define S-197 discharges are as follows:

- Operation of S-197 based on S-177 HW stage criteria remains unchanged from the 2012 WCAs-ENP-SDCS Water Control with the expectation that the available capacity at S-200 and S-199 will be used as specified under the C-111 Spreader Canal Western Project.
- When S-18C HW is 2.25 feet NGVD, S-18C will be opened in accordance with use of Column 2 operational criteria for SDCS canals when the WCA 3A stage is above the Increment 1 Action Line (S-334 may be closed).
- When the S-18C HW stage is greater than 3.1 feet NGVD, S-197 target flow will be determined according to the 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c).
- For the field test, additional criteria will be used which prescribe small discharges expected to assist in moderating high stages in the C-111 Canal and S-197 discharges (**Table 2-5**). In place of S-18C HW criteria when S-18C HW is below 3.1 feet NGVD, S-197 will be operated based upon S-178 TW stage as prescribed below only when the S-18C gates are fully open and S-178 TW equals or exceeds 2.5 feet NGVD. These additional S-197 operating criteria reduce how much S-197 is opened for the first level (normally S-197 opened to one third of S-197 capacity) while leaving the criteria for the second level (two thirds open) and third level (full open) unchanged. The reduction in discharge for level one opening of S-197 is from approximately 800 cfs to 500 cfs.

TABLE 2-5. S-197 OPERATING CRITERIA

S-178 TW (feet, NGVD)	S-197 Target Flow (cfs) (daily time-weighted average)
2.5 to 2.6	50 to 100
2.61 to 2.7	100 to 150
2.71 to 2.9	150 to 200
Greater than 2.9	500 (reduced from ~ 800)

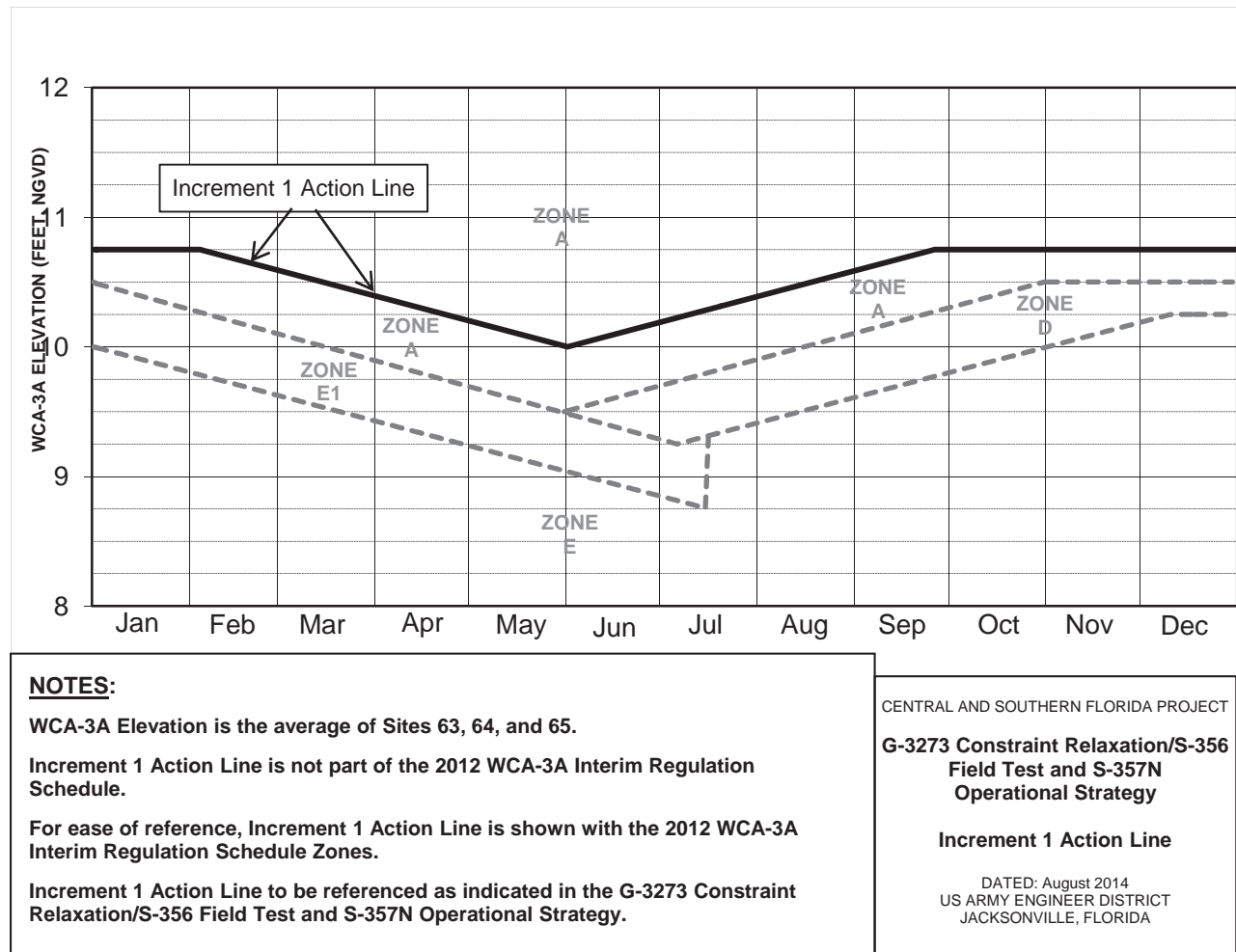


FIGURE 2-1. INCREMENT 1 ACTION LINE

2012 Water Control Plan	Structure/ Operational Component	Column 1: No WCA-3A Regulatory Releases to SDCS or SRS	Column 2: WCA-3A Releases to SDCS
	<p>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.</p>		
	<p>S-333: G-3273 less than or equal to 6.8 feet, NGVD</p>	<p>Rainfall Plan target flow for S-333 (to NESRS).</p> <p>When WCA-3A is in Zone E1 or Zone A, maximum practicable through S-333 to NESRS.</p> <p>Note: If FDOT has no roadway sub base concerns S-333 will be closed when the tailwater is above 9.0 feet, NGVD. However, when FDOT has roadway sub base 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.</p>	<p>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.</p> <p>When WCA-3A is in Zone E1 or Zone A, maximum practicable through S-333 to NESRS.</p> <p>Note: If FDOT has no roadway sub base concerns S-333 will be closed when the tailwater is above 9.0 feet, NGVD. However, when FDOT has roadway sub base 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.</p>
	<p>S-333: G-3273 greater than 6.8 feet, NGVD</p>	<p>Closed</p>	<p>Match S-333 with S-334 flows.</p>
Temporary Deviation for Increment 1	<p>S-333</p>	<p>Water supply.</p> <p>S-333 releases to L-29/NESRS subject to S-333/S-356 priority as defined in 1) thru 4) below and S-334 Temporary Deviation. This includes L-29 constraint (L-29 stage limitations); Stop flows into L-29 Canal when the L-29 Canal stage (average of S-333 TW and S-334 HW) rises above 7.5 feet, NGVD.</p> <ol style="list-style-type: none"> 1) Year-round when stage at G-3273 is below 6.8 and when WCA-3A stage is below the Increment 1 Action Line (Figure 1) (S-333 has priority; S-356 use is secondary to S-333 but S-356 can and should be used subject to L-29 stage limitations): S-333 will be used to release up to the full rate prescribed by WCA-3A Regulation Schedule and the Rainfall Plan into NESRS subject only to the L-29 constraint. 2) Year-round when stage at G-3273 is above 6.8 and the WCA-3A stage is below the Increment 1 Action Line (Figure 1) (S-356 has limited priority over S-333): S-333 will be used to release up to the full rate prescribed by the WCA-3A Regulation Schedule and the Rainfall Plan into NESRS subject to the L-29 constraint and an assured minimum available capacity of 250 cfs through S-356. If 250 cfs at S-356 is not possible due to the L-29 constraint, then S-333 releases will be reduced to allow S-356 to achieve the minimum available capacity of 250 cfs, if the S-356 capacity is needed to maintain the target stage range in L-31N. 3) When WCA-3A stage is above the Increment 1 Action Line (Figure 1) from 1 November through 14 July (S-333 has priority with no use of S-356): S-333 makes maximum releases to NESRS subject to L-29 constraint, with no dependency or other constraints (S-334 Temporary Deviation). 4) When WCA-3A stage is above the Increment 1 Action Line (Figure 1) from 15 July through 31 October (S-333 has priority with no use of S-356): S-333 makes maximum releases to NESRS subject only to L-29 constraint. 	

2012 Water Control Plan	Structure/ Operational Component	Column 1: No WCA-3A Regulatory Releases to SDCS or SRS	Column 2: WCA-3A Releases to SDCS
		Water supply	
Temporary Deviation 1 for Increment 1	S-334	Pass all or partial S-333 flows depending on stage at G-3273.	
		<p>Water supply.</p> <p>When WCA-3A stage is above the Increment 1 Action Line (Figure 1) from 1 November through 14 July * (S-333 has priority)</p> <p>When L-29 constraint is reached or exceeded, S-334 may be utilized to maintain the L-29 Canal stage at or below 7.5 feet by delivering a portion of the WCA-3A regulatory releases to the SDCS (including the use of pumping stations S-331, S-332B, S-332C, and S-332D) when the following conditions (i, ii, and iii) are met:</p> <ul style="list-style-type: none"> i) S-12C and S-12D are full open, and ii) the discharge to tide from all of the WCAs are maximized to the extent that downstream condition allow, and iii) the SDCS has available capacity (daily combined pumping rate at S-332B, C, and D is less than 1,125 cfs to maintain L-31N stage in the lower half of the range). <p>Under these conditions (i, ii, and iii), the following criteria (iv, v, and vi) will govern S-334 operation, including maximum discharge limits:</p> <ul style="list-style-type: none"> iv) When daily combined pumping at S-332B, C, and D is less than 1,125 cfs, S-334 may be utilized up to a maximum flow rate of 250 cfs. v) When daily combined pumping at S-332B, C, and D is less than 1,000 cfs (increased storage capacity may be available within the SDCS), S-334 may be utilized up to 400 cfs. vi) S-334 flows will not be constrained by S-333 flows, and there is no constraint to require matching S-333 and S-334 flows. <p>* The use of S-334 may continue long enough past the end of the S-12A and S-12B closure period (14 July) to release the volume of water that would have been released, according to the WCA-3A Regulation Schedule, had the S-12s been allowed to be open. The determination of the extent to which the S-12 closures cause water to be retained in WCA-3A beyond that expected during the pre-ISOP schedule for WCA-3A will be computed weekly by USACE water managers and reported annually by the USACE for the period from 1 November thru 14 July. When the combined WCA-3A releases from the S-12s and S-333 are less than the releases computed for the pre-ISOP schedule, a WCA-3A "discharge deficit" resulting in additional accumulation of water in WCA-3A is indicated for the period from 1 November thru 14 July. For this WCA-3A accounting computation, S-333 discharges to NESRS computed under the pre-ISOP schedule will be based on inclusion of the G-3273 constraint of 6.8 feet.</p> <p>In addition to above, the following additional criteria will govern the use of S-334 operation after 14 July:</p> <ul style="list-style-type: none"> I. When daily combined pumping at S-332B, C, and D is less than 1,125 cfs, S-334 may be utilized up to a maximum limit of 250 cfs to deliver a portion of the WCA-3A regulatory releases to the SDCS. Use of S-334 will be temporarily discontinued when daily combined pumping at S-332B, C, and D is greater than 1,125 cfs. II. Use of S-334 will be discontinued when the WCA-3A storage volume accumulated due to the discharge deficit (the balance) is discharged. S-334 discharges to the SDCS and S-333 deliveries to NESRS when G-3273 stage is above 6.8 feet (S-333 flows greater than S-334 flows) will both count as flows to be subtracted from the WCA-3A balance computed through 14 July. III. S-334 will not be used after 14 July during periods when the WCA-3A stage is below the Increment 1 Action Line. Regardless of conditions within WCA-3A or any residual WCA-3A storage deficit balance, the use of S-334 to deliver a portion of WCA-3A regulatory releases to the SDCS will be discontinued on 15 August. The WCA-3A storage deficit balance resultant from the S-12 closures, if applicable for the prior period from 1 Nov thru 14 July, will zero-out on 15 Aug and will preclude a balance carryover into the next year. IV. If more water was released from WCA-3A under Increment 1 than computed for the pre-ISOP schedule, a WCA-3A "discharge surplus" balance is indicated for the period from 1 November through 14 July, and S-334 will not be utilized for WCA-3A regulatory releases to the SDCS during the period from 15 July through 31 October. 	

Structure/ Operational Component	Column 1: No WCA-3A Regulatory Releases to SDCS or SRS	Column 2: WCA-3A Releases to SDCS										
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.												
S-197	<p>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.</p> <p>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.</p> <p>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 total of 13 open.</p> <p>Close gates when all the following conditions are met:</p> <ol style="list-style-type: none">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 basin3. 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.											
	<p>Year-round when WCA-3A stage is below the Increment 1 Action Line (Figure 1):</p> <p>If S-177 HW is greater than 4.1 feet, NGVD or S-18C HW is greater than 2.8 feet, NGVD, S-197 release 1/3 capacity.</p> <p>If S-177 HW is greater than 4.2 feet, NGVD for 24 hours or S-18C HW is greater than 3.1 feet, NGVD, S-197 release 2/3 capacity.</p> <p>If S-177 HW is greater than 4.3 feet, NGVD or S-18C HW is greater than 3.3 feet, NGVD, S-197 release full capacity.</p> <p>Close gates when all the following three conditions are met:</p> <ol style="list-style-type: none">(1.) S-176 HW is less than 5.2 feet, NGVD and S-177 HW 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 gates open necessary only to match residual flow through S-176. All gates should be closed if S-177 HW is less than 4.1 feet, NGVD after all conditions are satisfied. <p>Year-round when WCA-3A stage is above the Increment 1 Action Line (Figure 1):</p> <p>If S-177 HW is greater than 4.1 feet, NGVD, S-197 release 1/3 capacity.</p> <p>When the S-18C gates are out of the water and S-178 TW exceeds 2.4 feet, NGVD follow below table and text:</p> <table><tr><td>S-178 TW (feet, NGVD)</td><td>2.5 to 2.6</td><td>2.61 to 2.7</td><td>2.71 to 2.9</td><td>Greater than 2.9</td></tr><tr><td>S-197 Target Flow (daily average cfs) *</td><td>50 to 100</td><td>100 to 150</td><td>150 to 200</td><td>500</td></tr></table> <p>*If the number of gate changes or the ability to maintain flow within the prescribed flow ranges becomes impractical, the three flow ranges may be consolidated to two (2.5 to 2.65 feet and 2.66 to 2.9 feet) with corresponding flows of 100 cfs and 200 cfs, respectively.</p> <p>If S-177 HW is greater than 4.2 feet, NGVD for 24 hours or S-18C HW is greater than 3.1 feet, NGVD, S-197 release 2/3 capacity.</p> <p>If S-177 HW is greater than 4.3 feet, NGVD or S-18C HW is greater than 3.3 feet, NGVD, S-197 release full capacity.</p> <p>When S-197 is releasing due to S-178 TW:</p> <p>S-197 gates may be adjusted to maintain the daily average flow rates and stages within the appropriate and corresponding ranges. If a flow or stage is outside of the corresponding range for more than one day (24 hour average) then the appropriate gate change will be made no later than the next working day. In addition to these criteria, if S-18C TW falls below 2.4 feet for 24 hours, S-197 will be reduced or closed as necessary to bring S-18C HW above 2.4 feet in 24 hours.</p> <p>When S-197 is releasing due to S-177 HW or S-18C HW:</p> <p>Close gates when all the following three conditions are met:</p> <ol style="list-style-type: none">(1.) S-176 HW is less than 5.2 feet, NGVD and S-177 HW 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 gates open necessary only to match residual flow through S-176. All gates should be closed if S-177 HW is less than 4.1 feet, NGVD after all conditions are satisfied.	S-178 TW (feet, NGVD)	2.5 to 2.6	2.61 to 2.7	2.71 to 2.9	Greater than 2.9	S-197 Target Flow (daily average cfs) *	50 to 100	100 to 150	150 to 200	500	
S-178 TW (feet, NGVD)	2.5 to 2.6	2.61 to 2.7	2.71 to 2.9	Greater than 2.9								
S-197 Target Flow (daily average cfs) *	50 to 100	100 to 150	150 to 200	500								

2012 Water Control Plan	
Temporary Deviation for Increment 1	S-197

2012 Water Control Plan	Structure/ Operational Component	Column 1: No WCA-3A Regulatory Releases to SDCS or SRS	Column 2: WCA-3A Releases to SDCS
		<p>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.</p>	
Temporary Deviation for Increment 1		<p>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.</p> <p>When WCA-3A stage is above the Increment 1 Action Line (Figure 1): C-111 structures (S-332B, S-332C, S-332D, S-176, S-177, S-18C, S-194, and S-196) are operated according to the 2012 WCP Column 2 criteria.</p> <p>When Hydraulic Testing for detention areas between S-331 and S-177: Hydraulic testing is not to exceed one month duration and limits of keeping L-31N no lower than Column 2 (4.5 feet, NGVD) by S-332B, S-332C, S-332D or S-176. Hydraulic testing is not to exceed one month duration and limits of keeping C-111 Canal no lower than the C-111 Spreader Canal Western Project Preliminary Project Operating Manual off criteria for S-199 and S-200 (3.6 feet, NGVD), which is the same as the Column 1 and Column 2 gate closure criteria for S-177.</p>	

TABLE 2-6. ALTERNATIVE G OPERATING CRITERIA: COMPARISON TO 2012 WCAS-ENP-SDCS WATER CONTROL PLAN

2.1.6 Alternative E: Relaxation of G-3273 Constraint and Operational Criteria Changes at S-197 (Trigger S-18C HW)

Operational criteria for Alternative E are identical to that described for Alternative G (**Section 2.1.5**), except for the opening criteria used to define additional S-197 discharges (in addition to the S-197 operating criteria defined in the WCAs-ENP-SDCS Water Control Plan). Alternative E is consistent with Alternative G, in that additional S-197 discharges would only occur under conditions when the WCA 3A stage is above the Increment 1 Action Line (**Figure 2-1** and **Appendix A**) and S-18C is fully open. Under these conditions, operational criteria used to define S-197 discharges are as follows:

- Operation of S-197 based on S-177 HW stage criteria remains unchanged from the 2012 WCAs-ENP-SDCS Water Control, with the expectation that the available capacity at S-200 and S-199 will be used as specified under the C-111 Spreader Canal Western Project.
- When S-18C HW is 2.25 feet NGVD, S-18C will be opened in accordance with use of Column 2 operational criteria for SDCS canals when the WCA 3A stage is above the Increment 1 Action Line (S-334 may be closed).
- When the S-18C gate is fully open and S-18C HW exceeds 2.4 feet NGVD, S-197 may be operated to release up to a maximum of 200 cfs.

2.1.7 Alternative F: Relaxation of G-3273 Constraint Without Operational Criteria Changes at S-197

Operational criteria for Alternative F are identical to that described for Alternative E above, but exclude the revisions to the operational criteria for S-197. Under Alternative F, S-197 would continue to operate as defined in the 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c).

2.2 ISSUES AND BASIS FOR CHOICE

The objective of this EA is to evaluate whether to modify the G-3273 constraint. The alternatives described in **Section 2.0** were formulated, considered, and evaluated based on achievement of field test objectives (**Section 1.5**) and field test constraints (**Section 1.6**). Potential environmental effects and effects to other resources outlined in **Table 2-8** were also evaluated. **Table 2-7** provides a summary of the issues and basis for choice of the Preferred Alternative, Alternative G.

Currently, the delivery of a net inflow of water to NESRS by S-333 is discontinued when the stage at G-3273 exceeds 6.8 feet NGVD. Relaxation of G-3273 constraint up to the L-29 Canal maximum operating stage limit of 7.5 feet NGVD and operation of S-356 will increase water deliveries to NESRS. As a result, reliance on S-334 releases to SDCS (Column 2 operations) to assist with the lowering of stages in WCA 3A is expected to decrease due to the increased availability to discharge into NESRS. Additional water being delivered to NESRS may also reduce the volume of flow through the S-12 structures, thereby increasing the likelihood of meeting the Rainfall Plan Target of 55% to NESRS and thereby limiting conditions where the S-12 structures are needed to discharge greater than 45% of target flows. Alternatives which did not maximize hydrologic improvements to NESRS while modifying Column 2 operations to maintain required regulatory releases from WCA 3A were eliminated from detailed evaluation. Therefore, Alternatives B, C, and D were eliminated from further evaluation (**Section 2.3**). Alternative C was identified as a potentially viable alternative pending further refinement to the operational criteria to maintain required regulatory releases from WCA 3A and maintain current flood protection within agricultural and urban areas in southern Miami-Dade County. Continued coordination and modifications to the operational criteria led to the revision of Alternative C into Alternatives E, F, and G with the primary difference between the Alternatives being the inclusion of operational criteria for S-197 (*i.e.* Alternatives E and G versus Alternative F) and the trigger location used to define operating criteria for S-197 discharges (*i.e.* Alternative E versus Alternative G). The SFWMD and FDACS proposed operational revisions for the S-197 structure on the C-111 Canal within the field test due to concerns from South Dade stakeholders related to agricultural lands located east of ENP (**Section 1.9** and **Appendix D**).

The Preferred Alternative is expected to benefit ENP by increasing flows to NESRS. Alternative E, F, and G best accomplish this objective, relative to the No Action Alternative, and are expected to improve hydrologic conditions in NESRS. Compared to the No Action Alternative, Alternatives E, F and G are anticipated to increase the number of days with WCA 3A unconstrained discharges to NESRS by up to 1176 days (up to 64% increase) (**Figure 4-23**) and reduce the total duration of WCA 3A regulatory releases to the SDCS by an estimated 832 days (81% reduction; frequency reduced from 23.5% to 4.5% of period of analysis) (**Figure 4-23**). Alternatives E, F, and G are also anticipated to reduce the volume of WCA 3A regulatory releases to SDCS by an estimated 85% (735 kAF under IOP/ERTP to 112 kAF) relative to the No Action Alternative (**Figure 4-24**). The hydrologic assessment of potential effects to WCA 3A, NESRS, and the SDCS was conducted using the historical period from July 2002 (initial IOP operations) through June 2014 (start of Increment 1 development), as described in **Section 4.5**.

Alternatives E, F, and G meet field test objectives; however uncertainty exists regarding the ability of Alternatives E and G to maintain the authorized purposes of the C&SF Project and

subsequent modifications, to include the MWD Project, C-111 South Dade Project, and CERP (**Table 2-7**).

The C-111 South Dade GRR and EIS published in May 1994 (USACE 1994) described a plan for five pump stations and a levee-bounded retention/detention area to be built west of the L-31N Canal, between the 8.5 SMA and the Frog Pond Area (south of S-332D) to control seepage out of ENP and reduce damaging freshwater discharges to Manatee Bay and Barnes Sound while maintaining flood protection to agricultural lands east of C-111 Canal. The 1994 GRR plan also proposed a spreader canal (subsequently deferred to the planned CERP C-111 Spreader Canal Eastern Project PIR), plugs in the C-109 and C-110 Canals, and degradation of the spoil mound south of the C-111 Canal to provide overland flow into the ENP Eastern Panhandle towards northeast Florida Bay. The 1994 C-111 South Dade GRR and EIS stated goal for the objective of eliminating freshwater discharges to Manatee Bay and Barnes Sound includes reducing the number of occurrences of major releases at S-197 and diversion of daily flows to the marsh east of C-111, if available and desired; the objective to maintain flood protection involved maintaining the original C&SF Project design canal stages and discharge capacities while restoring more natural conditions within ENP (USACE 1994).

The WRRDA of 2014 authorized the C-111 Spreader Canal Western Project to modify the existing C-111 Canal to change the flow of ground and surface water as a first step in the restoration of the southeastern portion of the Everglades ecosystem. The C-111 Spreader Canal Western Project is essential to achieving the restoration of Taylor Slough and downstream affected areas in Florida Bay, ENP, the Model Lands, and the Southern Glades. The Frog Pond Detention Area and Aerojet Canal facility work in unison to create a hydraulic ridge that blocks the drainage effects of the C-111 Canal. As a result, rainfall and natural flows into Taylor Slough will be retained, preventing seepage that depletes the hydroperiod of Taylor Slough and alters the natural flow patterns toward the south into Florida Bay. The intermediate water control features, planned incremental S-18C changes L-31E Canal changes, and C-110 Canal plugs serve to raise hydroperiods and promote sheetflow within the Southern Glades and Model Lands while preserving existing levels of flood damage reduction. Features of the project also serve to return salinities to more natural levels in portions of Florida Bay and its associated estuaries.

In order to maximize restoration opportunities, the C-111 Spreader Canal Western Project Final Integrated PIR and EIS (USACE 2011a) included incremental operational changes in the current “open and close” triggers at the existing structure S-18C. The “open and close” triggers are to be increased in increments of no more than 0.1 feet per year and the total change in either trigger shall not exceed 0.4 feet. Stage override triggers are to be established immediately downstream of S-177 and/or in the adjacent agricultural lands to establish a “backstop” at which S-18C triggers return to their existing levels. The incremental operational changes at S-18C will serve to supplement groundwater stage increases in the lower C-111 area. Incremental increases in the open/close stage triggers at S-18C have not yet been implemented.

The purposes of S-18C are to maintain a desirable freshwater head to prevent saltwater intrusion through the C-111 Canal, pass flood flows, and act as a control point for water deliveries to the Eastern Panhandle of ENP. Side-cast spoil material (from canal construction) on the southern side of the C-111 Canal between S-18C and S-197 has been 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 the C-111 Canal and prevents saltwater intrusion during high tides. Most of the time, S-197 is closed and diverts discharge from S-18C overland to the Eastern Panhandle of ENP, and S-197 releases water only during major floods according to S-197 operating criteria (USACE 2012c).

Alternatives E, F and G each include use of Column 2 operational criteria for the SDCS canals when the WCA 3A stage is above the Increment 1 Action Line, which typically occurs under normal to wet hydrologic conditions. Additional operational criteria for S-197, as defined under Alternatives E and G, are expected to shift some water flow from the ENP panhandle to Manatee Bay and lower stages in the C-111 Canal (upstream of both S-18C and S-197) during normal to wet hydrologic conditions, relative to the No Action Alternative and Alternative F (due to the inclusion of additional Column 2 operational criteria for the SDCS canals, Alternative F is expected to lower stages in the C-111 Canal, compared to the No Action Alternative).

Uncertainty arises concerning the compatibility of Alternatives E and G with the plan described in the C-111 South Dade GRR and EIS published in May 1994 which would reduce damaging freshwater discharges to Manatee Bay and Barnes Sound, extend hydroperiods within the ENP Eastern Panhandle, and promote additional overland flow across the ENP Eastern Panhandle towards northeast Florida Bay. Uncertainty also arises concerning the compatibility of Alternatives E and G and the C-111 Spreader Canal Final Western Project Final PIR and EIS (USACE 2011a) and the associated Department of Army permit (SAJ-2005-9856 [IP-AAZ]) issued to the SFWMD, which proposed to incrementally increase the operational stages maintained at S-18C with concurrent monitoring. Following assessment of these uncertainties with respect to maintaining the authorized purposes of the C&SF Project and subsequent modifications, Alternatives E and G were carried forward for detailed evaluation based on the following rationale: (1) potential minor adverse effects to Manatee Bay and Barnes Sound associated with salinity fluctuations from increased S-197 discharges would be temporary and spatially limited to nearshore areas within the southern estuaries; (2) detailed assessment the C-111 South Dade/CERP proposed eastern C-111 spreader canal feature has been deferred to the planned CERP C-111 Spreader Canal Eastern Project PIR); (3) incremental increases at S-18C are not expected to be implemented by the SFWMD during the planned duration of the Increment 1 field test; and (4) operating criteria for S-197 will be reassessed once construction of the C-111 South Dade NDA is constructed and operable, and/or upon completion of the Increment 1 field test.

Alternatives that did not include operational changes at S-197 (Alternatives A, B, C, D, and F) were noted as uncertain with respect to the field test constraint of no reduction in current flood protection (**Table 2-7**). Increased flood control releases from S-18C and S-197 were included within Alternatives E and G to mitigate for potential risks to flood protection for areas within South Dade which may be affected by a combination of the following water management factors during the field test: increased seepage to the L-31N Canal south of S-331 prior to completion of C-111 South Dade NDA; increased discharges from S-331 for 8.5 SMA flood mitigation (potentially offset by reduced S-331 discharges with limited WCA 3A regulatory releases to the SDCS); and operation of the downstream S-332 D pump station and/or the C-111 South Dade SDA to manage L-31N Canal stages during periods of increased inflows.

Alternative G is the Preferred Alternative. Field test water management operations may result in increased seepage to the L-31N Canal south of the S-331 pump station, prior to the construction and operation of the C-111 South Dade Project NDA. Alternative G best alleviates this concern. The trigger location (S-178 TW) used to define opening criteria for S-197 discharges is closer to the agricultural lands of concern identified by South Dade stakeholders (**Section 1.9**) and reduces the IOP/ERTP Level 1 S-197 opening from 800 cfs to 500 cfs. Temporary minor adverse impacts have the potential to occur within ENP's Eastern Panhandle and Manatee Bay and Barnes Sound due to the shifting of some water flow from ENP Panhandle to Manatee Bay and the resultant increases in the frequency, duration, and volume of S-197 discharges estimated from a period of analysis limited to historical operations between July 2012 and June 2014 (**Section 4.5**); however significant impacts are not expected. Potential environmental effects would be limited in spatial extent to the nearshore areas of the southern estuaries (**Section 4.7**). Alternative G reduces the potential for temporary environmental effects relative to Alternative E (**Table 2-7**).

TABLE 2-7. ISSUES AND BASIS FOR CHOICE: SELECTION OF THE PREFERRED ALTERNATIVE (ALTERNATIVE G)

ALTERNATIVE	MEETS FIELD TEST OBJECTIVES	MEETS FIELD TEST CONSTRAINTS				ENVIRONMENTAL EFFECTS				REDUCTION IN FLOWS TO SDCS FROM WCA 3A
		L-29 Canal maximum operating limit of 7.5 feet NGVD, pending future acquisition of real estate interests along Tamiami Trail and additional NEPA documentation	Maintain the authorized purposes of the C&SF Project and subsequent modifications to include: i. MWD Project, ii. C-111 South Dade Project., iii. CERP	No reduction in current flood protection	Maintain the current multi- species objectives of the 2012 Water Control Plan and comply with the requirements of the applicable biological opinion from the USFWS to include the ERTF and CERP C-111 Spreader Canal Western Project	WCA 3A	ENP	EASTERN FLORIDA BAY	MANATEE BAY AND BARNES SOUND	
A	NO	YES	YES	YES	YES	0	0	0	0	0
B	YES	YES	YES	UNCERTAIN	YES	0	+	0	0	+
C	YES	YES	YES	UNCERTAIN	YES	0	++	0	0	++
D	YES	YES	YES	UNCERTAIN	YES	-	++	0	0	+++
E	YES	YES	UNCERTAIN	YES	YES	0	++	--	--	++
F	YES	YES	YES	UNCERTAIN	YES	0	++	0	0	++
G	YES	YES	UNCERTAIN	YES	YES	0	++	-	-	++

- NEGATIVE, + POSITIVE, 0 NEUTRAL (NO CHANGE FROM EXISTING CONDITIONS/ALTERNATIVE A)
CHART REQUIRES INTERPRETATION. ADDITIONAL JUSTIFICATION WITH RESPECT TO ENVIRONMENTAL EFFECTS IS FOUND IN SECTION 40.

2.3 ALTERNATIVES ELIMINATED FROM DETAILED EVALUATION

Alternatives B, C, and D were eliminated from detailed evaluation for the reasons outlined below:

- **Alternative B:** Alternative B would modify the G-3273 stage constraint to include calendar based restrictions throughout the year, ranging from an elevation of 6.9 feet NGVD up to 7.5 feet NGVD. Alternative B does not best achieve field test objectives to improve hydrological conditions in NESRS through relaxing the G-3273 stage criteria to increase water deliveries from WCA 3A to NESRS. Inflows to NESRS would continue to be limited during approximately 8 months of the year (when G-3273 constraint < 7.3 feet NGVD). For the historical hydrologic assessment period of July 2002 through June 2014, which includes the IOP and ERTTP operations through the start of Increment 1 development, Alternative B would have increased the number of days with unconstrained discharges to NESRS by up to 965 days (**Figure 2-2**). Compared to the other action alternatives which include no calendar based restrictions for G-3273 relaxation (Alternatives C, D, E, F, and G), the opportunity for increased discharges to NESRS is reduced by 211 days (18%), with the intra-annual reduction principally occurring during the early wet season months of June, July, and August (**Figure 2-3**). In addition, with limited opportunity to utilize additional storage in NESRS for WCA 3A releases, the need for Column 2 releases through S-334 to the SDCS, including outside of the S-12A seasonal closure period, would not be able to be significantly reduced in order to avoid increasing the magnitude and frequency of high water conditions in WCA 3A.
- **Alternative C:** Column 2 releases from WCA 3A to the SDCS via S-334 cannot be conducted concurrently while S-356 is pumping. Alternative C does not include comprehensive criteria restricting when and how S-334 is used to pass S-333 flows during Column 2 operations, although use of S-334 is restricted to the S-12A seasonal closure period. Further assessment of S-334 Column 2 criteria is desirable. Alternative C does not best achieve the field test objectives to improve hydrological conditions in NESRS. Under this Alternative, additional water that could be passed to NESRS would be sent to the SDCS due to lack of operational modification at S-334. Alternative C refinements should further reduce use of S-334 Column 2 operations to maximize the opportunity to increase flows to NESRS, while maintaining limited Column 2 capability during WCA 3A high water conditions. Operating criteria should be developed to establish relative priority for S-333 and S-356 discharges into the L-29 Canal under a comprehensive range of WCA 3A and G-3273 stage conditions.
- **Alternative D:** For the historical hydrologic assessment period of July 2002 through June 2014, which includes IOP and ERTTP operations through the start of Increment 1 development, Column 2 operations at S-334 were used for a total duration of 1,028 days to convey a total volume of 735 kAF from WCA 3A to the SDCS (**Figure 2-4**). Removal of Column 2 operations at S-334 may result in an inability to make WCA 3A releases to the SDCS when water storage capacity is available in the C-111 detention areas, resulting in potentially increased magnitude and frequency of high water levels in WCA 3A as a result of decreased S-333/S-334 releases from WCA 3A.

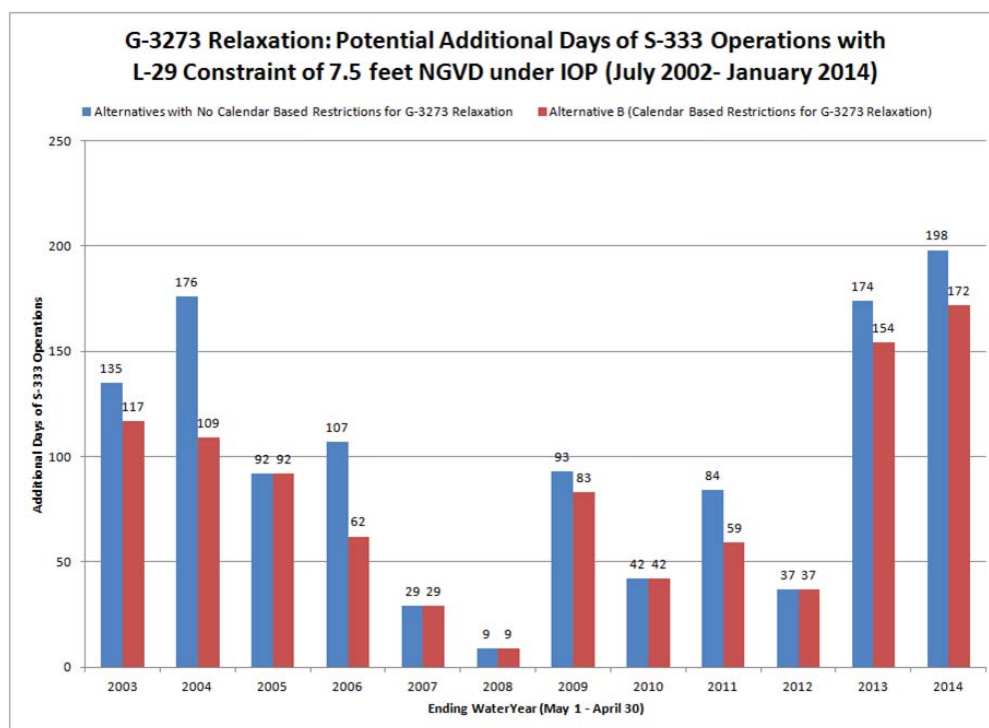


FIGURE 2-2. WATER YEAR SUMMARY OF POTENTIAL ADDITIONAL DAYS FOR UNCONSTRAINED DISCHARGES TO NESRS (ALTERNATIVE B), 2002-2014

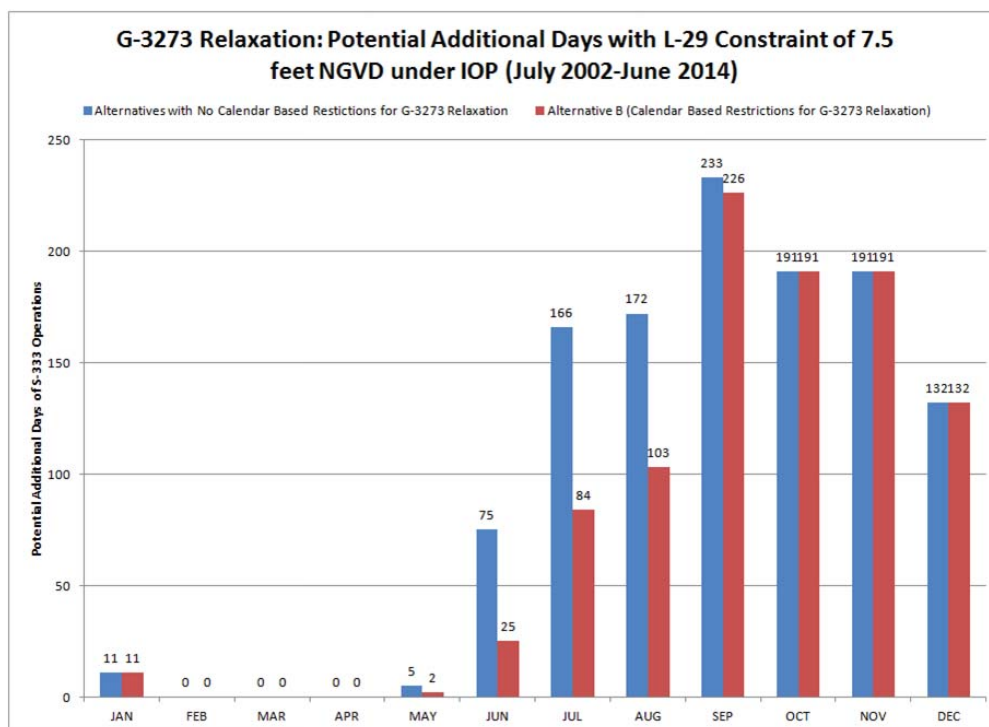


FIGURE 2-3. INTRA-ANNUAL SUMMARY OF POTENTIAL ADDITIONAL DAYS FOR UNCONSTRAINED DISCHARGES TO NESRS (ALTERNATIVE B), 2002-2014

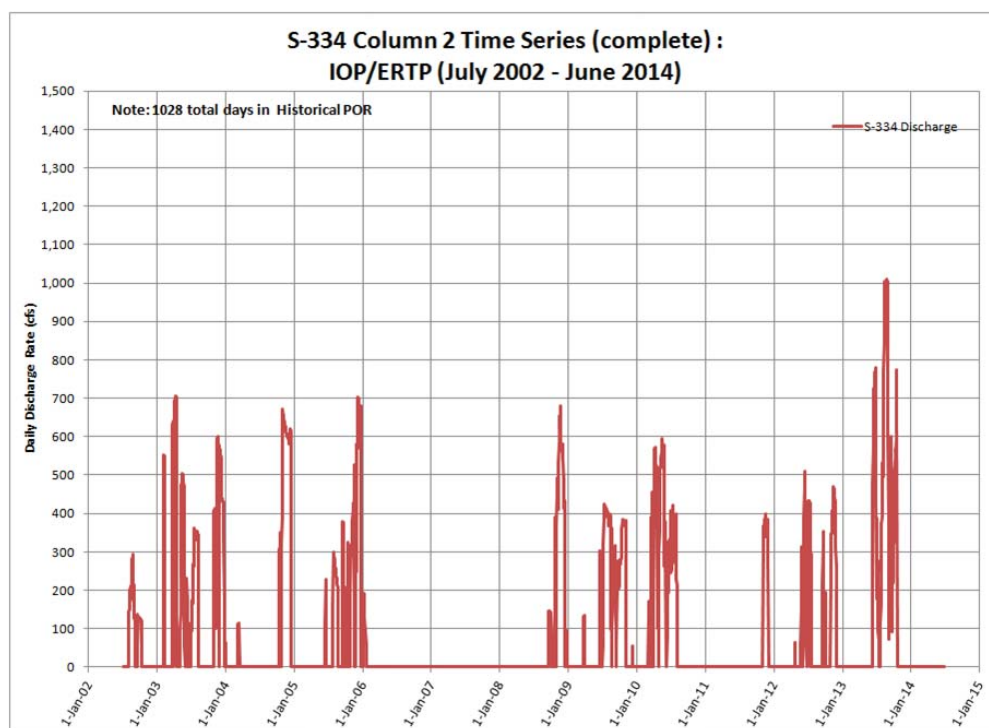


FIGURE 2-4. HYDROGRAPH OF HISTORICAL COLUMN 2 OPERATIONS AT S-334, 2002-2014.

2.4 PREFERRED ALTERNATIVE

Based upon the impact analysis conducted within this EA, Alternative G is the Preferred Alternative. This plan is expected to best meet the objectives and constraints of the field test while minimizing any negative impacts. Summary details of the Preferred Alternative are listed below:

- The L-29 Canal will be managed to prevent a sustained stage above 7.5 feet NGVD (average of S-333 TW and S-334 HW, which is the maximum operating stage intended within the 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c)). This will be achieved by stopping inflow into the L-29 Canal when the L-29 Canal stage rises above 7.5 feet NGVD.
- Both S-333 and S-356 releases to the L-29 Canal will be subject to the 7.5 feet NGVD constraint. However, the water level at G-3273 will no longer be a constraint, allowing NESRS to receive additional water year-round, pursuant to the WCA 3A Regulation Schedule and Rainfall Plan.
- The 6.8 feet NGVD water level at G-3273 and the WCA 3A water level (as measured using the average of monitoring gauges/sites 63, 64, and 65) will be utilized to define the priority of releases from S-333 and S-356 to the L-29 Canal and NESRS. In addition, the Increment 1 Action Line (**Figure 2-1** and **Appendix A**) is a seasonally varying WCA 3A water level (10.0 to 10.75 feet NGVD) which will also serve to define the S-333 and S-356 releases to the L-29 Canal and NESRS.

- Operating criteria for S-197 will be reassessed once construction of the C-111 South Dade NDA is constructed and operable, and/or upon completion of the Increment 1 field test. It is the intention of the Corps that the operating criteria for S-197 will revert to the 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c) once all features of the C-111 South Dade and MWD Projects are constructed and operational, if supported by the analysis of the data collected during the field test.
- Implementation of a testing protocol for S-357N will be incorporated into the field test following completion of the C-358 seepage collection canal and the associated S-357N control structure.
- Field test duration is planned for approximately two years, with a minimum duration of one year. The Increment 1 field test will initiate when hydrologic conditions allow for relaxation of G-3273 above 6.8 feet NGVD consistent with the objectives of this field test. The field test may be implemented as early as June 2015. The Corps Water Management Section's assessment of hydrometeorological conditions and stakeholder or agency input may suspend or discontinue the field test due to impacts greater than expected/discussed within this EA.
- Multiple purposes of the C&SF Project to provide flood control, water supply for municipal, industrial, and agricultural uses, prevention of saltwater intrusion, water supply for ENP, and protection of fish and wildlife will be maintained. A Monitoring Plan has been developed for the field test. Existing monitoring currently being funded by the Corps and/or other Federal and state agencies is noted in **Appendix C**. Roles and responsibilities are also identified within the Monitoring Plan.
- Operational changes based on the Increment 1 field test are planned to be incorporated into the 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c).

2.5 ALTERNATIVES AND PREFERRED PLAN

Table 2-8 summarizes the major features and consequences of the No Action Alternative, Alternative E, Alternative F, and Alternative G. See **Section 4** for a more detailed discussion of potential environmental and other impacts of the four alternatives.

TABLE 2-8. SUMMARY OF DIRECT AND INDIRECT IMPACTS

* Existing operations in the project area are currently governed by the 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c). Potential environmental effects of operations are discussed within the 2011 ERTF Final EIS (USACE 2011b) and are hereby incorporated by reference. Environmental effects of the No Action Alternative are described in the above table relative to the IOP (USACE 2006); the existing operations of the C&SF Project at the time of implementation of ERTF. Refer to text in ERTF Final EIS for details. Alternative E, F, and G are compared to and evaluated against the No Action Alternative.

ENVIRONMENTAL FACTOR	ALTERNATIVE A (NO ACTION)*	ALTERNATIVE E	ALTERNATIVE F	ALTERNATIVE G (PREFERRED ALTERNATIVE)
CLIMATE	No significant effect	No significant effect	No significant effect	No significant effect
GEOLOGY AND SOILS	Moderate: Increased potential for oxidation, subsidence, and peat fires due to increased duration of dry downs in NESRS.	Improved hydroperiods within NESRS has the potential to reduce soil oxidation, which is expected to promote peat accretion. A potential decrease in drying event severity relative to the No Action Alternative, if achieved, should result in reduced fire incidence within NESRS; however the frequency of muck fires are primarily controlled by weather patterns within the area. Alternative E may have a temporary minor beneficial effect on geology and soils within NESRS. Geology and soils within WCA 3 would not be expected to change from current conditions.	Similar effects as discussed under Alternative E.	Similar effects as discussed under Alternative E.
STUDY AREA LAND USE	No significant effect	No significant effect	No significant effect	No significant effect

ENVIRONMENTAL FACTOR	ALTERNATIVE A (NO ACTION)*	ALTERNATIVE E	ALTERNATIVE F	ALTERNATIVE G (PREFERRED ALTERNATIVE)
HYDROLOGY	<p>NESRS: No significant change in water level, with no change to the G-3273 or L-29 Canal constraints.</p> <p>WCA 3A: significant reduction in water level (by as much as 0.2 or 0.3 feet) during wet to normal hydrologic conditions; minor reduction during normal to dry conditions; no significant change during extreme wet or extreme dry conditions.</p> <p>ENP Eastern Panhandle and Manatee Bay/Barnes Sound: No significant change to structure flows at S-18C or S-197. During the IOP/ERTP historical period (July 2002-June 2014), S-197 discharges have been recorded for a total duration of 137 days with a total discharge volume of approximately 162,000 acre-feet (kAF). For the hydrologic assessment period following operation of the CERP C-111 Spreader Canal Western Project (July 2012 – June 2014), S-197 historical operations indicate four periods with S-197 gate openings, with a total release duration of 14 days and 18 kAF; the average daily S-197 discharge rate exceeded 800 cfs during 6 of the 14 days.</p>	<p>NESRS: Minor to moderate improvement, with the number of days with WCA 3A unconstrained discharges to NESRS increased by up to 64% following relaxation of the G-3273 constraint (L-29 constraint of 7.5 feet NGVD maintained).</p> <p>WCA 3A: Minor improvement with increased discharges to NESRS and reduced regulatory releases to the SDCS; no increase to WCA 3A peak stage and no increase to the duration or frequency of WCA 3A high water conditions.</p> <p>ENP Eastern Panhandle and Manatee Bay/Barnes Sound: Minor to moderate impact with increased frequency and duration of low volume S-197 discharges; frequency and duration of S-197 discharges from 200-800 cfs (Level 1 S-197 gate opening range) and greater than 800 cfs similar to effects discussed for No Action Alternative (refer to Section 4.5).</p>	<p>NESRS and WCA 3A: Similar effects as discussed under Alternative E.</p> <p>ENP Eastern Panhandle and Manatee Bay/Barnes Sound: No significant change.</p>	<p>NESRS and WCA 3A: Similar effects as discussed under Alternative E.</p> <p>ENP Eastern Panhandle and Manatee Bay/Barnes Sound: Minor impact with increased frequency and duration of low volume S-197 discharges; frequency and duration of S-197 discharges from 200-800 cfs (Level 1 S-197 gate opening range) will be reduced; and frequency and duration of flows greater than 800 cfs similar to effects discussed for No Action Alternative (refer to Section 4.5).</p>

ENVIRONMENTAL FACTOR	ALTERNATIVE A (NO ACTION)*	ALTERNATIVE E	ALTERNATIVE F	ALTERNATIVE G (PREFERRED ALTERNATIVE)
FLOOD CONTROL	<p>WCA 3A: significant reduction in water level (by as much as 0.2 or 0.3 feet) during wet to normal hydrologic conditions; no significant change during extreme wet conditions.</p> <p>South-Dade County: No significant effect, as less water is passed to the SDCS as compared with IOP.</p>	<p>WCA 3A: no significant effect, with no increase to WCA 3A peak stage and no increase to the duration or frequency of WCA 3A high water conditions.</p> <p>South-Dade County: no significant effect, due to regulatory reduction in WCA 3A SDCS and inclusion of increased flood control releases from S-18C and S-197 to mitigate for increased risk to flood protection for South Dade areas which may be conditionally affected by the field test.</p>	<p>WCA 3A: Similar effects as discussed under Alternative E.</p> <p>South-Dade County: Potential negligible to minor adverse effect due to net effect of reduced WCA 3A regulatory discharges to SDCS combined with increased flood control releases from S-331/S-173 and increased seepage to the L-31N Canal south of S-331 with no increased flood control releases from S-18C and S-197; additional inflow volumes to L-31N Canal, if resultant from the field test, are expected to be primarily managed with the C-111 South Detention Area using S-332 B, S-332C, and S-332D.</p>	<p>WCA 3A: Similar effects as discussed under Alternative E.</p> <p>South-Dade County: Similar effects as discussed under Alternative E.</p>

ENVIRONMENTAL FACTOR	ALTERNATIVE A (NO ACTION)*	ALTERNATIVE E	ALTERNATIVE F	ALTERNATIVE G (PREFERRED ALTERNATIVE)
VEGETATIVE COMMUNITIES	Negligible to Minor: Dependent upon location. The greatest effects on vegetation will be observed within WCA 3A where water levels will be reduced and prolonged periods of flooding will be lessened through lowering of WCA 3A Regulation Schedule. Impacts in vegetation in NESRS may occur due to potential changes in water quality.	<p>As a result of increased durations, it is expected that shorter hydroperiod sawgrass marshes may transition to wet prairie and slough/open water marsh communities. Increased hydroperiods within the eastern marl prairies may act to alleviate some of the problems associated with drier conditions and promote a shift in vegetation. Alternative E may have a temporary minor beneficial effect on vegetative communities within NESRS. However, due to the short duration of this test, significant vegetation changes are not anticipated.</p> <p>Potential minor adverse effects associated with salinity fluctuations from increased S-197 discharges would be temporary and spatially limited to nearshore areas within the southern estuaries. Alternative E is not expected to have a significant effect on vegetative communities within the southern estuaries. Alternative E is expected to increase the total volume of S-197 discharges from 18 kAF under the No Action Alternative to a range between 24 to 38 kAF (July 2012-June 2014 period of analysis).</p>	Similar effects as discussed under Alternative E for WCA 3 and NESRS. Vegetative communities within the southern estuaries would not be expected to change from current conditions.	Similar effects as discussed under Alternative E for WCA 3 and NESRS. Potential impacts to vegetative communities in the southern estuaries under Alternative G would be reduced relative to Alternative E. Alternative G is not expected to have significant effects on vegetative communities within the southern estuaries. Alternative G is expected to increase the total volume of S-197 discharges from 18 kAF under the No Action Alternative to a range between 20 to 30 kAF (July 2012-June 2014 period of analysis).

ENVIRONMENTAL FACTOR	ALTERNATIVE A (NO ACTION)*	ALTERNATIVE E	ALTERNATIVE F	ALTERNATIVE G (PREFERRED ALTERNATIVE)
FISH AND WILDLIFE RESOURCES	Negligible to Moderate: Depending upon location and species. Due to extension of Zones D and E1, there is greater opportunity for more flexible water management operations in WCA 3A to meet needs of fish and wildlife species.	<p>As a result of increased hydroperiods, Alternative E may have a temporary minor beneficial effect on fish and wildlife resources within NESRS. Increases in forage prey availability (i.e. crayfish and other invertebrates, fish) resulting from improved hydroperiods would in turn provide beneficial effects for amphibian, reptile, small mammal, and wading bird species.</p> <p>Additional low volume freshwater releases from S-197 would not be sufficient to affect mangrove and seagrass habitats within the coastal estuaries. Potential minor adverse impacts associated with salinity fluctuations would be temporary and spatially limited to nearshore areas within the southern estuaries. Significant effects to fish and wildlife resources within eastern Florida Bay and Manatee Bay and Barnes Sound are not anticipated. Alternative E is expected to increase the total volume of S-197 discharges from 18 kAF under the No Action Alternative to a range between 24 to 38 kAF (July 2012-June 2014 period of analysis).</p>	Similar effects as discussed under Alternative E for WCA 3 and NESRS. Vegetative communities within the southern estuaries would not be expected to change from current conditions.	Similar effects as discussed under Alternative E for WCA 3 and NESRS. Potential impacts to fish and wildlife resources within the southern estuaries under Alternative G would be reduced relative to Alternative E. Alternative G is not expected to have significant effects on vegetative communities within the southern estuaries. Alternative G is expected to increase the total volume of S-197 discharges from 18 kAF under the No Action Alternative to a range between 20 to 30 kAF (July 2012-June 2014 period of analysis).

ENVIRONMENTAL FACTOR	ALTERNATIVE A (NO ACTION)*	ALTERNATIVE E	ALTERNATIVE F	ALTERNATIVE G (PREFERRED ALTERNATIVE)
THREATENED AND ENDANGERED SPECIES	May affect the CSSS (<i>Ammodramus maritimus mirabilis</i>), and CSSS critical habitat, Everglade snail kite (<i>Rostrhamus sociabilis plumbeus</i>), and Everglade snail kite critical habitat, and wood stork (<i>Mycteria americana</i>). Additional determinations to Federally listed species found in ERTF Final EIS.	The Corps has determined that the Proposed Action may affect, but is not likely to adversely affect, CSSS (<i>Ammodramus maritimus mirabilis</i>), and its associated critical habitat, Everglade snail kite (<i>Rostrhamus sociabilis plumbeus</i>) and its associated critical habitat, and wood stork (<i>Mycteria americana</i>); and will have no effect on the other Federally listed species.	Similar effects as discussed under Alternative E.	Similar effects as discussed under Alternative E.
ESSENTIAL HABITAT	No significant effect	No significant effect	No significant effect	No significant effect

ENVIRONMENTAL FACTOR	ALTERNATIVE A (NO ACTION)*	ALTERNATIVE E	ALTERNATIVE F	ALTERNATIVE G (PREFERRED ALTERNATIVE)
WATER QUALITY	Continued periodic exceedance of Settlement Agreement Appendix A Long-Term Limit (LTL) for flows entering ENP along the L-29 Canal. No change to water quality conditions in L-30, L-31N, or C-111 basins. No significant change expected in mercury methylation potential in ENP or WCA 3A.	S-356 flows are likely to be in compliance with the FDEP/SFWMD proposed annual and multi-year compliance assessment methodology for flows entering ENP an Outstanding Florida Water (OFW). The proposed S-356 OFW compliance criteria are flow Weighted Mean (FWM) Total Phosphorus (TP) concentration no greater than 11 parts per billion (ppb) on an annual basis and no greater than 9 ppb on a three-year average annual basis. Compared to No Action Alternative, estimated 10 to 20 percent increase in frequency of exceedance of the Appendix A LTL for flows entering ENP at L-29 Canal (Section 4.11). Corps can mitigate for this increase in frequency of Appendix A exceedance by using flexibility within ERTTP operations. No adverse impact to water quality conditions in WCA 3A/B, L-30, L-31N, or C-111 Basins. No significant change expected in mercury methylation potential in ENP or WCA 3A/B.	Same as Alternative E.	Same as Alternative E.
NATIVE AMERICANS	The No Action Alternative would maintain current operations within the project area.	Negligible: The alternative is not expected to have any effects on tribal lands. The increased flexibility within this alternative provides additional outlets for water removal.	Similar effects as discussed under Alternative E.	Similar effects as discussed under Alternative E.

ENVIRONMENTAL FACTOR	ALTERNATIVE A (NO ACTION)*	ALTERNATIVE E	ALTERNATIVE F	ALTERNATIVE G (PREFERRED ALTERNATIVE)
CULTURAL RESOURCES	The No Action Alternative would maintain current operations within the project area. Such operations would continue to be governed by the Programmatic Agreement among the Corps, the Advisory Council on Historic Preservation, and the Florida State Historic Preservation Officer (FHPO) Regarding the Everglades Restoration Plan for Feature of the Central and Southern Florida Project in Southern Florida.	Negligible: Conditions within this alternative are such that they would not alter or affect any elements of historic properties. While resources will certainly encounter changes as a result of this test none are such that they would be classified as adverse in nature.	Similar effects as discussed under Alternative E.	Similar effects as discussed under Alternative E.
AIR QUALITY	Negligible: No effects on air quality are anticipated.	Air quality emissions associated with the field test would occur from the operation of S-356. Air quality impacts are not expected to cause negative effects to human health. Potential impacts due to implementation of Alternative E on air quality would be negligible. Operations of S-356 will be in compliance with the existing air quality permit for the pump station and the Clean Air Act.	Similar effects as discussed under Alternative E.	Similar effects as discussed under Alternative E.
HAZARDOUS, TOXIC, RADIOACTIVE WASTES (HTRW)	No significant effect	Implementation of Alternative E would not result in the discovery of HTRW since there is no excavation or other construction activities associated with this project. The project has a very low risk for increased mobilization of existing HTRW.	Similar effects as discussed under Alternative E.	Similar effects as discussed under Alternative E.

ENVIRONMENTAL FACTOR	ALTERNATIVE A (NO ACTION)*	ALTERNATIVE E	ALTERNATIVE F	ALTERNATIVE G (PREFERRED ALTERNATIVE)
NOISE	Negligible: slight decrease in noise may be associated with less air boat traffic during very dry periods.	Noise levels within the area are expected to increase as a result of the operation of S-356 during the field test. Sound levels would decrease with distance from the pump station due to attenuation. Increased noise levels are not expected to cause negative effects to human health. Changes in noise levels would be negligible.	Similar effects as discussed under Alternative E.	Similar effects as discussed under Alternative E.
AESTHETICS	Minor: Due to installation of Tram Road stoppers, water may pond on the east side of Tram Road drawing wildlife closer to the roadway and enhancing the ENP visitor's experience.	Alternative does not include construction of permanent structures or structural modifications to existing C&SF Project features. As such, the existing landscape profile would not be altered. Alternative E would not result in significant impacts to aesthetic resources.	Similar effects as discussed under Alternative E.	Similar effects as discussed under Alternative E.
SOCIOECONOMICS	Minor: Potential for limited air boat access to some areas of the marsh during dry periods. Since other areas will remain wet, potential impacts on concessionaires will be minor and largely determined by meteorological conditions rather than water management.	Stage levels experienced at G-3273 and other locations within NESRS are expected to be similar to the intra-annual range of water stages experienced under recent C&SF Project operations. The duration at which water stages within the L-29 Canal approach 7.5 feet NGVD is expected to increase under the proposed field test, and the duration at which water stages at G-3273 exceed 6.8 feet NGVD is also expected to increase. No significant impacts to local airboat concessionaires and property owners along Tamiami Trail and within NESRS are expected under the field test.	Similar effects as discussed under Alternative E.	Similar effects as discussed under Alternative E.

ENVIRONMENTAL FACTOR	ALTERNATIVE A (NO ACTION)*	ALTERNATIVE E	ALTERNATIVE F	ALTERNATIVE G (PREFERRED ALTERNATIVE)
AGRICULTURE	Negligible: Less water is passed to the SDCS as compared to IOP.	Approximately 975 acres of Prime and Unique Farmland are located within the project area; mainly within the boundaries of ENP. Conversion of Prime and Unique Farmland as a result of the field test is not anticipated based on the expected change in hydrology. Since not all flood mitigation and seepage management features envisioned in the MWD and C-111 South Dade Projects are constructed, Alternative E includes additional water management operating criteria for features of the SDCS (<i>i.e.</i> S-197) to mitigate for potential risks to flood protection for areas within South Dade which may be conditionally affected by operation of the field test. Significant impacts to agriculture are not expected.	Similar effects as discussed under Alternative E. Alternatives that did not include operational changes at S-197 were noted as uncertain with respect to the field test constraint of no reduction in current flood protection for areas within south Dade which may be conditionally affected during the field test.	Similar effects as discussed under Alternative E.
RECREATION	No significant effect	No significant effect	No significant effect	No significant effect

3.0 AFFECTED ENVIRONMENT

3.1 GENERAL ENVIRONMENTAL SETTING

The remaining portion of the Greater Everglades wetlands includes a mosaic of interconnected freshwater wetlands and estuaries located primarily south of the Everglades Agricultural Area (EAA). A ridge and slough system of patterned, freshwater peat lands extends throughout the WCAs into SRS in ENP. The ridge and slough wetlands drain into tidal rivers that flow through mangrove estuaries into the Gulf of Mexico. Higher elevation wetlands that flank either side of SRS are characterized by marl substrates and exposed limestone bedrock. Those wetland areas located to the east of SRS include the drainage basin for Taylor Slough, which flows through an estuary of dwarf mangrove forests into northeast Florida Bay. The Everglades wetlands merge with the forested wetlands of Big Cypress National Preserve (BCNP) to the west of WCA 3.

Declines in ecological function of the Everglades have been well documented. Rainfall and seasonal discharge from Lake Okeechobee resulted in overland surface flows (sheet flow) which helped to maintain the spatial extent of ridges and sloughs. The depths, distributions and duration of surface flooding largely determined the vegetation patterns, as well as the distribution, abundance and seasonal movements, and reproductive dynamics of all of the aquatic and many of the terrestrial animals in the Everglades (Davis and Ogden 1994, Kushlan and Kushlan 1979, Holling, Gunderson and Walters 1994, Walters and Gunderson 1994). Construction of canals and levees by the C&SF Project resulted in the creation of artificial impoundments and has altered hydroperiods and depths within the project area. The result has been substantially altered plant community structures, reduced abundance and diversity of animals and spread of non-native vegetation.

3.2 CLIMATE

The subtropical climate of south Florida, with its distinct wet and dry seasons, high rate of evapotranspiration, and climatic extremes of floods, droughts, and hurricanes, represents a major physical driving force that sustains the Everglades while creating water supply and flood control issues in the agricultural and urban segments.

Seasonal rainfall patterns in south Florida resemble the wet and dry season patterns of the humid tropics more than the winter and summer patterns of temperate latitudes. Of the 53 inches of rain that south Florida receives on average annually, 75% falls during the wet season months of May through October. During the wet season, thunderstorms that result from easterly trade winds and land-sea convection patterns occur almost daily. Wet season rainfall follows a bimodal pattern with peaks during May through June and September through October. Tropical storms and hurricanes also provide major contributions to wet season rainfall with a high level of interannual variability and low level of predictability. During the dry season (November through April), rainfall is governed by large-scale winter weather fronts that pass through the region approximately weekly. However, due to the variability of climate patterns (La Niña and El Niño), dry periods may occur during the wet season and wet periods may occur during the dry season. Multi-year high and low rainfall periods often alternate on a time scale approximately on the order of decades (USACE 1999).

High evapotranspiration rates in south Florida roughly equal annual precipitation. Evapotranspiration removes between 70% and 90% of the rainfall in undisturbed south Florida wetlands (Duever et. al. 1994). Evaporation from open water surfaces peak annually in the late spring when temperatures and wind speeds are high and relative humidity is low. Evaporation is lowest during the winter when the temperatures and wind speeds are low (Duever et. al. 1994).

Mean annual temperature for the south Florida ecosystem ranges from 72 ° Fahrenheit (F) (22 ° Celsius [C]) in the northern Everglades to 76 ° F (24 °C) in the southern Everglades (Thomas 1974). Mean monthly temperatures range from a low of 63° F (17 °C) in January to a high of 85 ° F (29 ° C) in August (Thomas 1974). Infrequently, freezing temperatures and frost occur when arctic air masses follow winter cold fronts into the area.

There is now evidence of anthropogenic changes to global climate patterns that will likely have an impact on south Florida in terms of rainfall, evapotranspiration, and temperature. Climatologists predict air temperatures will increase, with projections of summer temperatures being up to 3°F to 7°F warmer by 2100. Increases in air temperature are expected to increase evapotranspiration. The Florida Oceans Council (2009) predicts more frequent intense rainfall events will occur coupled with longer dry periods in between. Sea level change is one of the more certain consequences of climate change, and because it affects the land/ocean interface, it has the potential for environmental impacts on coastal areas. Future rates of sea level change are expected to result in significant impacts on coastal canals and communities, with loss of flood protection and increased saltwater intrusion being the primary effects. Additionally, coastal ecosystems and estuaries are expected to be adversely affected and require additional deliveries of freshwater to maintain desirable salinity patterns and healthy ecosystem.

3.3 GEOLOGY AND SOILS

The geology and soils of South Florida represent many of the opportunities, constraints, and impacts of regional water management. The high transmissivity of the Biscayne Aquifer allows rapid recharge of lower east coast well fields while it sets the stage for water competition between the Everglades and Biscayne Bay regarding the issue of seepage control. The loss of peat soils of the Everglades provides an indicator of ecosystem change due to drainage activities. Peat soils predominate in previously flooded areas. Peat soils have subsided as a result of oxidation due to drainage, which has affected local topography and hydroperiods.

The lower east coast on the Atlantic Coastal Ridge is mostly underlain by thin sand and Miami Limestone that are highly permeable and moderately to well drained. To the west of the coastal ridge, soils of the lower east coast contain fine sand and loamy material and have poor drainage. Rockland areas on the coastal ridge in Miami-Dade County are characterized by weathered limestone surfaces and karst features such as solution holes and sinkholes. Higher elevation marshes of the southern Everglades on either side of Shark River Slough are characterized by calcitic marl soils deposited by calcareous algal mats and exposed limerock surfaces with karst features such as solution pits and sinkholes.

3.4 STUDY AREA LAND USE

The existing land use within the study area varies widely from agricultural to high-density multi-family and industrial urban uses. Much of the land use/cover change occurring in south Florida

over the past several years can be categorized as either the creation of new developments in previously natural or agricultural areas, or the change in the types of agriculture practiced. Generally, urban development is concentrated along the Lower East Coast (LEC) from Palm Beach County to Miami-Dade County. Much of the land within the area potentially impacted by the Proposed Action is within ENP and is publicly owned. However, a number of privately owned parcels still exist within this region. The 8.5 SMA is an inhabited residential and agricultural area bounded on the west by ENP and separated from more intensively developed urban lands to the east by the L-31N flood protection levee and borrow canal. WCA 3, located directly north of ENP, is part of the Everglades Complex of Wildlife Management Areas (ECWMA). The ECWMA includes three adjacent Wildlife Management Areas (WMAs). These include the: (1) Rotenberger WMA; (2) Holey Land WMA; (3) Everglades (WCA 3A) and Francis S. Taylor (WCA 3B) WMAs. The Rotenberger and Holey Land WMAs are located north of WCA 3A and south of Lake Okeechobee between the Miami and North New River Canals. Lands in the ECWMA are managed by the FWC.

3.5 HYDROLOGY

The major characteristics of south Florida's hydrology are: (1) local rainfall; (2) evapotranspiration; (3) canals and water control structures; (4) flat topography; (5) the highly permeable surficial aquifer along a thirty to forty mile-wide coastal strip. Local rainfall is the source of all of south Florida's fresh water. The surface water that is not removed from the land by evapotranspiration and seepage to the underlying aquifer is drained to the Atlantic Ocean, Florida Bay, or the Gulf of Mexico by very slow, shallow sheetflow through wetlands or relatively quickly through man-made canals.

Levees and canals constructed during the last 60 years under the C&SF Project have divided the former Everglades into areas designated for development and areas for fish and wildlife benefits, natural system preservation, and water storage. The natural areas consist of the three WCAs located north of Tamiami Trail. ENP is located south of Tamiami Trail. The WCAs provide detention storage for water from Lake Okeechobee, the EAA, and parts of the east coast region. Detention of water helps prevent floodwaters from inundating the east coast urban areas; provides water supply and detention for east coast urban and agricultural areas and ENP; improves the water supply for east coast communities by recharging underground freshwater reservoirs; reduces seepage; and provides control for saltwater intrusion in coastal aquifers. While the WCAs may reduce the severity of the drainage of the Everglades caused by the major canal systems, thus reducing impacts to fish and wildlife caused by the major drainage systems, the levees surrounding the WCAs still function to impound the Everglades, precluding the historic flow patterns. The C&SF Project infrastructure, combined with operational constraints, makes it difficult to provide natural timing, volume and distribution. In wet periods, water is impounded in the WCAs and then discharged to ENP or coastal canals for eventual release to tide. During dry periods, water can flow through the canals to coastal areas and bypass the ENP wetlands.

3.5.1 Water Conservation Areas 3A and 3B

The largest WCA is WCA 3, which is divided into two parts, 3A and 3B. It is approximately 40 miles long from north to south and covers approximately 915 square miles. Ground elevations slope southeasterly one to three feet in ten miles ranging from 13 feet NGVD in northwest WCA

3A to six feet NGVD in southeast WCA 3B. The area is enclosed by approximately 111 miles of levees, of which 15 miles are common to WCA 2. An interior levee system across the southeastern corner of the area reduces seepage into an extremely pervious aquifer.

The upper pool, WCA 3A, provides an area of approximately 752 square miles for storage of excess water from WCA 2A; rainfall excess from approximately 750 square miles in Collier and Hendry counties (through Mullet Slough), and from 71 square miles of the former Davie agricultural area lying east of Pump station S-9 in Broward County; and excess water from a 208 square mile agricultural drainage area of the Miami Canal and other adjacent EAA areas to the north. WCA 3A provides water supply to the LEC, as well as the SDCS, in accordance with the WCA 3A Regulation Schedule, and WCA 3A provides water supply to ENP in accordance with the Rainfall Formula and the WCA 3A Regulation Schedule, collectively referred to as the Rainfall Plan (USACE 2006). Due to its limited discharge capacity compared to the spatial extent of the watershed from which it receives water, consecutive rainfall events have the potential to quickly utilize potential storage within WCA 3A and result in discharges from WCA 3A to SRS and/or the SDCS via the S-12 structures and/or S-333 and S-334.

South of WCA 3 and within ENP, the northern portion of SRS is also partially divided by the remaining 5.5 miles of the L-67 Extension Levee, which extends south from the southern terminus of L-67A at Tamiami Trail. Outflows from WCA 3A to ENP are regulated according to the WCA 3A Regulation Schedule, with some additional WCA 3A outflows to ENP from groundwater seepage across Tamiami Trail and seasonal surface water flows through the L-28 gaps, which then continue south along the L-28 borrow canal towards the Tamiami Trail bridges west of S-12A.

Stage variability within WCA 3 typically follows an annual cycle; the levels vary from high stages in the late fall and early winter to low stages at the beginning of the wet season (typically late May or early June). The cycle is primarily driven by rainfall, though it is also heavily influenced by water management operations designed to maintain congressionally authorized project purposes, including water supply to the LEC and ENP and flood protection to the adjacent EAA and LEC, as well as protection for tropical cyclone events and other extreme storm events. The annual cycle permits the storage of runoff during the wet season and the release of stored water to ENP during the dry season and maintains elements of the habitat essential to fish and wildlife. The distribution of water for flood control and water supply varies seasonally. The regulation schedules for the WCAs include a minimum water level, below which water releases are not permitted unless water is supplied from another source. The annual stage hydrograph statistical distribution plot for WCA 3A during the IOP and ERTTP period from July 2002 through June 2014 is shown in **Figure 3-1** (the 2002-2014 period is used for the assessment of hydrologic effects, in **Section 4.5**); to generate the figure, daily statistics were computed based on the WCA 3A three gage average stage, and the daily values were then smoothed by averaging across each month.

Overall, water stage decreases from northwest to southeast within WCA 3, consistent with the general direction of surface water flow and prevailing topography within WCA 3. Water depth is typically between one to two and a half feet, with the shallower waters in the higher elevation northwestern portion of WCA 3. Water stages and depths in WCA 3B are typically much lower

than water stages and depths in WCA 3A, due to limited surface water inflows into WCA 3B and the reduction of seepage from WCA 3A to WCA 3B consistent with the design purpose of the L-67A and L-67C levees. Water levels in WCA 3B are affected by seepage losses to the east towards the L-30 borrow canal and seepage losses to the south towards the L-29 Canal.

Water supply deliveries from the C&SF Project (also known as the Regional system) to coastal canals are utilized to recharge coastal well fields and to prevent saltwater intrusion into the Biscayne aquifer. When canal levels drop below adequate recharge levels due to a combination of wellfield drawdowns, evaporation, and lack of rainfall, water supply deliveries are typically made from the Regional system. When canal levels drop in Miami-Dade County, regional water supply is delivered from WCA 3A through one of two delivery routes. Depending on system conditions, both routes may be utilized concurrently. For the northern delivery route from WCA 3A, water supply deliveries are either released from S-151 to the Miami Canal within WCA 3B (C-304), followed by downstream releases to either Miami-Dade County's SDCS by utilizing S-337 and/or by utilizing S-31 to release into the C-6 Canal. For the southern delivery route from WCA 3A, water supply deliveries are released from S-333 (from the upstream L-67A Canal), passed through the L-29 Canal, and are released to the SDCS by utilizing S-334.

The most important component of the groundwater system within the study area is the Biscayne aquifer, an unconfined aquifer unit underlying an area of approximately 3,000 square miles in southeast Florida, from southern Palm Beach County southward through Broward County to South Miami-Dade County. This huge, freshwater, underground aquifer is highly productive along the coastal ridge and for a considerable distance to the west. Groundwater in WCA 3 generally flows from the northwest to the southeast, with extensive seepage across the eastern and southern levees, L-30 (southeast corner of WCA 3B) in particular. However, the direction of groundwater flow may be locally influenced by rainfall, drainage canals, or well fields. Fluctuations in groundwater levels are seasonal. Groundwater levels within WCA 3 are influenced by water levels in adjacent canals. Where there is no impermeable formation above the aquifer, surface water recharges the system and the groundwater level can rise freely. In times of heavy rainfall, the aquifer fills and the water table rises above the land surface, contributing to seasonal inundation patterns throughout the area. Over much of its extent, the Biscayne aquifer is covered by only a few inches of soil. The permeable limestone of the aquifer is shielded against upward intrusion of saline water from the Floridan aquifer by relatively impermeable beds of clay and marl.

The timing and distribution of water within WCA 3A, WCA 3B, and ENP is affected by direct rainfall, evapotranspiration, and regional water management operations. Specifics relating to both the effects of evaporation on WCA 3A water levels and the effects of inflows/releases on WCA 3A water level can be found in **Table 3-1** and **Table 3-2**.

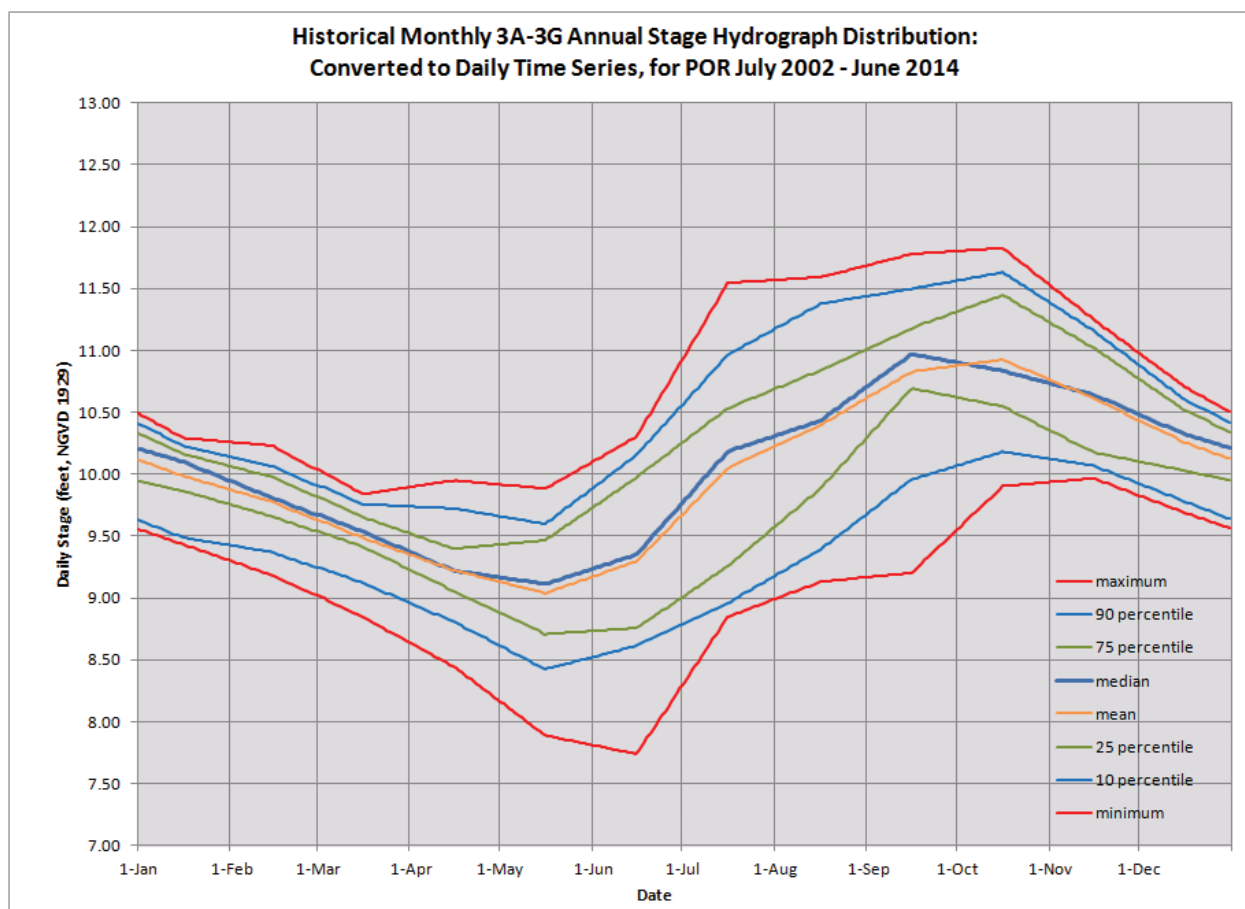


FIGURE 3-1. ANNUAL AVERAGE STAGE HYDROGRAPH FOR WCA 3A THREE GAGE AVERAGE, 2002-2014

TABLE 3-1. EFFECTS OF EVAPORATION ON WCA 3A WATER LEVEL

Month	Evaporation		Evaporation	
	Duration (days)	Effect on WCA 3A (feet)*	Duration (days)	Effect on WCA 3A (feet)*
January	1	0.011	20	0.222
February	1	0.014	20	0.281
March	1	0.018	20	0.364
April	1	0.022	20	0.441
May	1	0.023	20	0.468
June	1	0.022	20	0.432
July	1	0.021	20	0.425
August	1	0.020	20	0.402
September	1	0.019	20	0.377
October	1	0.017	20	0.342
November	1	0.013	20	0.268
December	1	0.011	20	0.217

* Average of Moore Haven Lock 1 and Hialeah Stations used by the National Oceanic and Atmospheric Administration National climatic Data Center to calculate pan evaporation.

Link: <http://www.ncdc.noaa.gov/oa/ncdc/html>

TABLE 3-2. EFFECTS OF INFLOWS/RELEASES ON WCA 3A WATER LEVEL

Inflow/Outflow WCA 3A (average daily cfs)	Duration (days)	Effect on WCA 3A (feet)*	Duration (days)	Effect on WCA 3A (feet)*
200	1	0.001	20	0.018
300	1	0.001	20	0.027
400	1	0.002	20	0.036
500	1	0.002	20	0.044
600	1	0.003	20	0.053
700	1	0.003	20	0.062
800	1	0.004	20	0.071
900	1	0.004	20	0.080
1000	1	0.004	20	0.089
1100	1	0.005	20	0.098
1200	1	0.005	20	0.107
1300	1	0.006	20	0.116
1400	1	0.006	20	0.125
1500	1	0.007	20	0.133
1600	1	0.007	20	0.142
1700	1	0.008	20	0.151
1800	1	0.008	20	0.160
1900	1	0.008	20	0.169
2000	1	0.009	20	0.178
2100	1	0.009	20	0.187
2200	1	0.010	20	0.196
2300	1	0.010	20	0.205
2400	1	0.011	20	0.214
2500	1	0.011	20	0.222
2600	1	0.012	20	0.231
2700	1	0.012	20	0.240
2800	1	0.012	20	0.249

* Effect on WCA 3A based on storage change from 9.0 feet to 10.0 feet (445 kAF)

3.5.2 Northeast Shark River Slough

NESRS is a complex area located in the northeast corner of ENP. It is currently the northern terminus of SRS, which is aligned from the northeast to southwest across ENP. Tamiami Trail is the northern boundary, the L-31N Canal the eastern boundary, and the L-67 Extension Canal the western boundary of the NESRS. Prior to construction and operation of the C&SF Project, NESRS would have been characterized as wet most of the year, but regional developments have impacted historic freshwater routes into the area. In addition, if historic levels are not maintained through the end of the wet season, significant reductions in surface water can occur during the dry season below historic dry season levels.

Water enters NESRS primarily from WCA 3A via S-333, and then to the L-29 Borrow Canal and subsequent passage through several sets of culverts and the one-mile Tamiami Trail bridge (completed as part of the MWD Project in 2013) under Tamiami Trail. In addition, pending approval of an operational permit, S-355A and S-355B may also be used to deliver water from WCA 3B to the L-29 Canal for subsequent passage through the culverts to NESRS. The

discharges made from WCA 3A through the S-12 structures and S-333 are target flows determined from the Rainfall Plan (USACE 2012c). Under the Rainfall Plan, water deliveries would be computed and operations adjusted weekly, if necessary based on the sum of two components: a rainfall response component and a WCA 3A regulatory component. The normal operational target flow distribution is 55% through the S-333 into NESRS and 45% through the S-12 structures into ENP west of the L-67 Extension. Eastern portions of the ENP are also influenced by the system of canals and structures that provide flood control and water supply for the LEC urban and agricultural areas.

3.5.3 Western Shark River Slough

Western SRS located to the west of L-67 Extension Levee and bounded on the north by Tamiami Trail, is primarily influenced by rainfall and water management operations at the S-12 structures (A, B, C and D). Under ERTTP, the utilization of the S-12 structures and the seasonal sequential closure periods beginning from the west at S-12A (November 1 – July 15) and S-12B (January 1 – July 15) is meant to move water from WCA 3A into SRS while providing conditions for Cape Sable seaside sparrow Subpopulation-A (CSSS-A) nesting and breeding. Although not required in water management operations, there is a rule-of-thumb that is often utilized outside of the seasonal closure period that includes delivering the Rainfall Plan S-12 structure target flows from east to west with 40 %, 30 %, 20 %, and 10 % being discharged at S-12D, S-12C, S-12B, and S-12A, respectively. Releases from WCA 3A are specified by the Rainfall Plan, which includes the regulation schedule for WCA 3A and the Rainfall Formula. This Rainfall Based Management Plan consists of a rainfall-based delivery target and a supplemental regulatory component that specifies the amount of water to be delivered to ENP in weekly volumes through the S-333 and S-12 structures. Under ERTTP, the normal operational target flow distribution is 55% through S-333 into NESRS and 45% through the S-12 structures into ENP west of the L-67 Extension.

3.5.4 Taylor Slough

Taylor Slough is in the southeast quadrant of ENP. The area through the Rocky Glades and Taylor Slough is higher in elevation compared to ground levels north, south, or west. Because of this characteristic, the area is normally drier than other areas in the ENP. The Rocky Glades and Taylor Slough are somewhat like an island or a peninsula extending from the canals into the ENP. Under ERTTP, specified C-111 basin canal water levels/ranges and S-332D pump station operations have resulted in Taylor Slough being provided water from the C-111 Basin mainly during the wet season. During the dry season, under ERTTP, water deliveries to Taylor Slough were limited to provide conditions conducive to CSSS Sub-population C nesting (325 cfs from December 1 – January 31; 250 cfs from February 1 – July 14).

3.5.5 Lower East Coast Area

The LEC area is located to the east of the L-31N, L-31W, and C-111 canals. Under ERTTP, specified canal water levels/ranges are meant to provide flood protection, water supply, and prevention of saltwater intrusion for the LEC. The LEC can be provided water supply from WCA 3A and Lake Okeechobee according to their respective regulation schedules. In wet conditions, the excess water from the LEC is discharged to tide.

3.5.6 8.5 Square Mile Area

The 8.5 SMA is a primarily residential area adjacent to, but west of, the L-31N Canal. The 8.5 SMA, which is also known as the Las Palmas community, is bordered on both the west and north by NESRS. The community has water management infrastructure consisting of a perimeter levee, a seepage collection canal, a pump station (S-357), and a southern detention area meant to collectively provide flood mitigation as part of the MWD Project (USACE 2000). An additional seepage collection canal and gated water control structure (S-357N), which are being constructed along the southern boundary of the 8.5 SMA (along Richmond Drive) as part of the MWD Project, are presently planned for completion in April 2016.

3.5.7 Biscayne Bay

Biscayne Bay is a shallow, tidal sound located near the extreme southeastern part of Florida. Biscayne Bay, its tributaries, and Card Sound are designated by the State of Florida as aquatic preserves, while Card and Barnes Sounds are part of the Florida Keys National Marine Sanctuary. A significant portion of the central and southern portions of Biscayne Bay comprise Biscayne National Park. Under IOP 2006, specified canal water levels/ranges are meant to provide flood protection for the portions of the LEC and Miami-Dade County, which may result in discharges to Biscayne Bay.

3.5.8 Florida Bay

Florida Bay and the Ten Thousand Islands comprise approximately 1,500 square miles of ENP. The bay is shallow, with an average depth of less than three feet. To the north is the Florida mainland and to the south lie the Florida Keys. Sheet flow across the marl prairies of the southern Everglades and 20 creek systems fed by Taylor Slough and the C-111 Canal provide direct inflow of freshwater to the bay. Surface water from SRS flows into Whitewater Bay and these flows may also provide essential recharge for central and western Florida Bay. Exchange with Florida Bay occurs when this lower salinity water mass flows around Cape Sable into the western sub-region of the bay.

3.6 REGIONAL WATER MANAGEMENT (OPERATIONS)

The C&SF Project has numerous water management structures consisting of culverts, spillways, and pump stations that have specified operating criteria for managing or regulating water levels for Congressionally-authorized project purposes. The C&SF Project contains multiple water bodies created by the existing C&SF levee infrastructure and implementation of the water management operating criteria, including WCA 1, WCA 2, and WCA 3. Associated with the inflow to and discharge from the water bodies is an infrastructure of structures and canals that are managed by the implementation of water management operating criteria that can include specified water levels or ranges. The WCA 3A Interim Regulation Schedule is a compilation of water management operating criteria, guidelines, rule curves, and specifications that govern storage and release functions. Typically, a regulation schedule has water level thresholds which vary with the time of year and result in discharges. The threshold lines of regulation schedules define the discharge zones and are traditionally displayed graphically. Additionally, a corresponding table is typically used to identify the structure discharge rules for the zones. As with most regulation schedules, the WCA 1, WCA 2, and WCA 3A regulation schedules must take into account various, and often conflicting, project purposes.

The WCAs are regulated for the Congressionally-authorized C&SF Project purposes 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. An important component of flood control is the maintenance of marsh vegetation in the WCAs, which provide a dampening effect on hurricane-induced wind tides that have the potential to affect residential areas to the east of the WCAs. The marsh vegetation, along with the east coast protection levee, also prevents floodwaters that historically flowed eastward from the Everglades from flowing into the developed areas along the southeast coast of Florida.

Besides releases from WCA 2A via the S-11 structures, WCA 3A receives inflow from pumping stations S-8, S-9, and S-140. The S-9 pump station removes runoff in the area west of Ft. Lauderdale known as Western C-11. The S-9A pump station, located adjacent to the S-9 pump station, returns seepage water from WCA 3A and WCA3B collected in the L-37, L-33 and the US 27 borrow canals. The S-140 pump station serves the 110 square mile area north and east of the interceptor canal and west of L-28. S-140 is used to maintain canal levels below 10.5 feet NGVD unless gravity flow into WCA 3A is possible at an adequate rate. Water also enters northeastern WCA 3A by gravity through the S-150 gated culvert. Discharges at S-142 are made from WCA 3A into the North New River Canal. The SFWMD can pump runoff from the North New River Canal and the C-13 Canal into WCA 3A through S-142 by operating their pump station, G-123.

Water levels in WCA 3A are managed primarily by five gated spillways: the S-12 structures (S-12A, S-12B, S-12C, and S-12D) and S-333. Additionally, the S-151, S-343A, S-343B and S-344 gated culvert structures can be utilized to discharge from WCA 3A. The S-12s and S-333 are utilized to provide water deliveries to ENP, in accordance with the 2012 ERTF Final EIS. From July 2002 through October 2012, WCA 3A was regulated according to a seasonally varying 8.75 to 10.75 feet NGVD regulation schedule and the Rainfall Plan (initiated in 1985), as per IOP (2002 IOP EIS and 2006 IOP Final Supplemental EIS). The discharges made from WCA 3A through the S-12s and S-333 are target flows determined from the Rainfall Plan; when WCA 3A is in Zone A, these target flows are the maximum flow possible based on structure design capacities and consideration of downstream operational constraints. Under the Rainfall Plan, water deliveries are computed and operations adjusted weekly, if necessary based on the sum of two components: a rainfall response component and a WCA 3A supplemental regulatory component. The Rainfall Plan provides for the rainfall response component within all zones of the WCA 3A Regulation Schedule, with the additional regulatory release requirement added when the WCA 3A water levels fall within the higher regulation schedule zones above Zone E, including Zone E1. Under ERTF, the goal of the rainfall and regulatory components is to split the flows between the S-12 structures and S-333, with 45% of the total flow from WCA 3A passing through the S-12 structures to Western SRS and the remaining 55% to discharge through S-333 to NESRS unless in the dry season (80% to NESRS, 20% to Western SRS in dry season), establishing the target flows for both the S-12 structures and S-333. ERTF specifies seasonal closure of the S-12A and B structures, with the following rigid closure periods: November 1 – July 14 for S-12A; January 1 – July 14 for S-12B. There are no closing periods for S-12C or D.

Water deliveries to eastern ENP (NESRS) are controlled by the stage in L-29 Canal, as pressure from the water within the canal (hydraulic head), is required to force water through the Tamiami Trail culverts and the one mile bridge and into ENP. As the L-29 Canal stage increases, more water is forced beneath the road through 17 sets of culverts (49 total culverts, three culverts per set in most locations) and the one mile bridge. The L-29 Canal maximum operating stage has been limited under ERTTP and previous regional operating plans due to concerns regarding: (1) potential flooding and seepage effects within residential or agricultural areas of Miami-Dade County; (2) potential damage to the Tamiami Trail roadway sub-base; and (3) potential flooding effects to privately-owned real estate adjacent to Tamiami Trail and within eastern ENP. The MWD Tamiami Trail Modifications (TTM) Project, which was completed in December 2013, included construction of the one mile bridge and Tamiami Trail roadway reconstruction/resurfacing to allow for the maximum operating stage in the L-29 Canal to be raised from 7.5 feet to 8.5 feet NGVD following the acquisition of the required real estate interests by the Corps and ENP. Following completion of the MWD TTM Project, the current ERTTP water management operating criteria for the L-29 Canal between S-333 and S-334 is meant to limit the L-29 Canal stage to no more than 7.5 feet NGVD in response to potential flooding effects to privately-owned real estate adjacent to Tamiami Trail and within eastern ENP which may result from extended durations with higher operating stages in the L-29 Canal (above 7.5 feet NGVD). In addition, ERTTP includes an additional operational constraint for the L-29 Canal water level related to potential flooding and seepage effects within residential and/or agricultural areas of Miami-Dade County: (1) when the G-3273 water level within NESRS reaches 6.8 feet NGVD during the normal Column 1 mode of operations, S-333 discharges to NESRS will be discontinued until G-3273 falls below 6.8 feet NGVD; or (2) when the G-3273 water level within NESRS reaches 6.8 feet NGVD during the Column 2 mode of operations, S-333 discharges into the L-29 Canal will be matched with S-334 discharges out of the L-29 Canal (Column 1 and Column 2 operations are further described in the following text).

When WCA 3A water levels are in Zone A of the WCA 3A Interim Regulation Schedule, S-343A, S-343B, and S-344 can be utilized to discharge from WCA 3A into BCNP. Discharges can also be made through S-343A, S-343B and S-344 when agreed to by SFWMD, Corps, and NPS to extend hydroperiods within BCNP. The S-151 gated culvert structure, which is located along the Miami Canal and operated according to the WCA 3A Interim Regulation Schedule (USACE 2012c), is the only existing surface water connection between WCA 3A and WCA 3B. S-151 discharges into the Miami Canal (C-304) in WCA 3B for flood diversion and for the purpose of providing water supply to LEC canals and the SDCS. Under existing conditions, water does not flow directly from WCA 3B into the L-29 Borrow canal. There are two discharge structures, gated spillways S-355A and S-355B, along L-29 south of WCA 3B that are designed to move water from WCA 3B into the L-29 Canal, although the operation of these structures has not been previously authorized for more than short-term, temporary operations. The S-355 structures are completed components of the MWD Project, intended to function in concert with the proposed MWD S-345 structures along L-67A/L-67C to address the MWD Project objective of restoring WCA 3B as a functioning component of the Everglades hydrologic system and restoration of water deliveries to NESRS. Concurrent with development of the Increment 1 field test, coordination between the Corps and the FDEP is ongoing for issuance of an operating permit for the S-355 structures.

There are three distinct modes of water management operations for ERTTP, which are consistent with the previous IOP (2002, 2006 Supplement): Column 1, Column 2, and water supply. Column 1 refers to the condition when regulatory releases from WCA 3A can be met by normal operation of the WCA 3A regulatory outlets (the S-12 structures, S-333, S-151, S-343A, S-343B, and/or S-344). Column 2 refers to the condition when regulatory releases from WCA 3A are made via S-333 to the L-29 Canal and via S-334 to the L-31N Canal and the SDCS; Column 2 operations generally require the use of pump stations S-331, S-332B, S-332C, and S-332D. During Column 2 operations, the control stages along the L-31N Canal are also lowered to minimize potential flood impacts to the SDCS and also to provide the necessary downstream gradient for the S-334 releases to reach S-332B, S-332C, and S-332D pump stations. Column 2 is used to offset or mitigate for potential adverse effects on WCA 3A related to actions taken to protect CSSS sub-population A within western ENP, including seasonal closure of the S-12A and S-12B regulatory outlets under ERTTP (S-12C seasonal closure criteria were additionally included with IOP). The IOP/ERTTP generally prescribed that the Column 2 mode of operation would be used when any S-12 structure is closed in order to protect the CSSS (November 1 through July 14, under ERTTP), although Column 1 operations would continue until the capacity of the S-12 structures that remain open is insufficient to handle the discharge from WCA 3A. Similarly, the IOP/ERTTP generally prescribed that Column 2 operations may continue past re-opening of the S-12 structures (July 15) to mitigate for adverse effects on WCA 3A stage levels resulting from the ERTTP closures of S-12A, S-12B, S-343A, S-343B, and S-344, based on comparison to WCA stage levels that would have been expected under the WCA 3A Regulation Schedule in place prior to the 2000 Interim Structural and Operational Plan (ISOP; the predecessor of IOP 2002); the cited 1985 WCA 3A Regulation Schedule was first incorporated the Rainfall Plan and included no seasonal closures for the S-12s. Under historical IOP and ERTTP operations, the Column 2 mode of operations has also been used as an additional water management tool for WCA 3A high water conditions. Beginning in 2014, the Corps and SFWMD are applying a WCA 3A water budget accounting tool to track the expected effect on WCA 3A stage levels resulting from the ERTTP closures of S-12A, S-12B, S-343A, S-343B, and S-344.

3.7 FLOOD CONTROL

Water management and flood control is achieved in south Florida through a variety of canals, levees, pumping stations, and control structures within the WCAs, ENP, and SDCS. The WCAs provide a detention reservoir for rainfall over the WCAs, excess water from the EAA and parts of the east coast region, and for flood discharge from Lake Okeechobee to tide. The WCAs provide levees to prevent the Everglades floodwaters from inundating the east coast urban areas; provide a water supply for the east coast areas and ENP; improve water supply for east coast communities by recharging underground freshwater reservoirs; reduce seepage; ameliorate salt-water intrusion in coastal well fields; and provide mixed quality habitat for fish and wildlife in the Everglades.

The regulation schedules for the WCAs contain instructions and guidance on how project spillways are to be operated to maintain water levels in the WCAs. The regulation schedules represent the seasonal and monthly limits of storage which guides project regulation for the authorized purposes. In general, the schedules vary from high stages in the late fall and winter to

low stages at the beginning of the wet season. These regulation schedules must take into account various, and often conflicting, project purposes.

The East Coast Canals are flood control and outlet works that extend from St. Lucie County southward through Martin, Palm Beach, and Broward Counties to Miami-Dade County. The East Coast Canal watersheds encompass the primary canals and water control structures located along the LEC and their hydrologic basins. The main design functions of the project canals and structures in the East Coast Canal area are to protect the adjacent coastal areas against flooding; store water in conservation areas west of the levees; control water elevations in adjacent areas; prevent salt-water intrusion and over-drainage; provide freshwater to Biscayne Bay; and provide for water conservation and public consumption. The East Coast Canals consist of 40 independently operated canals, one levee, and 50 operating structures, consisting of 35 spillways, 14 culverts, and one pump station. The project operates to prevent major flood damage; however, due to urbanization, the existing surface water management system now has to handle greater peak flows than in the past. The SDCS provides a way to deliver water to areas of south Miami-Dade County. This canal system was overlaid on the existing flood control system. Many of these canals are used to remove water from interior areas to tide in times of excess water.

3.8 VEGETATIVE COMMUNITIES

The Everglades landscape is dominated by a complex of freshwater wetland communities that includes open water sloughs and marshes, dense grass- and sedge-dominated marshes, forested islands, and wet marl prairies. The primary factors influencing the distribution of dominant freshwater wetland plant species of the Everglades are soil type, soil depth, and hydrological regime (USFWS 1999). These communities generally occur along a hydrological gradient with the slough/open water marsh communities occupying the wettest areas (flooded more than nine months per year), followed by sawgrass marshes (flooded six to nine months per year), and wet marl prairie communities (flooded less than six months per year) (USFWS 1999). The Everglades freshwater wetlands eventually grade into intertidal mangrove wetlands and sub tidal seagrass beds in the estuarine waters of Florida Bay.

Development and drainage over the last century have dramatically reduced the overall spatial extent of freshwater wetlands within the Everglades, with approximately half of the pre-drainage 2.96 million acres of wetlands being converted for development and agriculture (Davis and Ogden 1997). Alteration of the normal flow of freshwater through the Everglades has also contributed to conversions between community types, invasion by exotic species, and a general loss of community diversity and heterogeneity. Vegetative trends in ENP have included a substantial shift from the longer hydroperiod slough/open water marsh communities to shorter hydroperiod sawgrass marshes (Davis and Ogden 1997; Armentano et al. 2006). In addition, invasion of sawgrass marshes and wet prairies by exotic woody species has led to the conversion of some marsh communities to forested wetlands (Gunderson et al. 1997).

Vegetative communities of the WCAs have suffered from both over-drainage and prolonged periods of inundation associated with the stabilization of water levels (USACE 1999). Many areas of WCA 3A still contain relatively good wetland habitat consisting of a complex of tree islands, sawgrass marshes, wet prairies, and aquatic sloughs. However, the northern portion of

WCA 3A has been over-drained, resulting in increased fire frequency and the associated loss of tree islands, wet prairie, and aquatic slough habitat. Northern WCA 3A is currently dominated largely by mono-specific sawgrass stands and lacks the diversity of communities that exists in southern WCA 3A. In southern WCA 3A, Wood and Tanner (1990) first documented the trend toward deep water lily dominated sloughs due to impoundment. In approximately 1991, the hydrology of southern WCA 3A shifted to the deeper water and extended hydroperiods of the new, wet hydrologic era resulting in corresponding shifts in vegetation communities north of the impoundment (Zweig and Kitchens 2008). Typical Everglades vegetation, including tree islands, wet prairies, sawgrass marshes, and aquatic sloughs is contained in WCA 3B. However, within WCA 3B, the ridge and slough landscape has been severely degraded by the virtual elimination of overland sheetflow due to the L-67 Canal and Levee system. WCA 3B experiences very little overland flow and has become primarily a rain-fed system pre-dominated by shorter hydroperiod sawgrass marshes with relatively few sloughs or tree islands remaining. Water levels in WCA 3B are also too low and do not vary seasonally, contributing to poor ridge and slough patterning. Loss of sheetflow to WCA 3B has also accelerated soil loss reducing elevations of the remaining tree islands in WCA 3B and making them vulnerable to high water stages.

The estuarine communities of Florida Bay have also been affected by upstream changes in freshwater flows through the Everglades. A reduction in freshwater inflows into Florida Bay and alterations of the normal salinity balance have affected mangrove community composition and may have contributed to a large-scale die-off of seagrass beds (USFWS 1999). Mangrove communities along Biscayne Bay have also seen a reduction in freshwater inflows and a reduction in historic habitat range by urban and agricultural development leaving only a remnant ribbon of suitable habitat immediately adjacent to the bay. Both bays experiences salinities in excess of 40 psu on a seasonal basis. Manatee Bay and Barnes Sound are presently characterized by extended periods with little or no freshwater input, interspersed with erratic large volume discharges from the C-111 Canal, which is presently the major source of freshwater flows.

In contrast to the vast extent of wetland communities, upland communities comprise a relatively small component of the Everglades landscape and are largely restricted to Long Pine Key, the northern shores of Florida Bay, and the many tree islands scattered throughout the region. Vegetative communities of Long Pine Key include rockland pine forest and tropical hardwood forest. In addition, substantial areas of tropical hardwood hammock occur along the northern shores of Florida Bay and on elevated portions of some forested islands.

3.8.1 Slough/Open Water Marsh

The slough/open water marsh community occurs in the lowest, wettest areas of the Everglades. This community is a complex of open water marshes containing emergent, floating aquatic, and submerged aquatic vegetation components. The emergent marsh vegetation is typically dominated by spikerushes (*Eleocharis cellulosa* and *E. elongata*), beakrushes (*Rhynchospora tracyi* and *R. inundata*), and maidencane (*Panicum hemitomon*). Common floating aquatic dominants include fragrant water lily (*Nymphaea odorata*), floating hearts (*Nymphoides aquatica*), and spatterdock (*Nuphar lutea*); and the submerged aquatic community is typically dominated by bladderwort (*Utricularia foliosa*) and periphyton. As shown by Davis et al. (1994), vegetative trends in ENP have included the conversion of slough/open-water marsh communities to shorter hydroperiod sawgrass marshes.

3.8.2 Sawgrass Marsh

Sawgrass marshes are dominated by dense to sparse stands of *Cladium jamaicense*. Sawgrass marshes occurring on deep organic soils (more than one meter) form tall, dense, nearly monospecific stands. Sawgrass marshes occurring on shallow organic soils (less than one meter) form sparse, short stands that contain additional herbaceous species such as spikerush, water hyssop (*Bacopa caroliniana*), and marsh mermaid weed (*Proserpinaca palustris*) (Gunderson et al. 1997). The adaptations of sawgrass to flooding, burning, and oligotrophic conditions contribute to its dominance of the Everglades vegetation. Sawgrass-dominated marshes once covered an estimated 300,000 acres of the Everglades. Approximately 70,000 acres of tall, monospecific sawgrass marshes have been converted to agriculture in the EAA. Urban encroachment from the east and development within other portions of the Everglades has consumed an additional 79,000 acres of sawgrass-dominated communities (Davis and Ogden 1997).

3.8.3 Wet Marl Prairies

Wet marl prairies occur on marl soils and exposed limestone and experience the shortest hydroperiods of the slough/marsh/prairie wetland complex. Marl prairie is a sparsely vegetated community that is typically dominated by muhly grass (*Muhlenbergia capillaris*) and short-stature sawgrass. Additional important constituents include black sedge (*Schoenus nigricans*), arrowfeather (*Aristida purpurascens*), Florida little bluestem (*Schizachyrium rhizomatum*), and Elliot's lovegrass (*Eragrostis elliottii*). Periphyton mats that grow loosely attached to the vegetation and exposed limestone also form an important component of this community. Marl prairies occur in the southern Everglades along the eastern and western periphery of SRS. Approximately 146,000 acres of the eastern marl prairie have been lost to urban and agricultural encroachment (Davis and Ogden 1997). Pollen data indicate that the marl prairies west of SRS are not a natural feature of the Everglades landscape but developed after twentieth century hydrologic modification of the system reduced flow to the region (Bernhardt and Willard 2006). Prior to the modifications, plant communities at the sites analyzed by Bernhardt and Willard (2006) in western SRS consisted of sawgrass marshes. The authors concluded that “the current spatial distribution and community composition of marl prairies are a response to water management and land cover changes of the twentieth century; and further sampling of modern marl prairie communities and adjacent communities is necessary to document the pre- and post-drainage distribution of marl prairie” (Bernhardt and Willard 2006).

3.8.4 Tree Islands

Tree islands occur within the freshwater marshes on areas of slightly higher elevation relative to the surrounding marsh. The lower portions of tree islands are dominated by hydrophytic, evergreen, broad-leaved hardwoods such as red bay (*Persea palustris*), sweetbay (*Magnolia virginiana*), dahoon holly (*Ilex cassine*), and pond apple (*Annona glabra*). Tree islands typically have a dense shrub layer that is dominated by coco-plum (*Chrysobalanus icaco*). Additional constituents of the shrub layer commonly include buttonbush (*Cephalanthus occidentalis*) and large leather fern (*Acrostichum danaeifolium*). Elevated areas on the upstream side of some tree islands may contain an upland tropical hardwood hammock community dominated by species of West Indian origin (Gunderson et al. 1997). Extended periods of flooding may result in tree mortality and conversion to a non-forested community. Portions of the WCAs have been

flooded to the extent that many forested islands have lost all tropical hardwood hammock trees. Tree islands are considered an extremely important contributor to habitat heterogeneity and overall species diversity within the Everglades ecosystem (USFWS 1999).

3.8.5 Mangroves

Mangrove communities are forested wetlands occurring in intertidal, low-wave-energy, estuarine and marine environments. Extensive mangrove communities occur in the intertidal zone of Florida Bay. Mangrove forests have a dense canopy dominated by four species: red mangrove (*Rhizophora mangle*), black mangrove (*Avicennia germinans*), white mangrove (*Laguncularia racemosa*), and buttonwood (*Conocarpus erectus*). Mangrove communities occur within a range of salinities from 0 to 40 practical salinity unit (psu). Florida Bay experiences salinities in excess of 40 psu on a seasonal basis. Declines in freshwater flow through the Everglades have altered the salinity balance and species composition of mangrove communities within Florida Bay. Changes in freshwater flow can lead to an invasion by exotic species such as Australian pine (*Casuarina equisetifolia*) and Brazilian pepper (*Schinus terebinthifolius*).

3.8.6 Seagrass Beds

Seagrasses are submerged vascular plants that form dense rooted beds in shallow estuarine and marine environments. This community occurs in sub tidal areas that experience moderate wave energy. Within the action area, extensive seagrass beds occur in Florida Bay. The most abundant seagrasses in south Florida are turtle grass (*Thalassia testudinum*), manatee grass (*Syringodium filiforme*), and shoal grass (*Halodule wrightii*). Additional species include star grass (*Halophila engelmannii*), paddle grass (*Halophila decipiens*), and Johnson's seagrass (*Halophila johnsonii*). Widgeon grass may also occur in seagrass beds in areas of low salinity. Seagrasses have an optimum salinity range of 24 to 35 psu, but can tolerate considerable short-term salinity fluctuations. Large-scale seagrass die-off has occurred in Florida Bay since 1987, with over 18 percent of the total bay area affected. Suspected causes of seagrass mortality include high salinities and temperatures during the 1980s and long-term reductions of freshwater inflow to Florida Bay.

3.8.7 Rockland Pine Forest

Pine rocklands within the action area occur on the Miami Rock Ridge and extend into the Everglades as Long Pine Key. Pine rocklands occur on relatively flat terrain with moderately to well-drained soils. Most sites are wet for only short periods following heavy rains (Florida Natural Areas Inventory 1990). Limestone bedrock is close to the surface and the soils are typically shallow accumulations of sand, marl, and organic material. Pine rockland is an open, savanna-like community with a canopy of scattered south Florida slash pine (*Pinus elliottii* var. *densa*) and an open, low-stature understory. This is a fire-maintained community that requires regular burns to maintain the open shrub/herbaceous stratum and to control hardwood encroachment (Gunderson et al. 1997). The overstory is comprised of scattered south Florida slash pines. The shrub layer is comprised of a diverse assemblage of tropical and temperate species. Common shrubs include cabbage palm (*Sabal palmetto*), coco-plum (*Chrysobalanus icaco*), myrsine (*Rapanea punctata*), saw palmetto (*Serenoa repens*), southern sumac (*Rhus copallinum*), strangler fig (*Ficus aurea*), swamp bay (*Persea palustris*), wax myrtle (*Myrica cerifera*), white indigo berry (*Randia aculeata*), and willow-bustic (*Sideroxylon salicifolium*).

The herbaceous stratum is comprised of a very diverse assemblage of grasses, sedges, and forbs. Common herbaceous species include crimson bluestem (*Schizachyrium sanguineum*), wire bluestem (*Schizachyrium gracile*), hairy bluestem (*Andropogon longiberbis*), bushy bluestem (*Andropogon glomeratus* var. *pumilis*), candyweed (*Polygala grandiflora*), creeping morning-glory (*Evolvulus sericeus*), pineland heliotrope (*Heliotropium polyphyllum*), rabbit bells (*Crotolaria rotundifolia*), and thistle (*Cirsium horridulum*) (USFWS 1999). This community occurs on areas of relatively high elevation and consequently, has been subject to intense development pressure. In addition, fragmentation, fire suppression, invasion by exotic species, and a lowered water table have negatively affected the remaining tracts of pine rockland (USFWS 1999).

3.8.8 Tropical Hardwood Hammock

Tropical hardwood hammocks occur on upland sites where limestone is near the surface. Tropical hardwood hammocks within the action area occur on the Miami Rock Ridge, along the northern shores of Florida Bay, and on elevated outcrops on the upstream side of tree islands. This community consists of a closed canopy forest dominated by a diverse assemblage of hardwood tree species, a relatively open shrub layer, and a sparse herbaceous stratum. This community is dominated by West Indian species and contains numerous species whose entire United States distribution is limited to tropical hammocks of south Florida. Common canopy species include gumbo-limbo (*Bursera simaruba*), paradise tree (*Simarouba glauca*), pigeon-plum (*Coccoloba diversifolia*), strangler fig, wild mastic (*Sideroxylon foetidissimum*), willow-bustic, live oak (*Quercus virginiana*), short-leaf fig (*Ficus citrifolia*), and wild tamarind (*Lysiloma bahamense*). Common understory species include black ironwood (*Krugiodendron ferreum*), inkwood (*Exothea paniculata*), lancewood (*Ocotea coriacea*), marlberry (*Ardisia escallonioides*), poisonwood (*Metopium toxiferum*), satinleaf (*Chrysophyllum oliviforme*), and white stopper (*Eugenia axillaris*). Common species of the sparse shrub/herbaceous layer include shiny-leaf wild-coffee (*Psychotria nervosa*), rouge plant (*Rivinal humilis*), false mint (*Dicliptera sexangularis*), bamboo grass (*Lasiacis divaricata*), and woods grass (*Oplismenus hirtellus*). This community occurs on areas of relatively high elevation and consequently, has been subject to intense development pressure. Fragmentation of remaining tracts, invasion by exotic species, and alterations of water table elevations have also had negative impacts on this community. Tropical hardwood hammocks on the Miami Rock Ridge have been affected by a lowered water table associated with the reduction of freshwater flow through the Everglades. In contrast, tree islands in the WCAs have been flooded to the extent that many have lost all tropical hardwood hammock trees.

3.9 FISH AND WILDLIFE RESOURCES

Aquatic macroinvertebrates form a vital link between the algal and detrital food web base of freshwater wetlands and the fishes, amphibians, reptiles, and wading birds that feed upon them. Important macroinvertebrates of the freshwater aquatic community include crayfish (*Procambarus alleni*), riverine grass shrimp (*Palaemonetes paludosus*), amphipods (*Hyallela aztecus*), Florida apple snail (*Pomacea paludosa*), Seminole ramshorn (*Planorbella duryi*), and numerous species of aquatic insects (USACE 1999).

Small freshwater marsh fishes are also important processors of algae, plankton, macrophytes, and macroinvertebrates. Marsh fishes provide an important food source for wading birds,

amphibians, and reptiles. Common small freshwater marsh species include the native and introduced golden topminnow (*Fundulus chrysotus*), least killifish (*Heterandria formosa*), Florida flagfish (*Jordenella floridae*), golden shiner (*Notemigonus crysoleucas*), sailfin molly (*Poecilia latipinna*), bluefin killifish (*Lucania goodei*), oscar (*Astronotus ocellatus*), eastern mosquitofish (*Gambusia holbrooki*), and small sunfishes (*Lepomis* spp.) (USACE 1999). The density and distribution of marsh fish populations fluctuate with seasonal changes in water levels. Populations of marsh fishes increase during extended periods of continuous flooding during the wet season. As marsh surface waters recede during the dry season, marsh fishes become concentrated in areas that hold water through the dry season. Concentrated dry season assemblages of marsh fishes are more susceptible to predation and provide an important food source for wading birds (USACE 1999).

Within the Greater Everglades, numerous sport and larger predatory fishes occur in deeper canals and sloughs. Common species include largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), redear sunfish (*Lepomis microlophus*), black crappie (*Pomoxis nigromaculatus*), Florida gar (*Lepisosteus platyrhincus*), threadfin shad (*Dorosoma petenense*), gizzard shad (*Dorosoma cepedianum*), yellow bullhead (*Ameiurus natilis*), white catfish (*Ameiurus catus*), bowfin (*Amia calva*), and tilapia (*Tilapia* spp.) (USACE 1999). Larger fishes are an important food source for wading birds, alligators, otters, raccoons, and mink.

The freshwater wetland complex supports a diverse assemblage of reptiles and amphibians. Common amphibians include the greater siren (*Siren lacertina*), Everglades dwarf siren (*Pseudobranchius striatus*), two-toed amphiuma (*Amphiuma means*), pig frog (*Rana grylio*), southern leopard frog (*Rana sphenoccephala*), Florida cricket frog (*Acris gryllus*), southern chorus frog (*Pseudacris nigrita*), squirrel tree frog (*Hyla squirela*), and green tree frog (*Hyla cinerea*) (USACE 1999). Amphibians also represent an important forage base for wading birds, alligators, and larger predatory fishes (USACE 1999).

Common reptiles of freshwater wetlands include the American alligator (*Alligator mississippiensis*), snapping turtle (*Chelydra serpentina*), striped mud turtle (*Kinosternon bauri*), mud turtle (*Kinosternon subrubrum*), cooter (*Chrysemys floridana*), Florida chicken turtle (*Deirochelys reticularia*), Florida softshell turtle (*Trionys ferox*), water snake (*Natrix sipidon*), green water snake (*Natrix cyclopion*), mud snake (*Francia abacura*), and Florida cottonmouth (*Agkistrodon piscivorus*) (USACE 1999).

The freshwater wetlands of the Everglades are noted for their abundance and diversity of colonial wading birds. Common wading birds include the white ibis (*Eudocimus albus*), glossy ibis (*Plegadus falcenellus*), great egret (*Casmerodius albus*), great blue heron (*Ardea herodias*), little blue heron (*Egretta caerulea*), tricolored heron (*Egretta tricolor*), snowy egret (*Egretta thula*), green-backed heron (*Butorides striatus*), cattle egret (*Bubulcus ibis*), black-crowned night heron (*Nycticorax nycticorax*), yellow-crowned night heron (*Nycticorax violacea*), roseate spoonbill (*Ajaia ajaja*), and wood stork (*Mycteria americana*) (USACE 1999). The number of wading birds nesting in the Everglades has decreased by approximately 90 percent, and the distribution of breeding birds has shifted away from ENP into the WCAs (Bancroft et al. 1994). The WCAs support fewer numbers of breeding pairs with relatively lower reproductive success

(USACE 1999). Water management practices and wetland losses are believed to be the primary cause of the declines (Bancroft et al. 1994).

Mammals that are well-adapted to the aquatic and wetland conditions of the freshwater marsh complex include the rice rat (*Oryzomys palustris natator*), round-tailed muskrat (*Neofiber alleni*), and river otter (*Lutra canadensis*). Additional mammals that may utilize freshwater wetlands on a temporary basis include the white-tailed deer (*Odocoileus virginianus*), Florida panther (*Puma concolor coryi*), bobcat (*Lynx rufus*), and raccoon (*Procyon lotor*).

3.10 THREATENED AND ENDANGERED SPECIES

3.10.1 Federally Protected Species

The Corps has coordinated with the United States Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS), in accordance with Section 7 of the Endangered Species Act, to determine Federally listed threatened and endangered species that are either known to occur or are likely to occur within the project area (See **Appendix D**). Many of these species have been previously affected by habitat impacts resulting from wetland drainage, alteration of hydroperiod, wildfire, and water quality degradation. A number of candidate animal and plant species are also known to exist or potentially exist within the project area. For a complete list of Federally threatened and endangered species within the project area, their critical habitat, and candidate species refer to **Table 3-3**. For a complete description of each species, refer to **Appendix D**.

TABLE 3-3. FEDERALLY THREATENED AND ENDANGERED SPECIES WITHIN THE PROJECT AREA

Common Name	Scientific Name	Status
Mammals		
Florida panther	<i>Puma concolor coryi</i>	E
Florida manatee	<i>Trichechus manatus latirostris</i>	E, CH
Florida bonneted bat	<i>Eumops floridanus</i>	E
Birds		
Cape Sable seaside sparrow	<i>Ammodramus maritimus mirabilis</i>	E, CH
Everglade snail kite	<i>Rostrhamus sociabilis plumbeus</i>	E, CH
Piping plover	<i>Charadrius melodus</i>	T
Red-cockaded woodpecker	<i>Picoides borealis</i>	E
Roseate tern	<i>Sterna dougallii dougallii</i>	T
Wood stork	<i>Mycteria americana</i>	T
Reptiles		
American Alligator	<i>Alligator mississippiensis</i>	T, SA
American crocodile	<i>Crocodylus acutus</i>	T, CH
Eastern indigo snake	<i>Drymarchon corais couperi</i>	T
Gopher tortoise	<i>Gopherus polyphemus</i>	C
Green sea turtle	<i>Chelonia mydas</i>	E
Hawksbill sea turtle	<i>Eretmochelys imbricate</i>	E
Kemp's Ridley sea turtle	<i>Lipodochelys kempii</i>	E
Leatherback sea turtle	<i>Dermochelys coriacea</i>	E
Loggerhead sea turtle	<i>Caretta caretta</i>	E
Fish		

Smalltooth sawfish	<i>Pristis pectinata</i>	E, CH
Invertebrates		
Bartram's hairstreak butterfly	<i>Strymon acis bartrami</i>	C
Elkhorn coral	<i>Acropora palmata</i>	T, CH
Florida leafwing butterfly	<i>Anaea troglodyta floridalis</i>	C
Miami blue butterfly	<i>Cyclargus thomasi bethunebakeri</i>	E
Schaus swallowtail butterfly	<i>Heracles aristodemus ponceanus</i>	E
Staghorn coral	<i>Acropora cervicornis</i>	T, CH
Stock Island tree snail	<i>Orthalicus reses</i> (not incl. <i>nesodryas</i>)	T
Plants		
Crenulate lead plant	<i>Amorpha crenulata</i>	E
Deltoid spurge	<i>Chamaesyce deltoidea</i> spp. <i>deltoidea</i>	E
Garber's spurge	<i>Chamaesyce garberi</i>	T
Johnson's seagrass	<i>Halophila johnsonii</i>	E, CH
Okeechobee gourd	<i>Cucurbita okeechobeensis</i> spp. <i>okeechobeensis</i>	E
Small's milkpea	<i>Galactia smallii</i>	E
Tiny polygala	<i>Polygala smallii</i>	E
Big pine partridge pea	<i>Chamaecrista lineata</i> var. <i>keyensis</i>	C
Blodgett's silverbush	<i>Argythamnia blodgettii</i>	C
Cape Sable thoroughwort	<i>Chromolaena frustrata</i>	E, CH
Carter's small-flowered flax	<i>Linum carteri</i> var. <i>carteri</i>	E, Pr CH
Everglades bully	<i>Sideroxylon reclinatum</i> spp. <i>austrofloridense</i>	C
Florida brickell-bush	<i>Brickellia mosieri</i>	E, Pr CH
Florida bristle fern	<i>Trichomanes punctatum</i> spp. <i>floridanum</i>	C
Florida pineland crabgrass	<i>Digitaria pauciflora</i>	C
Florida prairie-clover	<i>Dalea carthagenensis</i> var. <i>floridana</i>	C
Florida semaphore cactus	<i>Consolea corallicola</i>	E
Pineland sandmat	<i>Chamaesyce deltoidea</i> ssp. <i>pinetorum</i>	C
Sand flax	<i>Linum arenicola</i>	C

E=Endangered; T=Threatened; SA=Similarity of Appearance; CH=Critical Habitat; Candidate Species, Pr CH = Proposed Critical Habitat

3.10.2 State Listed Species

The project area provides habitat for several state listed species. For a complete list of state listed species please see **Table 3-4**.

TABLE 3-4. STATE LISTED SPECIES WITHIN THE PROJECT AREA

Common Name	Scientific Name	Status
Mammals		
Florida black bear	<i>Ursus americanus floridanus</i>	T
Everglades mink	<i>Mustela vison evergladensis</i>	T
Florida mouse	<i>Podomys floridanus</i>	SC
Florida mastiff bat	<i>Eumops glaucinus floridanus</i>	E
Birds		
Piping plover	<i>Charadrius melodus</i>	T
Snowy plover	<i>Charadrius alexandrinus</i>	T
American oystercatcher	<i>Haematopus palliatus</i>	E
Brown pelican	<i>Pelecanus occidentalis</i>	SC
Black skimmer	<i>Rynchops niger</i>	SC
Least tern	<i>Sterna antillarum</i>	T

White-crowned pigeon	<i>Columba leucocephalus</i>	T
Least tern	<i>Sterna antillarum</i>	T
Limpkin	<i>Aramus guarauna</i>	SC
Little blue heron	<i>Egretta caerulea</i>	SC
Tricolored heron	<i>Egretta tricolor</i>	SC
Snowy egret	<i>Egretta thula</i>	SC
Reddish egret	<i>Egretta rufescens</i>	SC
White ibis	<i>Eudocimus albus</i>	SC
Roseate spoonbill	<i>Ajaja ajaja</i>	SC
Fish		
Mangrove rivulus	<i>Rivulus marmoratus</i>	SC
Invertebrates		
Miami blue butterfly	<i>Cyclargus [=Hermiargus] thomasi bethunebakeri</i>	E
Florida tree snail	<i>Liguus fasciatus</i>	SC
Plants		
Pine-pink orchid	<i>Bletia purpurea</i>	T
Lattace vein fern	<i>Thelypteris reticulata</i>	E
Eatons spikemoss	<i>Selaginella eatonii</i>	E
Wright's flowering fern	<i>Anemia wrightii</i>	E
Tropical fern	<i>Schizaea pennula</i>	E
Mexican vanilla	<i>Manilla mexicana</i>	E

E=Endangered; T=Threatened; SC=Species of Special Concern

3.11 ESSENTIAL FISH HABITAT

The Magnuson-Stevens Fishery Conservation and Management Act, 16USC 1801 et seq. Public Law 104-208 reflects the Secretary of Commerce and Fishery Management Council authority and responsibilities for the protection of essential fish habitat (EFH). The southern estuaries comprise Biscayne National Park and a large portion of ENP and are a shallow estuarine system (average depth less than 3 feet). Florida Bay is the main receiving water of the greater Everglades, heavily influenced by changes in timing, distribution, and quantity of freshwater flows into the southern estuaries. The southern estuaries contain essential fish habitat for corals; coral reef and live bottom habitat; red drum (*Sciaenops ocellatus*); penaeid shrimps; spiny lobster (*Panulirus argus*); other coastal migratory pelagic species and the snapper-grouper complex. Species generally present in the southern estuaries region include brown shrimp (*Penaeus aztecus*), pink shrimp (*Penaeus duorarum*), white shrimp (*Penaeus sp.*), spiny lobster (*Panulirus argus*), stone crab (*Menippe mercenaria*), gulf stone crab, red drum, Spanish mackerel (*Scomberomorus maculatus*), and gray snapper (*Lutjanus griseus*). Essential fish habitat in the southern estuaries is comprised of seagrasses, estuarine mangroves, intertidal flats, the estuarine water column, live/hard bottoms, and coral reefs.

3.12 WATER QUALITY

Water quality in the study area is significantly influenced by development. The C&SF Project led to significant changes in the landscape by opening large land tracts for urban development and agricultural uses, and by the construction of extensive drainage networks. Natural drainage patterns in the region have been disrupted by the extensive array of levees and canals which has resulted in further water quality degradation. The water quality of the study area is largely controlled by Lake Okeechobee and the EAA to the north and urban and agricultural development southeast of ENP. The northern WCAs are fed from the lake as well as runoff from

the EAA. Water quality impairment within the study area can generally be attributed to nutrients and bioavailable forms of mercury. A short discussion of each of these water pollutants is provided below followed by a review of water quality within the project area.

3.12.1 Nutrients

Nutrients such as phosphorous and nitrogen compounds are a concern in the estuaries, WCAs, ENP, and Lake Okeechobee since they result in an imbalance of flora and fauna. To address nutrient discharges the FDEP has recently established surface water quality numeric nutrient criteria for all Florida water bodies and developed National Pollution Discharge Elimination (NPDES) Total Maximum Daily Loads (TMDLs) for many watersheds with excessive nutrient pollution. TMDLs for phosphorus and/or nitrogen currently exist for Lake Okeechobee. Additional information on the status and implementation of TMDLs within the study area can be found at <http://www.dep.state.fl.us/water/tmdl/>. Within the Everglades Protection Area (EPA), phosphorus concentrations are regulated by the “Phosphorus Rule” 62-302.540 F.A.C. and are subject to the terms of the 1992 Consent Decree in *United States v. South Florida Water Mgmt. Dist* (S.D. Fla No. 88-1886-CIV-MORENO). .

Excess nutrients come primarily from agricultural fertilizers. The decomposition of the peat soils in the area also contributes to excess phosphorus in the system. Phosphorus is the limiting nutrient for Lake Okeechobee, the WCAs, and ENP; nitrogen is generally considered to be the limiting nutrient for the marine waters of south Florida. Prior to 1970, the background TP concentration in Lake Okeechobee was less than 0.040 milligrams per liter (mg/l) while at present it exceeds 0.090 mg/l. Within the remnant Everglades, the background phosphorus concentration in surface waters is between 0.004 mg/l and 0.006 mg/l TP. At the northern end of WCA 3, inflow TP concentrations can exceed 0.020 mg/l resulting in undesirable changes to soil composition and vegetation coverage. Soil phosphorus concentrations in pristine areas of ENP are on the order of 100 to 200 milligrams per kilogram (mg/kg) while in impacted areas of the WCAs near canals, soil phosphorus concentrations exceed 500 mg/kg (Craft 2007). The discharge of elevated concentrations of TP into the WCAs has resulted in sufficient soil phosphorus concentrations (< 650 mg/kg) to support cattail invasion into formerly sawgrass and bulrush dominated areas.

Nitrogen is generally not considered to be a problem within the Everglades landscape. The concentration of total nitrogen (TN) varies from about 2.2 mg/l in WCA 1 to around 0.85 mg/L in pristine areas of ENP. Lake Okeechobee TN concentration is presently around 1.7 mg/l. The average concentration of TN into Florida Bay is around 1.0 mg/l with very little provided as nitrate and nitrite.

Nutrient loading to the WCAs and ENP have resulted in significant degradation of the Everglades landscape by converting thousands of acres of sawgrass prairie into lesser quality habitat such as cattail marsh. The 1992 Consent Decree resolved complaints brought by the Federal government in 1988 against the State of Florida (SFWMD and FDEP) for failing to regulate discharges into ENP and the Arthur B. Marshall Loxahatchee National Wildlife Refuge. The 1992 Consent Decree, as modified in 2001, specified interim and long-term phosphorus concentration levels for the Arthur R. Marshall Loxahatchee National Wildlife Refuge, SRS, Taylor Slough and coastal basins in ENP. The SFWMD collects the required water quality data

and publishes a Settlement Agreement Report on a quarterly basis as part of complying with the terms of the 1992 Consent Decree. For the last several years, discharges into SRS have mostly complied with the requirements of the settlement agreement with the following exceptions: (1) exceedances in the 2008 and 2012 Federal Water Years of the Long-Term Limit which first became in effect in WY2007, and (2) exceedance of the allowable annual percentage of TP measurements exceeding 10 ppb at SRS for WY2010. Each of these exceedances was evaluated and discussed by the Technical Oversight Committee (TOC). With respect to the exceedance that occurred in WY 2012, the TOC agreed that the measures currently underway, including correct and timely implementation of the State Restoration Strategies Plan, were expected to achieve the requisite water quality in inflows from the WCAs to SRS. In addition, the SRS Settlement Agreement calculations for WY2009 and WY2010 show that the annual FWM TP concentration for these years was at the limits (8.2 ppb and 8.9 ppb, respectively). More recently, the Corps evaluation of SRS compliance indicates there was an exceedance of the SRS limit of approximately 1.0 ppb. (The official SRS compliance results for WY2014 will be published by the SFWMD around June of 2015.)

Compliance with the 1992 Consent Decree requirements long-term limits at SRS is of critical importance to the state, Federal and Tribal parties. Recent water quality trends into and out of WCA 3A indicate that FWM TP concentrations and SRS loads are decreasing based on flows and load total phosphorus data obtained from the SFWMD DBHYDRO database. **Figure 3-2** shows that over the past 20 years, the annual FWM TP concentrations entering WCA 3A (at S-9, S-9X, S-11X, S-140, S-150, S-190) have fallen from approximately 0.050 mg/l to 0.030 mg/l while the annual FWM TP concentration measured at SRS (at S-12X, S-333, S-334) has fallen from approximately 0.011 mg/l to approximately 0.009 mg/l. The reduction in inflow FWM and outflow FWM for WCA 3A is likely the result of the construction and operation of the STAs in the EAA. This is a slow trend and there may be periodic reversals due to weather conditions (e.g. droughts resulting in WCA dry downs, followed by wet periods flushing the mobilized nutrients). In portions of the WCAs that have historically received direct untreated discharges from the EAA, there is a large internal phosphorus load contained in the sediments.

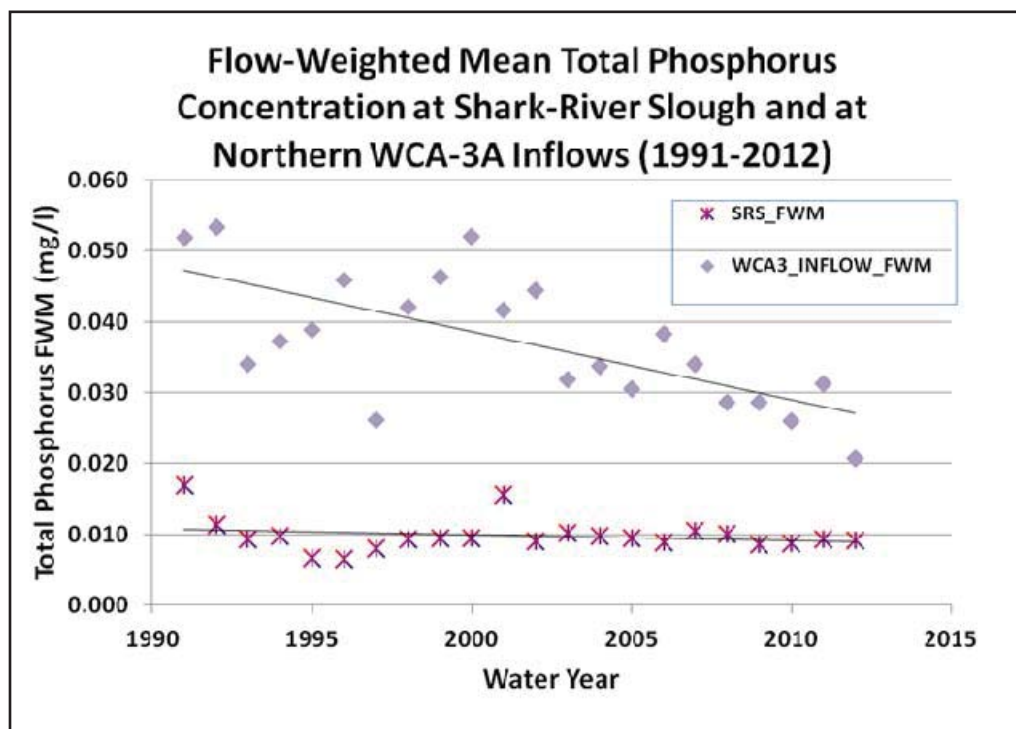


FIGURE 3-2. FLOW-WEIGHTED MEAN TOTAL PHOSPHOROUS CONCENTRATION AT SHARK RIVER SLOUGH AND NORTHERN WCA 3A INFLOWS

3.12.2 Bioavailable Mercury

Mercury (Hg) is widely distributed in the environment and originates primarily from volcanoes and human-induced (anthropogenic) sources such as combustion (Krabbenhoft and Sunderland, 2013). Hg is deposited from the atmosphere primarily as inorganic Hg. In the Everglades, the conversion of inorganic Hg to organic methylmercury (MeHg) is facilitated by naturally occurring reducing bacteria. This conversion of inorganic Hg to MeHg is one of the important steps in the bioaccumulation of Hg as it greatly increases toxicity and potential for accumulation in aquatic biota. The U.S. Environmental Protection Agency (USEPA) has established that a concentration of Hg in fish tissue in excess of 0.3 mg/kg is detrimental to human health. Water quality impairment for Hg is also measured by the incidence of game fish tissue with Hg in excess of 0.3 mg/Kg. Twenty species of Florida freshwater fish and over 60 species of marine fish are under consumptive advisory (FDOH 2013). These advisories apply to the EPA, including all of the WCAs and ENP. In the WCAs, largemouth bass Total Mercury (THg) concentrations declined sharply in the 1990's, but have changed little since 2000. Significantly, in ENP, largemouth bass THg concentrations have not changed in the last 23 years, from 1989 to 2011.

Over the past 15+ years, several agencies, educational institutions and organizations have conducted research to identify key chemical characteristics that play major roles in Hg methylation and have investigated trends in MeHg bioaccumulation within the Everglades freshwater ecosystems as well. Sulfur, Hg and dissolved organic carbon, have been identified as

significant drivers of Hg methylation (Ekstrom et al., 2003; Gilmour et al., 2004). It has been suggested that sulfate-reducing bacteria (SRB) are the dominant producer of MeHg in the Everglades aquatic ecosystems, however other groups of bacteria such as iron-reducing bacteria and methanogens also have the ability to methylate mercury (Gilmour 2012).

3.13 NATIVE AMERICANS

There are two Federally recognized tribes (Miccosukee Tribe of Indians of Florida and the Seminole Tribe of Florida) that are located within and adjacent to the project area. Both tribes maintain strong connection to the project area through continued use. The project area also includes portion of the Miccosukee Tribe's reservation which spans portions of WCA 3A. In addition both tribes have leases and easements within the WCA 3A and have historically recognized rights with the ENP that stems from the Native Americans who lived within ENP boundaries prior to the parks creation.

The Miccosukee Tribe of Indians of Florida and Seminole Tribe of Florida have a long history of living within the project area. The both tribes moved into the region during what is known as the Second Seminole War (1835-1842). Fleeing the U.S. Army and the forced relocation policies of the Indian Removal Act (1830), the Miccosukee and Seminoles were part of Native American groups commonly referred to as Seminoles; however, there are references to some of the groups involved in the conflict as Mikasuki which supports the later reasons for separations of the two groups and they had different groups from the start (Weisman 1999). Many of these groups fled into the swamp areas of south Florida and made their homes within the Everglades and other remote areas of region. The coming of the Civil War led to the abandonment of the removal efforts and the various Native American groups were largely left alone in the region until the late nineteenth century when the world slowly encroached again into the region. In 1928 the Tamiami Trail opened, cutting through the Everglades and bringing along with it tourists and explorers into the region, and, for the first time, bringing complete access for the various tribes to participate in the larger economy that was growing in south Florida. The promising tourism business led to the establishment of some groups along the Tamiami Trail who set up shops selling crafts and offering guided tours into the Everglades.

As early as 1894, the Federal governmental and later the State of Florida started to acquire lands within the Big Cypress area. However, initial attempts to relocate tribal members to these areas failed as there were simply no incentives to abandon traditionally occupied areas in favor of the new lands (Weisman 1999). "The Indian New Deal changed that, and for the first time, services, programs, and land were brought together...at Big Cypress (Weisman 1999:125)." In the 1930s, the Federal Government started to bring services to the various Seminole groups. Some of the groups relocated and started to receive Federal aid, while some groups resisted government intrusion into their lives and remained in various traditional areas that now included sites along Tamiami Trail (Weisman 1999). Throughout the next two decades the Federal Government instituted various aid programs to assist the Native American groups living within the reservations until the early 1950s. In the early 1950s, the Federal Government's policies radically changed, as it was felt that native groups should now join "mainstream society" and that Federal aid should come to an end (Weisman 1999:131). Being faced with a reduction in support and possible termination of recognition as a group by the government, various Native American groups on these reservations began to organize and form their own tribal governments

to assist in the protection of their interests. In 1957, the Seminole Tribe of Florida received Federal recognition. However, wishing to remain separate and to maintain their own identity, many of the groups along the Tamiami Trail refused to join and instead held out to form their own government that would be Federally recognized in 1962 as the Miccosukee Tribes of Indians of Florida.

Today most of the Miccosukee Tribe lives within the confines of the reservation located along the forty mile bend of Tamiami Trail (**Figure 3-3**) while many of the Seminoles tribal members live on various reservations properties with the largest being those of Big Cypress, Hollywood, and Brighton Reservations. In addition to the Federal reservation, the Miccosukee Tribe has also established a perpetual lease to large portions of the WCA 3A area while the Seminole Tribe has a lease within the northwestern portion of WCA 3A. The members of both groups maintain a traditional life style that is intricately connected to the Everglades. Traditional practices of hunting, fishing and general living are still maintained, along with modern entrepreneurship through various enterprises such as cattle ranching and with tourism related businesses along Tamiami Trail. Today, both tribes have vibrant, thriving culture based within the Everglades region. These practices continue to tie the Tribes to the Everglades in such a way that careful consideration of effects is warranted.

Members of both Tribes continue to rely upon the Everglades to support their cultural, medicinal, subsistence, and commercial activities. The specific issues impacting each tribe have been different over the last few decades, but they are all related to impacts due to man-made changes to the Everglades ecosystem. The Miccosukee Tribe of Indians of Florida's focus has been on the detrimental ponding of water on tribal property in WCA 3A, which affects subsistence practices and increases inundation risks to islands utilized by the Tribe. The Miccosukee Tribe of Indians of Florida has also voiced concerns with regards to the impacts of nutrient pollution on the system. The Seminole Tribe of Florida's focus has been on the detrimental drainage of water from the western basin and their Big Cypress Reservation, in addition to the impacts of nutrient pollution on the delicate Everglades system.

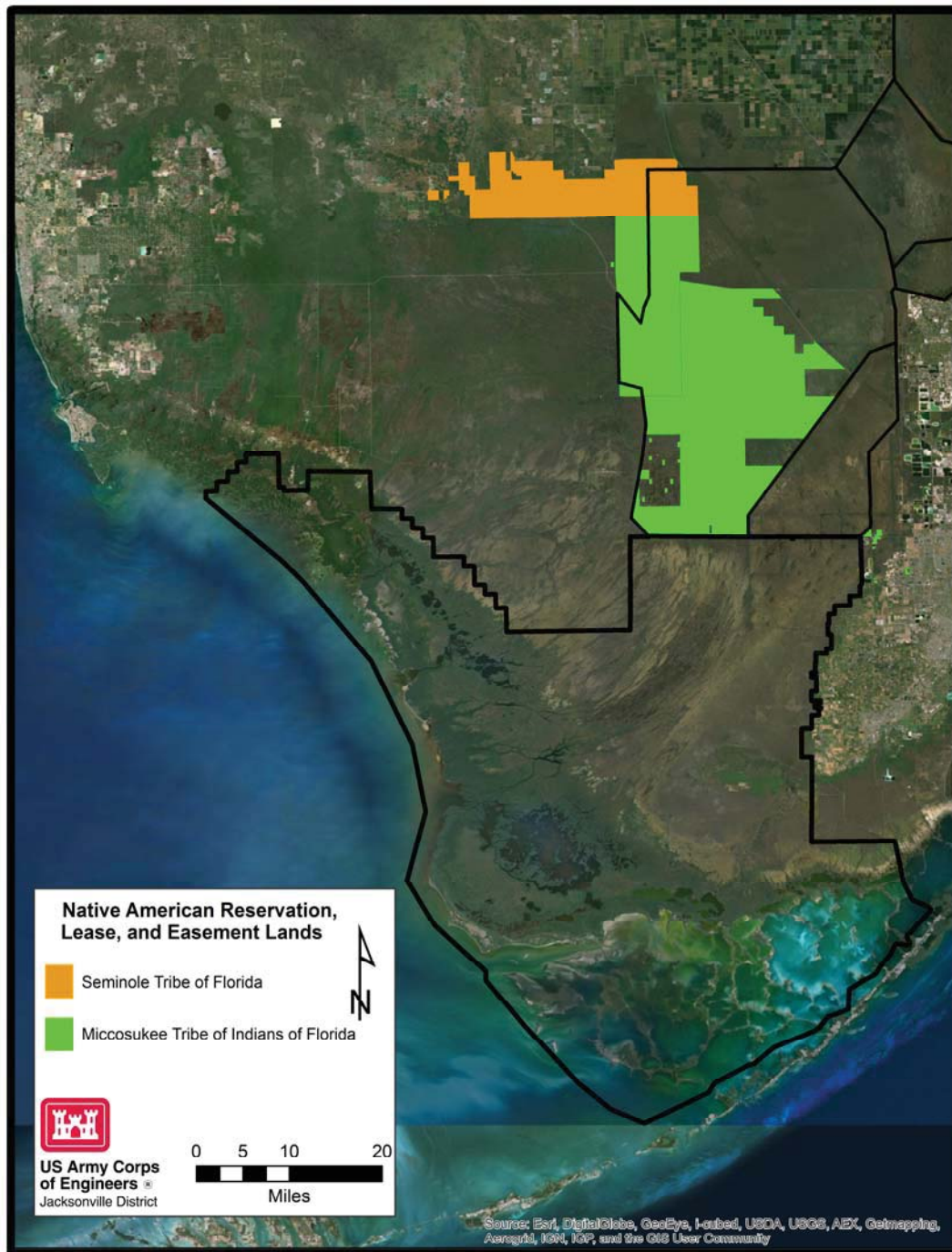


FIGURE 3-3. MAP OUTLINING THE LOCATION OF TRIBAL RESERVATION, LEASED AND EASEMENT LANDS

3.14 CULTURAL RESOURCES

Within the larger region that includes ENP, there are numerous recorded archeological sites indicative of Native American habitation. Prior to European contact, the Everglades were a heavily populated area. Native Americans traveled via canoe and on foot through the saw grass

and inhabited many of the tree islands that dot the landscape. The earliest known habitation sites date to the Early Archaic period (7,500 BC) when the Everglades were much drier. However, within the larger area of south Florida, evidence of Paleo-Indian (12,000 to 7,500 BC) habitation has also been recorded (i.e. Warm Mineral Springs (8SO18) and Little Salt Spring (8SO79) (Griffin 1988). Some of the Early Archaic habitation sites have only recently been rediscovered as the result of managed drainage programs in south Florida. As the climate warmed and sea level rose, many Native Americans abandoned the lowest of the tree islands as they became submerged. This process continued through what is known as the Middle Archaic, until climate conditions stabilized around 300 BC at the start of the Late Archaic. Today many sites from both the Early and Middle Archaic periods are no longer submerged and may have more modern Native American use.

After the Archaic period, the region became incorporated into what is known as the Glades region and remained inhabited until European contact, when Old World diseases and slave raiding heavily reduced the Native populations during the late 1,500s-1,700s. Many of the tree islands through this portion of the Everglades have sites associated to the Glades period. This period has been broken down into successive stages starting with Glades I, which dates from 500 BC to 750 AD, Glades Period II dating from 750 to 1,200 AD, and Glades Period III dating from 1,200 AD to European contact in the 1,500s. Typical habitation sites through this region are commonly referred to as middens, which are the accumulation of daily life activities on these tree islands. Material remains can stretch from the surface to well over one meter below the surface on certain islands. Native American burials can also be found among these habitation sites.

After European contact, Native American populations in the region continuously declined and remained at low levels until Miccosukee and Seminole tribal groups moved into the area while fleeing the U.S. Army and U.S. Governments' forced relocation program. Many sites associated with both the Miccosukee and Seminole tribes are known to exist throughout the region (See Native American section for more background). After the civil war these Native American groups would see the intrusion of white settlers in to the area as south Florida and its largest city Miami drew settlers into the region. Within region in consideration white settlers from central Florida seeking jobs and opportunity moved into the area.

Within ENP there are numerous archaeological sites that span the multitude of known occupational periods with the exclusion of the Paleo period although it is likely that some type of occupation from that period may be found within the park. Most likely no such sites have been found due to inundation of areas that may have been occupied by such people.

The main portion of ENP that is the consideration of this study falls within the Everglades park expansion area (Schwadron 2006; Schwadron et al. 2009). This portion of the park was surveyed in 2009 for the presence of cultural resources. Forty-two archaeological sites were identified and reported as existing within this portion of the park. In all there are several hundred reported archaeological sites with the full expanse of ENP. In addition, the park contains numerous historic structures and other resources.

Of importance though within the park is the National Register District within SRS. The SRS has been placed on the National Register of Historic Places. The slough was nominated as the Shark River Slough Archaeological District (8DA6693), containing 63 total resources, of which 39 of those resources are contributing resources to the district (Schwandron 1996). Site types typically found include multi-occupation sites such as Tiger Hammock (8DA11), which has middens associated with Glades II and III and Seminole occupations.

In summary the project areas contain a wide variety of resources that vary within their significance. There are archaeological resources associated with some of the earliest habitation sequences within south Florida and relatively modern sites directly associated with modern Native American tribes who were removed from the park shortly after its creation. In addition, the park has continued to be used by modern cultural groups such as Modern Gladesmen. Its history continues to develop and evolve as by those who use it.

3.15 UNESCO/ WORLD HERITAGES SITE

ENP is listed as a World Heritage site by the United Nations Educational, Scientific and Cultural Organization (UNESCO). It was first nominated in 1976 and listed by UNESCO in 1979. Over the years the park has been recognized for its significance as it was listed as a biosphere reserve in 1976 and was designated and remains a Ramsar site (Wetland of International Significance) in 1987 (<http://whc.unesco.org/en/list/76/>; <http://www.ramsar.org/sites-countries/the-ramsar-sites>) These recognitions have seen the park continued to be inscribed on the World Heritage list. However in 1993, the park was listed on the endangered list by UNESCO due to impacts to the park associated with Hurricane Andrew which had devastating effects inside the park. The park remained on the endangered list until 2007. On July 30, 2010, it was listed again by UNESCO because of issues associated with water flow within the park. Currently the park is addressing these issues and is expected to report back to UNESCO by February 1, 2015.

3.16 AIR QUALITY

Legal limitations on pollutant concentration levels allowed to occur in the ambient air, or air quality standards, have been established by the USEPA and the FDEP for six criteria pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO₂), ozone (O₃), particle pollution (10 microns or less in diameter (PM₁₀), and 2.5 microns or less in diameter (PM_{2.5}), and sulfur dioxide (SO₂). Primary sources of air pollution in south Florida are related to transportation, stationary fuel combustion sources, and solid waste disposal. The existing air quality within south Florida is considered good, as outlined within the FDEP 2010 Air Monitoring Report (FDEP 2010). Air monitoring reports are prepared annually by FDEP to inform the public of the air pollutant levels throughout the State of Florida. The report summarizes the results of monitoring that has been conducted to measure outdoor concentrations of those pollutants for which the USEPA and the State of Florida's Environmental Protection program have established ambient air quality standards. All areas within the state are designated with respect to each of the six pollutants as attainment (*i.e.*, in compliance with the standards); non-attainment (*i.e.*, not in compliance with the standards); or unclassifiable (*i.e.*, insufficient data to classify). Attainment areas can be further classified as maintenance areas. Maintenance areas are areas previously classified as non-attainment which have successfully reduced air pollutant concentrations to below the standard. Maintenance areas must maintain some of the non-attainment area plans to stay in compliance with the standards. Southeast Florida including

Miami-Dade County continues to be classified by the USEPA as an attainment/maintenance area for ozone. Florida remains designated as unclassifiable for PM₁₀. Although sufficient data have been collected for attainment determinations, USEPA has not considered PM₁₀ for attainment determinations in Florida yet.

3.17 HAZARDOUS, TOXIC OR RADIOACTIVE WASTES

3.17.1 L-29 Canal between S-333 and S-356 Structures

Along the southern boundary of WCA 3A and WCA 3B there are levees and canals constructed in the 1950s and 1960s that limit vehicle access to the interior. Activity within the WCA is generally limited to fishing, hunting, and birding though there may be some illegal dumping of solid wastes along the perimeter. No soil testing for residual contaminants has been conducted within the WCA 3A and WCA 3B as part of this project since the lands have no history of prior agricultural or industrial use that would cause such contamination.

A search of FDEP petroleum spill and storage sites database done in October of 2014 identified six petroleum storage sites and one spill site along Tamiami Trail between S-333 and S-356. Petroleum storage at Everglades Safari site was closed in 2005; however, a petroleum spill at this site is listed as ongoing as of October 2014. Petroleum storage facilities operated by the SFWMD are located at the S-333 and S-356 structures.

3.17.2 L-31N Canal between Tamiami Trail and S-331 Structure

A search of FDEP's databases of contamination sites and petroleum storage facilities identified five spill sites and 15 petroleum storage facilities located along the canal or within the 8.5 SMA. The SFWMD is listed as the permit holder for storage facilities at the S-357N and S-331 pump stations. The spill at the SFWMD's S331 pump station has been completed. A spill at the General Portland, Inc. facility west of the canal is listed as ongoing. Three non-petroleum cleanup sites are located along the L-31N Canal. Two of the sites are located along the L-31N Canal buffer trail and one is located within the 8.5 SMA.

3.18 NOISE

Noise levels are associated with surrounding land use. Within the major natural areas of south Florida, external sources of noise are limited and of low occurrence. Existing sources of noise are limited to vehicular traffic travelling on roads adjacent to and cutting through the project area. Wilderness ambient sound levels are typically in the range of 35 dB. Other sources of noise which may occur within these natural areas include air boats, off road vehicles, swamp buggies, motor boats, and occasional air traffic. Sound levels are typically in the range of 85 to 105 decibels (dB) for motorboats and air boats, respectively.

Sources of noise in rural, areas include noise associated with agricultural production such as the processing and transportation of agricultural produce. The use of farm equipment such as tractors, plows, and the use of irrigation facilities would be expected to be the dominant background noise. Rural areas have typical noise levels in the range of 35 to 55 dB.

Within the rural municipalities and urban areas, sound levels would be expected to be of greater intensity, frequency, and duration. Noise associated with transportation arteries, such as

highways, railroads, primary and secondary roads, airports etc., inherent in areas of higher population would be significant and probably override those sounds associated with natural emissions. Other sources of noise might be expected to include noise from everyday social and human communication and activity, operations of construction and landscaping equipment, and operations at commercial and industrial facilities. In general, urban emissions would not be expected to exceed 60 dB, but may attain 90 dB or greater in busier urban areas or near to frequently used high volume transportation arteries.

3.19 AESTHETICS

The visual characteristics of south Florida can be described according to the three dominant land use categories: natural areas, agricultural lands, and urban areas. The natural areas consist of a variety of upland and wetland ecosystems, including lakes, ponds, vast expanses of marsh and wet prairie, with varying vegetative components. Uplands are often dominated by pine, although other sub-tropical and tropical hardwoods do occur. Overall, the land is extremely flat, with few natural topographic features such as hills or other undulations. Much of the visible topographic features within the natural areas are man-made, including canals and levees. Additional man-made features include pump stations, secondary and primary roads, highways, electrical wires, communication towers, occasional buildings, borrow pits and other features which may or may not detract from the regional aesthetic. Agricultural lands are cultivated for citrus, sugarcane, vegetables, sod, and greenhouse/nursery. Generally, urban development is concentrated along the LEC from Palm Beach County to Miami-Dade County. Major cities are visually congested with residential communities, major transportation arteries (i.e. heavily used roads and highways), and intensively developed commercial and industrial facilities. Development is typically immediately adjacent to or nearby protected natural areas.

3.20 SOCIOECONOMICS

Florida's economy is characterized by strong wholesale and retail trade, government, and service sectors. The economy of south Florida is based on services, agriculture, and tourism. Florida's warm weather and extensive coastline attract vacationers and other visitors and help make the state a significant retirement destination. The three counties that comprise the LEC are heavily populated, and it is estimated that over 6.9 million people will reside in this region by the year 2050.

Much of the land within the area potentially impacted by the Proposed Action is within ENP and is publicly owned. However, a number of privately owned parcels still exist within this region. Several private entities currently own real estate within the project area adjacent to Tamiami Trail and within ENP (**Figure 3-4**). Property owners include airboat concessionaires, the Airboat Association of Florida, Florida Power and Light, Lincoln Financial Media, and Salem Communications. The Miccosukee Indian Tribe of Florida current lease two areas adjacent to Tamiami Trail (Osceola and Tigertail Camps).

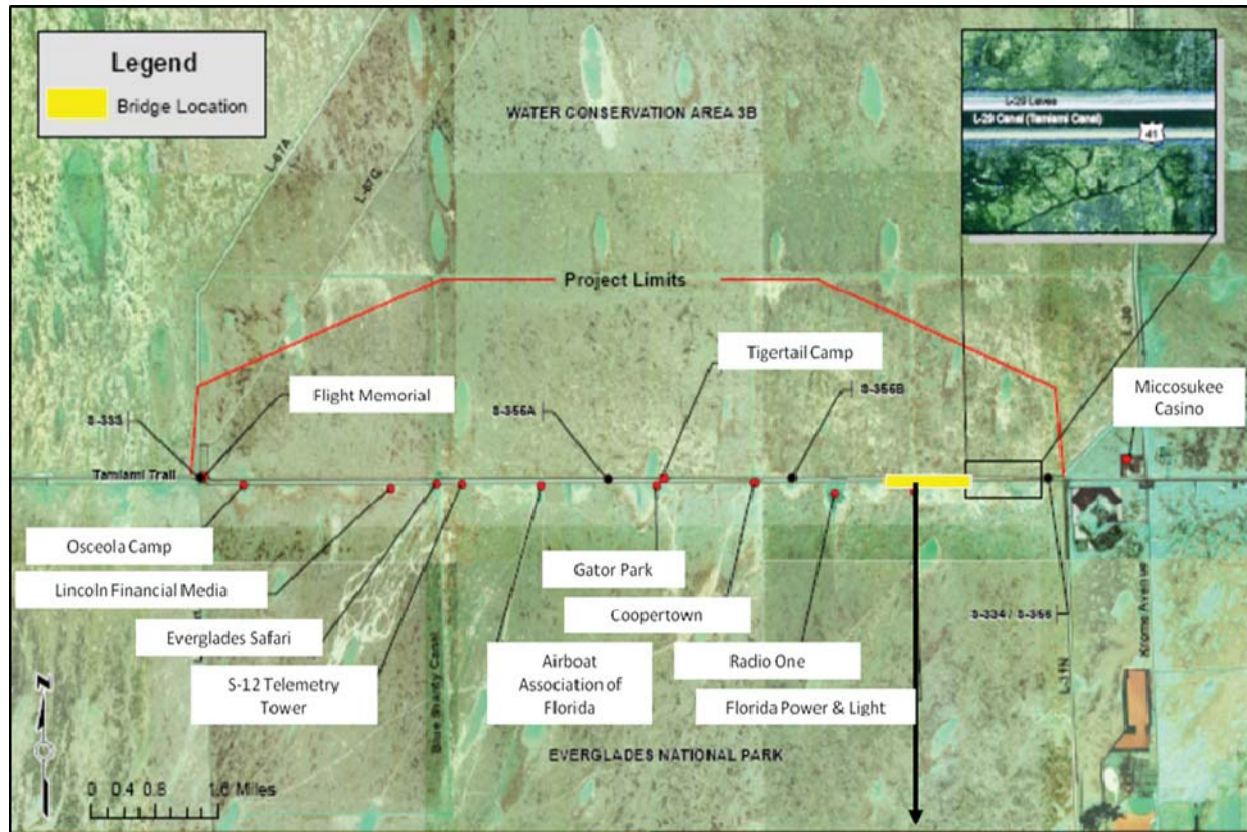


FIGURE 3-4. LOCATIONS OF PRIVATELY OWNED REAL ESTATE WITHIN THE PROJECT AREA

3.21 AGRICULTURE

The Miami-Dade County agricultural industry is unique in both the types of commodities produced and the method of cultivation. The majority of agricultural activities in the county are located south of Tamiami Trail and east of ENP. A variety of vegetables, fruits, and ornamentals are grown within this region and include many tropical and subtropical crops, which are grown year-round. The most active growing season is between September and May. Because of the wet and dry rainy seasons in the area, planting times are controlled by the elevation of ground water. Soils in these agricultural areas are rocky soils and marl soils. The finer texture of the marl soils make them more suitable for tuber crops, such as potatoes and ornamentals, requiring root balls when harvested. The rocky soils, including rockdale and rockland, require a preparation process, which gives this type of farming a unique character. It is necessary to break the hard limestone outcroppings into smaller particles by scarifying or rock plowing before cultivation can take place. When the material is sufficiently pulverized, the fields are prepared in row mounds to gain added protection from the high water tables. Fertilizer is used in both marls and rockland soil farming.

3.22 RECREATION

There are many recreational opportunities throughout south Florida. WCA 3 has been used for recreational activities including hunting, fishing, frogging, boating, camping, and off-road

vehicle use. Fishing is a popular recreational activity and also holds numerous tournaments each year. The majority of fishing activity occurs in the canals along Interstate 75, Tamiami Trail, and in the Miami, L-67A, and L-67C canals. These canals support many species of game fish. Private camps are located throughout WCA 3. A variety of other nature-based recreational opportunities are also provided to the public within WCA 3. These activities include wildlife viewing and nature photography. Hiking and bicycling are also permitted on existing levees within the project area where appropriate. There are also several recreation areas at locations along the boundary of WCA 3. These facilities, along with several on Tamiami Trail, provide boat ramps, camping facilities, boat rentals, airboat tours, fishing guides, bait and tackle supplies, and food. Some of these areas are privately owned, while others are public properties leased to private providers of services.

Similar recreational opportunities are provided in ENP. ENP provides high-quality fishing, boating, camping, wildlife viewing, hiking, bicycling, and nature interpretation activities. One third of ENP is covered by water, creating excellent boating and fishing opportunities. Boat ramps are located throughout the park. Day use and camping facilities are also available. Regularly scheduled concession or ranger guided tours are also available.

4.0 ENVIRONMENTAL EFFECTS

4.1 GENERAL ENVIRONMENTAL EFFECTS

The general environmental effect of the field test would be minimal, due to the short duration and remaining constraints in the system. Environmental effects are expected to be spatially limited and small in magnitude. See **Table 2-8** in **Section 2.5** for a summary of impacts. The following includes anticipated changes to the existing environment including direct, indirect, and cumulative effects. Potential environmental effects of current water management operations (No Action Alternative) as described in the 2012 WCAs-ENP-SDCS Water Control Plan are thoroughly evaluated within the 2011 ERTF Final EIS (USACE 2011b) and are hereby incorporated by reference.

4.2 CLIMATE

Implementation of the No Action Alternative, Alternative E, Alternative F, and Alternative G, would not result in significant impacts to the climate of south Florida.

4.3 GEOLOGY AND SOILS

4.3.1 Alternative A: No Action Alternative

Geology and soils within the project area would not be expected to change from current conditions. The continued implementation of ERTF has the potential for moderate localized effects (*i.e.* increased oxidation, subsidence, and peat fires) on soils within northern and central portions of WCA 3A due to increased duration of dry downs (USACE 2011b).

4.3.2 Alternative E: Removal of G-3273 Constraint and Operational Criteria Changes at S-197 (Trigger S-18C HW)

Alternative E consists of an operational change to the 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c) and does not include construction of permanent structures or structural modifications to existing C&SF Project features. Geologic impacts resulting from removal of surface cover (*i.e.* vegetation and soil), or removal of caprock from blasting and/or removal of limestone would not occur.

Implementation of Alternative E has the potential to affect geology and soils within the project area as a result of operational changes. During the field test, the stage levels experienced at G-3273 and other locations within NESRS are expected to be similar to the intra-annual range of water stages experienced under recent C&SF Project operations. The duration at which water stages at G-3273 exceed 6.8 feet NGVD is expected to increase. Improved hydroperiods within NESRS has the potential to reduce soil oxidation, which is expected to promote peat accretion. A potential decrease in drying event severity relative to the No Action Alternative, if achieved, should result in reduced fire incidence within NESRS; however the frequency of muck fires are primarily controlled by weather patterns within the area. Additional water being delivered to NESRS is also only expected to occur during the wet season when areas are already anticipated to be inundated. Alternative E may have a temporary minor beneficial effect on geology and soils within NESRS.

4.3.3 Alternative F: Relaxation of G-3273 Constraint Without Operational Criteria Changes at S-197

Implementation of Alternative F would result in similar effects as discussed under Alternative E.

4.3.4 Alternative G: Relaxation of G-3273 Constraint and Operational Criteria Changes at S-197 (Trigger S-178 TW) (PREFERRED ALTERNATIVE)

Implementation of Alternative G would result in similar effects as discussed under Alternative E.

4.4 STUDY AREA LAND USE

Implementation of the No Action Alternative, Alternative E, Alternative F, and Alternative G, would not result in significant impacts to study area land use.

4.5 HYDROLOGY

Regional water management operations under ERTTP are described in **Section 3.6**. Compared to the predecessor regional water management plan (IOP), ERTTP included no operational changes which significantly affect the range of stage levels maintained within the eastern L-29 Canal (between S-333 and S-334) and NESRS. IOP and ERTTP each include the following operational criteria: (1) maximum operating limit of 7.5 feet NGVD in the L-29 Canal; (2) G-3273 stage constraint of 6.8 feet NGVD to limit net inflows to NESRS; (3) Column 1 and Column 2 modes of operations for WCA 3A regulatory outlet structures and the SDCS canal network. Based on this continuity of water management criteria for NESRS, the hydrologic assessment of potential effects to WCA 3A, NESRS, and the SDCS in response to relaxation of the G-3273 constraint, revisions to the criteria for Column 2 regulatory releases from WCA 3A to the SDCS, and revisions to the criteria for SDCS Column 1 and Column 2 canal operations are assessed for the historical period from July 2002 (initial IOP operations) through June 2014 (start of Increment 1 development).

Climatologic and hydrologic conditions within WCA 3A, ENP, and the adjacent LEC demonstrate a wide range of variability over this period. Given the inability to precisely forecast the hydrologic conditions that will be observed during the proposed field test, a comprehensive assessment of historical data was conducted to anticipate the potential hydrologic effects of the alternatives. Hydrographs and summary results are generally reported using Water Year periods, which are defined for this application from 01 May of the start year to 30 April of the ending year in order to account for the annual water management cycle in South Florida from wet season precipitation through the subsequent dry season (water years are denoted using the ending year; example -- Water Year 2003: 01 May 2002 --30 April 2003). All monitoring gage information was extracted from the SFWMD DBHYDRO water management database (www.sfwmd.gov/dbhydro).

The SFWMD initiated operation of the C-111 Spreader Canal Western Project constructed components in June 2012. Since the C-111 Spreader Canal Western Project was authorized in WRRDA 2014, operation of the C-111 Spreader Canal Western Project was not included as part of the 2012 WCAs-ENP-SDCS Water Control Plan (updated for the 2012 ERTTP). According to the 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c), the S-197 gated culvert is

operated to provide drainage to the lower C-111 Canal based on upstream canal stage triggers at the S-177 HW and/or the S-18C HW, with increased discharges specified if C-111 Canal stages continue to rise above the initial gate open trigger levels:

- Level 1 gate opening for 550-800 cfs (approximately one-third of S-197 design capacity of 2400 cfs): S-177 HW > 4.1 feet NGVD or S-18C HW > 2.8 feet NGVD
- Level 2 gate opening for 1300-1600 cfs (approximately two-thirds of S-197 design capacity): S-177 HW > 4.2 feet NGVD or S-18C HW > 3.1 feet NGVD
- Level 3 gate opening for maximum discharge (S-197 design capacity is approximately 2400 cfs): S-177 HW > 4.3 feet NGVD or S-18C HW > 3.3 feet NGVD

Note: S-197 criteria under ERTTP are unchanged from IOP, and S-197 operational criteria are the same under both the Column 1 and Column 2 modes of operation.

Under ERTTP, the S-177 gated spillway is operated to manage C-111 local basin runoff when the S-177 HW stage exceeds 4.2 feet NGVD, and the structure is closed when the S-177 HW stage is lowered below 3.6 feet NGVD. The C-111 Spreader Canal Western Project S-199 and S-200 pump stations, which have been operated by the SFWMD since July 2012, redirect potential S-177 discharges into the Frog Pond Detention Area and the Aerojet Canal to create a hydraulic ridge that blocks the drainage effects of the C-111 Canal. As a result of these operational and structural components of the C-111 Spreader Canal Western Project, rainfall and natural flows into Taylor Slough will be retained, preventing seepage that depletes the hydroperiod of Taylor Slough and alters the natural flow patterns toward the south into Florida Bay. The S-199 and S-200 pump stations (both pump stations have three 75 cfs pump units, for a total capacity of 225 cfs) are initially triggered to turn on when the S-177 HW stage exceeds 3.8 feet NGVD, and the pumps may be operated at maximum capacity when the S-177 HW stage exceeds 4.0 feet NGVD; the pumps are turned off when the S-177 HW stage is lowered below 3.6 feet NGVD. Because the S-199 and S-200 pump stations redirect up to 450 cfs of potential S-177 discharges prior to S-177 HW stage rising to trigger opening of the S-177 structure gates (4.2 feet NGVD) or the S-197 culverts (4.1-4.3 feet NGVD), continued operation of the C-111 Spreader Canal Western Project will reduce the frequency, duration, and magnitude of S-197 discharges to Manatee Bay and Barnes Sound. Given recognition of this significant operational shift following initial SFWMD operation of the C-111 Spreader Canal Western Project, hydrologic effects for the ENP Eastern Panhandle and Manatee Bay/Barnes Sound are only assessed for the limited historical period from July 2012 through June 2014 (start of field test development).

Climatologic and hydrologic conditions within the C-111 Basin of the LEC demonstrate a representative range of variability over this 2012-2014 period. Given the inability to precisely forecast the hydrologic conditions that will be observed during the proposed field test, a comprehensive assessment of the applicable historical data was conducted to anticipate the potential hydrologic effects of the alternatives. Due to the limited duration of the analysis period (two years) for the ENP Eastern Panhandle and Manatee Bay/Barnes Sound, hydrographs display the complete hydrologic assessment period and summary results are reported for the complete period.

Detailed hydrologic assessments of the alternatives were conducted for the following two spatial areas: (1) ENP NESRS; and (2) the ENP Eastern Panhandle and Manatee Bay/Barnes Sound.

Historical stage levels within NESRS from 2002-2014, as recorded in the L-29 Canal (average stage for S-333 TW gage and S-334 HW gage) and at the G-3273 monitoring gage, are shown in **Figure 4-1**. The corresponding WCA 3A three-gage average stage and the top regulatory zone of the concurrent WCA 3A Regulation Schedule (IOP from July 2002 – October 2012; ERTTP from October 2012 – June 2014) are also indicated in **Figure 4-1**. Historical periods with G-3273 stage levels above the 6.8 feet NGVD operational constraint are also depicted on the figure, including several years with G-3273 stage levels above 6.8 feet NGVD for durations in excess of six months (2003, 2005, 2012, and 2013). During Column 2 operations, when the G-3273 stage is above 6.8 feet NGVD, S-333 and S-334 flows are matched, but local rainfall and groundwater inflows may cause the G-3273 stage to remain above the 6.8 feet NGVD threshold. Inflows to the L-29 Canal are discontinued if stages exceed the 7.5 feet NGVD maximum operating limit, although local rainfall and groundwater inflows may cause stages to exceed the 7.5 feet NGVD maximum operating limit. The daily hydrograph data from 2002 – 2014 was rank sorted to generate stage duration curves for the L-29 Canal and G-3273, which are shown in **Figure 4-2**. Under peak historical wet season stages, the typical stage gradient between the L-29 Canal and the G-3273 monitoring gage (located approximately 9 miles south of the L-29 Canal) is approximately 0.2 feet.

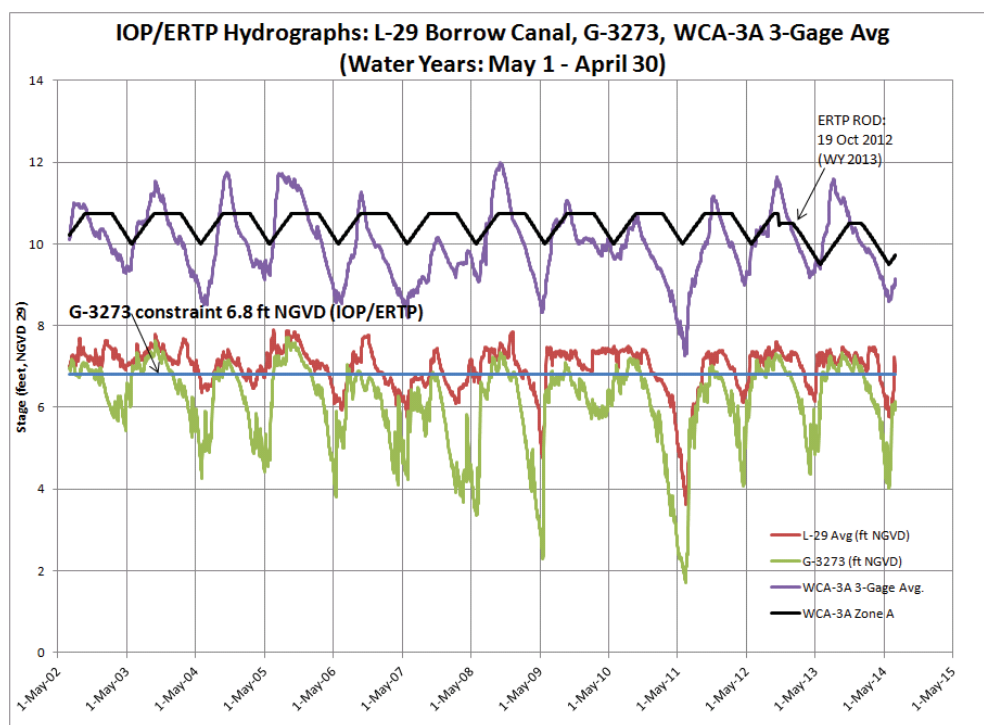


FIGURE 4-1. STAGE HYDROGRAPHS FOR WCA 3A, L-29 CANAL, AND G-3273 (2002-2014)

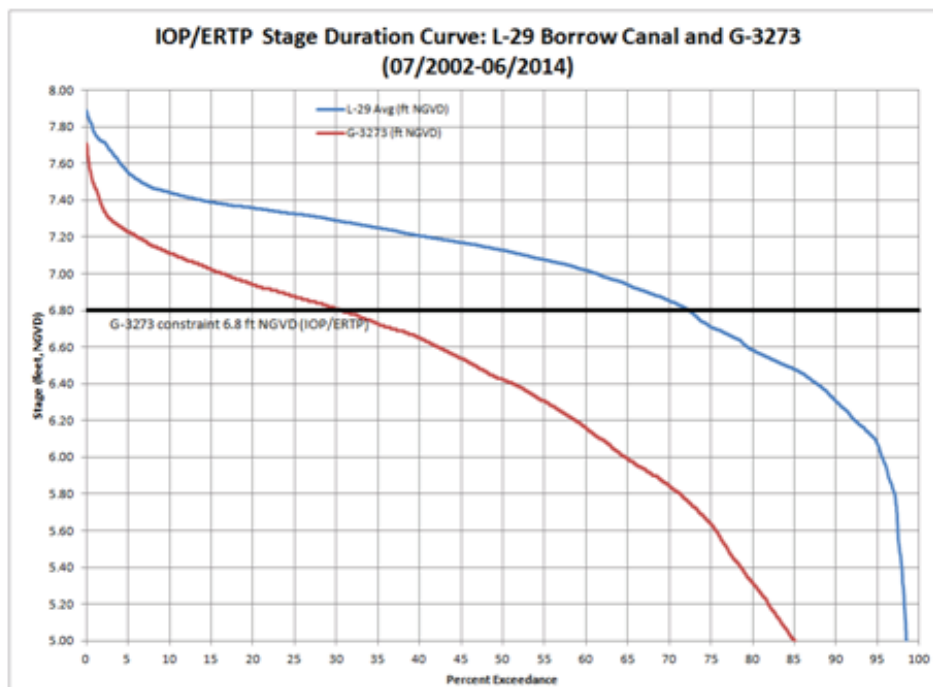


FIGURE 4-2. STAGE DURATION CURVES FOR L-29 CANAL AND G-3273 (2002-2014)

To quantify the potential opportunity for hydrologic benefits to be realized through increased water stages and improved timing within NESRS, the historical operations at S-333 and historical stage levels for the L-29 Canal and G-3273 were evaluated to identify periods where S-333 inflows to NESRS was limited solely due to the G-3273 constraint of 6.8 feet NGVD. The weekly Rainfall Plan operational targets for NESRS were initially checked, to identify periods where water deliveries from WCA 3A to NESRS were active in response to rainfall and stage conditions within upstream WCA 3A; note, however, that under extreme dry conditions, water managers may provide limited deliveries to NESRS when the Rainfall Plan target is zero, although deliveries to NESRS under these conditions are not expected to be effected by relaxation of the G-3273 constraint. Daily operations for the 2002 – 2014 assessment period (4,383 total days) were each classified under one of the following operational conditions: (1) S-333 restricted by Rainfall Plan target = 0; (2) S-333 not restricted by Rainfall Plan, G-3273, or L-29 Canal Stage; (3) S-333 restricted by G-3273 and/or L-29 Canal stage. The operational periods with S-333 restricted by G-3273 and/or L-29 Canal stage were further sub-divided to specify dates where S-333 was restricted by the L-29 Canal maximum operating limit of 7.5 feet NGVD (periods which would not achieve increased S-333 inflows to NESRS with relaxation of the G-3273 constraint) and dates where S-333 was restricted only by the G-3273 constraint of 6.8 feet NGVD. Based on this evaluation, summarized in **Figure 4-3**, 1176 days within the 2002 – 2014 assessment period were identified as potential opportunities for hydrologic benefits to NESRS through relaxation of the G-3273 constraint. Compared to the 1830 days where S-333 operations were not restricted by Rainfall Plan, G-3273, or L-29 Canal Stage, the additional 1176 days represents a 64% increase. The water year annual variability and intra-annual variability of

the 1176 days which were historically limited by the G-3273 constraint are shown in **Figure 4-4** and **Figure 4-5**, respectively.

In order to realize the maximum potential opportunity for increased inflows to NESRS, the G-3273 constraint must be completely removed for these periods, with S-333 operations restricted only by the maximum operating limit of 7.5 feet NGVD in the L-29 Canal. Prior to formulation of alternatives, a generalized assessment was completed to assess the sensitivity of the number of days with potential opportunity for increased inflows to NESRS to the degree of relaxation of the G-3273 constraint (**Figure 4-6**). Consistent with the stage gradient observed during historical peak wet season stages, relaxation of the G-3273 constraint from 6.8 feet NGVD to 7.3 feet NGVD achieves most of the potential benefits that would result from complete removal of the G-3273 constraint and restriction of S-333 only by the L-29 Canal stage criteria.

To estimate the expected spatial extent within NESRS that may experience stage increases from relaxation of the G-3273 constraint, three recent historical periods were identified where the stage level at G-3273 gradually ascended from approximately 6.8 feet NGVD (IOP/ERTP G-3273 constraint level) to approximately 7.3 feet NGVD during historical periods of Column 2 operations: 02 -- 24 June 2012; 19 September -- 03 October 2012; and 26 August -- 22 September 2013. In addition to the G-3273 stage criteria and direct rainfall, NESRS stages are effected by adjacent water levels and canal operations: L-29 Canal stages (north of NESRS); S-12 operations and water levels west of the L-67 Extension Levee within Western SRS (west); S-331 and S-357 pump station operations, including L-31N Canal stages (east); and antecedent conditions within NESRS and Central SRS (south). Initial and ending NESRS stage levels were compared for each of the three recent historical periods by using stage difference maps generated from the historical daily water surface maps produced by the USGS Everglades Depth Estimation Network (EDEN); additional information on the EDEN, including the monitoring gage network used to generate the water surface within NESRS (the EDEN water surface extends to the L-31N Levee, including the 8.5 SMA located east/interior of the perimeter protection levee), is available through the USGS: <http://sofia.usgs.gov/eden/index.php>).

Based on review of the stage difference maps for NESRS, relaxation of the G-3273 stage constraint to 7.5 feet NGVD may increase water stages within NESRS by up to 0.4 -- 0.5 feet for an area extending up to 10-12 miles south of the L-29 Canal. The data collection and evaluations associated with the field test monitoring plan will provide more precise information regarding the spatial extent of hydrological changes within NESRS. A representative example of the EDEN stage difference maps used for this assessment, including selected reference gage locations, is provided in **Figure 4-7**, for the period from 26 August -- 22 September 2013. During this 2013 wet season period: G-3273 stages increased from 6.85 to 7.34 feet NGVD; L-29 Canal stages increased from 7.06 to 7.49 feet NGVD; S-334 Column 2 discharges ranged between 200-1000 cfs; S-331 pump station discharges ranged between 500-1200 cfs; and the S-357 pump station for the 8.5 SMA was not operated (note: groundwater increases observed at Angel's Well, located approximately 0.25 miles west of the 8.5 SMA western perimeter levee, influence the localized groundwater contours west of the 8.5 SMA).

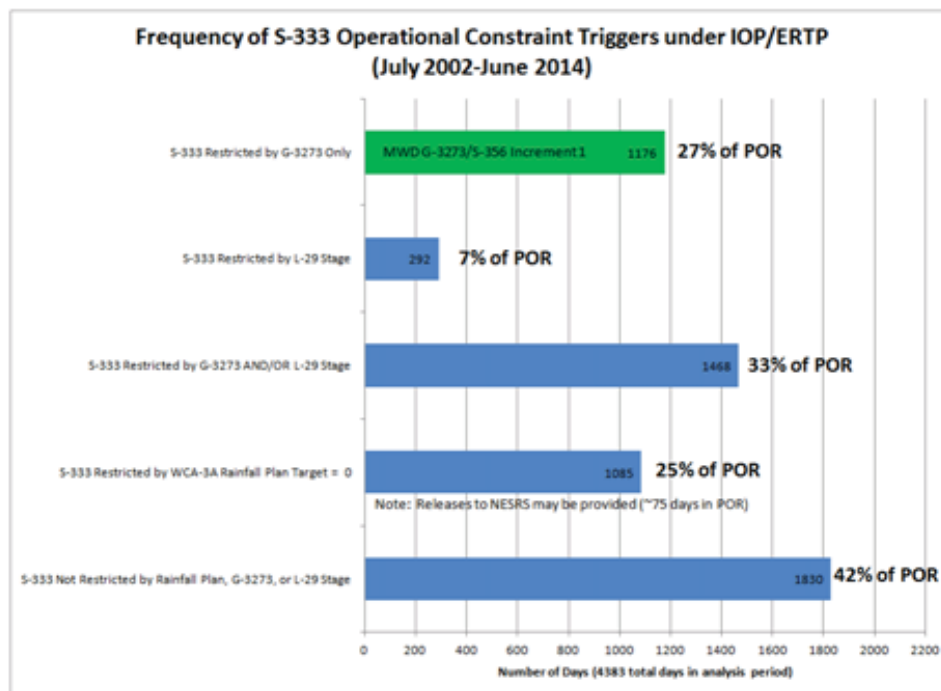


FIGURE 4-3. FREQUENCY OF S-333 OPERATIONAL CONSTRAINT TRIGGERS (2002-2014)

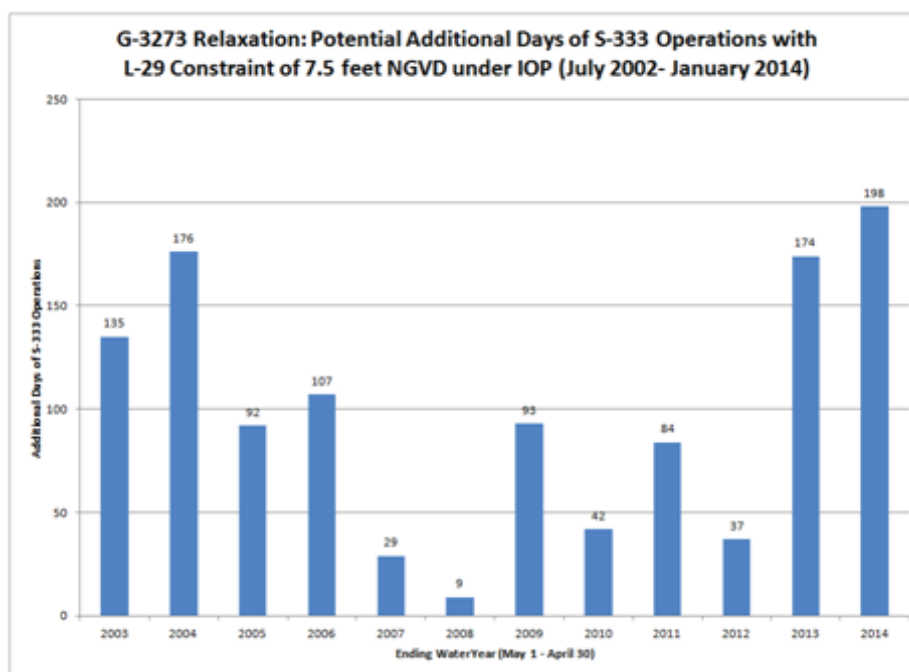


FIGURE 4-4. POTENTIAL ADDITIONAL DAYS OF S-333 OPERATIONS WITH ERTP L-29 CONSTRAINT (2002-2014 WATER YEARS)

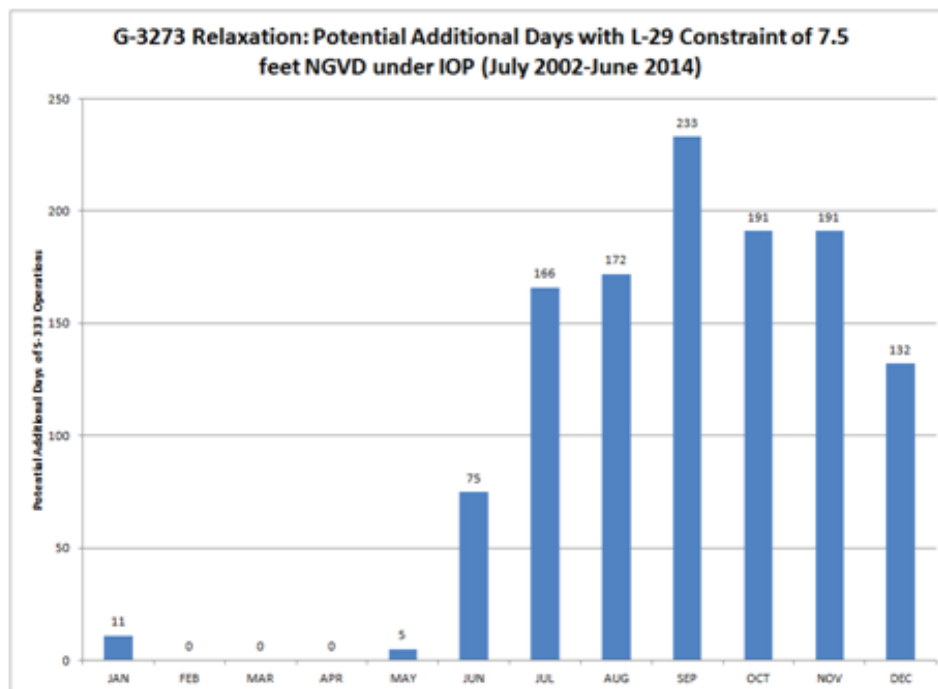


FIGURE 4-5. POTENTIAL ADDITIONAL DAYS OF S-333 OPERATIONS WITH ERTF L-29 CONSTRAINT, 2002-2014 INTRA-ANNUAL VARIABILITY

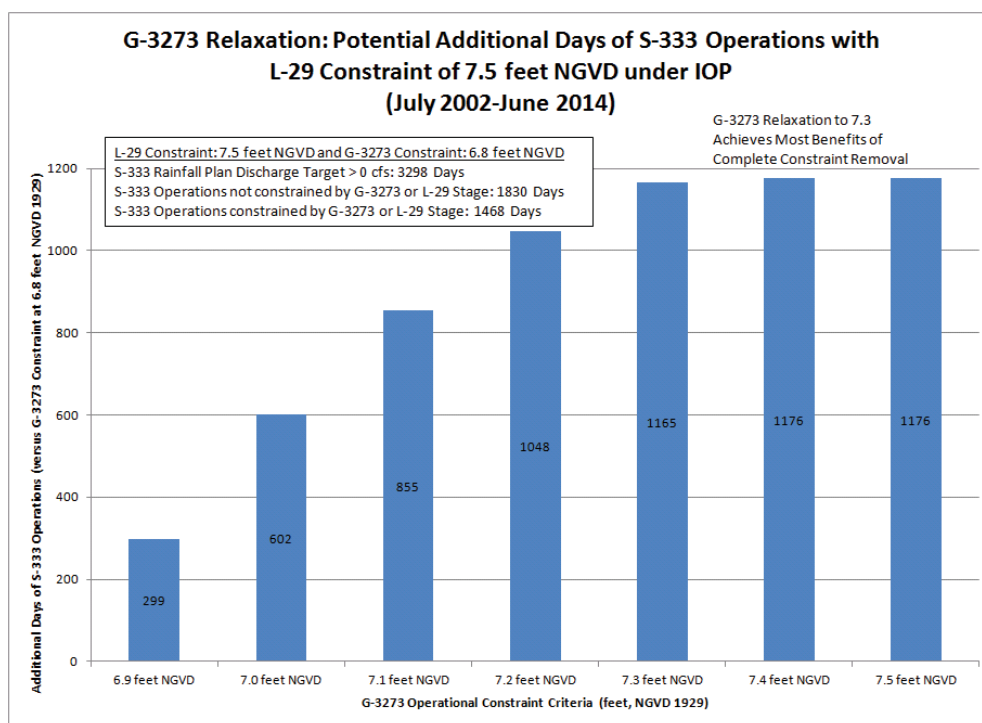


FIGURE 4-6. POTENTIAL ADDITIONAL DAYS OF S-333 OPERATIONS WITH ERTF L-29 CONSTRAINT UNDER INCREMENTAL CHANGES TO THE G-3273 CONSTRAINT (2002-2014)

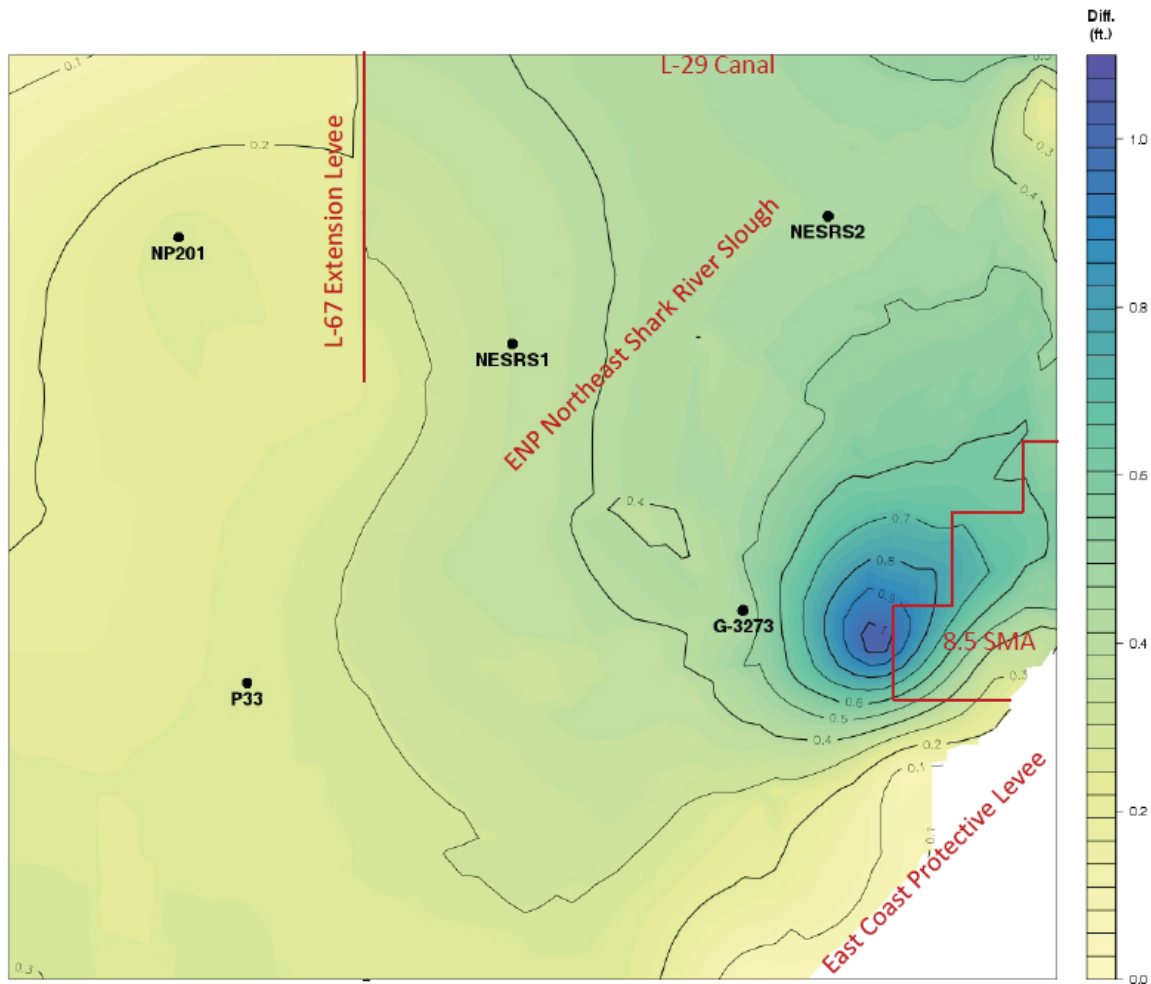


FIGURE 4-7. EDEN STAGE DIFFERENCE MAP OF NESRS FOR AUGUST TO SEPTEMBER 2013, ILLUSTRATING POTENTIAL SPATIAL EXTENT OF FIELD TEST EFFECTS WITHIN NESRS

Within the SDCS, S-331/S-173 releases are the result of water management operations to: (1) maintain target L-31N Canal stages; (2) provide flood mitigation to the 8.5 SMA eastern areas when sufficient capacity is available at S-357 and maintain flood mitigation for the 8.5 SMA when S-357 operational capacity is limited; and (3) WCA 3A regulatory releases to the SDCS from S-334 during Column 2 operations. As a result of increased stages within NESRS, each of the Action Alternatives (Alternative E, Alternative F, and Alternative G) will increase flood control releases from S-331 for 8.5 SMA mitigation and increase seepage to L-31N south of S-331, prior to completion of C-111 South Dade NDA. Based on the significant reduction to WCA 3A regulatory releases to the SDCS, under typical hydro-meteorological conditions, the combined flows through S-331 and the adjacent S-173 gated culvert to the C-111 Basin are anticipated to be less than what would have been discharged through these features under the No Action Alternative. The net effect of reduced WCA 3A regulatory discharges to NESRS combined with increased flood control releases from S-331/S-173 and increased seepage to the L-31N Canal south of S-331 is not able to be quantified prior to completion of the field test and

associated hydrologic monitoring. The field test hydrologic monitoring will aid in quantifying both long-term and intra-annual/seasonal effects of increased stages within NESRS. Additional inflow volumes to L-31N Canal, if resultant from the field test, are expected to be primarily managed with the C-111 South Dade SDA using S-332 B, S-332C, and S-332D, given the significant reduction in WCA 3A regulatory releases to the SDCS. However, under certain hydrologic and operational conditions during the field test, increased risk to flood protection for South Dade areas may result from a combination of the following water management factors during the field test: increased seepage to the L-31N Canal south of S-331 prior to completion of C-111 South Dade NDA; increased discharges from S-331 for 8.5 SMA flood mitigation (potentially offset by reduced S-331 discharges with limited WCA 3A regulatory releases to the SDCS); operation of the downstream S-332D pump station and/or the C-111 South Dade SDA to manage L-31N Canal stages during periods of increased inflows.

Because the S-199 and S-200 pump stations redirect up to 450 cfs of potential S-177 discharges prior to S-177 HW stage rising to trigger opening of the S-177 structure gates (4.2 feet NGVD) or the S-197 culverts (4.1-4.3 feet NGVD), continued operation of the C-111 Spreader Canal Western Project will reduce the frequency, duration, and magnitude of S-197 discharges to the downstream Manatee Bay and Barnes Sound. **Figure 4-8** provides a long-term summary of the accumulation volume of S-177 structure discharges and S-199/S-200 discharges for water years 1992 through 2014 (water year periods were defined as 01 October through 30 September; S-199/S-200 operations initiated in water year 2013), and **Figure 4-9** provides a long-term summary of S-197 discharge volumes compared to upstream basin inflows from S-177 for each S-197 discharge event during this same period. Collectively, these figures validate the anticipated reduction in the duration and magnitude of S-197 discharges to the downstream Manatee Bay and Barnes Sound in response to operation of the C-111 Spreader Canal Western Project.

To evaluate the potential effects of the low level freshwater releases from S-197 proposed under Alternative E and Alternative G, historical stages for the WCA 3A three-gauge average and historical S-18C gate openings from DBHYDRO were used to estimate periods of new S-197 discharges. Empirical relationships between S-18C HW/TW stages (gates fully open) and S-197 discharges during 2002-2014 (IOP/ERTP) were used to adjust historical S-18C HW stages/S-178 TW stages in response to new proposed S-197 discharges, in place of solely relying on historical S-18C/S-178 TW stages to estimate the duration and magnitude of new potential S-197 discharges; the empirical data analysis identified that S-18C HW stages may be lowered by an estimated range of 0.01 – 0.05 feet per day for every day with 200 cfs discharges from S-197, based on observed historical conditions with S-18C fully open and S-197 discharging less than 800 cfs. The hydrologic evaluation to quantify potential changes to S-197 operations for Alternative E and Alternative G does not account for potential effects due to the following: (1) climatological/hydrologic conditions not observed during 2012-2014 assessment period; (2) WCA 3A changes from ERTTP Regulation Schedule during July – Sept. 2012 (ERTTP replaced IOP in October 2012); (3) WCA 3A stage changes which would result from Increment 1 operations, with increased flows to NESRS and revised criteria for regulatory releases to the SDCS via S-334 (ERTTP Column 2); (4) effects from S-18C gate opening when S-18C HW > 2.25 when WCA 3A stage is above the Action Level during S-12A closure period (included in Action Alternatives E, F, and G); (5) potential additional or prolonged S-197 gate openings if

operated below prescribed flow rates; and (6) water management operations to minimize open/close cycles at S-197.

Operating criteria for S-197 will be reassessed once construction of the C-111 South Dade NDA is constructed and operable and/or upon completion of the field test. As described in the hydrometeorologic monitoring plan, the field test assessments will incorporate information provided by the SFWMD from their continued monitoring and analysis of the C-111 Spreader Canal Western Project.

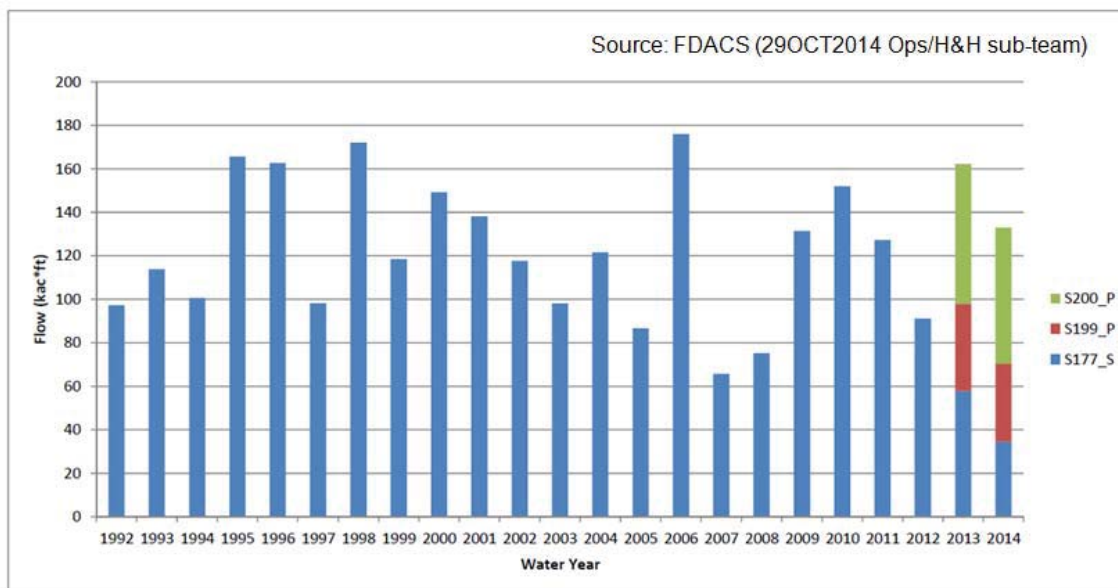


FIGURE 4-8. S-177 AND S-199/S-200 ACCUMULATED ANNUAL DISCHARGE VOLUMES (WATER YEARS 1992—2014)

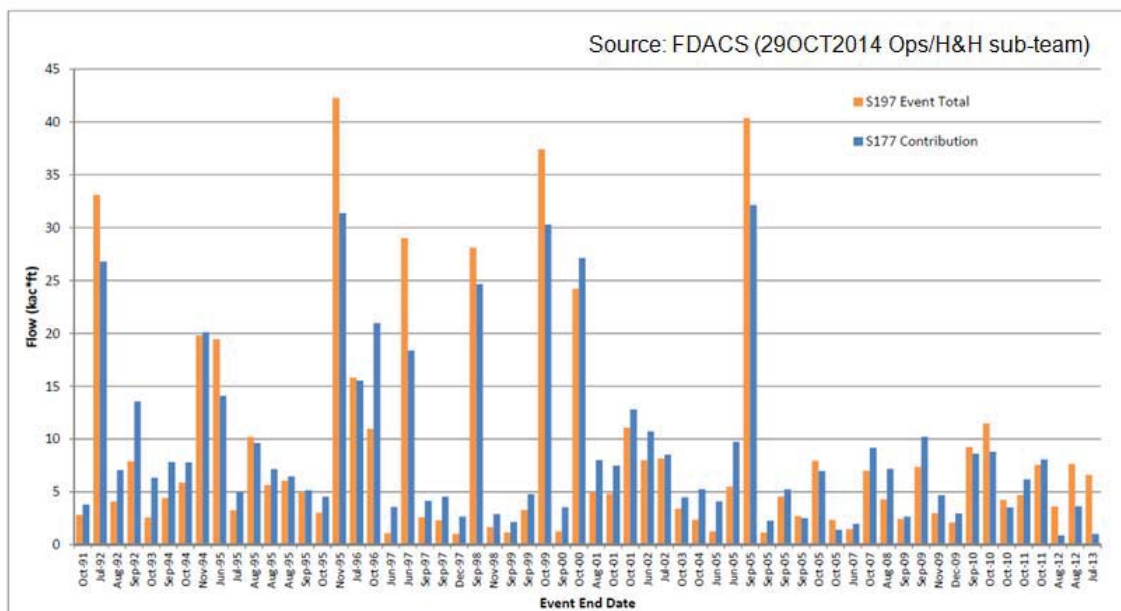


FIGURE 4-9. S-177 AND S-197 DISCHARGE VOLUMES FOR EACH S-197 DISCHARGE EVENT (WATER YEARS 1992-2014)

4.5.1 Alternative A: No Action Alternative

Alternative A includes no relaxation of the G-3273 constraint, no changes to the use of Column 2 operations at S-334 and the SDCS, and no changes to the operational criteria for S-197. Alternative A will not provide increased inflows to NESRS and will not initiate operation of the MWD S-356 pump station. Potential hydrologic effects of current water management operations as described in the 2012 WCAs-ENP-SDCS Water Control Plan are thoroughly evaluated within the 2011 ERTF Final EIS (USACE 2011b).

4.5.2 Alternative E: Relaxation of G-3273 Constraint and Operational Criteria Changes at S-197 (Trigger S-18C HW)

4.5.2.1 ENP Northeast Shark River Slough

Compared to No Action Alternative, based on assessment of the historical hydrological conditions experienced during IOP/ERTF (July 2002 through June 2014), Alternative E is anticipated to provide the following hydrologic effects within WCA 3A and NESRS:

- Increase the number of days with WCA 3A unconstrained discharges to NESRS by up to 1176 days (up to 64% increase);
- Increase the frequency and duration of L-29 Canal stages approaching the maximum operating limit of 7.5 feet NGVD (IOP/ERTF stage exceeds 7.3 feet NGVD ~29 % of the 2002-2014 assessment period);
- No increase to WCA 3A peak stage and no increase to the duration or frequency of WCA 3A high water conditions;
- Reduced seepage losses from ENP to the SDCS due to reduced use of Column 2 operational criteria for the SDCS Canals during the period from November through June (including the dry season months of November through May)

4.5.2.2 ENP Eastern Panhandle and Manatee Bay/Barnes Sound

For the hydrologic assessment period from July 2012 - June 2014, S-197 historical operations indicate the following periods of gate openings: 11-13 August 2012 (maximum daily discharge rate of ~800 cfs); 26-30 August 2012 (maximum ~1100 cfs); 18-22 July 2013 (maximum ~830 cfs); and 22 October 2013 (110 cfs). The hydrologic assessment assumed that the operational criteria specified for Alternative E would have no measurable effect on the 14 total days (18 kAF total discharge volume) of historical S-197 operations during this period.

Compared to No Action Alternative, based on assessment of the historical hydrological conditions experienced during the two-year C-111 Spreader Canal Western Project operational period (July 2012 through June 2014), Alternatives E is anticipated to provide the following hydrologic effects within the ENP Eastern Panhandle and Manatee Bay/Barnes Sound:

- Increase the frequency and duration of S-197 discharges to Manatee Bay/Barnes Sound from 14 days to a range of 29-64 days;
- Increase the total volume of S-197 discharges from 18 kAF to a range between 24-38 kAF (increase of 33-111%), with a comparable reduction to overland flow across the ENP Eastern Panhandle to eastern Florida Bay;
- No significant change to the timing of S-197 operations (July to October / wet season);
- Increase flood control releases from S-18C and S-197 to mitigate for increased risk to flood protection for South Dade areas, which may be conditionally affected by a combination of the following water management factors during the field test: increased seepage to the L-31N Canal south of S-331 prior to completion of C-111 South Dade NDA; increased discharges from S-331 for 8.5 SMA flood mitigation and/or increased discharges from G-211/S-331 when S-356 operations are limited due to WCA 3A high water conditions above the WCA 3A Action Line (potentially offset by reduced S-331 discharges with limited WCA 3A regulatory releases to the SDCS); and operation of the S-332 D pump station and/or the C-111 South Dade SDA to manage L-31N Canal stages during periods of increased inflows.

A hydrograph of the historical and estimated maximum new S-197 discharges (+50 days) is shown in **Figure 4-10**. The timing of the estimated new S-197 discharges (increased over the historical duration by 15 to 50 days), compared to the historical timing, is shown in **Figure 4-11**.

4.5.3 Alternative F: Relaxation of G-3273 Constraint Without Operational Criteria Changes at S-197

4.5.3.1 ENP Northeast Shark River Slough

Compared to No Action Alternative, based on assessment of the historical hydrological conditions experienced during IOP/ERTP (July 2002 through June 2014), Alternatives F is anticipated to provide the same hydrologic effects within WCA 3A, NESRS, and the SDCS as were previously described for Alternative E.

4.5.3.2 ENP Eastern Panhandle and Manatee Bay/Barnes Sound

Alternative F will maintain the current ERTF gate opening criteria for S-197. Compared to the No Action Alternative, Alternative F will result in no additional discharges to Manatee Bay and Barnes Sound from S-197 and no increased flood control releases from S-18C. Alternative F may reduce seepage losses from ENP to the SDCS due to reduced use of Column 2 operational criteria for the SDCS canals during the period from November through June (including the dry season months of November through May), with a minor associated increase to overland flow across the ENP Eastern Panhandle to eastern Florida Bay during this period.

4.5.4 Alternative G: Relaxation of G-3273 Constraint and Operational Criteria Changes at S-197 (Trigger S-178 TW) (PREFERRED ALTERNATIVE)

4.5.4.1 ENP Northeast Shark River Slough

Compared to No Action Alternative, based on assessment of the historical hydrological conditions experienced during IOP/ERTF (July 2002 through June 2014), Alternatives G is anticipated to provide the same hydrologic effects within WCA 3A, NESRS, and the SDCS as were described for Alternative E.

4.5.4.2 ENP Eastern Panhandle and Manatee Bay/Barnes Sound

In order to complete the hydrologic assessment of Alternative G, the empirical relationship developed between S-18C HW/TW stages (gates fully open) and S-197 discharges during 2002-2014 (IOP/ERTF) was used to adjust historical S-178 TW stages in response to new proposed S-197 discharges. Based on comparison of the historical hydrographs for S-18C HW and the upstream S-178 TW (refer to **Figure 4-12**), which are located approximately 5.5 miles apart along the same C-111E/C-111 Canal reach, the daily stage data sets are highly correlated (correlation coefficient is greater than 98%); the daily stage difference is also displayed at the bottom of **Figure 4-12**, with the average daily stage difference computed as 0.04 feet. For the condition with the S-18C gates fully open, the average daily stage difference between the S-178 TW stage and the S-18C HW stage is approximately 0.10 feet. Based on these comparisons, the same empirical data analysis used to adjust S-18C HW stages in response to potential new S-197 discharges for the Alternative E assessment was applied to adjust S-178 TW stages in response to potential new S-197 discharges for the Alternative G assessment; S-178 TW stages may be lowered by an estimated range of 0.01 – 0.05 feet per day for every day with 200 cfs discharges from S-197, based on observed historical conditions with S-18C fully open and S-197 discharging less than 800 cfs.

Based on an average stage gradient of 0.10 feet between S-178 TW stage and S-18C HW stage when the S-18C gates are fully, the trigger stages for new low volume operation of S-197 can be directly compared between Alternative E and Alternative G:

- The initial gate opening criteria for Alternative G (S-178 TW: 2.5 feet NGVD) corresponds to an S-18C HW stage of approximately 2.4 feet NGVD, which is the initial gate opening criteria specified for Alternative E; at this equivalent initial gate opening criteria, Alternative G discharges are limited to 100 cfs compared to 200 cfs for Alternative E;

- The opening criteria for up to 200 cfs at S-197 for Alternative G (S-178 TW > 2.7 feet NGVD) corresponds to an S-18C HW stage of approximately 2.6 feet NGVD, or 0.2 feet above the C-111E/C-111 Canal stage at which Alternative E may discharge up to 200 cfs;
- The operational trigger for up to 500 cfs Level 1 gate openings at S-197 for Alternative G (S-178 TW stages above 2.9 feet NGVD) corresponds to an S-18C HW stage of approximately 2.8 feet NGVD; when S-18C HW stages exceed 2.8 feet NGVD under Alternative E, the ERTF Level 1 release volume of 700-800 cfs may be released from S-197.

During the iterative formulation process, the operations sub-team conducted preliminary discussions regarding other alternative and/or additional operational triggers for the new low volume operation of S-197, including combined pump station discharges at S-332B/S-332C/S-332D and stages within the ENP Taylor Slough. However, the operational trigger criteria specified above were recommended for inclusion within Alternative G. Monitoring and evaluations conducted during the field test are expected to quantitatively assess the suitability of the new S-197 operational criteria, and the field test monitoring may also provide technical information needed to assess alternative and/or additional operational triggers.

For the hydrologic assessment period from July 2012 – June 2014, S-197 historical operations indicate the following periods of gate openings: 11-13 August 2012 (maximum daily discharge rate of ~800 cfs); 26-30 August 2012 (maximum ~1100 cfs); 18-22 July 2013 (maximum ~830 cfs); and 22 October 2013 (110 cfs). The hydrologic assessment assumed that the operational criteria specified for Alternative G would have a measurable effect on the 14 total days of historical S-197 operations during this period because Alternative E caps the maximum Level 1 releases at S-197 when triggered by the S-178 TW criteria to 500 cfs. For each historical S-197 gate opening event of less than 800 cfs with historical S-18C HW stages below 3.1 feet NGVD (S-197 Level 2 criteria, unchanged for Alternative G) and historical S-177 HW stages below 4.1 feet NGVD (S-197 Level 1 criteria, unchanged for Alternative G), the historical S-197 daily discharge volumes were adjusted based on the historical S-178 TW stage, in order to estimate the effects of Alternative G.

Compared to No Action Alternative, based on assessment of the historical hydrological conditions experienced during the two-year C-111 Spreader Canal Western Project operational period (July 2012 through June 2014), Alternative G is anticipated to provide the following hydrologic effects within the ENP Eastern Panhandle and Manatee Bay/Barnes Sound:

- Increase the frequency and duration of S-197 discharges to Manatee Bay/Barnes Sound from 14 days to a range of 39-82 days (S-197 discharge durations are slightly higher than Alternative E since releases start at a lower discharge rate of 100 cfs);
- Increase the total volume of S-197 discharges from 18 kAF to a range between 20-30 kAF (increase of 11-67%), with a comparable reduction to overland flow across the ENP Eastern Panhandle to eastern Florida Bay;
- Reduce the frequency and duration of S-197 discharges from 200-800 cfs (Level 1 S-197 gate opening range) (refer to
- **Figure 4-17**);

- No significant change to the timing of S-197 operations (July to October / wet season);
- Increase flood control releases from S-18C and S-197 to mitigate for increased risk to flood protection for South Dade areas, which may be conditionally affected by a combination of the following water management factors during the field test: increased seepage to the L-31N Canal south of S-331 prior to completion of C-111 South Dade NDA; increased discharges from S-331 for 8.5 SMA flood mitigation and/or increased discharges from G-211/S-331 when S-356 operations are limited due to WCA 3A high water conditions above the WCA 3A Action Line (potentially offset by reduced S-331 discharges with limited WCA 3A regulatory releases to the SDCS); and operation of the S-332 D pump station and/or the C-111 South Dade SDA to manage L-31N Canal stages during periods of increased inflows.

A hydrograph of the historical and estimated maximum new S-197 discharges (+68 days) is shown in **Figure 4-13**. The timing of the estimated new S-197 discharges (increased over the historical duration by 25 to 68 days), compared to the historical timing, is shown in **Figure 4-14**.

The total number of days of S-197 operations for the no action alternative, Alternative E, Alternative F, and Alternative G are compared in **Figure 4-15**. The 14 days of historical S-197 operations during the 2012-2014 assessment period are indicated for the No Action Alternative and Alternative F, and the 14 days of historical S-197 operations are included in the range displayed for the duration of S-197 operations for Alternative E and Alternative G.

The total accumulated discharge volume associated with the S-197 operations for the No Action Alternative, Alternative E, Alternative F, and Alternative G are compared in **Figure 4-16**. The 18 kAF of historical S-197 discharge volume during the 2012-2014 assessment period are indicated for the no action alternative and Alternative F. For Alternative E, the 18,000 acre-feet discharge volume due to historical S-197 operations is included in the range displayed for the total discharge volume from S-197 operations. For Alternative G, the proposed changes to the Level 1 operational criteria for S-197 resulted in a reduction of 4,000 acre-feet to the discharge volume during historical S-197 operations, and this reduction is included in the range displayed for the total discharge volume from S-197 operations.

Figure 4-17 classifies the estimated S-197 daily discharges, including new potential S-197 discharges (Alternative E and Alternative G) and adjusted historical S-197 discharges (Alternative G only), into five discrete flow classifications: (1) 1-100 cfs; (2) 101-200 cfs; (3) 201-500 cfs; (4) 501-800 cfs; and (5) greater than 800 cfs (Level 2 and Level 3 S-197 discharges). Consistent with the empirical relationships applied to adjust S-18C HW and S-178 TW stages in response to low volume new potential S-197 discharges, both the maximum and minimum ranges are displayed for Alternative E and Alternative G. The No Action Alternative and Alternative F are displayed with a single set of bars, with both alternatives indicating the flow classification distribution for the historical S-197 operations during the 2012-2014 hydrologic assessment period.

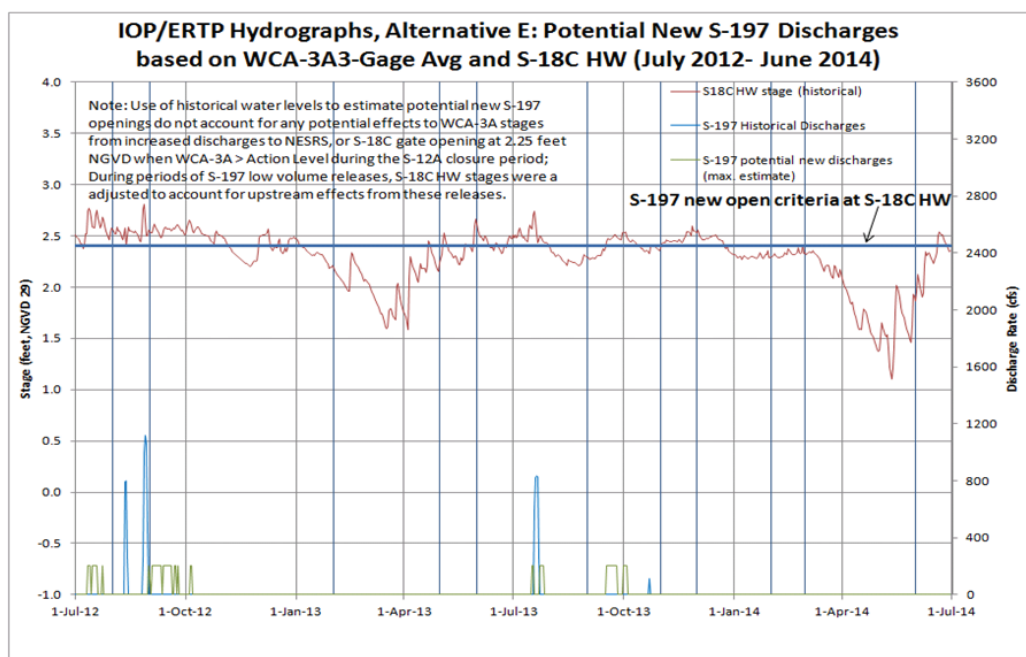


FIGURE 4-10. DISCHARGE HYDROGRAPH OF THE HISTORICAL AND ESTIMATED MAXIMUM NEW S-197 DISCHARGES FOR ALTERNATIVE E (2012—2014)

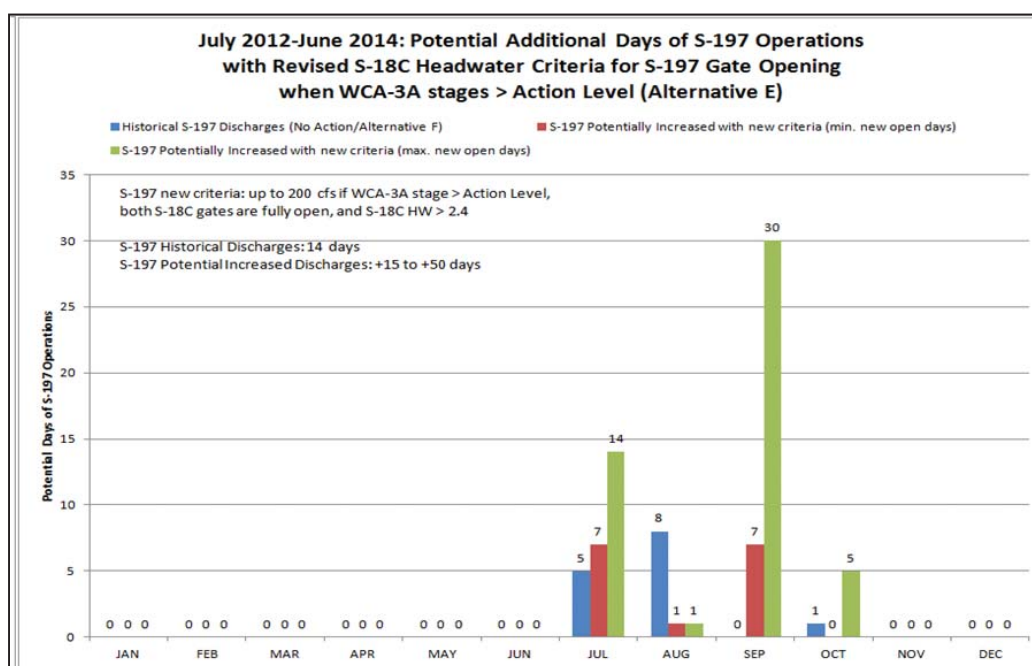


FIGURE 4-11. INTRA-ANNUAL TIMING AND DURATION OF THE HISTORICAL S-197 DISCHARGES AND THE ESTIMATED MINIMUM AND MAXIMUM RANGE FOR NEW S-197 DISCHARGES WITH ALTERNATIVE E (2012--2014)

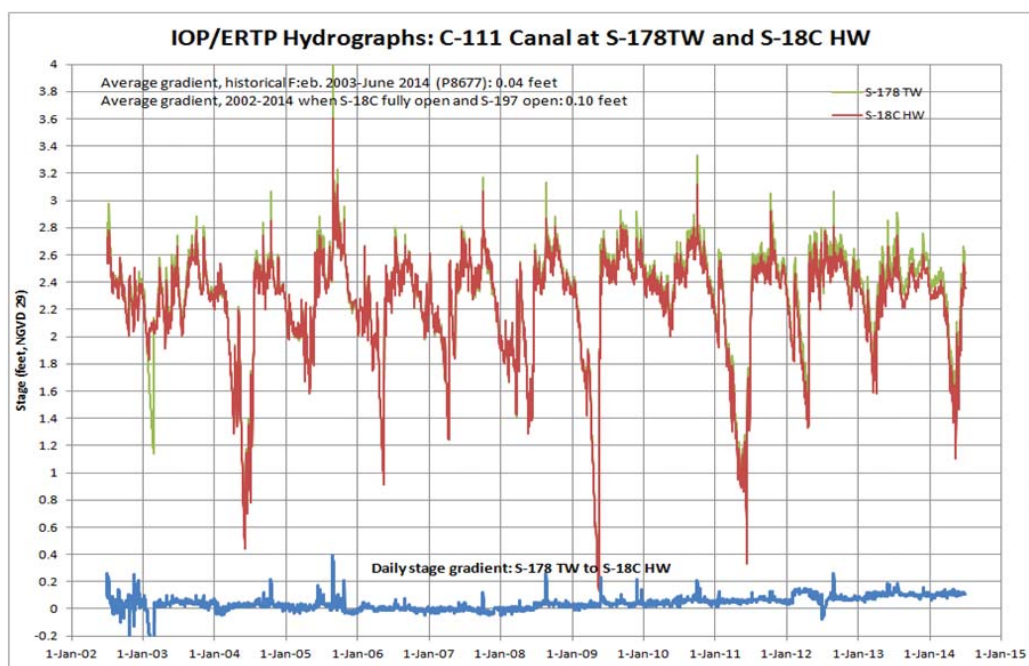


FIGURE 4-12. HISTORICAL STAGE HYDROGRAPH AND DAILY STAGE DIFFERENCE FOR S-178 TAILWATER AND S-18C HEADWATER (2002--2014)

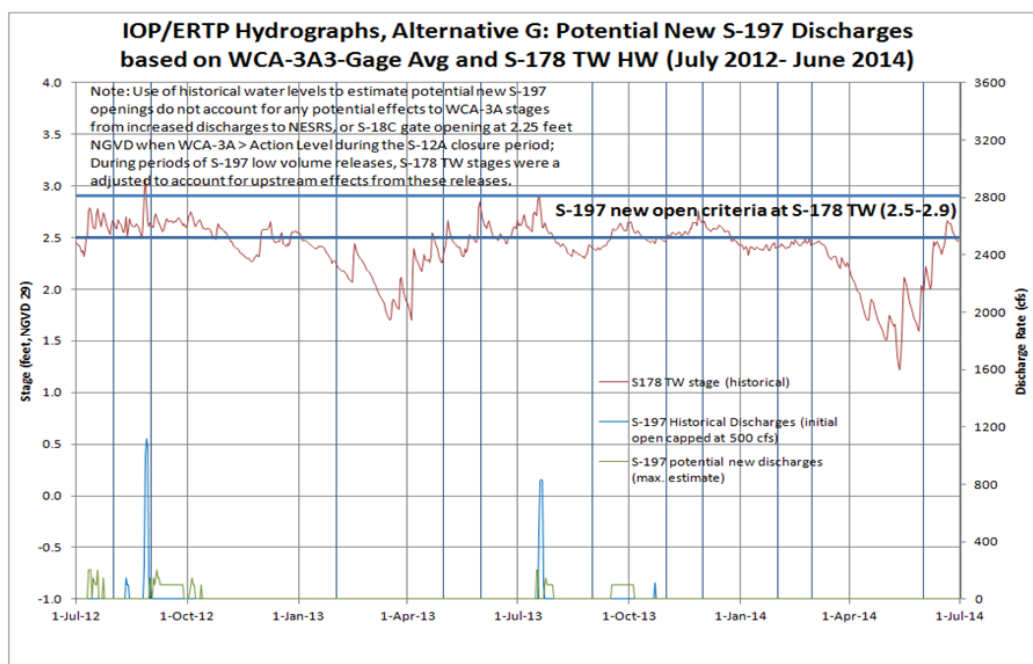


FIGURE 4-13. DISCHARGE HYDROGRAPH OF THE HISTORICAL AND ESTIMATED MAXIMUM NEW S-197 DISCHARGES FOR ALTERNATIVE G (2012--2014)

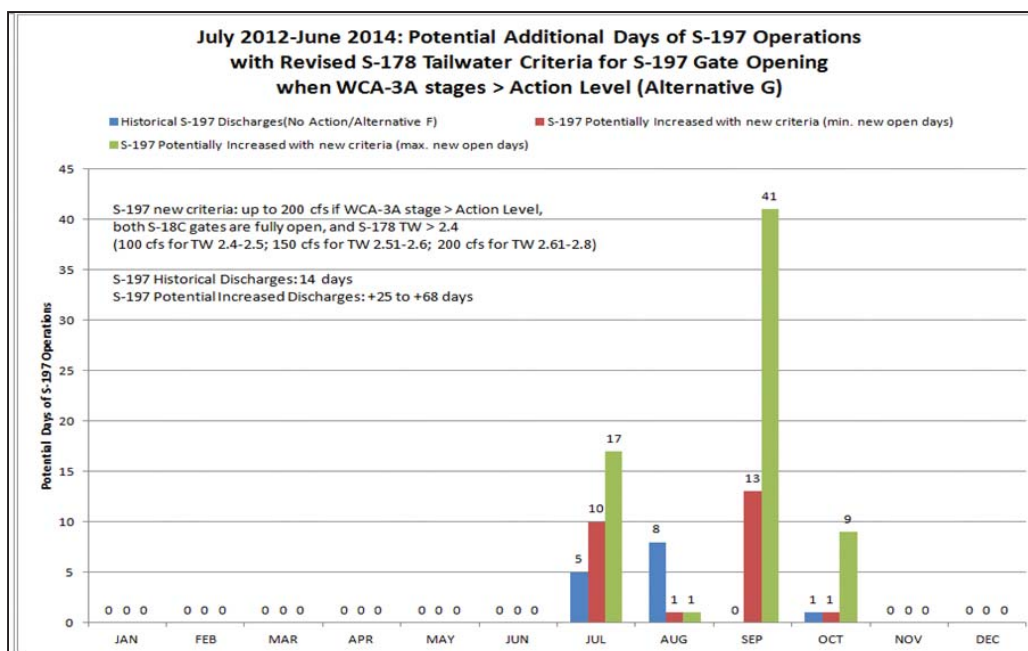


FIGURE 4-14. INTRA-ANNUAL TIMING AND DURATION OF THE HISTORICAL S-197 DISCHARGES AND THE ESTIMATED MINIMUM AND MAXIMUM RANGE FOR NEW S-197 DISCHARGES WITH ALTERNATIVE G (2012--2014)

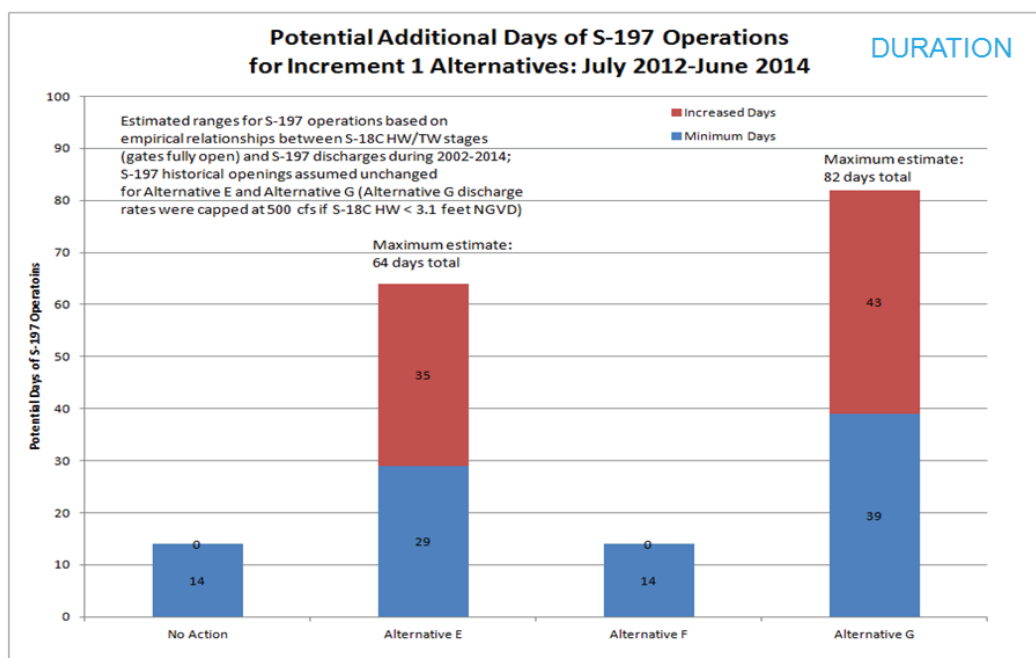


FIGURE 4-15. TOTAL NUMBER OF DAYS OF S-197 OPERATIONS FOR THE NO ACTION ALTERNATIVE, ALTERNATIVE E, ALTERNATIVE F, AND ALTERNATIVE G (2012--2014)

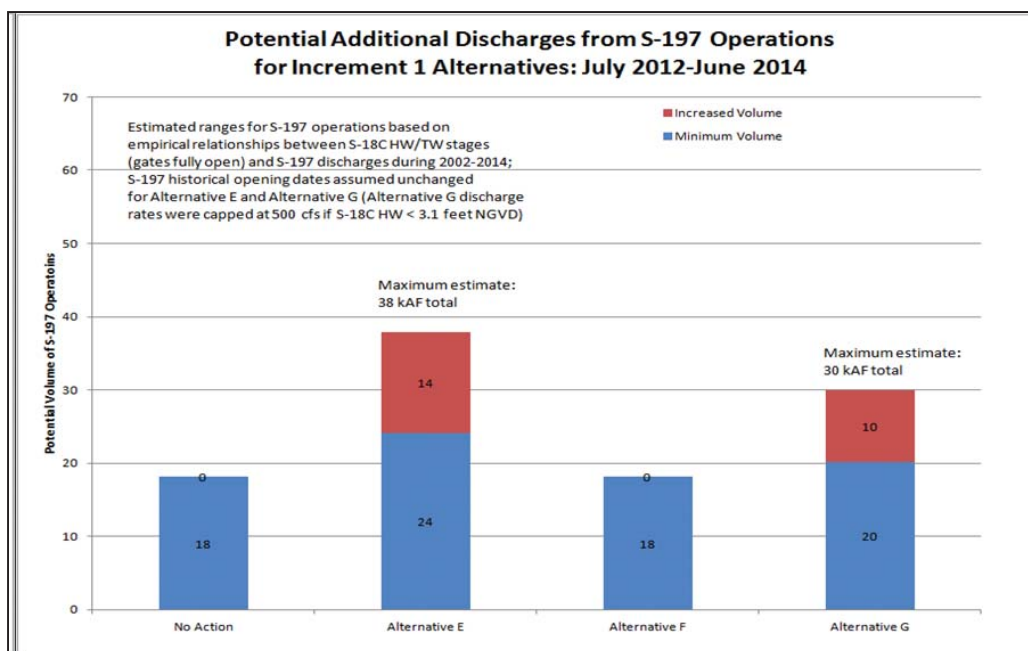


FIGURE 4-16. TOTAL ACCUMULATED DISCHARGE VOLUME FROM S-197 OPERATIONS FOR THE NO ACTION ALTERNATIVE, ALTERNATIVE E, ALTERNATIVE F, AND ALTERNATIVE G (2012—2014)

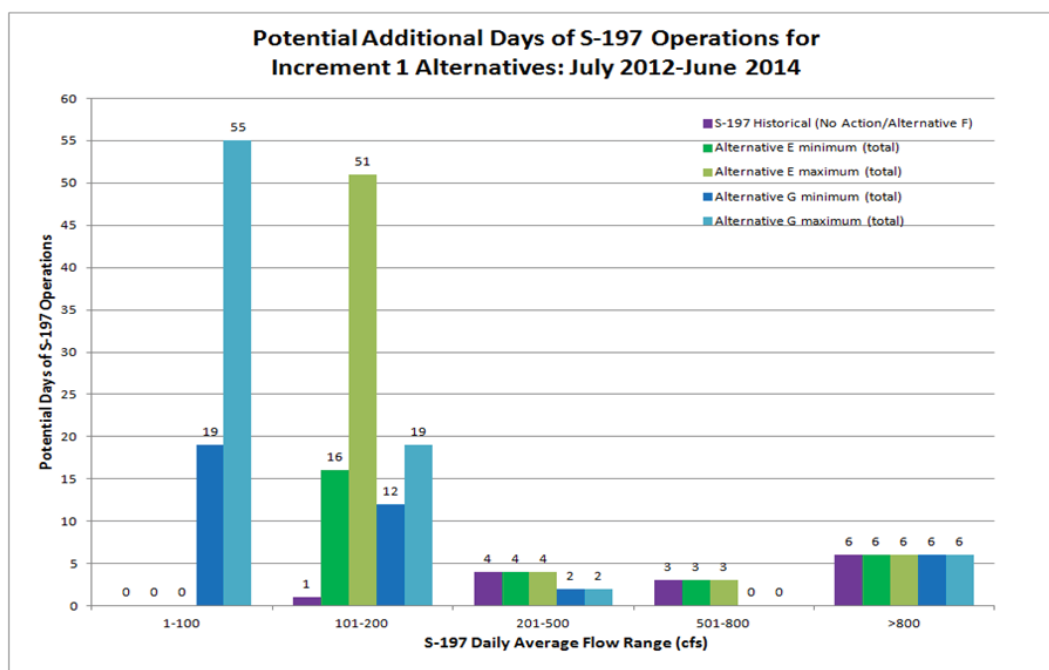


FIGURE 4-17. FLOW CLASSIFICATIONS AND DURATION DISTRIBUTIONS FOR ESTIMATED S-197 DAILY DISCHARGES WITH THE NO ACTION ALTERNATIVE, ALTERNATIVE E, ALTERNATIVE F, AND ALTERNATIVE G (2012--2014)

4.6 FLOOD CONTROL

The flood control assessments conducted for the alternatives included a quantitative evaluation of potential effects to high water conditions within WCA 3A and a qualitative assessment of potential effects to the South-Dade County basin (south of the S-331 pump station), which is provided flood protection by operation of the S-332B/S-332C/S-332D pump stations completed under the C-111 South Dade Project and through operation of the L-31N and C-111 Canal control structures (S-176, S-177, S-18C, and S-197).

Column 2 refers to the mode of operations when regulatory releases from WCA 3A are made via S-333 to the L-29 Canal and via S-334 to the L-31N Canal and the ENP SDCS. During Column 2 operations, the control stages along the L-31N Canal are also lowered to minimize potential flood impacts to the SDCS and also to provide the necessary downstream gradient for the S-334 releases to reach S-332B, S-332C, and S-332D pump stations. Detailed description of the Column 1 and Column 2 modes of operation for the WCA 3A regulatory outlet structures and the SDCS is provided in **Section 3.6**.

The field test constraints require maintaining the authorized purposed of the C&SF Project, including the flood control function of the WCAs. For the purposes of this EA assessment, based on recognition of the concerns previously raised by the Corps regarding WCA 3A high water stages experienced under IOP, the flood control function of WCA 3A will be assumed to be maintained if no net adverse effects are anticipated for WCA 3A high water conditions compared to conditions anticipated under the current E RTP. Development of new criteria for the field test restricting when and how S-334 is used to pass S-333 flows during Column 2 operations relied, in part, on a quantitative comparison between the number of days with potential opportunity for increased inflows to NESRS (dependent on degree of relaxation of the G-3273 constraint) and the number of days with reduced or eliminated Column 2 operations over the 2002-2014 historical hydrological assessment period. Over the 2002-2014 assessment period, the average discharge rate at S-333 during Column 1 operations corresponding to Increment 1 field test conditions (assumed L-29 Canal stage above 7.0 feet NGVD) was estimated at 340 cfs and the average discharge rate at S-334 during Column 2 operations was 360 cfs. With a qualitative recognition that the average discharge rate at S-333 during Column 1 operations should increase due to the expanded hydrologic connectivity between the L-29 Canal and NESRS at the MWD one mile bridge location (limited monitoring data is available since the bridge construction and removal of the adjacent Tamiami Trail roadway segment was completed in March 2013), the hydrologic assessment conducted for WCA 3A assumes that the increased days of discharge from WCA 3A due to relaxation of the G-3273 constraint are directly comparable to the decreased days of discharge from WCA 3A associated with restricted criteria for Column 2 regulatory discharges to the SDCS.

To provide a baseline for assessment of the Column 2 modifications proposed with the alternatives, historical operations were reviewed to identify historical periods of Column 2 operations. Column 2 operations were assumed for historical daily conditions with concurrent S-334 daily discharge rates greater than 50 cfs and combined S-332B/S-332C discharge rates greater than 75 cfs (75 cfs is the minimum pump rate for the S-332B and S-332C pump units, which each include four 125 cfs diesel pump units and one 75 cfs electric pump unit). The discharge hydrographs of historical S-334 daily discharges during Column 2 operations and S-

333 daily discharges is provided on **Figure 4-18**. A water year comparison of the accumulated net inflow to NESRS (computed as the difference between S-333 inflows and S-334 outflows) and the S-334 accumulated discharges during Column 2 operations, each of which contribute to the WCA 3A outflow water budget, is provided on **Figure 4-19**; over the historical hydrologic assessment period from 2002 – 2014, the Column 2 discharges at S-334 (735 kAF) corresponds to approximately 38 percent of the total discharges from WCA 3A to S-333 (1922 kAF). Historical use of Column 2 operations at S-334 during the IOP/ERTP S-12A closure period (01 November through 14 July) is shown in **Figure 4-20**. Historical use of Column 2 operations at S-334 during the IOP/ERTP S-12A non-closure period (15 July through 31 October) is shown in **Figure 4-21**.

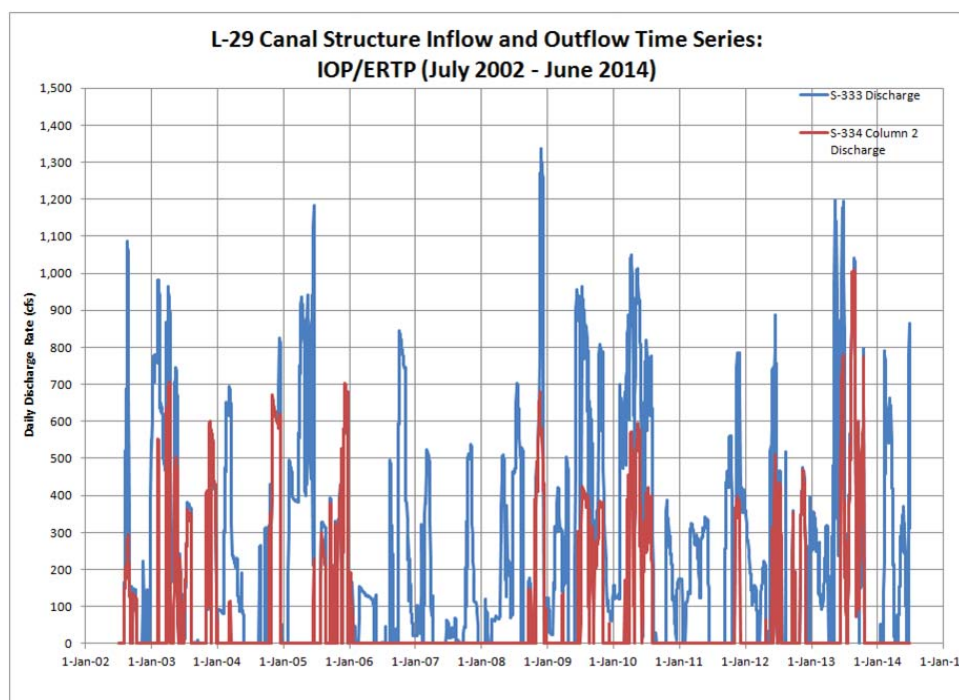


FIGURE 4-18. HISTORICAL DISCHARGE HYDROGRAPHS OF S-334 DISCHARGES DURING COLUMN 2 OPERATIONS AND S-333 DAILY DISCHARGES (2002-2014)

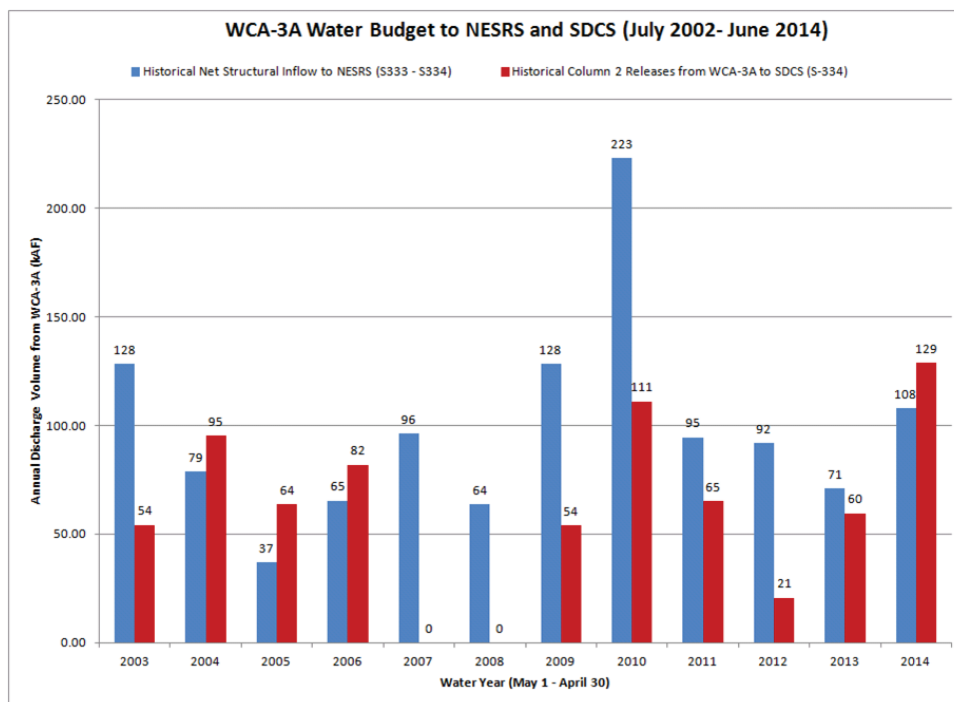


FIGURE 4-19. COMPARISON OF S-334 ACCUMULATED DISCHARGES DURING COLUMN 2 OPERATIONS AND ACCUMULATED NET INFLOW TO NESRS, WATER YEARS 2003 THROUGH 2014

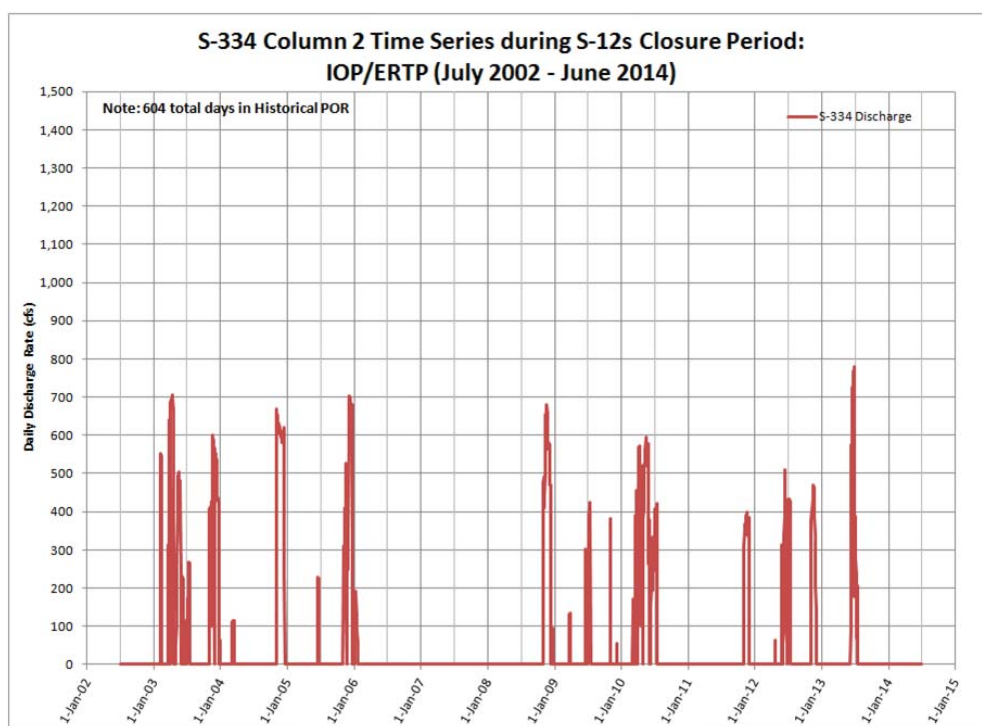


FIGURE 4-20. HISTORICAL DISCHARGE HYDROGRAPHS OF S-334 DISCHARGES DURING COLUMN 2 OPERATIONS WITHIN THE IOP/ERTP S-12A CLOSURE PERIOD (2002-2014)

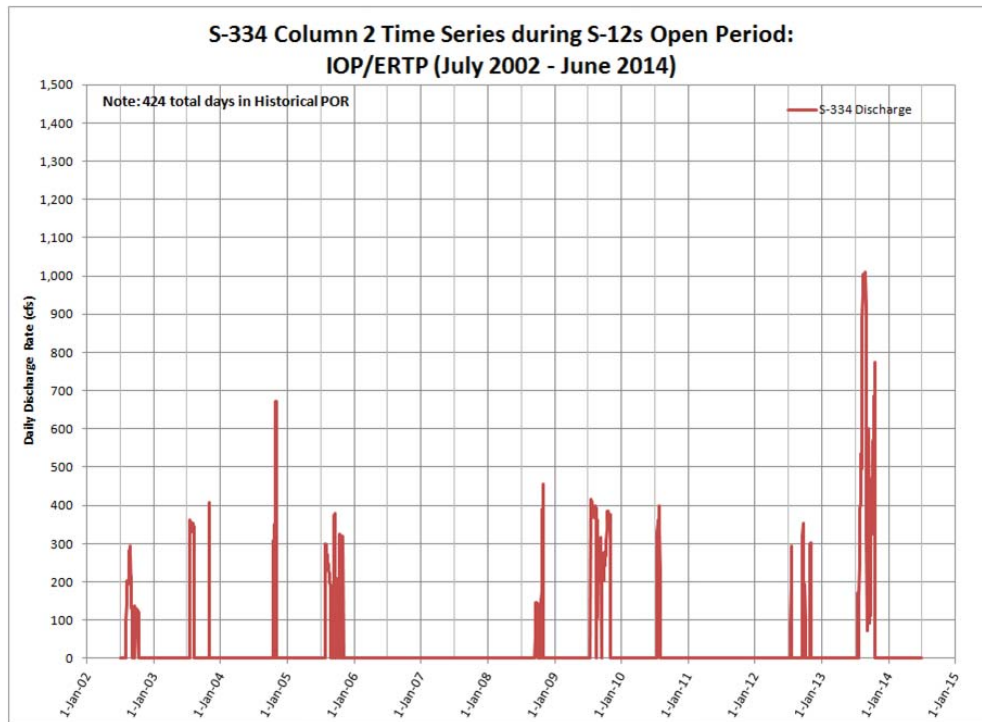


FIGURE 4-21. HISTORICAL DISCHARGE HYDROGRAPHS OF S-334 DISCHARGES DURING COLUMN 2 OPERATIONS OUTSIDE OF THE IOP/ERTP S-12A CLOSURE PERIOD (2002-2014)

A brief summary of the WCA 3A high water concerns, the ERTTP interim risk reduction measures, and an update on the status of further ongoing investigations by the Corps, is provided within the remainder of this section; for a more comprehensive discussion, the reader should refer to the 2011 ERTTP Final EIS (USACE 2011c).

During 2010-2011, concurrent with the formulation of the ERTTP, the Corps conducted a preliminary review of the original WCA 3A design documents and has analyzed historical hydrologic data and U.S. Geological Survey (USGS) rating curve measurements in the area. Based on this review, documented in Appendix A-5 of the November 2011 Final EIS for the ERTTP, SAJ concluded the S-12s may not be capable of achieving their original design discharge of 32,000 cfs and that the current configuration of WCA 3A would result in a predicted increase in the Standard Project Flood (SPF) stage for WCA 3A of between 1.3 and 1.4 feet, compared to the WCA 3A design assumptions. Based on the hydrologic insights gained from the preliminary analysis, the significant change to the original design assumptions, and the diminished extent of emergent vegetation within WCA 3A, the Corps, Jacksonville District recommended the lowering of Zone A of the WCA 3A Regulation Schedule (compared to IOP) as an interim risk reduction measure under ERTTP. With the approval of the ERTTP Record of Decision (ROD) in October 2012, ERTTP implemented the 1960 WCA 3A 9.5 to 10.5 feet NGVD Regulation Schedule as a required component for the interim water management criteria for WCA 3A Zone A. Prior to implementation of ERTTP in October 2012, Zone A of the IOP Regulation Schedule for WCA 3A ranged seasonally from 10.0-10.75 feet NGVD.

In addition to the interim risk reduction measure implemented under ERTTP, the Corps recommended completion of a detailed engineering assessment to evaluate the combined effects of the potential S-12s discharge limitations and the WCA 3A Regulation Schedule modifications on the frequency and duration of high water events. The detailed engineering assessment was to include a rigorous evaluation of SPF conditions within WCA 3A/WCA 3B and the upstream WCAs 1 and 2 within the context of the regional C&SF Project system infrastructure and operations. As the initial step towards the recommended detailed engineering assessment, the Corps initiated efforts to develop a comprehensive flood routing model of the C&SF Project WCA system in 2014 as part of the Corps' C&SF System Baseline and Modification Modeling (BAMM) Project. The purpose of the BAMM analysis is to determine if cumulative system-wide alterations to the C&SF Flood Control Project have altered peak SPF stages within each of the WCAs.

Within the ERTTP Final EIS, the Jacksonville District originally proposed a two-phased analysis approach for the WCA 3A high water events. Phase 1 was completed with implementation of the ERTTP in October 2012 and included the interim water management criteria for WCA 3A. The Phase 1 effort was limited to a water budget spreadsheet hydrologic and hydraulic assessment. Phase 2 includes the BAMM effort, which is presently expected to be completed in late 2016. However, the full Phase 2 effort will need to integrate the results of the BAMM modeling analysis as part of a broader engineering assessment of the public health and safety aspects associated with the levees and structures of the C&SF WCAs. Phase 2 would also include a more comprehensive evaluation of the hydraulic, geotechnical and structural engineering effects of the system alterations; incorporation of current Corps risk analysis requirements, focusing on potential human health and safety concerns resulting from increased WCA stages; and evaluation of potential water management operating criteria and/or infrastructure modification options to mitigate adverse changes to the high-water performance of the WCAs. The scope and schedule for completion of the Phase 2 assessments will be developed based on the results from the BAMM modeling analyses.

One of the primary purposes of the South-Dade County portion of the C&SF Project is flood protection. The project was authorized to remove 40-percent SPF flows. This purpose remains an important objective because of the remaining agriculture within the basin. The South-Dade County basin (south of the S-331 pump station) is provided flood protection by operation of the S-332B/S-332C/S-332D pump stations completed under the C-111 South Dade Project and through operation of the L-31N and C-111 Canal control structures (S-176, S-177, S-18C, and S-197). Development of the COP will be informed by the Increment 1 and Increment 2 field tests. The COP will conduct regional hydrologic modeling in order to balance the ecological restoration objectives of the MWD and C-111 South Dade projects while demonstrating compliance with the project constraints, which will include requirements to maintain the mitigation for project induced flood damages in the 8.5 SMA and to maintain the level of flood damage reduction associated with the 1994 C-111 GRR Recommended Plan.

Within the SDCS, S-331/S-173 releases are the result of water management operations to: (1) maintain target L-31N Canal stages; (2) provide flood mitigation to the 8.5 SMA eastern areas when sufficient capacity is available at S-357 and maintain flood mitigation for the 8.5 SMA when S-357 operational capacity is limited; and (3) WCA 3A regulatory releases to the SDCS

from S-334 during Column 2 operations. As a result of increased stages within NESRS, each action alternative will increase flood control releases from S-331 for 8.5 SMA mitigation and increase seepage to L-31N south of S-331, prior to completion of C-111 South Dade North Detention Area. Based on the significant reduction to WCA 3A regulatory releases to the SDCS, under typical hydro-meteorological conditions, the combined flows through S-331 and the adjacent S-173 gated culvert to the C-111 Basin are anticipated to be less than what would have been discharged through these features under the no action alternative. The net effect of reduced WCA 3A regulatory discharges to NESRS combined with increased flood control releases from S-331/S-173 and increased seepage to the L-31N Canal south of S-331 is not able to be quantified prior to completion of the field test and associated hydrologic monitoring. The field test hydrologic monitoring will aid in quantifying both long-term and intra-annual/seasonal effects of increased stages within NESRS. Additional inflow volumes to L-31N Canal, if resultant from the field test, are expected to be primarily managed with the C-111 South Detention Area using S-332 B, S-332C, and S-332D, given the significant reduction in WCA 3A regulatory releases to the SDCS.

The C-111 Spreader Canal Western Project will continue to be operated by SFWMD and provide flows to Taylor Slough. The SFWMD efforts to monitor the impacts of the project operation and ensure protection of privately-owned lands in the vicinity of the C-111 Spreader Canal Western Project area remain ongoing and inconclusive based on the limited period of monitoring data collected since June 2012. To mitigate for potential increased risk to flood protection in south Miami-Dade County areas, which may be affected by increased water levels in NESRS and associated water management operations within south Miami-Dade County during the field test, low volume releases from S-197 are being considered for inclusion in the 1 field test, specifically as components of Alternative E and Alternative G. The field test will include assessment of the combined effects of increased seepage east resultant from increased stage levels in NESRS and will incorporate the ongoing SFWMD operations, monitoring, and performance assessments conducted as part of the C-111 Spreader Canal Western Project.

The following sections (**Section 4.6.1** through **4.6.4**) describe the potential effects of each alternative on flood control. Flood control effects associated with high water conditions within WCA 3A are described in **Section 4.6.1** (Alternative A), **Section 4.6.2.1** (Alternative E), **Section 4.6.3.1** (Alternative F), and **Section 4.6.4.1** (Alternative G); the assessments described within these sections consider potential changes to the depths and durations of high water within WCA 3A, potential changes to the frequency, duration, and intra-annual timing of regulatory releases from WCA 3A to the SDCS (Column 2 operations using S-334), and potential changes to the frequency and intra-annual timing of Column 2 operational criteria for the SDCS Canals. The field test approach to assess flood control effects associated with increased water levels in NESRS and associated changes to water management operations within south Miami-Dade County (south of S-331) are described in **Section 4.6.2.2** (Alternative E), **Section 4.6.3.2** (Alternative F), and **Section 4.6.4.2** (Alternative G) for the action alternatives; as previously described in **Section 2.1.5** and **Section 4.5**, the proposed assessment approach recognizes the potential for increased risk to flood protection for South Dade areas, which may be conditionally affected by a combination of the following water management factors during the field test: increased seepage to the L-31N Canal south of S-331 prior to completion of C-111 South Dade NDA; increased discharges from S-331 for 8.5 SMA flood mitigation and/or increased

discharges from G-211/S-331 when S-356 operations are limited due to WCA 3A high water conditions above the WCA 3A Action Line (potentially offset by reduced S-331 discharges with limited WCA 3A regulatory releases to the SDCS); and operation of the S-332 D pump station and/or the C-111 South Dade SDA to manage L-31N Canal stages during periods of increased inflows.

4.6.1 Alternative A: No Action Alternative

Alternative A includes no relaxation of the G-3273 constraint and no changes to the historical use of Column 2 operations at S-334 and the SDCS. Alternative A will not provide increased inflows to NESRS and will not initiate operation of the MWD S-356 pump station. Flood control effects to WCA 3A and regulatory releases from WCA 3A to the SDCS are described in the 2011 ERTF Final EIS (USACE 2011c). Potential flood control effects of current water management operations within South-Dade County are as described in the 2012 WCAs-ENP-SDCS Water Control Plan are thoroughly evaluated within the 2011 ERTF Final EIS (USACE 2011c).

4.6.2 Alternative E: Relaxation of G-3273 Constraint and Operational Criteria Changes at S-197 (Trigger S-18C HW)

4.6.2.1 WCA 3A High Water Conditions and SDCS Column 2 Operations

During the S-12A seasonal closure period (01 November through 14 July), Alternative E limits the use of Column 2 operations at S-334 to convey WCA 3A regulatory releases to the SDCS to periods when the WCA 3A stage is above the Action Level (S-356 is off under this condition), S-333 discharges to NESRS are maximized, S-12C and S-12D are full open, and the SDCS has available capacity. The S-334 discharge rate during Column 2 operations is conditionally limited to 250-400 cfs, dependant on the concurrent daily combined pumping rates at S-332B, S-332C, and S-332D. Column 2 operations at S-334 will not be used outside of the S-12A seasonal closure period, except during years in which excess water is accumulated in WCA 3A as a result of the S-12 seasonal closure requirements, resulting in a WCA 3A discharge deficit. For years with a discharge deficit on July 14, the use of S-334 may continue through 15 August to release the volume of water that would have been released, according to the WCA 3A Regulation Schedule, had the S-12s been allowed to be open. Based on a review of historical WCA 3A water budget accounting results from 2006 through 2014, which may be used to track the expected effect on WCA 3A stage levels resulting from IOP/ERTF seasonal closures of WCA 3A outlet structures, continued use of S-334 from 15 July through 15 August would have enabled reduction of the WCA 3A discharge deficit during the 2010 water year (July 2009) due to historical WCA 3A stages that exceeded the WCA 3A Action Line.

Figure 4-22 provides a water year comparison of the potential number of days with the opportunity for increased discharges from WCA 3A to NESRS from relaxation of the G-3273 constraint and the potential number of days with potential decreased discharges from WCA 3A using S-333/S-334 due to the modified criteria for Column 2 regulatory discharges to the SDCS. **Figure 4-23** displays the same information from **Figure 4-22** as an intra-annual distribution, illustrating the reduced need for Column 2 regulatory releases during the later dry season months leading into the start of the wet season in late May or June due to the increased capacity for WCA 3A releases to NESRS during the wet season. The historical Column 2 regulatory releases

from 2002-2014 and the proposed Alternative E Column 2 regulatory releases based on the criteria proposed for Alternative E are converted to accumulated discharge volumes and displayed for each water year in **Figure 4-24** and as an intra-annual distribution in **Figure 4-25**.

Under Alternative E, the SDCS canals may be operated using Column 2 open/close criteria when the WCA 3A stage is above the Action Level (S-356 is off under this condition) and S-333 discharges to NESRS are maximized, to mitigate for potential flood impacts in SDCS that may result from increased stages within NESRS and concurrent restrictions on S-356 pump operations. Under historical IOP/ERTP operational criteria, SDCS Column 2 canal operations were only used when Column 2 regulatory discharges were being conveyed from WCA 3A to the SDCS using S-334 and S-331. Based on the modified criteria for SDCS Column 2 canal operations with Alternative E, comparison graphics were developed to compare the water year variability (**Figure 4-26**) and the intra-annual variability (**Figure 4-27**) differences between historical 2002-2014 SDCS Column 2 canal operations and the modified criteria proposed in Alternative E. These figures illustrate that over the 2002-2014 hydrological assessment period, the cumulative expected duration of SDCS Column 2 canal operations does not significantly change between the historical observations (no action alternative: 1,028 total days) and Alternative E (1,037 total days). However, because Alternative E would use SDCS Column 2 canal operations when WCA 3A stages exceed the WCA 3A Action Level, independent of whether S-334 discharges are being conducted concurrently (S-356 pump operations are not used when WCA 3A stages are above the Action Level), the timing of Alternative E SDCS Column 2 canal operations is significantly shifted to predominantly occur during the wet season months of June through October and into the typical dry season months of November and December during more extreme or extended wet years.

Compared to No Action Alternative, based on assessment of the historical hydrological conditions experienced during IOP/ERTP (July 2002 through June 2014), Alternatives E is anticipated to provide the following flood control effects within WCA 3A and the SDCS:

- Increase the frequency and duration of L-29 Canal stages approaching the maximum operating limit of 7.5 feet NGVD (IOP/ERTP stage exceeds 7.3 feet NGVD ~29 % of the 2002-2014 assessment period);
- Reduce the total duration of WCA 3A regulatory releases to the SDCS by an estimated 832 days (81% reduction; frequency reduced from 23.5 % to 4.5 percent of the assessment period);
- Reduce the accumulated volume of WCA 3A regulatory releases to the SDCS by an estimated 85% (735 kAF under IOP/ERTP to 112 kAF);
- No increase to WCA 3A peak stage and no increase to the duration or frequency of WCA 3A high water conditions;
- Increased use of Column 2 operational criteria for the SDCS Canals during the wet season months of July through October, which provide increased canal storage for management of local basin runoff and potential increased seepage from NESRS;
- Limited increased structure discharges from the L-31N Canal to central Biscayne Bay when conveyance capacity is available within the C-102 Canal (S-194) and/or the C-103 Canal (S-196) during the wet season months of July through October, due to increased

use of Column 2 operational criteria for the SDCS Canals (design capacity of the S-194 and S-196 gated culverts are each 200 cfs).

4.6.2.2 South-Dade County Flood Control

The net effect of reduced WCA 3A regulatory discharges to NESRS combined with increased flood control releases from S-331/S-173 and increased seepage to the L-31N Canal south of S-331 is not able to be quantified prior to completion of the field test and associated hydrologic monitoring. The field test hydrologic monitoring will aid in quantifying both long-term and intra-annual/seasonal effects of increased stages within NESRS. Additional inflow volumes to L-31N Canal, if resultant from the field test, are expected to be primarily managed with the C-111 South Detention Area using S-332 B, S-332C, and S-332D, given the significant reduction in WCA 3A regulatory releases to the SDCS.

The C-111 Spreader Canal Western Project will continue to be operated by SFWMD and provide flows to Taylor Slough. The SFWMD efforts to monitor the impacts of the project operation and ensure protection of privately-owned lands in the vicinity of the C-111 Spreader Canal Western Project area remain ongoing and inconclusive based on the limited period of monitoring data collected since June 2012. To mitigate for potential increased risk to flood protection in south Miami-Dade County areas, which may be affected by increased water levels in NESRS and associated water management operations within south Miami-Dade County during the field test, low volume releases from S-197 are included as components of Alternative E. The field test will include assessment of the combined effects of increased seepage east resultant from increased stage levels in NESRS and will incorporate the ongoing SFWMD operations, monitoring, and performance assessments conducted as part of the C 111 Spreader Canal Western Project.

4.6.3 Alternative F: Relaxation of G-3273 Constraint Without Operational Criteria Changes at S-197

4.6.3.1 WCA 3A High Water Conditions and SDCS Column 2 Operations

Compared to the No Action Alternative, based on assessment of the historical hydrological conditions experienced during IOP/ERTP (July 2002 through June 2014), Alternative F is anticipated to result in the same flood control effects to WCA 3A and regulatory releases from WCA 3A to the SDCS as were described for Alternative E. Changes to the frequency and intra-annual timing of Column 2 operational criteria for the SDCS Canals, including effects on C-102 and C-103 structure discharges to Biscayne Bay, are also consistent with the assessment provided for Alternative E.

4.6.3.2 South-Dade County Flood Control

Compared to the no action alternative, Alternative F is anticipated to provide diminished flood control performance within South-Dade County. Alternative F does not include low volume releases from S-197 mitigate for potential increased risk to flood protection in south Miami-Dade County areas, which may be affected by increased water levels in NESRS and associated water management operations within south Miami-Dade County during the field test. Alternative F is expected to increase risk to flood protection for South Dade areas, which may be conditionally affected by a combination of the following water management factors during the field test: increased seepage to the L-31N Canal south of S-331 prior to completion of C-111 South Dade

NDA; increased discharges from S-331 for 8.5 SMA flood mitigation and/or increased discharges from G-211/S-331 when S-356 operations are limited due to WCA 3A high water conditions above the WCA 3A Action Line (potentially offset by reduced S-331 discharges with limited WCA 3A regulatory releases to the SDCS); and operation of the S-332 D pump station and/or the C-111 South Dade SDA to manage L-31N Canal stages during periods of increased inflows.

The net effect of reduced WCA 3A regulatory discharges to NESRS combined with increased flood control releases from S-331/S-173 and increased seepage to the L-31N Canal south of S-331 is not able to be quantified prior to completion of the Increment 1 field test and associated hydrologic monitoring. The field test hydrologic monitoring will aid in quantifying both long-term and intra-annual/seasonal effects of increased stages within NESRS. Additional inflow volumes to L-31N Canal, if resultant from the field test, are expected to be primarily managed with the C-111 South Detention Area using S-332 B, S-332C, and S-332D, given the significant reduction in WCA 3A regulatory releases to the SDCS.

The C-111 Spreader Canal Western Project will continue to be operated by SFWMD and provide flows to Taylor Slough. The SFWMD efforts to monitor the impacts of the project operation and ensure protection of privately-owned lands in the vicinity of the C-111 Spreader Canal Western Project area remain ongoing and inconclusive based on the limited period of monitoring data collected since June 2012. Although increased water levels within NESRS and associated water management operations within south Miami-Dade County during the Increment 1 field test will result in potential increased risk to flood protection in south Miami-Dade County areas, low volume releases from S-197 are not included as components of Alternative F. The field test will include assessment of the combined effects of increased seepage east resultant from increased stage levels in NESRS and will incorporate the ongoing SFWMD operations, monitoring, and performance assessments conducted as part of the CERP C 111 Spreader Canal Western Project.

4.6.4 Alternative G: Relaxation of G-3273 Constraint and Operational Criteria Changes at S-197 (Trigger S-178 TW) (PREFERRED ALTERNATIVE)

4.6.4.1 WCA 3A High Water Conditions and SDCS Column 2 Operations

Compared to the no action alternative, based on assessment of the historical hydrological conditions experienced during IOP/ERTP (July 2002 through June 2014), Alternative G is anticipated to result in the same flood control effects to WCA 3A and the regulatory releases from WCA 3A to SDCS as were described for Alternative E. Changes to the frequency and intra-annual timing of Column 2 operational criteria for the SDCS Canals, including effects on C-102 and C-103 structure discharges to Biscayne Bay, are also consistent with the assessment provided for Alternative E.

4.6.4.2 South-Dade County Flood Control

Compared to the No Action Alternative, Alternatives G is anticipated to provide the same flood control effects within South-Dade County as were described for Alternative E. Minor reductions in the volume of water estimated for discharge from S-197, compared to Alternative E, is not expected to significantly change the potential increased risk to flood protection in south Miami-

Dade County areas as previously described for Alternative E (refer to **Section 4.6.2.2**), which may be affected by increased water levels in NESRS and associated water management operations within south Miami-Dade County during the field test.

The field test will include assessment of the combined effects of increased seepage east resultant from increased stage levels in NESRS and will incorporate the ongoing SFWMD operations, monitoring, and performance assessments conducted as part of the C-111 Spreader Canal Western Project.

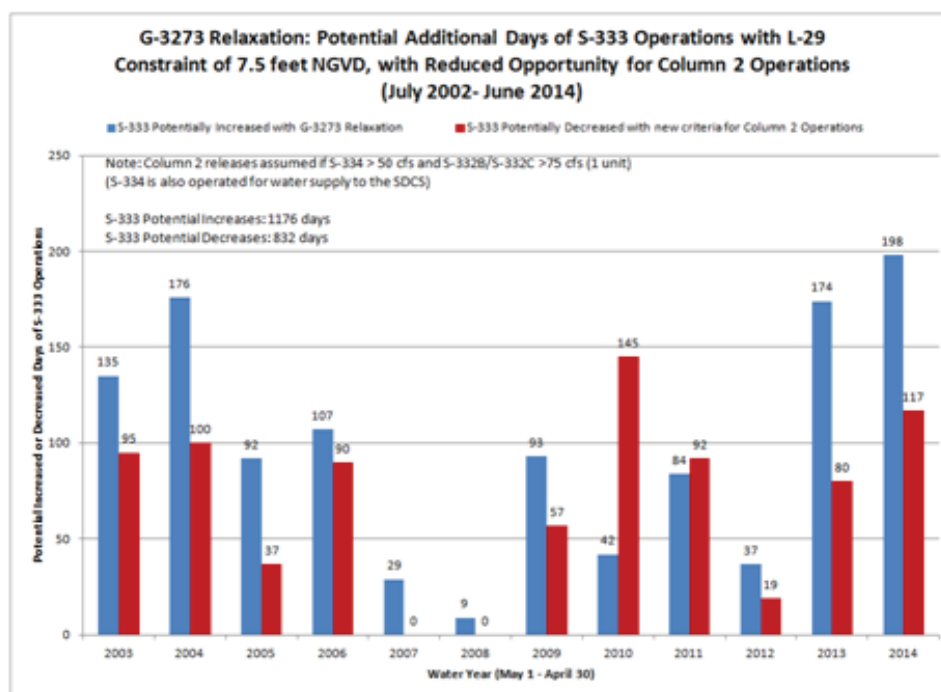


FIGURE 4-22. WATER YEAR COMPARISON OF THE POTENTIAL NUMBER OF DAYS WITH THE OPPORTUNITY FOR INCREASED DISCHARGES FROM WCA 3A TO NESRS AND THE POTENTIAL NUMBER OF DAYS WITH POTENTIAL DECREASED DISCHARGES FROM WCA 3A DUE TO THE MODIFIED CRITERIA FOR COLUMN 2 REGULATORY DISCHARGES TO THE SDCS FOR ACTION ALTERNATIVES E/F/G (2002-2014)

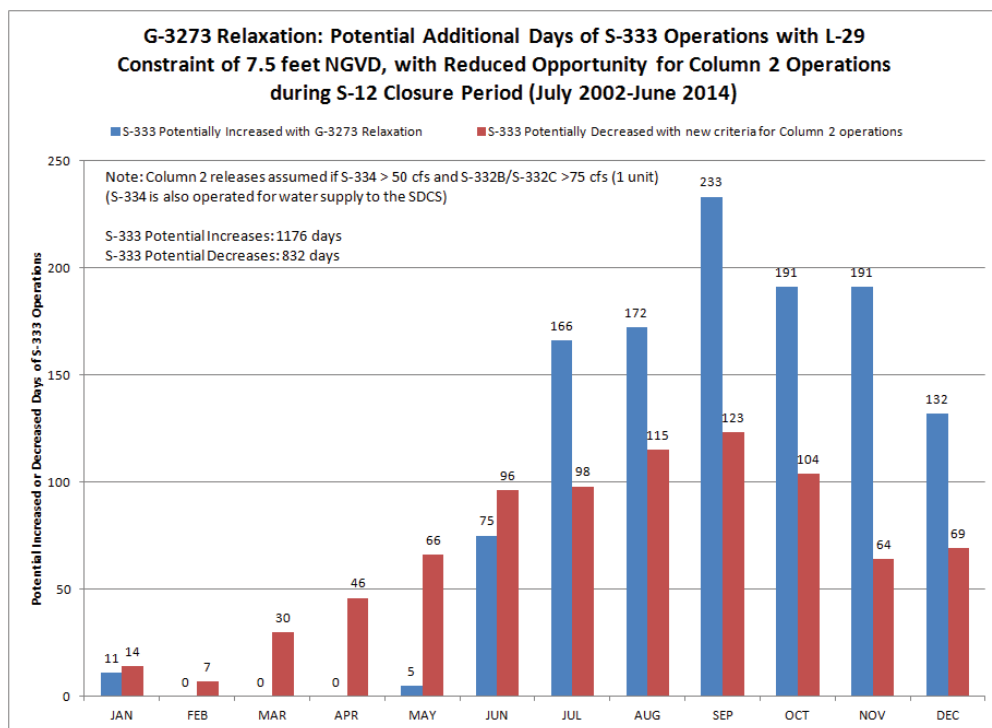


FIGURE 4-23. COMPARISON INTRA-ANNUAL VARIABILITY OF THE POTENTIAL NUMBER OF DAYS WITH THE OPPORTUNITY FOR INCREASED DISCHARGES FROM WCA 3A TO NESRS AND THE POTENTIAL NUMBER OF DAYS WITH POTENTIAL DECREASED DISCHARGES FROM WCA 3A DUE TO THE MODIFIED CRITERIA FOR COLUMN 2 REGULATORY DISCHARGES TO THE SDCS FOR ACTION ALTERNATIVES E/F/G (2002-2014)

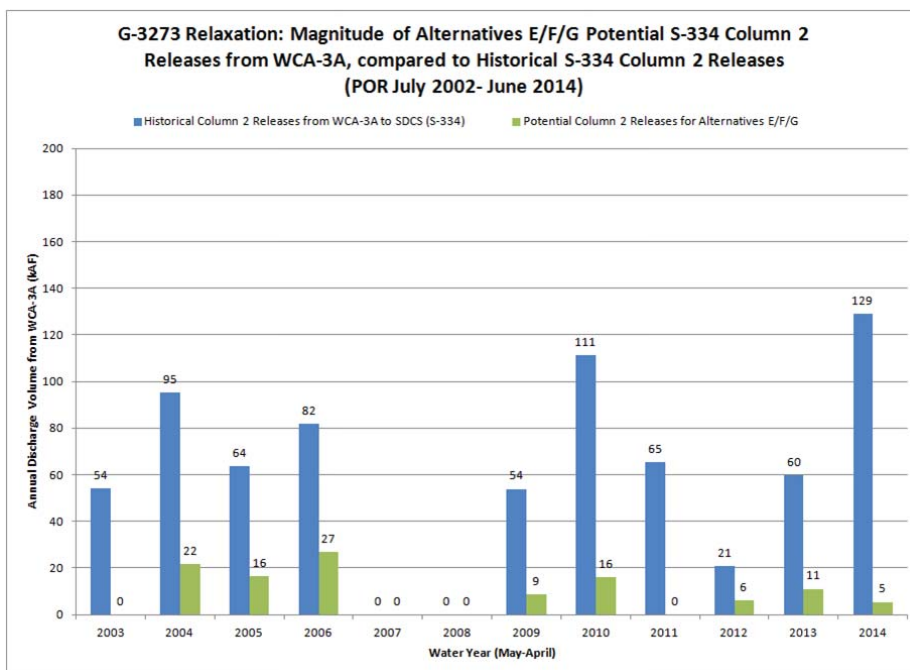


FIGURE 4-24. COMPARISON OF HISTORICAL COLUMN 2 REGULATORY RELEASE VOLUMES AND PROPOSED COLUMN 2 REGULATORY RELEASE VOLUMES FOR ACTION ALTERNATIVES E/F/G (2002—2014)

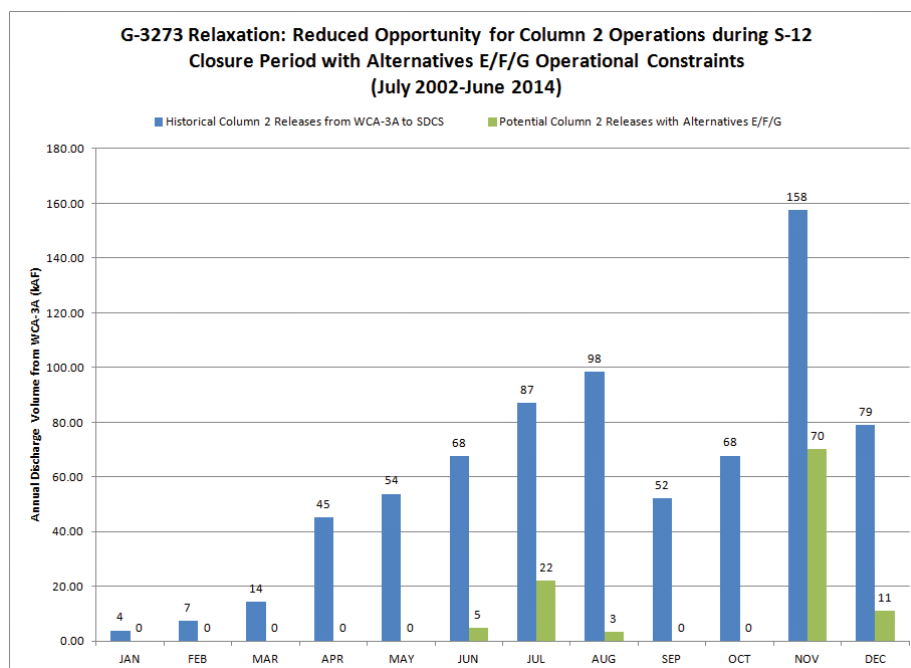


FIGURE 4-25. COMPARISON OF INTRA-ANNUAL TIMING OF HISTORICAL COLUMN 2 REGULATORY RELEASE VOLUMES AND PROPOSED COLUMN 2 REGULATORY RELEASE VOLUMES FOR ACTION ALTERNATIVES E/F/G (2002—2014)

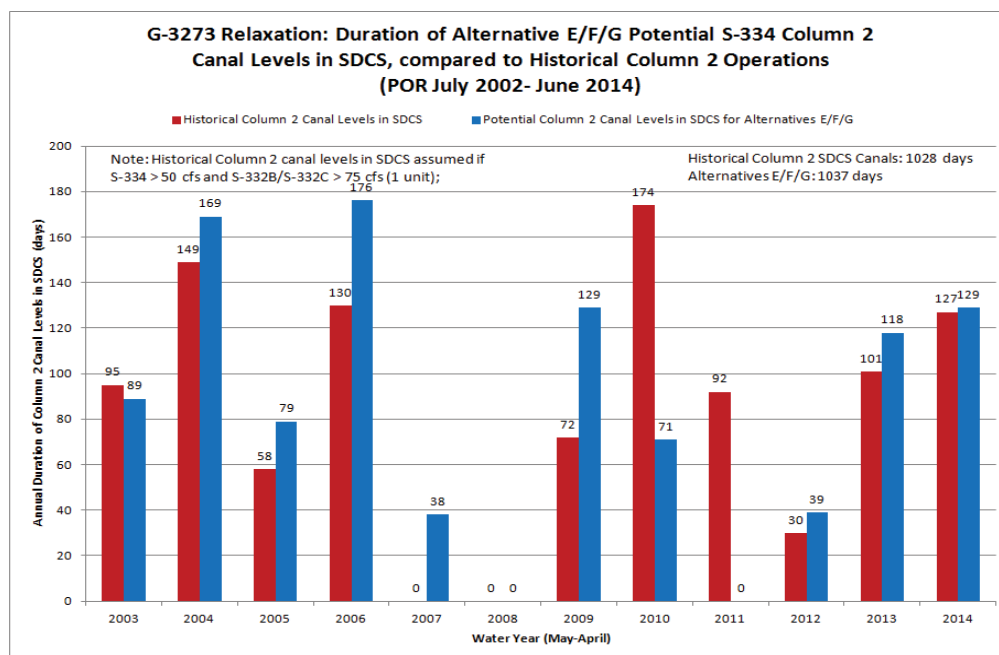


FIGURE 4-26. COMPARISON OF WATER YEAR VARIABILITY DIFFERENCES BETWEEN HISTORICAL 2002-2014 SDCS COLUMN 2 CANAL OPERATIONS AND THE MODIFIED CRITERIA PROPOSED IN ACTION ALTERNATIVES E/F/G (2002--2014)

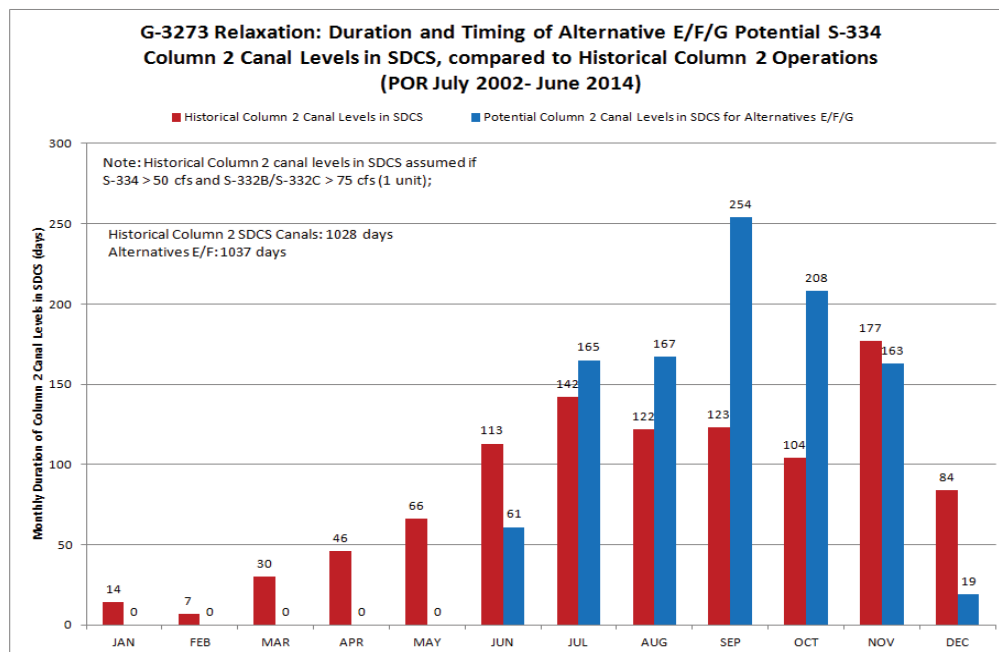


FIGURE 4-27. COMPARISON OF INTRA-ANNUAL VARIABILITY DIFFERENCES BETWEEN HISTORICAL 2002-2014 SDCS COLUMN 2 CANAL OPERATIONS AND THE MODIFIED CRITERIA PROPOSED IN ACTION ALTERNATIVES E/F/G (2002--2014)

4.7 VEGETATIVE COMMUNITIES

4.7.1 Alternative A: No Action Alternative

Vegetation within the project area would not be expected to change from current conditions. The continued implementation of ERTTP has the potential for negligible to minor effects on vegetation primarily within WCA 3A where water levels will be reduced and prolonged periods of flooding will be lessened through lowering of WCA 3A Regulation Schedule. Potential impacts in vegetation in NESRS may occur due to changes in water quality (USACE 2011b).

4.7.2 Alternative E: Relaxation of G-3273 Constraint and Operational Criteria Changes at S-197 (Trigger S-18C HW)

Deep slough communities formerly occurred throughout the pre-drainage Ridge and Slough region of the Everglades (McVoy et al. 2011). Sloughs within the Greater Everglades have been degraded by compartmentalization resulting in reduced sheetflow, depths and inundation durations, and alteration of vegetation communities. The primary factors influencing the distribution of dominant freshwater wetland plant species of the Everglades are soil type, soil depth, and hydrological regime (USFWS 1999).

Vegetation within WCA 3A would not be expected to change from current conditions with implementation of Alternative E. Alternative E includes a seasonally varying WCA 3A water level of 10.0 to 10.75 feet NGVD (*i.e.* Increment 1 Action Line), as measured by the three gage average, which will serve to define S-333 and S-356 releases to the L-29 Canal and NESRS. Implementation of the Increment 1 Action Line to manage high water conditions in WCA 3A, would help to prevent conditions of extreme high water levels and prolonged inundation periods within WCA 3A that result in negative impacts to its natural communities.

During the field test, the stage levels experienced at G-3273 and other locations within NESRS are expected to be similar to the intra-annual range of water stages experienced under recent C&SF Project operations. The duration at which water stages at G-3273 exceed 6.8 feet NGVD is expected to increase. Improved hydroperiods within NESRS and ENP has the potential to reduce soil oxidation, which is expected to promote peat accretion. A potential decrease in drying event severity relative to the No Action Alternative, if achieved, would aid in restoration of historic wetland vegetation communities. Alternative E may have a temporary minor beneficial effect on vegetative communities within NESRS. However, due to the short duration of this test, significant vegetation changes are not anticipated.

The field test includes include increasing flows through S-333. With an increase in S-333 flow, there is an increased likelihood of increased TP entering NESRS. The Everglades, a phosphorus-limited system, historically received most inputs of phosphorus through rainfall, with average TP concentrations of less than 0.01 mg/L (McCormick et al. 1996, Newman et al. 2004). However, more recently, areas within ENP, including NESRS, have been exposed to TP concentrations at or in excess of 0.10 mg/L (SFWMD 2010). Vegetation that can assimilate nutrients directly from the water column appears to be the most sensitive to nutrient enrichment and include periphyton and floating-leaved plants, such as spatterdock and water lily (Chaing et al. 2000; Newman et al. 2004). Potential effects to vegetation and species composition within NESRS and ENP as a result of changes in water quality cannot be fully determined at this time.

The estuarine communities of Florida and Biscayne Bays have been affected by upstream changes in freshwater flows through the Everglades and eastward across the Miami Rock Ridge. The estuarine communities of Biscayne Bay have been further affected by agricultural and urban development of the areas east of the current boundaries of ENP. A reduction in freshwater inflows into Florida Bay and alterations of the normal salinity balance have affected mangrove community composition and may have contributed to a large-scale die-off of seagrass beds (USFWS 1999). Mangrove communities along Biscayne Bay have also seen a reduction in freshwater inflows and a reduction in historic habitat range by urban and agricultural development leaving only a remnant ribbon of suitable habitat immediately adjacent to the bay. Both bays experiences salinities in excess of 40 psu on a seasonal basis. Manatee Bay and Barnes Sound are presently characterized by extended periods with little or no freshwater input, interspersed with erratic large volume discharges from the C-111 Canal, which is presently the major source of freshwater flows. The timing and quantity of these flows however cause abrupt, major reductions in salinity that may persist for periods of days to weeks, followed by a return to moderate-to-high salinities.

Based on a period of analysis limited to historical operations between July 2012 and June 2014, the frequency of S-197 discharges potentially increase from 14 days under the No Action Alternative to a range of 29 to 65 days (timing unchanged) under Alternative E (**Figure 4-15**). Alternative E is also expected to increase the total volume of S-197 discharges from 18 kAF under the No Action Alternative to a range between 24 to 38 kAF (**Figure 4-16**). The same magnitude of historical releases at S-197 would continue to occur, as Alternative E does not propose operational changes to the “open and close” triggers at S-177 and S-18C that are currently defined within the 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c). Potential increases in the frequency and volume of S-197 discharges, under Alternative E are expected to occur during the wet season (June-November) (**Figure 4-11**).

There is potential for limited increases in structural discharges from the L-31N Canal to central Biscayne Bay during the field test when conveyance capacity is available within the C-102 Canal (S-194) and/or the C-103 Canal (S-196) during the wet season months of July through October, due to increased use of Column 2 operational criteria for the SDCS Canal. Design capacity of the S-194 and S-196 gated culverts are each 200 cfs.

Manatee Bay and Barnes Sound are relatively large bodies of water with open connections to Card Sound and the Atlantic Ocean. Waters within Manatee Bay and Barnes Sound have been documented to have shorter residence times and experience more tidal flushing relative to northeastern Florida Bay (Marshall 2014). Low volume releases at S-197 has the potential to decrease flows to Taylor Slough, and subsequently Florida Bay. Currently, water which discharges from S-18C, is allowed to flow over the scraped down canal banks into ENP's Eastern Panhandle, and towards the tidal creeks feeding into Long Sound and Joe Bay.

Potential minor adverse impacts associated with salinity fluctuations would be temporary and spatially limited to nearshore areas within the southern estuaries. Alternative E is not expected to have significant effects on vegetative communities within the southern estuaries.

4.7.2.1 Slough/Open Water Marsh

Flows through NESRS under current system compartmentalization and water management practices are greatly reduced when compared with pre-drainage conditions. The result has been lower wet season depths and more frequent and severe dry downs in sloughs and reduction in extent of shallow water edges. Over-drainage within ENP has resulted in the conversion of slough/open-water marsh communities to shorter hydroperiod sawgrass marshes and wet prairies (Davis et al. 1994, Davis and Ogden 1997; Armentano et al. 2006; McVoy et al. 2011). Shorter hydroperiod sawgrass marshes may transition to wet prairie and slough/open water marsh communities with improved hydroperiods under Alternative E. 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). Alternative E may have a temporary minor beneficial effect on slough/open water marsh communities within NESRS. However, due to the short duration of this test, significant vegetation changes are not anticipated.

4.7.2.2 Sawgrass Marsh

As a result of increased durations under Alternative E, it is expected that shorter hydroperiod sawgrass marshes within ENP may transition to wet prairie, except where there is deep water that will transition to slough.

4.7.2.3 Wet Marl Prairies

Areas within the eastern marl prairies along the boundary of ENP suffer from over-drainage, reduced water flow, exotic tree invasion and frequent human-induced fires (Lockwood et al. 2003; Ross et al. 2006). To alleviate the perpetually drier conditions and associated problems, increased water flows within this area are required. Increased hydroperiods within the eastern marl prairies may act to alleviate some of the problems associated with drier conditions and promote a shift in species community composition to benefit native vegetation and provide a temporary minor beneficial effect.

4.7.2.4 Rockland Pine Forest

Pine rocklands within the action area occur on the Miami Rock Ridge and extend into the Everglades as Long Pine Key. Under the field test, there are no proposed changes to the operations of the C-111 South Dade Detention Area. Field test water management operations may result in increased seepage to the L-31N Canal south of the S-331 pump station, prior to the construction and operation of the C-111 South Dade Project NDA. The additional volume of seepage to the L-31N Canal is expected to be primarily managed with the C-111 South Detention Area using S-331. Significant impacts are not predicted within rockland pine forest with implementation of Alternative E.

4.7.2.5 Tropical Hardwood Hammock

Tropical hardwood hammocks on the Miami Rock Ridge have been affected by a lowered water table associated with the reduction of freshwater flow through the Everglades. Tropical hardwood hammocks within the action area occur on the Miami Rock Ridge, along the northern shores of Florida Bay, and on elevated outcrops on the upstream side of tree islands. Significant

impacts are not predicted within tropical hardwood hammock with implementation of Alternative E.

4.7.2.6 Tree Islands

Tree islands in SRS rise above the surrounding marsh. Potential for flooding stress is low with implementation of Alternative E. Since 1942, a 55% decline in the extent and number of tree islands in SRS has been observed due to intensive fires that migrate across the marshes and burn tree island peat soils leaving rocky outcroppings. Tree islands are connected to the surrounding marsh via the roots of the trees. When the water table drops below these roots, tree islands often become too dry and can burn. Under Alternative E, the duration of water above the marsh surface is expected to improve. Alternative E may have a temporary minor beneficial effect on tree islands within ENP by reducing the potential for devastating fires. Reference **Section 4.13** for additional information regarding tree islands.

4.7.2.7 Mangroves

Mangrove communities occur within a range of salinities from 0 to 40 practical salinity units (psu). Jiang et al. (2012) developed a model to estimate the resilience of a system against a regime shift. Their model was applied to a halophytic mangrove and glycophytic hardwood hammock ecotone to measure its resilience to storm surge. The boundary between these two vegetative types is typically distinct, with only slight changes in topography. The authors noted that a disturbance, such as an input of salinity to the soil from a storm event, could upset this ecotone boundary. This could possibly cause salinity-tolerant vegetation to migrate inland. For the model developed in this study, the authors found a pulse disturbance was not sufficient to cause a regime shift in the vegetative boundary. Any change in salinity would have to be held at a high level for some time for this type of boundary shift to occur (Jiang et al., 2012). Based on a period of analysis limited to historical operations between July 2012 and June 2014, the frequency and volume of S-197 discharges to Manatee Bay and Barnes Sound are expected to increase (See **Section 4.5.4.2**). Although the above referenced study by Jiang et al. (2012) provides only limited data on how mangrove habitats respond to salinity variations, it suggests that low volume freshwater releases (*i.e.* 200 cfs) from S-197 would not be sufficient to affect mangrove habitats within the coastal estuaries. Furthermore, potential for limited increases in structural discharges from the L-31N Canal to central Biscayne Bay during the field test are subject to available conveyance capacity within the C-102 Canal (S-194) and/or the C-103 Canal (S-196).

4.7.2.8 Seagrass Beds

Nearshore salinity conditions within the coastal estuaries are elevated much of the year as a result of the less than adequate freshwater flow deliveries. Based on a period of analysis limited to historical operations between July 2012 and June 2014, the frequency and volume of S-197 discharges to Manatee Bay and Barnes Sound are expected to increase (See **Section 4.5.4.2**). Overland flow of freshwater into coastal estuaries is preferred as compared with transfers through the S-197 structure, however; low volume releases to Manatee Bay and Barnes Sound through this structure are considered preferential to high volume releases which result in increased incidence of large salinity swings as well as high nutrient load delivery. Extreme salinity fluctuations associated with high volume discharges are not expected under Alternative

E, as additional S-197 releases would be constrained to 200 cfs. Scouring of bottom sediments and significant increases in turbidity resulting in diminished light penetrations through the water column is not expected. Significant impacts to seagrass beds within the coastal estuaries are not expected due to the limited duration and limited extent of operational changes at S-197 being considered. Furthermore, potential for limited increases in structural discharges from the L-31N Canal to central Biscayne Bay during the field test are subject to available conveyance capacity within the C-102 Canal (S-194) and/or the C-103 Canal (S-196). Seagrasses have an optimum salinity range of 24 to 35 psu, but can tolerate considerable short-term salinity fluctuations.

4.7.3 Alternative F: Relaxation of G-3273 Constraint Without Operational Criteria Changes at S-197

Implementation of Alternative F would result in similar effects as discussed under Alternative E within WCA 3 and ENP. Alternative F may have a temporary minor beneficial effect on vegetative communities within NESRS. Operational criteria for Alternative F are identical to that described for Alternative E, except for inclusion of S-197. Under Alternative F, S-197 would continue to operate as defined in the 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c). Vegetative communities within the southern estuaries would not be expected to change from current conditions.

4.7.4 Alternative G: Relaxation of G-3273 Constraint and Operational Criteria Changes at S-197 (Trigger S-178 TW) (PREFERRED ALTERNATIVE)

Implementation of Alternative G would result in similar effects as discussed under Alternative E within WCA 3 and ENP. Alternative G may have a temporary minor beneficial effect on vegetative communities within NESRS.

Potential minor adverse impacts associated with salinity fluctuations would be temporary and spatially limited to nearshore areas within the southern estuaries. Based on a period of analysis limited to historical operations between July 2012 and June 2014, the frequency of S-197 discharges potentially increase from 14 days under the No Action Alternative to a range of 39 to 82 days (timing unchanged) under Alternative G (**Figure 4-15**). Durations are slightly higher than Alternative E, since S-197 discharges start at a lower discharge rate of 100 cfs. Alternative G is also expected to increase the total volume of S-197 discharges from 18 kAF under the No Action Alternative to a range between 20 to 30 kAF (**Figure 4-16**). Alternative G also reduces the IOP/ERTP Level 1 S-197 opening from 800 cfs to 500 cfs. Potential impacts to vegetative communities under Alternative G would be reduced relative to Alternative E. Alternative G is not expected to have significant effects on vegetative communities within the southern estuaries.

4.8 FISH AND WILDLIFE RESOURCES

4.8.1 Alternative A: No Action Alternative

Fish and wildlife resources within the project area would not be expected to change from current conditions. The continued implementation of ERTTP has the potential for negligible to moderate effects on fish and wildlife resources depending upon location and species. Due to extension of Zones D and E1 within the WCA 3A Regulation Schedule, there is greater opportunity for more flexible water management operations in WCA 3A to meet needs of fish and wildlife species (USACE 2011b)

4.8.2 Alternative E: Relaxation of G-3273 Constraint and Operational Criteria Changes at S-197 (Trigger S-18C HW)

Fish and wildlife resources within WCA 3A would not be expected to change from current conditions with implementation of Alternative E. Alternative E includes a seasonally varying WCA 3A water level of 10.0 to 10.75 feet NGVD (*i.e.* Increment 1 Action Line), as measured by the three gage average, which will serve to define S-333 and S-356 releases to the L-29 Canal and NESRS. Implementation of the Increment 1 Action Line to manage high water conditions in WCA 3A, would help to prevent conditions of extreme high water levels and prolonged inundation periods within WCA 3A that result in negative impacts to its natural communities.

During the field test, the stage levels experienced at G-3273 and other locations within NESRS are expected to be similar to the intra-annual range of water stages experienced under recent C&SF Project operations. The duration at which water stages at G-3273 exceed 6.8 feet NGVD is expected to increase. Alternative E may have a temporary minor beneficial effect on fish and wildlife resources within NESRS.

Flows through NESRS under current system compartmentalization and water management practices are greatly reduced when compared with pre-drainage conditions. The result has been lower wet season depths and more frequent and severe dry downs in sloughs and reduction in extent of shallow water edges. Improved hydroperiods would directly benefit aquatic invertebrates within the project area. Shorter hydroperiod sawgrass marshes may transition to wet prairie and slough/open water marsh communities with improved hydroperiods under Alternative E. 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). Submerged aquatic plants are commonly associated with sloughs providing structure for growth of periphyton, the main source of primary production within the freshwater Everglades (Gunderson 1994; Powers 2005) and a primary component of invertebrate diets.

Crayfish are important components within the Everglades food web, serving as primary dietary components of higher trophic level species including fish, amphibians, alligators, wading birds and mammals such as raccoons and river otters (Kushlan and Kushlan 1979). Crayfish species composition and abundance within the Greater Everglades are linked to hydroperiod. Increases in hydroperiod associated with implementation of Alternative E may provide temporary, minor beneficial effects to crayfishes within areas of NESRS.

Increases in forage prey availability (*i.e.* crayfish and other invertebrates, fish) resulting from improved hydroperiods would in turn provide beneficial effects for amphibian, reptile, small mammal, and wading bird species. Abrupt increases in water levels during nesting, termed reversals, may cause wading bird nest abandonment, re-nesting, late nest initiation, and poor fledging success. Potential wading bird colony abandonment due to artificial reversals at the end of the dry season/start of the wet season is not anticipated as a result of field test implementation. Potential adverse effects to small mammals resulting from elimination or modification of upland habitat are not expected under the field test.

Additional low volume freshwater releases from S-197 and potential increases in structural discharges from the L-31 N Canal considered under Alternative E would not be sufficient to affect mangrove and seagrass habitats within the coastal estuaries (**Section 4.7.2.7** and **Section 4.7.2.8**). Mangrove habitats provide food and refuge to a large variety of species. Seagrass habitats are heavily utilized by both juvenile and adult fishes and invertebrates for feeding and shelter. Potential minor adverse impacts associated with salinity fluctuations would be temporary and spatially limited to nearshore areas within the southern estuaries. Significant effects to fish and wildlife resources with eastern Florida Bay, Biscayne Bay, and Manatee Bay and Barnes Sound are not anticipated as a result of the test.

4.8.3 Alternative F: Relaxation of G-3273 Constraint Without Operational Criteria Changes at S-197

Implementation of Alternative F would result in similar effects as discussed under Alternative E within WCA 3 and ENP. Alternative F may have a temporary minor beneficial effect on fish and wildlife resources within NESRS. Operational criteria for Alternative F are identical to that described for Alternative E, except for inclusion of S-197. Under Alternative F, S-197 would continue to operate as defined in the 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c). Fish and wildlife resources within the southern estuaries would not be expected to change from current conditions.

4.8.4 Alternative G: Relaxation of G-3273 Constraint and Operational Criteria Changes at S-197 (Trigger S-178 TW) (PREFERRED ALTERNATIVE)

Implementation of Alternative G would result in similar effects as discussed under Alternative E within WCA 3 and ENP. Alternative G may have a temporary minor beneficial effect on fish and wildlife resources within NESRS. Potential impacts to fish and wildlife resources under Alternative G would be reduced relative to Alternative E (**Section 4.7.4**). Alternative G is not expected to have significant effects on fish and wildlife resources within the southern estuaries.

4.9 THREATENED AND ENDANGERED SPECIES

4.9.1 Federally Protected Species

The Corps has determined that the Proposed Action may affect, but is not likely to adversely affect, Cape Sable Seaside Sparrow (CSSS) (*Ammodramus maritimus mirabilis*) and its associated critical habitat; Everglade snail kite (*Rostrhamus sociabilis plumbeus*) and its associated critical habitat; wood stork (*Mycteria americana*); Florida bonneted bat (*Eumops floridanus*); Deltoid spurge (*Chamaesyce deltoidea* spp. *Deltoidea*); Garber's spurge (*Chamaesyce garberi*); Small's milkpea (*Galactia smallii*); and Tiny polygala (*Polygala smallii*). Effects determinations for Federally threatened and endangered species within the project area are listed within **TABLE 4-1**. Informal consultation with the USFWS was initiated on January 6, 2015 with submission of a complete initiation package (**Appendix D**). Concurrence on these determinations was received from USFWS on February 10, 2015. These determinations are based on the short duration of the field test and the generally beneficial nature of this action. Terms and Conditions within the USFWS Biological Opinion (BO) on the E RTP require the Corps to initiate the planning process to begin field testing and relaxing or removing the existing G-3273 gage constraint of 6.8 feet NGVD in order to be exempt from the prohibitions of Section 9 of the Endangered Species Act (ESA) (USFWS 2010). Effects determinations of Federally

listed species for the No Action Alternative are provided within the 2011 ERTF Final EIS (USACE 2011b) and are hereby incorporated by reference.

TABLE 4-1. FEDERALLY THREATENED AND ENDANGERED SPECIES WITHIN THE PROJECT AREA AND SPECIES DETERMINATION FOR THE PROPOSED ACTION

Common Name	Scientific Name	Status	May Affect, Likely to Adversely Effect	May Affect, Not Likely to Adversely Effect	No Effect
Mammals					
Florida panther	<i>Puma concolor coryi</i>	E			X
Florida manatee	<i>Trichechus manatus latirostris</i>	E, CH			X
Florida bonneted bat	<i>Eumops floridanus</i>	E		X	
Birds					
Cape Sable seaside sparrow	<i>Ammodramus maritimus mirabilis</i>	E, CH		X	
Everglade snail kite	<i>Rostrhamus sociabilis plumbeus</i>	E, CH		X	
Piping plover	<i>Charadrius melodus</i>	T			X
Red-cockaded woodpecker	<i>Picoides borealis</i>	E			X
Roseate tern	<i>Sterna dougallii dougallii</i>	T			X
Wood stork	<i>Mycteria americana</i>	T		X	
Reptiles					
American Alligator	<i>Alligator mississippiensis</i>	T, SA			X
American crocodile	<i>Crocodylus acutus</i>	T, CH			X
Eastern indigo snake	<i>Drymarchon corais couperi</i>	T			X
Gopher tortoise	<i>Gopherus polyphemus</i>	C			X
Green sea turtle	<i>Chelonia mydas</i>	E			X
Hawksbill sea turtle	<i>Eretmochelys imbricate</i>	E			X
Kemp's Ridley sea turtle	<i>Lipodochelys kempii</i>	E			X
Leatherback sea turtle	<i>Dermochelys coriacea</i>	E			X
Loggerhead sea turtle	<i>Caretta caretta</i>	E			X
Fish					

Smalltooth sawfish	<i>Pristis pectinata</i>	E, CH			X
Invertebrates					
Bartram's hairstreak butterfly	<i>Strymon acis bartrami</i>	C			X
Elkhorn coral	<i>Acropora palmata</i>	T, CH			X
Florida leafwing butterfly	<i>Anaea troglodyta floridalis</i>	C			X
Miami blue butterfly	<i>Cyclargus thomasi bethunebakeri</i>	E			X
Schaus swallowtail butterfly	<i>Heracles aristodemus ponceanus</i>	E			X
Staghorn coral	<i>Acropora cervicornis</i>	T, CH			X
Stock Island tree snail	<i>Orthalicus reses</i> (not incl. <i>nesodryas</i>)	T			X
Plants					
Crenulate lead plant	<i>Amorpha crenulata</i>	E			X
Deltoid spurge	<i>Chamaesyce deltoidea</i> spp. <i>deltoidea</i>	E		X	
Garber's spurge	<i>Chamaesyce garberi</i>	T		X	
Johnson's seagrass	<i>Halophila johnsonii</i>	E, CH			X
Okeechobee gourd	<i>Cucurbita okeechobeensis</i> ssp. <i>okeechobeensis</i>	E			X
Small's milkpea	<i>Galactia smallii</i>	E		X	
Tiny polygala	<i>Polygala smallii</i>	E		X	
Big pine partridge pea	<i>Chamaecrista lineata</i> var. <i>keyensis</i>	C			X
Blodgett's silverbush	<i>Argythamnia blodgettii</i>	C			X
Cape Sable thoroughwort	<i>Chromolaena frustrata</i>	E, CH			X
Carter's small-flowered flax	<i>Linum carteri</i> var. <i>carteri</i>	E, Pr CH			X
Everglades bully	<i>Sideroxylon reclinatum</i> spp. <i>austrofloridense</i>	C			X
Florida brickell-bush	<i>Brickellia mosieri</i>	E, Pr CH			X
Florida bristle fern	<i>Trichomanes punctatum</i> spp. <i>floridanum</i>	Pr E			X

Florida pineland crabgrass	<i>Digitaria pauciflora</i>	C			X
Florida prairie-clover	<i>Dalea carthagenensis</i> var. <i>floridana</i>	C			X
Florida semaphore cactus	<i>Consolea corallicola</i>	E			X
Pineland sandmat	<i>Chamaesyce deltoidea</i> ssp. <i>pinetorum</i>	C			X
Sand flax	<i>Linum arenicola</i>	C			X

E=Endangered; T=Threatened; SA=Similarity of Appearance; CH=Critical Habitat; Candidate Species, Pr E = Proposed Endangered, Pr CH = Proposed Critical Habitat

4.9.2 State Listed Species

Implementation of the Proposed Action would not result in significant impacts to state listed species. State listed species determinations are provided in **TABLE 4-2**. Impacts to state listed species would be similar to those outlined for fish and wildlife resources in **Section 4.8**. The Corps has determined that the field test may affect, but is not likely to adversely affect the little blue heron (*Egretta caerulea*), tricolored heron (*Egretta tricolor*), white ibis (*Eudocimus albus*), and snowy egret (*Egretta thula*). Data obtained from the 2013 South Florida Wading Bird Report shows nesting activity by these species in surveyed colonies within NESRS and adjacent to G-3273 (Cook 2013). Potential impacts to these species would be similar to those outlined for the wood stork in **Appendix D**. Potential effects on state listed species for the No Action Alternative are provided within the 2011 ERTF Final EIS (USACE 2011b) and are hereby incorporated by reference.

TABLE 4-2. STATE LISTED SPECIES WITHIN THE PROJECT AREA AND SPECIES DETERMINATION FOR THE PROPOSED ACTION

Common Name	Scientific Name	Status	May Affect, Likely to Adversely Effect	May Affect, Not Likely to Adversely Effect	No Effect
Mammals					
Florida black bear	<i>Ursus americanus floridanus</i>	T			X
Everglades mink	<i>Mustela vison evergladensis</i>	T			X
Florida mouse	<i>Podomys floridanus</i>	SC			X
Florida mastiff bat	<i>Eumops glaucinus floridanus</i>	E			X
Birds					
Piping plover	<i>Charadrius melodus</i>	T			X
Snowy plover	<i>Charadrius alexandrinus</i>	T			X

American oystercatcher	<i>Haematopus palliatus</i>	E			X
Brown pelican	<i>Pelecanus occidentalis</i>	SC			X
Black skimmer	<i>Rynchops niger</i>	SC			X
Least tern	<i>Sterna antillarum</i>	T			X
White-crowned pigeon	<i>Columba leucocephalus</i>	T			X
Least tern	<i>Sterna antillarum</i>	T			X
Limpkin	<i>Aramus guarauna</i>	SC			X
Little blue heron	<i>Egretta caerulea</i>	SC		X	X
Tricolored heron	<i>Egretta tricolor</i>	SC		X	X
Snowy egret	<i>Egretta thula</i>	SC		X	X
Reddish egret	<i>Egretta rufescens</i>	SC			X
White ibis	<i>Eudocimus albus</i>	SC		X	
Roseate spoonbill	<i>Ajaia ajaja</i>	SC			X
Fish					
Mangrove rivulus	<i>Rivulus marmoratus</i>	SC			X
Invertebrates					
Miami blue butterfly	<i>Cyclargus</i> [= <i>Hermiargus</i>] <i>thomasi</i> <i>bethunebakeri</i>	E			X
Florida tree snail	<i>Liguus fasciatus</i>	SC			X
Plants					
Pine-pink orchid	<i>Bletia purpurea</i>	T			X
Lattace vein fern	<i>Thelypteris reticulata</i>	E			X
Eatons spikemoss	<i>Selaginella eatonii</i>	E			X
Wright's flowering fern	<i>Anemia wrightii</i>	E			X
Tropical fern	<i>Schizaea pennula</i>	E			X
Mexican vanilla	<i>Manilla mexicana</i>	E			X

E=Endangered; T=Threatened; SC=Species of Special Concern

4.10 ESSENTIAL FISH HABITAT

Implementation of the No Action Alternative, Alternative E, Alternative F, and Alternative G are not expected to adversely affect Essential Fish Habitat.

Mangrove habitats provide food and refuge to a large variety of species (SAFM 1998). These species include: spiny lobsters, pink shrimp, snook (*Centropomus undecimalis*), goliath grouper (*Epinephelus itajara*), tripletail (*Lobotes surinamensis*), leatherjack (*Oligoplites saurus*), gray snapper (*Lutjanus griseus*), dog snapper (*L. jocu*), sailor's choice (*Haemulon parra*), bluestriped grunt (*H. sciurus*), sheepshead (*Archosargus probatocephalus*), black drum (*Pogonias cromis*) and red drum (SAFM 1998). Additional low volume freshwater releases from S-197 considered under Alternatives E and G would not be sufficient to affect mangrove habitats within the coastal estuaries (**Section 4.7.2.7** and **Section 4.7.4**).

Seagrass habitats are heavily utilized by both juvenile and adult fishes and invertebrates for feeding and shelter (SAFM 1998). Species that depend on seagrass habitats include the penaeid pink and brown shrimp, and spiny lobster (SAFM 1998). Seagrass performs as an important nursery habitat for red drum, snook (*Centropomus undecimalis*), bonefish (*Albula vulpes*), tarpon (*Megalops atlanticus*) and several species of snapper and grouper, and is critical to the health of Biscayne Bay, Florida Bay, and a number of commercial and recreational fisheries (SAFM 1998). Significant impacts to seagrass beds within the coastal estuaries are not expected due to the limited duration and limited extent of operational changes at S-197 being considered. Furthermore, potential for limited increases in structural discharges from the L-31N Canal to central Biscayne Bay during the field test are subject to available conveyance capacity within the C-102 Canal (S-194) and/or the C-103 Canal (S-196). Seagrasses have an optimum salinity range of 24 to 35 psu, but can tolerate considerable short-term salinity fluctuations (**Section 4.7.2.8** and **Section 4.7.4**).

There are no coral reefs or hard bottom communities located within the proposed project site or the nearshore waters affected by the project. Corals found within Florida Bay and Biscayne Bay are outside the area of potential effect.

4.11 WATER QUALITY

Water deliveries to ENP and NESRS are subject to the water quality limit for TP contained in Appendix A of the 1991 Settlement Agreement. Appendix A compliance is currently assessed by comparing the LTL against the 12-month FWM TP concentration in ppb, calculated using the measured total annual flows from the S-12A, S-12B, S-12C, S-12D, and S-333 (S-333 flows expressed as S-333 minus S-334) structures that distribute flows from WCA 3A into Shark River Slough. The LTL equation from Appendix A has an inverse relationship with flow: as flow into Shark River Slough increases, the LTL gradually falls until reaching 7.6 ppb for flow volumes equal or greater than $1,061 \times 10^3$ AF per year. Although the effect of the Increment 1 test is largely to redistribute existing flows, with respect to the Appendix A LTL, Increment 1 operations are expected to result in higher flow volumes through the S333 structure, lower flow volumes through the S-334 structure, and moderately lower flow volumes through the S-12D structure. In view of known patterns of TP concentrations across inflow structures, it is anticipated that these flow changes are likely to cause some increase in the FWM TP concentration and a decrease in the associated LTL due to increased flow volumes. Given that the FWM TP concentration has been at or just below the LTL for four of the past seven years, it is possible that Increment 1 test operations will increase the risk of exceeding the LTL limit.

At present, TP concentrations measured at the S-356 pump station are not included in the Appendix A calculation. However, the TOC is evaluating whether this structure may be incorporated in future Appendix A calculations. The SFWMD proposed and FDEP will require a water quality assessment methodology to assess Outstanding Florida Waters compliance as part of the FDEP test authorization requirements. The proposed methodology is expected to require that the S-356 FWM TP concentration not exceed 11 ppb on an annual basis and the annual FWM TP concentration not exceed 9 ppb on a three year average basis. During the duration of Increment 1, the Appendix A compliance will be evaluated by the TOC. For S-356, it is anticipated that the Increment 1 testing is likely to show that the FWM TP concentrations through the structure meet the proposed compliance evaluation as part of FDEP test

authorization since this flow is largely expected to be composed of seepage water from NESRS and WCA3B. The concentration of seepage water in this portion of the Everglades is generally expected to be less than 9 ppb. Hydrologic and water quality data collected under the Increment 1 test will be assessed to discern sources of water pumped by S356.

Water quality monitoring and analyses during Increment 1 testing will be used to help identify potential changes to the operating rules that could increase the probability of water quality compliance for additional flows entering NESRS. A water quality assessment will be evaluated at the S-356 pump station in accordance with the FDEP test authorization to conduct Increment 1 testing. Concurrently, compliance with the LTL will be determined in accordance with the Settlement Agreement Appendix A requirements on an annual basis during Increment 1 testing. Both the water quality assessment of S356 and the Appendix A compliance calculations are based on the same annual period of October 1st through September 30th. Given that the Increment 1 testing is proposed to begin in the Spring of 2015, the first year of water quality assessment of the Increment 1 test will contain a partial year with test conditions. The second year of the Increment 1 test will likely include 12 months of test conditions. Because of this, operating plan changes resulting from the S-356 water quality assessment, if needed because of Increment 1 operations, would be implemented only after the conclusion of the Increment 1 test period (up to two years). During Increment 1 test operations, the Corps does not plan to impose operational constraints for water quality that could restrict or otherwise limit inflows to NESRS.

Water quality conditions in the vicinity of the L-29 Canal and L-31N Canal might be affected by implementation of the project. South of the S-331 pump station, none of the project alternatives is likely to significantly affect concentrations and loads of nutrients or mercury methylation conditions along the southern portion of the L-31N Canal or in the C-111 Basin. As discussed in the affected environment section, the primary water quality concerns in the area are the discharge of phosphorus into ENP and the effect of changed water flows on methylation and bioaccumulation of mercury. Each of these topics is addressed below.

4.11.1 Effect of Project on Mercury Methylation in ENP

Over the past 10 years, fish mercury concentrations within ENP have not decreased as much as that observed in WCA 3. The reasons for continued higher concentrations of bioaccumulated mercury in ENP fish are not well understood at this time due to the complexity of processes involved. The range of sulfate concentrations that maximize methylmercury formation in ENP may differ from that in the water conservation areas (SFWMD, 2011). The effect that small changes in sulfate in ENP would have on fish mercury are difficult to predict.

Sulfate loading into ENP under any of the with-project alternatives is likely to increase somewhat relative to the No Action Alternative primarily because of the moderate increase in annual flows from WCA 3A into NESRS. The additional flow will increase stages within Shark River Slough which could reduce areas that are subject to dry out and rewetting. Increased sulfate loading into ENP is likely to increase mercury methylation; however, reduced dry out and rewetting will reduce the recycling of sulfate and mercury that exacerbates mercury bioaccumulation. Overall, the effects of Increment 1 testing on formation and bioaccumulation of methylmercury cannot be predicted with certainty since the mechanisms that affect mercury methylation rates in ENP are not fully understood at this time. However, it is likely that future

with-project mercury methylation conditions will not exceed the peak concentrations observed in ENP in 1999 unless atmospheric deposition of mercury increases in the future. Continued monitoring and scientific investigation of mercury within the EPA will provide more certainty regarding potential project impacts.

4.11.2 Water Quality Compliance at S-356 Pump Station

The FDEP will require a water quality assessment methodology for S-356 flows to assess Outstanding Florida Waters compliance as part of the FDEP Increment 1 test authorization requirements. The proposed methodology is expected to require that the S356 FWM TP concentration not exceed 11 ppb on an annual basis and the annual FWM TP concentration not exceed 9 ppb on a three year average basis.

The only water quality data that exists for flows at this structure cover a two week period of operations that occurred in July and August of 2006. The average TP concentration at this structure during this limited operation period was 12 ppb with a range of 7 to 17 ppb for the four collected samples. The results of this short term operation are not believed to reflect an annual average concentration computed for flows that will occur in other months of the year when TP concentrations are expected to be lower than those that occurred in July/August of 2006. The S-356 pump station will be operated primarily during periods when other structures in the L-30 Canal and L-29 Canal are closed. For this reason, water pumped at the S-356 pump station during the test is likely to be drawn from groundwater seepage into the L-30 Canal that borders WCA 3B and the L-29 Canal that borders ENP. Sampling in WCA 3B show that the annual geometric mean TP concentrations at marsh stations along the eastern boundary of WCA 3B are typically below 6 ppb. Average TP concentrations at the S-335 and S-331 structures for the 2003 through 2014 period are around 6 ppb. Using the available TP data at the S-335 and S-331 structures and WCA 3B marsh as the basis for assessing compliance, it likely that the annual flow flow-weighted TP concentration at S-356 will meet the FDEP proposed annual and multi-year TP test for flows at S-356. Non-compliance with the S-356 criteria could occur in the unlikely event that during a given Federal water year, the structure is operated only in July and August when TP concentrations are at their highest in WCA 3A.

4.11.3 Effect of Project on Settlement Agreement Compliance

Table 4-3 below shows the estimated impact of the project on the 1992 Settlement Agreement compliance calculation for flows entering ENP from WCA 3A for the 2003 through 2013 Federal water years. This period covers all of the water years where flows through the S-12X and S-333 structures were subject to the rainfall formula for releases from WCA 3A. These estimates were made by re-calculating the flow-weighted TP concentration for flows entering ENP under different flow scenarios. The red highlighted cells represent FWM TP concentrations that exceed the SRS LTL for a given year. The estimated historic FWM TP concentrations do not exactly match the SFWMD Settlement Agreement calculations presumably because of revisions to TP and flow data available in the DBHYDRO database and perhaps due to subtle differences in calculation assumptions. No-Action operations of the system without the Increment 1 operations show that the number of exceedance years for the 11 year water quality evaluation period would increase from 3 to 5. The two additional years are 2009 and 2010 which the SFWMD reported as having FWM TP concentrations equal to the LTL for those years. The

SRS Settlement Agreement allows the subtraction of S-334 flows and loads from the S-333 flows and loads when calculating the SRS total compliance flows and loads at S-333.

Alternatives E, F, and G will increase flows during periods when G-3273 is above 6.8 feet NGVD and L-29 is below 7.5 feet NGVD and S-333 flows are less than the calculated rainfall formula rate for that day. With no history of operations similar to the Increment 1 test and no available hydrologic modeling, it is difficult to estimate the volume of additional water that might be release through S-333 during G-3273 relaxation periods. For this reason, **Table 4-3** includes estimates of changes to the SRS FWM TP concentration and compliance LTL when additional daily S-333 discharges range from 50 to 1,000 cfs. This analysis shows that if S-333 flows had been increased by up to 50 cfs/day during relaxation periods (G-3273 > 6.8 feet NGVD and L-29 Canal stage < 7.5 feet NGVD) there would have been no additional years of non-compliance. If S-333 flows had been increased during relaxation periods by up to 150 cfs there would have been one additional year (2006) of non-compliance. If S-333 flows had been increased during relaxation periods by up to 500 cfs/day there would have been a second additional non-compliance year (2004). The SFWMD reported concentrations for 2004 show a difference of only 0.1 ppb between the FWM TP concentration and the LTL so it is not surprising that sufficient additional flow at S-333 results in a non-compliance condition for the water year.

Future operations, which include a reduction in S-334 flows as compared to historic that will occur under both the No Action Alternative and all of the Action Alternatives, appear to have a greater impact on future SRS Appendix A compliance than providing additional S-333 flows during G-3273 relaxation periods. Nonetheless, this assessment of Appendix A compliance effects shows that the Increment 1 operations may result in a higher frequency of exceeding the annual SRS LTL. To mitigate for this potential effect, the Corps may work with its agency partners (USDOJ, SFWMD, and FDEP) to use the existing flexibility within the ERTTP operations plan to minimize S-333 flows during periods when TP concentrations are known or suspected of being elevated. For instance, a review of the Water Year 2014 (October 1 2013 through September 30, 2014) and historic compliance data suggests that S-333 releases when the southern end of L-67A canal is below 8.5 feet NGVD will result in discharges of high concentration TP. The cause of high TP concentrations at S-333 during these low stage events are thought to be related to increased potential for scouring and a higher proportion of canal flow relative to marsh flow reaching the structures due to reduced head driving flow from the marsh into the canal. To limit these high phosphorus discharge events during Increment 1 operations and minimize potential adverse impact to the annual SRS compliance calculation, the Corps can use the flexibility within ERTTP to limit or delay S-333 discharges until low stage conditions end.

4.11.4 Effect of Project on Methylation and Bioaccumulation of Mercury

The No Action Alternative and the Actions Alternatives are not expected to have a significant effect on mercury methylation or bioaccumulation of mercury by aquatic species.

4.12 NATIVE AMERICANS

As part of the development of this project consultation has occurred and is ongoing between the Corps and the two Federally recognized tribes within the immediate area of potential effect. Letters requesting participation in the project development team were sent to both the Miccosukee and Seminole Chairmen on June 26, 2014 (See **Appendix D**). In addition, presentations and face-to-face meetings were conducted as well as email and phone correspondence with tribal government staff members to brief them on alternatives and discuss issues of concern to each tribe. Consultation is ongoing. The following evaluations are designed to evaluate potential impacts to Native American lands discussed in **Section 3.13**. The reader should note that Native American concerns extend beyond physical impacts to their lands and as such considerations, while not always explicit, have taken into account discussions and consultations that have occurred with Federally recognized tribes.

There have been concerns that increased flows in the L-29, L-30, and L-31N canals could affect water levels on tribal lands located to the east. To ensure that Tribal lands located east of the L-30 Canal and north of L-29 Canal are not affected by increased flows and groundwater seepage, the stages of the L-30 Canal between the S-335TW and the S-334 TW stations will be monitored continuously.

The Jacksonville District Corps of Engineers is developing with the Seminole Tribe of Florida, an agreement to outline the Corps Trust responsibilities to the tribe in regards to Native American burial resources. The memorandum will apply to all Civil Works and Regulatory actions within the respective jurisdiction of these Jacksonville District programs in the State of Florida. This agreement is designed to outline discussion/consultation and decision making protocols in regards Jacksonville District's Federal Trust Responsibilities to the Seminole Tribe of Florida. No such similar agreement is under development with other Federally recognized tribes, however, the Jacksonville District will continue to hold the Trust Responsibilities to all Federally recognized tribes in the highest regard, especially with regard to protection of burial resources.

4.12.1 Alternative A: No Action Alternative

Implementation of the No Action Alternative would not cause changes to current water control plan thus no changes would be seen. However, past discussions with the tribes have focused on excessive high water levels within WCA 3A and ENP. As other alternatives have the ability to provide the ability to remove such waters from the WCA and provide better operational flexibility, the No Action Alternative could be viewed as keeping conditions present to which the local tribes have voiced concern over (See Miccosukee Response to ERTF Draft EIS **Appendix D**).

4.12.2 Alternative E: Relaxation of G-3273 Constraint and Operational Criteria Changes at S-197 (Trigger S-18C HW)

Alternative E will have no effect to tribal properties. Affiliated non- Federally recognized tribes located along Tamiami Trail are of sufficient elevation that increased water flows will have no effect. In addition as discussed under the No Action Alternative, the ability for increased flows out of WCA 3A can alleviate concerns associated within excessive high water elevations with the WCA. The alternative is not expected to have any affects on tribal lands. The increased flexibility within this alternative provides additional outlets for water removal.

4.12.3 Alternative F: Relaxation of G-3273 Constraint Without Operational Criteria Changes at S-197

Implementation of Alternative F would result in similar effects as discussed under Alternative E.

4.12.4 Alternative G: Relaxation of G-3273 Constraint and Operational Criteria Changes at S-197 (Trigger S-178 TW) (PREFERRED ALTERNATIVE)

Implementation of Alternative G would result in similar effects as discussed under Alternative E.

4.13 CULTURAL RESOURCES

As part of consideration of effects, the Corps has been actively consulting with interested parties in conjunction with its obligation under Section 106 of the National Historic Preservation Act. Within these consultation events information has been sought to determine what if any resources exist within the project area and what if any effects the project could have on such resources. While some interested parties have expressed little to no concern for potential effects from the project to occur, others have raised concerns about the potential impacts of increased water deliveries (See **Appendix D**).

In conjunction with this effort the Corps has also undertaken a review of water elevations provided by the Everglades Depth Estimation Network (EDEN) network. Currently, as part of the ERTTP Programmatic Agreement the Corps is monitoring waters levels at 58 known tree islands (35 of which contain known cultural resources) within ENP. The use of this data is warranted as it is a common factor that most if not all of the known archaeological sites are located on such tree islands thus creating relationship within effects to tree islands and the cultural resources contained within them.

Data from the EDEN network was requested from and provided by the United States Geological Survey (USGS). Data sets for four periods were reviewed. These four periods represent four periods within the last few years where natural conditions from rain fall and normal operations mimicked short term conditions which would satisfy the purposes of this test. The four periods of consideration are as follows:

- June 1 thru June 24, 2012 G-3273 average 6.84 feet NGVD
- September 19 thru October 3, 2012 G-3273 average 7.14 feet NGVD
- July 3 thru July 8, 2013 G-3273 average 6.93 feet NGVD
- September 19 thru September 24, 2013 average 7.35 feet NGVD

Using this data it is possible to assess the water levels at each of the 58 tree islands when conditions representing many of the alternatives would be replicated. Use of this data allows for a better understanding of potential conditions that may be encountered during some alternatives and allows us to make a clearer determination of effects. It is the Corps intention to continue to use the EDEN network to monitor actual conditions during the test (See **Appendix C**).

Finally, consultation was conducted with ENP directly to seek the park's opinion on potential effects to cultural resources within ENP. Data described above was presented to park staff and discussions have occurred to better understand the potential effects. Based on these discussions ENP has determined that increased water levels associated Increment 1 and the raising of L-29 Canal stage to 7.5 feet NGVD for the purpose of a testing the relaxation of the Gage 3273 constraint will have no adverse effect to significant cultural resources (See **Appendix D**).

4.13.1 Alternative A: No Action Alternative

The No Action Alternative would maintain current operations within the project area. Such operations would continue to be governed by the *Programmatic Agreement among the US Army Corps of Engineers, the Advisory Council on Historic Preservation, and the Florida State Historic Preservation Officer (FL SHPO) Regarding the Everglades Restoration Plan for Feature of the Central and Southern Florida Project in Southern Florida* (PA). This agreement outlines stipulations for completion of the Corps Section 106 of the NHPA compliance for the current water control plan that is in effect within the project area. Actions and stipulations provided for in the agreement would continue to be provided for in the absence of a defined deviation such as this project which is excluded from the PA and subject to separate consultation.

4.13.2 Alternative E: Relaxation of G-3273 Constraint and Operational Criteria Changes at S-197 (Trigger S-18C HW)

The relaxation of the G-3273 constraint is anticipated to have no adverse effects on cultural resources. This is due to multiple factors that have been taken into consideration. The first factor is the limitation of the extent of the test. The effects from this alternative would mainly be from water and the limitation of the test creates conditions whereby any measurable effects on cultural resources that interact with the increased water elevations are negligible. Flows from the water are also in such a way that no erosion would occur causing any resources to become exposed or damaged as they would in comparison to a fast flowing water course. Finally, in review of the operational plan, the maximum level of gage relaxation would be to a height of 7.5 feet NGVD which would make this the equivalent to the maximum elevation for control of the L-29 Canal and while the relaxation would be equivalent, water conditions and fall off rates of water elevation would not anticipate the possibility of such conditions existing.

As discussed above, a review of water elevation occurring at tree islands indicates that even during conditions where the northern most tree island, SS-93 (situated just south of the L-29 Canal in NESRS) reached an average water height of 7.88 feet NGVD, (September 19 thru September 24, 2013 over the 6 day period) water levels at the G-3273 only reached an average height of 7.3 feet NGVD over the same period. Using this data, an examination of tree islands that are being monitored under EDEN indicated that water elevation should not exceed the maximum elevation of tree islands that contain cultural resources. Of the 58 tree islands, 35 are known to contain archaeological sites and while the data set did indicate that some tree islands

would be over topped during the test if water is available to the level of this alternative, none of the archaeological sites would see overtopping on the tree islands. Of the rest of the tree islands under consideration, 12 of the tree islands should experience some overtopping for periods when water is available and the highest relaxation occurs but again no resources are known to exist on these islands as general archaeological predictive models indicate a preference of higher elevations for habitation uses within tree islands.

In addition, in consideration of other types of resources such as the National Register Shark River Slough District, historic structures, roadway and canals, this project is not anticipated to have any adverse effects on such resources.

Operational use of both S-18C and S-197 will also have no effect on significance historic properties. The use of S-18C to return water flows into the southern end of ENP places waters within the immediate reach of tidally influenced areas and there are no anticipated impacts from changing conditions. Finally as S-197 empties directly into Manatee Bay there should be no effects to any cultural resources as a direct result of the use of this structure. The inclusion of this operational flexibility provides greater protection to resources than any other alternative.

In sum, conditions within this alternative are such that they would not alter or affect any elements of historic properties. While resources will certainly encounter changes as a result of this test none are such that they would be classified as adverse in nature.

4.13.3 Alternative F: Relaxation of G-3273 Constraint Without Operational Criteria Changes at S-197

The relaxation of the G-3273 constraint is anticipated to have no adverse effects on cultural resources. This is due to multiple factors that have been taken into consideration. The first factor is the limitation of the extent of the test. The effects from this alternative would mainly be from water and the limitation of the test creates conditions whereby any measurable effects on cultural resources that interact with the increased water elevations are negligible. Flows from the water are also in such a way that no erosion would occur causing any resources to become exposed or damaged as they would in comparison to a fast flowing water course. Finally, in review of the operational plan, the maximum level of gage relaxation would be to a height of 7.5 feet which would make this the equivalent to the maximum elevation for control of the L-29 Canal and while the relaxation would be equivalent, water conditions and fall off rates of water elevation would not anticipate the possibility of such conditions existing.

As discussed above, a review of water elevation occurring at tree islands indicates that even during conditions where the northern most tree island, SS-93 (situated just south of the L-29 in NESRS) reached an average water height of 7.88 feet NGVD, (September 19 thru September 24, 2013 over the 6 day period) water levels at the G-3273 only reached an average height of 7.3 feet NGVD over the same period. Using this data, an examination of tree islands that are being monitored under EDEN indicated that water elevation should not exceed the maximum elevation of tree islands that contain cultural resources. Of the 58 tree islands, 35 are known to contain archaeological sites and while the data set did indicate that some tree islands would be over topped during the test if water is available to the level of this alternative that none of the archaeological sites would see overtopping on the tree islands. Of the rest of the tree islands

under consideration, 12 of the tree islands should experience some overtopping for periods when water is available and the highest relaxation occurs but again no resources are known to exist on these islands as general archaeological predictive models indicate a preference of higher elevations for habitation uses within tree islands.

In addition, in consideration of other types of resources such as the National Register Shark River Slough District, historic structures, roadway and canals, this project is not anticipated to have any adverse effects on such resources. Conditions within this alternative are such that they would not alter or affect any elements of historic properties.

In sum, conditions within this alternative are such that they would not alter or affect any elements of historic properties. While resources will certainly encounter changes as a result of this test none are such that they would be classified as adverse in nature.

4.13.4 Alternative G: Relaxation of G-3273 Constraint and Operational Criteria Changes at S-197 (Trigger S-178 TW) (PREFERRED ALTERNATIVE)

Implementation of Alternative G would result in similar effects as discussed under Alternative E

4.14 UNESCO/ WORLD HERITAGES SITE

4.14.1 Alternative A: No Action Alternative

The No Action Alternative will have detrimental effects towards the resolution of the removing the park from the endangered listed by UNESCO which is considered endangered because of associated with water and water flow issues within the park. As part of the resolution the park has committed to completion of the MWD Project of which this test is a part of. Resolution of the MWD Project will be a step towards removal from the endangered list. Without the test, completion of the MWD Project becomes more difficult to complete. As states above, currently the park is addressing these issues and is expected to report back to UNESCO by 1 February, 2015 and progress under this test will show progress under the MWD Project.

4.14.2 Alternative E: Relaxation of G-3273 Constraint and Operational Criteria Changes at S-197 (Trigger S-18C HW)

As discussed under the No Action Alternative, any alternative that leads towards completion MWD Project will have positive impacts with compliance with UNECSO provisions for removal from the endangered list and maintenance of the parks Outstanding Universal Values (OUVs). As performance is of the test is a requirement for completion of MWD, this alternative will have a positive effect to restoring the OUVs.

4.14.3 Alternative F: Relaxation of G-3273 Constraint Without Operational Criteria Changes at S-197

Implementation of Alternative F would result in similar effects as discussed under Alternative E.

4.14.4 Alternative G: Relaxation of G-3273 Constraint and Operational Criteria Changes at S-197 (Trigger S-178 TW) (PREFERRED ALTERNATIVE)

Implementation of Alternative G would result in similar effects as discussed under Alternative E.

4.15 AIR QUALITY

4.15.1 Alternative A: No Action Alternative

Air quality within the project area would not be expected to change from current conditions. The continued implementation of ERTTP has the potential for minor changes in water levels that may result in slightly drier conditions in northern WCA 3A (USACE 2011b). Extreme dry downs could increase the probability of muck fires, which can have significant temporary impacts to air quality; however weather patterns have the highest degree of control over dry downs and the frequency of muck fires within the area.

4.15.2 Alternative E: Relaxation of G-3273 Constraint and Operational Criteria Changes at S-197 (Trigger S-18C HW)

Air quality emissions associated with the field test would occur from the operation of S-356. S-356 is a four diesel-unit pump station. Sources of air emissions during operation would include diesel exhaust. Diesel exhaust includes gaseous compounds (*e.g.*, carbon dioxide, oxygen, nitrogen, water vapor, carbon monoxide, nitrogen compounds, sulfur compounds, and numerous low molecular-weight hydrocarbons) and contains fine particulate matter, PM_{2.5}. Air quality impacts are not expected to cause negative effects to human health. Operations of S-356 will be in compliance with the existing air quality permit for the pump station and the Clean Air Act.

During the field test, the stage levels experienced at G-3273 and other locations within NESRS are expected to be similar to the intra-annual range of water stages experienced under recent C&SF Project operations. The duration at which water stages at G-3273 exceed 6.8 feet NGVD is expected to increase. A potential decrease in drying event severity relative to the No Action Alternative, if achieved, may result in reduced fire incidence within wetlands which should improve air quality; however the frequency of muck fires are primarily controlled by weather patterns within the area. Additional water being delivered to NESRS is also only expected to occur during the wet season when areas are already anticipated to be inundated. Potential impacts due to implementation of Alternative E on air quality would be negligible.

4.15.3 Alternative F: Relaxation of G-3273 Constraint Without Operational Criteria Changes at S-197

Implementation of Alternative F would result in similar effects as discussed under Alternative E.

4.15.4 Alternative G: Relaxation of G-3273 Constraint and Operational Criteria Changes at S-197 (Trigger S-178 TW) (PREFERRED ALTERNATIVE)

Implementation of Alternative G would result in similar effects as discussed under Alternative E.

4.16 HAZARDOUS, TOXIC OR RADIOACTIVE WASTES (HTRW)

Implementation of the No Action Alternative, Alternative E, Alternative F, and Alternative G would not result in the discovery of HTRW since there is no excavation or other construction activities associated with this project. The project has a very low risk for increased mobilization of existing HTRW where it might exist within the study area. Operation of the S-356 pump station will increase the frequency of diesel fuel delivery to the S-356 pump station. Operating

conditions at pump stations upstream (south) of the S-356 pump station may change somewhat which could marginally affect the use of diesel fuel at the S-331, and S-332X pump stations.

4.17 NOISE

4.17.1 Alternative A: No Action Alternative

Noise levels within the project area would not be expected to change from current conditions. Continued implementation of ERTF and potentially slighter drier conditions in northern WCA 3A could reduce airboat traffic in that area due to lower water levels, however, it would be very difficult to demonstrate that the operational plan caused that condition (USACE 2011b).

4.17.2 Alternative E: Relaxation of G-3273 Constraint and Operational Criteria Changes at S-197 (Trigger S-18C HW)

Noise levels within the area are expected to increase as a result of the operation of S-356 during the field test. Such impacts would be limited to the immediate vicinity of the pump station. Sound levels would decrease with distance from the pump station due to attenuation. Increased noise levels are not expected to cause negative effects to human health. Residential communities are not located adjacent to the pump station. Potential impacts due to implementation of Alternative E on noise levels would be negligible.

4.17.3 Alternative F: Relaxation of G-3273 Constraint Without Operational Criteria Changes at S-197

Implementation of Alternative F would result in similar effects as discussed under Alternative E.

4.17.4 Alternative G: Relaxation of G-3273 Constraint and Operational Criteria Changes at S-197 (Trigger S-178 TW) (PREFERRED ALTERNATIVE)

Implementation of Alternative G would result in similar effects as discussed under Alternative E.

4.18 AESTHETICS

4.18.1 Alternative A: No Action Alternative

Aesthetics within the project area would not be expected to change from current conditions (USACE 2011b).

4.18.2 Alternative E: Relaxation of G-3273 Constraint and Operational Criteria Changes at S-197 (Trigger S-18C HW)

Alternative E consists of an operational change to the 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c) and does not include construction of permanent structures or structural modifications to existing C&SF Project features. As such, the existing landscape profile would not be altered. During the field test, the stage levels experienced at G-3273 and other locations within NESRS are expected to be similar to the intra-annual range of water stages experienced under recent C&SF Project operations. The duration at which water stages at G-3273 exceed 6.8 feet NGVD is expected to increase. A potential increase in hydroperiods relative to the No Action Alternative, if achieved, may contribute positively to maintaining a healthy and

aesthetically pleasing ecosystem. Alternative E would not result in significant impacts to aesthetic resources.

4.18.3 Alternative F: Relaxation of G-3273 Constraint Without Operational Criteria Changes at S-197

Implementation of Alternative F would result in similar effects as discussed under Alternative E.

4.18.4 Alternative G: Relaxation of G-3273 Constraint and Operational Criteria Changes at S-197 (Trigger S-178 TW) (PREFERRED ALTERNATIVE)

Implementation of Alternative G would result in similar effects as discussed under Alternative E.

4.19 SOCIOECONOMICS

4.19.1 Alternative A: No Action Alternative

Socioeconomics within the project are would not be expected to change from current conditions. The continued implementation of ERTTP has the potential to reduce airboat access during extremely dry periods, particularly within northern WCA 3A, which could potentially impact local airboat concessionaires. However, the likelihood of limited airboat access is largely determined by weather patterns rather than water management operations (USACE 2011b).

4.19.2 Alternative E: Relaxation of G-3273 Constraint and Operational Criteria Changes at S-197 (Trigger S-18C HW)

A review of hydrologic data shows that under the recent Corps C&SF Project Water Control Plans for the 2012 WCAs-ENP-SDCS, wet season water stages at G-3273 frequently exceed the current operational constraint of 6.8 feet NGVD for continued inflows to NESRS due to rainfall and Column 2 operational criteria used during WCA 3A regulatory releases to the SDCS. During the field test, the stage levels experienced at G-3273 and other locations within NESRS are expected to be similar to the intra-annual range of water stages experienced under recent C&SF Project operations. The field test will maintain the current 7.5 feet NGVD maximum operating limit in the L-29 Canal, which is located approximately 9 miles upstream of G-3273. The duration at which water stages within the L-29 Canal approach 7.5 feet NGVD is expected to increase under the proposed field test, and the duration at which water stages at G-3273 exceed 6.8 feet NGVD is also expected to increase. No impacts to local airboat concessionaires and property owners along Tamiami Trail and within NESRS (**Figure 3-4**) are expected under the field test. Implementation of Alternative E would not result in significant impacts to socioeconomics. Efforts by the Corps and ENP to acquire real estate interests along Tamiami Trail Roadway are ongoing. These acquisitions are scheduled to be complete prior to raising the maximum operating limit of the L-29 Canal under future efforts.

4.19.3 Alternative F: Relaxation of G-3273 Constraint Without Operational Criteria Changes at S-197

Implementation of Alternative F would result in similar effects as discussed under Alternative E.

4.19.4 Alternative G: Relaxation of G-3273 Constraint and Operational Criteria Changes at S-197 (Trigger S-178 TW) (PREFERRED ALTERNATIVE)

Implementation of Alternative G would result in similar effects as discussed under Alternative E.

4.20 AGRICULTURE

4.20.1 Alternative A: No Action Alternative

Implementation of the No Action Alternative would not result in significant impacts to agriculture. As described in the E RTP Final EIS (USACE 2011b), slightly less water is passed to the SDCS, as compared with IOP. No significant changes were noted for water stages within the SDCS.

4.20.2 Alternative E: Relaxation of G-3273 Constraint and Operational Criteria Changes at S-197 (Trigger S-18C HW)

Implementation of Alternative E would not result in significant impacts to agriculture. It is anticipated that during the field test, the combined flows to NESRS through S-333 and S-356 will be more than what would have otherwise been discharged through S-333 under current operations. Additionally, it is expected that the combined flows through S-173 and S-331 to the C-111 Basin will be less than what would have been discharged through these features currently. Field test water management operations may result in increased seepage to the L-31N Canal south of the S-331 pump station, prior to the construction and operation of the C-111 South Dade Project NDA. Since not all flood mitigation and seepage management features envisioned in the MWD and C-111 South Dade Projects are constructed, Alternative E includes additional water management operating criteria for features of the SDCS (*i.e.* S-197) to mitigate for potential risks to flood protection for areas within South Dade which may be affected by a combination of the following water management factors during the field test: increased seepage to the L-31N Canal south of S-331 prior to completion of C-111 South Dade NDA; increased discharges from S-331 for 8.5 SMA flood mitigation and/or increased discharges from G-211/S-331 when S-356 operations are limited due to WCA 3A high water conditions above the WCA 3A Action Line (potentially offset by reduced S-331 discharges with limited WCA 3A regulatory releases to the SDCS); and operation of the S-332 D pump station and/or the C-111 South Dade SDA to manage L-31N Canal stages during periods of increased inflows.

Approximately 975 acres of Prime and Unique Farmland are located within the project area; mainly within the boundaries of ENP (**Appendix D**). Conversion of Prime and Unique Farmland as a result of the field test is not anticipated based on the expected change in hydrology.

4.20.3 Alternative F: Relaxation of G-3273 Constraint Without Operational Criteria Changes at S-197

Alternatives that did not include operational changes at S-197 (Alternatives A, B, C, D, and F) were noted as uncertain with respect to the field test constraint of no reduction in current flood protection (**Table 2-7**). Increased flood control releases from S-18C and S-197 were included within Alternatives E and G to mitigate for potential risks to flood protection for areas within South Dade which may be affected by a combination of the following water management factors

during the field test: increased seepage to the L-31N Canal south of S-331 prior to completion of C-111 South Dade NDA; increased discharges from S-331 for 8.5 SMA flood mitigation and/or increased discharges from G-211/S-331 when S-356 operations are limited due to WCA 3A high water conditions above the WCA 3A Action Line (potentially offset by reduced S-331 discharges with limited WCA 3A regulatory releases to the SDCS); and operation of the S-332 D pump station and/or the C-111 South Dade SDA to manage L-31N Canal stages during periods of increased inflows.

4.20.4 Alternative G: Relaxation of G-3273 Constraint and Operational Criteria Changes at S-197 (Trigger S-178 TW) (PREFERRED ALTERNATIVE)

Implementation of Alternative G would result in similar effects as discuss under Alternative E.

4.21 RECREATION

4.21.1 Alternative A: No Action Alternative

Recreation within the project are would not be expected to change from current conditions. The continued implementation of ERTTP has the potential to reduce airboat access during extremely dry periods, particularly within northern WCA 3A, which could potentially impact local airboat concessionaires. However the likelihood of limited airboat access is largely determined by weather patterns rather than water management operations (USACE 2011b).

4.21.1.1 Alternative E: Relaxation of G-3273 Constraint and Operational Criteria Changes at S-197 (Trigger S-18C HW)

Implementation of Alternative E would not result in significant impacts to recreational resources.

4.21.1.2 Alternative F: Relaxation of G-3273 Constraint Without Operational Criteria Changes at S-197

Implementation of Alternative F would result in similar effects as discussed under Alternative E.

4.21.2 Alternative G: Relaxation of G-3273 Constraint Without Operational Criteria Changes at S-197 (Trigger S-178 TW) (PREFERRED ALTERNATIVE)

Implementation of Alternative G would result in similar effects as discuss under Alternative E.

4.22 CUMULATIVE EFFECTS

Cumulative effects are defined in 40 CFR 1508.7 as those effects that result from:

the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Cumulative effects for the Proposed Action were assessed in accordance with guidance provided by the President's Council on Environmental Quality. The primary goal of cumulative effects analysis is to determine the magnitude and significance of the environmental consequences of

the Proposed Action in the context of the cumulative effects of other past, present, and future actions. The following summarizes past, present, and projected Corps efforts that cumulatively affect the regional environment of south Florida (**Table 4-4**). Additional information on design refinements and operational modifications to MWD and C-111 South Dade Project features can be found within the environmental documents listed in **Section 1.7**. **Table 4-5** shows the net cumulative effects of the various resources which are directly or indirectly impacted. The field test is expected to contribute to a net beneficial cumulative impact on the regional ecosystem. The field test is expected to benefit ENP by increasing flows to NESRS.

There are many components of the ongoing comprehensive effort to restore the Everglades ecosystem. The field test is one small step towards restoration. By reducing limitations on S-333, potentially more water will be delivered to NESRS. The linchpin of the restoration effort is the C&SF Flood Control Project Comprehensive Restudy, now referred to as the CERP. CERP projects would increase the supply of freshwater for the Everglades and south Florida ecosystem. CERP project components, especially storage, seepage control, and redirection of canal flows to overland flow will act to restore more natural freshwater flows to the northern and southern estuaries, reduce seepage losses from the Everglades, and improve recharge of the Biscayne aquifer, resulting in beneficial environmental effects.

Non-CERP projects, which incorporate similar restoration goals of improving flow and water quality to the Everglades, include the USDOJ Tamiami Trail Modifications Next Steps Project and the Restoration Strategies Regional Water Quality Preliminary Plan. The DOI through NPS and ENP completed a study to evaluate the feasibility of additional Tamiami Trail bridge length, beyond that constructed pursuant to the MWD Project, to restore more natural water flow to ENP and Florida Bay and for the purpose of restoring habitat within the ENP. The Restoration Strategies Regional Water Quality Preliminary Plan describes resulting projects developed to address water quality concerns associated with existing flows to the Everglades Protection Area to achieve water quality standards established for the Everglades.

TABLE 4-4. PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS AND PLANS AFFECTING THE PROJECT AREA

	Past Actions/Authorized Plans	Current Actions and Operating Plans	Reasonably Foreseeable Future Actions and Plans
Status of Non-CERP Projects	<ul style="list-style-type: none"> - C&SF Project (1948) - ENP Protection and Expansion Act (1989) - MWD GDM and Final EIS (1992) - C-111 South Dade GRR (1994) 	<ul style="list-style-type: none"> - MWD 8.5 SMA GRR (2000) - MWD Tamiami Trail Modifications Limited Reevaluation Report (2008) - MWD 8.5 SMA Interim Operating Criteria EA (2011) and Design Refinement EA (2012) - C&SF C-51 West End Flood Control Project - Kissimmee River Restoration - Seepage Barrier near the L-31 N Levee (Miami-Dade Limestone Products Association) 	<ul style="list-style-type: none"> - Tamiami Trail Modifications Next Steps (TTMNS) Project - SFWMD Restoration Strategies Project - MWD Closeout - C-111 South Dade Project (Contracts 8 and 9)
Operations Plan for Lake Okeechobee, WCA 3A, ENP and the SDCS	<ul style="list-style-type: none"> - Water Supply and Environment (WSE) Lake Okeechobee Regulation Schedule (2000) - IOP 2002 to Present 	<ul style="list-style-type: none"> - Lake Okeechobee Regulation Schedule (LORS 2008) - SFWMD LEC Regional Water Supply Plan - ERTTP October 2012 to present 	<ul style="list-style-type: none"> - LORS 2008 to be replaced by revised Lake Okeechobee Regulation Schedule - SFWMD periodically revises the LEC Regional Water Supply Interim Plan - ERTTP to be replaced by COP to be completed to include MWD and C-111 components.
CERP Projects		<p>Congressional Authorization Received:</p> <ul style="list-style-type: none"> - Biscayne Bay Coastal Wetlands Project - Broward County Water Preserve Areas Project - Caloosahatchee River (C-43) West Basin Storage Reservoir - C-111 Spreader Canal Western Project. <p>Congressional Authorization Received and Construction in Progress:</p> <ul style="list-style-type: none"> - Indian River Lagoon-South Project - Picayune Strand Restoration Project - Site 1 Impoundment Project 	<ul style="list-style-type: none"> - Future CERP Projects

TABLE 4-5. SUMMARY OF CUMULATIVE EFFECTS

Hydrology	
Past Actions	Flood and water control projects have greatly altered the natural hydrology.
Present Actions	Federal and state agencies are coordinating on and implementing projects to improve hydrology.
Proposed Action	During the field test, the combined flows to NESRS through S-333 and S-356 will be more than what would have otherwise been discharged through current operations. The combined flows through S-173 and S-331 to the C-111 Basin will be less than what would have been discharged through these features current. Hydroperiods within NESRS are expected to improve with the Proposed Action.
Future Actions	Additional CERP projects propose to restore hydrology to more natural conditions.
Cumulative Effect	Although it is unlikely that natural hydrologic conditions would be fully restored to pre-drainage conditions, improved hydrology would occur. CERP is expected to improve the quantity, quality, timing and distribution of freshwater flow.
Threatened and Endangered Species	
Past Actions	Water management practices and urbanization have resulted in the degradation of existing habitat function and direct habitat loss leading to negative population trends of threatened and endangered species.
Present Actions	ERTP implementation represents a paradigm shift from single species to multi-species management. ERTP includes performance measures specifically directed at managing water levels and releases for the protection of multiple species and their habitats within the project area.
Proposed Action	The Corps has determined that the Proposed Action may affect, but is not likely to adversely affect, CSSS and its associated critical habitat; Everglade snail kite and its associated critical habitat; wood stork; Florida bonneted bat; Deltoid spurge; Garber's spurge; Small's milkpea; and Tiny polygala. Effects determinations for Federally threatened and endangered species within the project area are listed within TABLE 4-1 .
Future Actions	Ongoing projects would be implemented to maintain threatened and endangered species within the project area.
Cumulative Effect	Habitat improvement, monitoring and management of threatened and endangered species are anticipated to allow populations to be maintained. Improvement of degraded populations is expected to be facilitated by the restoration and enhancement of suitable habitat through efforts to restore more natural hydrologic conditions within the project area.
Fish and Wildlife Resources	
Past Actions	Water management practices have resulted in aquatic vegetation community changes and a resultant disruption of aquatic productivity and function that has had repercussions through the food web, including effects on wading birds, large predatory fishes, reptiles and mammals.
Present Actions	Ongoing efforts have been made by Federal and state agencies to implement projects to improve hydrology within the project area to restore habitat conditions for fish and wildlife resources.
Proposed Action	Increases in forage prey availability (<i>i.e.</i> crayfish and other invertebrates, fish) resulting from improved hydroperiods would in turn provide beneficial effects for amphibian, reptile, small mammal, and wading bird species within NESRS. Additional low volume freshwater releases from S-197 would not be sufficient to affect mangrove and seagrass habitats within the coastal estuaries. Significant effects to fish and wildlife resources with eastern Florida Bay, Biscayne Bay, and Manatee Bay and Barnes Sound are not anticipated.
Future Actions	Some level of improvement to fish and wildlife resources is expected to occur as a result of implementation of projects with the capability of improving the timing, quantity, quality and distribution of freshwater flow to the study area. Hydrologic restoration planned as part of CERP would further improve fish and wildlife habitat.
Cumulative Effect	Habitat improvement efforts are anticipated to benefit fish and wildlife resources.

Vegetation and Wetlands	
Past Actions	Drainage of Florida's interior wetlands, conversion of wetlands to agriculture, and urban development has reduced the spatial extent and quality of wetland resources.
Present Actions	Efforts are being taken by state and Federal regulatory agencies to reduce wetland losses.
Proposed Action	Increased hydroperiods within the eastern marl prairies may act to alleviate some of the problems associated with drier conditions. The Proposed Action may have a temporary minor beneficial effect on vegetative communities within NESRS.
Future Actions	Some level of improvement to vegetative communities is expected to occur as a result of implementation of projects with the capability of improving the timing, quantity, quality and distribution of freshwater flow to the study area. More natural hydrology as part of the CERP would assist in restoring natural plant communities.
Cumulative Effect	While the spatial extent of natural plant communities would not be restored to historic proportions, the quality of vegetative communities would be improved.
Cultural Resources	
Past Actions	Previous water control plans and associated environmental analyses had determined that there were no effects associated with changing water regulation schedules.
Present Actions	Long term effects to cultural resources remain unknown. Current testing associated with the ERTTP Programmatic Agreement is investigating such cumulative issues.
Proposed Action	The Proposed Action by its short nature is not capable of producing a cumulative effect as such effects if they were to occur would cease at the end of test period.
Future Actions	Continued improvement to hydroperiods and sheetflow within WCA 3A, 3B and ENP could reduce soil oxidation, which could stabilize the environment, and this in turn could stabilize tree islands containing cultural resources. Investigations mandated in the Programmatic Agreement for ERTTP will be completed (ca. 2016) and will determine the effects of fluctuating water on subsurface historic properties.
Cumulative Effect	Cumulative effects to historic properties and culturally significant sites will potentially be long-term adverse effects if not avoided. Mitigation measures for effects to historic properties could potentially reduce the cumulative effect to minor long-term adverse effects. Mitigation measures for culturally significant sites are unknown.
Water Quality	
Past Actions	Water quality has been degraded from urban, suburban, commercial, industrial, recreational and agricultural development.
Present Actions	Efforts to improve water quality from agricultural areas are ongoing. Federal and state projects can temporarily elevate localized levels of suspended solids and turbidity.
Proposed Action	Water quality conditions in the vicinity of the L-29 Canal and L-31N Canal may be affected by implementation of the field test.
Future Actions	Actions by the State of Florida's Restoration Strategies will decrease nutrient concentration and loadings to the project area. The Broward County Water Preserve Area Project would reduce storm runoff deliveries to WCA 3 and improve water quality coming across Tamiami Trail.
Cumulative Effect	While anthropogenic effects on water quality are unlikely to be eliminated, water quality is expected to slowly improve. Corps and SFWMD are committed to ensuring that project feature implementation will not result in violations of water quality standards.

4.23 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

An irreversible commitment of resources is one in which the ability to use and/or enjoy the resource is lost forever. One example of an irreversible commitment might be the mining of a mineral resource. An irretrievable commitment of resources is one in which, due to decisions to manage the resource for another purpose, opportunities to use or enjoy the resource as they

presently exist are lost for a period of time. An example of an irretrievable loss might be where a type of vegetation is lost due to road construction. The Preferred Alternative consists of an operational change to the 2012 WCAs-ENP-SDCS Water Control Plan (USACE 2012c) and does not include construction of permanent structures or structural modifications to existing C&SF Project features. Resources to be committed include the expenditure of funding, energy, and labor. The Proposed Action would not cause the permanent removal or consumption of any natural resources.

4.24 UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

Environmental effects for each resource are discussed in **Section 4.0**. Adverse environmental effects associated with implementing the Preferred Alternative are expected to be minimal based on the short duration of the field test and the generally beneficial nature of this action. Temporary minor adverse impacts have the potential to occur within ENP's Eastern Panhandle and Manatee Bay and Barnes Sound due to increases in the frequency, duration, and volume of S-197 discharges estimated from a period of analysis limited to historical operations between July 2012 and June 2014 (See **Section 4.5**); however significant impacts are not expected. Potential environmental effects would be limited in spatial extent to the nearshore areas of the southern estuaries (See **Section 4.7**).

4.25 CONFLICTS AND CONTROVERSY

Over the lifetime of the MWD and C-111 South Dade Projects, considerable interest has been generated among local and regional stakeholders. The Corps continually strives to include all interested parties in its decision making process and will continue to consider all issues that arise. A letter soliciting comments was issued for this action to request assistance in identifying issues and resources to be considered during the scoping process. Issues identified are summarized in **Section 1.9**.

4.26 ENVIRONMENTAL COMMITMENTS

The Corps commits to avoiding, minimizing or mitigating for adverse effects. All practicable means to avoid or minimize environmental effects were incorporated into the Preferred Alternative. A Monitoring Plan has been developed for the field test in **Appendix C**. Interagency workshops to facilitate discussion of field test performance relative to the achievement of field test goals and objectives are planned to be conducted. Field Test operations updates and action items will be discussed on a weekly basis between water managers from the Corps and SFWMD, as well as ENP when needed, to provide collective interpretation of results and evaluate implementation of field test operations relative to the goals, objectives, and constraints. Corps, SFWMD, and ENP water managers will meet monthly to discuss the collected data and the results of preliminary analyses, as well as system conditions and field test operations; additional technical staff from these agencies who are involved in the monitoring and data assessment efforts will also participate in the monthly coordination meetings, as needed. Results from these weekly and monthly coordination meetings, including preliminary recommendations from water managers to incrementally modify the operational strategy (within the covered NEPA EA scope), will be further discussed with the project delivery team (PDT) during regularly-scheduled interagency meetings to occur four times per year. PDT meetings will also include updates from the water quality and ecological monitoring sub-teams. Additional

meetings (*i.e.* WCA 3 Periodic Scientist Calls as discussed within the ERTF Final EIS (USACE 2011b)) and/or workshops may be conducted in support of the field test on an as-needed basis based upon ongoing or anticipated conditions within WCAs, ENP, and/or the SDCS.

It is recognized that as hydrologic restoration actions are implemented there may be water quality issues that need to be worked through in order to allow restoration to progress. Language was developed to address a path forward to address water quality potential concerns and how to work through them in the Central Everglades Planning Project (CEPP) Final Project Implementation Report (PIR) and EIS (Chapter 8, Section 8.3). The Corps intends to follow these guiding principles identified in the CEPP language to resolve water quality issues associated with this field test. This CEPP language addressing water quality issues is provided below:

***“CEPP Water Quality Language as a Framework for MWD to ENP Project Increments
Source: CEPP Final PIR and EIS (Chapter 8, Section 8.3)***

“In addition to the aforementioned items of local cooperation, the United States Army and the State of Florida entered into a separate agreement regarding water quality that is intended to govern the implementation and operation of CEPP project features:

Restoration of the Everglades requires projects that address hydrologic restoration as well as water quality improvement. This has been recognized by the National Academy of Sciences in its most recent biennial report where it noted that near-term progress to address both water quality and water quantity improvements in the central Everglades is needed to prevent further declines of the ecosystem. The significant amount of water resulting from CEPP is contemplated to significantly improve restoration of the Everglades. Both the Federal and State parties recognize that water quantity and quality restoration should be pursued concurrently and have collaborated to develop and concur on a suite of restoration strategies being implemented by the State to improve water quality (“State Restoration Strategies”), as well as other State and Federal restoration projects, both underway and planned, to best achieve Everglades hydrologic objectives. Specific examples of Federally authorized projects include the Everglades Restoration Transition Plan, Modified Water Deliveries to Everglades National Park Project, and the Tamiami Trail Next Steps Project.¹ One of the goals of these projects and their associated operating plans, as well as certain components of the CERP awaiting authorization or that are being planned as part of the CEPP is to improve water quantity and quality in the Everglades through more natural water flow within the remnant Everglades which includes the water conservation areas and ENP. Variations in flows of the C&SF system may result from a variety of reasons. These reasons include natural phenomena (e.g. weather) and updates to the operating manuals to achieve the purposes of the C&SF Project such as flood control and water supply.

One goal of the Consent Decree² is to restore and maintain water quality within ENP. The Consent Decree established, among other things, long-term water quality limits for water entering ENP to achieve this goal. The existing limits for ENP are flow

dependent and, generally, increased volume of water results in a lower allowable concentration of phosphorus to maintain the overall load of phosphorus entering the ENP. There will be redistribution of flows and increased water volume above existing flows associated with system restoration efforts beyond the current State Restoration Strategies projects. The USACE and its Federal and State partners recognize that to achieve long-term hydrologic improvement, water quality may be impacted, particularly as measured by the current Consent Decree Appendix A compliance methodology. The USACE and the State partners agree that the monitoring locations/stations for inflows to ENP will require revision. An evaluation of this and other aspects of the compliance methodology are currently being conducted by the Technical Oversight Committee (TOC).

In an effort to address these potential impacts and determine updates to Appendix A to reflect increased inflows and new discharges into ENP since the Consent Decree was entered, the parties to the Consent Decree have established a process and scope for evaluating and identifying necessary revisions to the Appendix A compliance methodology utilizing the scientific expertise of the TOC. The TOC may consider all relevant data, including the 20 years of data collected since Appendix A was implemented. Ultimately, such evaluations and changes to the Appendix A compliance methodology would be recommended by the Consent Decree's TOC for potential agreement by all parties. Failure to develop a mutually agreed upon and scientifically supportable revised compliance methodology will impact the State's ability to implement or approve these projects.

The aforementioned State Restoration Strategies will be implemented under a Clean Water Act discharge permit that incorporates and requires implementation of corrective actions required under a State law Consent Order, as well as a Framework Agreement between the U.S. Environmental Protection Agency and the State discharge permitting agency, the Florida Department of Environmental Protection, to ensure compliance with Clean Water Act and State water quality requirements for existing flows into the Everglades. The Clean Water Act permit for the State facilities, the associated Consent Order (including a detailed schedule for the planning, design, construction, and operation of the new project features), and technical support documents were reviewed by, and addressed all of, the U.S. Environmental Protection Agency's previous objections related to the draft National Pollutant Discharge Elimination System ("NPDES") permits, prior to issuance.

All parties are committed to implementing the State Restoration Strategies, joint restoration projects, and associated operational plans, in an adaptive manner that is consistent with the objectives of the underlying C&SF Project. The USACE and the State will use all available relevant data and supporting information to inform operational planning and decision making, document decisions made, and evaluate the resulting information from those decisions to avoid adverse impacts to water quality where practicable and consistent with the purposes of the C&SF Project. Based upon current and best available technical information, the Federal parties believe at this time that the State Restoration Strategies, implemented in accordance with the State issued Consent Order and other joint restoration projects, are sufficient and

anticipated to achieve water quality requirements for existing flows to the Everglades. If there is an exceedance of the Appendix A compliance limits, which results from a change in operation of a Federal project, and it has been determined that an exceedance cannot be remedied without additional water quality measures, the Federal and State partners agree to meet to determine the most appropriate course of action, including what joint measures should be undertaken as a matter of shared responsibility. These discussions will include whether it is appropriate to exercise any applicable cost share authority. If additional measures are required and mutually agreed upon, then they shall be implemented in accordance with an approved process, such as a general reevaluation report or limited reevaluation report, and if necessary, supported through individual project partnership agreements. Failure to develop mutually agreed upon measures and cost share for these measures may impact the State's ability to operate the Federal project features."

¹The next phase of bridging for Tamiami Trail roadway as authorized by Congress.

²*United States v. South Florida Water Management District, et al., Case No. 88-1886-CIV-Moreno (U.S.D.C., S.D.Fla.).*

4.27 COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS

4.27.1 National Environmental Policy Act of 1969

Environmental information on the project has been compiled and this EA has been prepared and coordinated for public, state, and Federal agency review. The Proposed Action is in compliance with the National Environmental Policy Act.

4.27.2 Endangered Species Act of 1973

Upon completion of a biological assessment for species under NMFS purview it was determined that the Proposed Action would have no effect on these species; therefore, consultation with NMFS was not necessary (**Appendix D**). The Corps requested written confirmation of Federally listed threatened and endangered species that are either known to occur or are likely to occur within the project area from the USFWS by letter dated August 22, 2014. Concurrence on the presence of listed species was received on September 11, 2014. The USFWS provided an update to the concurrence letter on December 17, 2014. Informal consultation was initiated with the USFWS on January 6, 2015 with submission of a complete initiation package (**Appendix D**). Concurrence on these determinations was received from USFWS on February 10, 2015. Terms and Conditions within the USFWS BO on the ERTTP require the Corps to initiate the planning process to begin field testing and relaxing or removing the existing G-3273 gage constraint of 6.8 feet NGVD. The Proposed Action is being fully coordinated under the Endangered Species Act and will be in full compliance with the Act.

4.27.3 Fish and Wildlife Coordination Act of 1958, as amended

The Proposed Action has been fully coordinated with the USFWS and FWC. ERTTP Periodic Scientist Calls, as discussed within the ERTTP Final EIS (USACE 2011b) will continue to be conducted throughout the field test to ensure wildlife recommendations are considered during the water management decision process. In response to the requirements of the Act, the Corps has

and will continue to maintain continuous coordination with the USFWS. The Proposed Action is in full compliance with the Act.

4.27.4 National Historic Preservation Act of 1966

The Proposed Action is in compliance with Section 106 of the National Historic Preservation Act, as amended (PL89-665). As part of the requirements and consultation process contained within the National Historic Preservation Act implementing regulations of 36 CFR 800, this project is also in compliance through ongoing consultation with the Archaeological and Historic Preservation Act, as amended (PL93-29), Archeological Resources Protection Act (PL96-95), American Indian Religious Freedom Act (PL 95-341), Native American Graves Protection and Repatriation Act (NAGPRA), Executive Order 11593, 13007, and 13175, the Presidential Memo of 1994 on Government to Government Relations and appropriate Florida Statutes. Consultation with the Florida SHPO, appropriate Federally recognized tribes, and other interested parties has been initiated. The Advisory Council on Historic Preservation declined to comment on 26 September 2014 and Florida SHPO concurrence on the determination of no adverse effects was received on 14 April, 2014. No formal comments were received from other interested parties. The Proposed Action is in compliance with the goals of this Act..

4.27.5 Clean Water Act of 1972

The Proposed Action is in compliance with this Act. This test will be coordinated with the State of Florida to determine CZMA consistency.

4.27.6 Clean Air Act of 1972

The Proposed Action is being coordinated with the State of Florida. Southeast Florida including Miami-Dade County continues to be classified by the USEPA as an attainment/maintenance area for ozone. Operations of S-356 will be in compliance with the existing air quality permit for the pump station. The Proposed Action is in compliance with Section 176 of the Clean Air Act, known as the General Conformity Rule.

4.27.7 Coastal Zone Management Act of 1972

A Federal consistency determination in accordance with 15 CFR 930 Subpart C is included in this report as **Appendix B**. State consistency review will be performed following the public coordination of the EA.

4.27.8 Farmland Protection Policy Act of 1981

Correspondence with the United States Department of Agriculture and Natural Resources Conservation Service (USDA-NRCS) occurred on November 21, 2014 (**Appendix D**). The USDA-NRCS is responsible for monitoring the conversion of Prime, Unique, or Locally Important Farmland to urban areas. The USDA-NRCS has determined that there are delineations of Important Farmland Soils (Farmland of Unique Importance) within the scope of this project. Approximately 975 acres of Prime and Unique Farmland are located within the project area; mainly within the boundaries of ENP. Conversion of Prime and Unique Farmland as a result of the field test is not anticipated based on the expected change in hydrology.

4.27.9 Wild and Scenic River Act of 1968

No designated Wild and Scenic river reaches would be affected by project related activities. This Act is not applicable.

4.27.10 Marine Mammal Protection Act of 1972

No marine mammals would be harmed, harassed, injured or killed as a result of the Proposed Action. Therefore, the Proposed Action is in compliance with this Act.

4.27.11 Estuary Protection Act of 1968

No designated estuary would be affected by the Proposed Action. This Act is not applicable.

4.27.12 Federal Water Project Recreation Act of 1965, as amended

Recreation and fish and wildlife enhancement have been given full consideration in planning Increment 1.

4.27.13 Fishery Conservation and Management Act of 1976

No fisheries or other areas under the purview of NMFS would be affected by this action. The Proposed Action is in compliance with the Act.

4.27.14 Submerged Lands Act of 1953

Potential minor adverse impacts associated with salinity fluctuations to Florida Bay, Manatee Bay, and Barnes Sound would be temporary and spatially limited to nearshore areas within the southern estuaries. Significant effects to fish and wildlife resources and vegetative communities within submerged lands of the State of Florida are not expected. No construction is proposed. A monitoring plan has been developed for the Proposed Action.

The Proposed Action is in compliance with the Act.

4.27.15 Coastal Barrier Resources Act and Coastal Barrier Improvement Act of 1990

There are no designated coastal barrier resources in the project area that would be affected by the Proposed Action. These Acts are not applicable.

4.27.16 Resource Conservation and Recovery Act (RCRA), As Amended by the Hazardous and Solid Waste Amendments (HSWA) of 1984, Comprehensive Environmental Response Compensation and Liability Act (CERCLA), Toxic Substances Control Act (TSCA) of 1976

Implementation of the Proposed Action is not expected to result in the discovery of HTRW since there is no excavation or other construction activities associated with this project. The Proposed Action has a very low risk for increased mobilization of existing HTRW where it might exist within the study area. The Proposed Action is in compliance with these Acts.

4.27.17 Rivers and Harbors Act of 1899

The Proposed Action would not obstruct navigable waters of the United States. The Proposed Action is in full compliance.

4.27.18 Safe Drinking Water Act of 1974, As Amended

The Proposed Action would not impact safe drinking water standards. The Proposed Action is in full compliance.

4.27.19 Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646)

Acquisition of real estate is not required for the Proposed Action. The Proposed Action is in compliance with this Act.

4.27.20 Anadromous Fish Conservation Act

Anadromous fish species would not be affected. The Proposed Action is in compliance with the Act.

4.27.21 Migratory Bird Treaty Act and Migratory Bird Conservation Act

Migratory and resident bird species have been observed within the project area and are likely to use available habitat for foraging, nesting, and breeding. The Proposed Action is not expected to destroy migratory birds, their active nests, their eggs, or their hatchlings. The Proposed Action will not pursue, hunt, take, capture, kill or sell migratory birds. The Proposed Action is in compliance with these Acts.

4.27.22 Marine Protection, Research and Sanctuaries Act

The Marine Protection, Research and Sanctuaries Act does not apply to the Proposed Action. Ocean disposal of dredge material is not proposed as part of the Proposed Action.

4.27.23 Magnuson-Stevens Fishery Conservation and Management Act

No Essential Fish Habitat would be impacted by this action. Therefore the Proposed Action is in compliance with this Act.

4.27.24 E.O. 11990, Protection of Wetlands

The Proposed Action is expected to have beneficial effects on wetlands. The Proposed Action is in compliance with the goals of this Executive Order (E.O.).

4.27.25 E.O. 11988, Floodplain Management

This E.O. instructs Federal agencies to avoid development in floodplains to the maximum extent possible. The Proposed Action is an operational change to existing infrastructure; therefore, no construction is proposed within this action. This action is consistent with the intent of this E.O. and is in compliance.

4.27.26 E.O. 12898, Environmental Justice

E.O. 12899 provides that each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority or low income populations. The Proposed Action would not result in disproportionately high and

adverse human health or environmental effects on minority populations and low-income populations. The Proposed Action is in compliance with this E.O.

4.27.27 E.O. 13089, Coral Reef Protection

No coral reefs would be impacted by the Proposed Action. This E.O. does not apply.

4.27.28 E.O. 13112, Invasive Species

The Proposed Action would have no significant impact on invasive species. The Proposed Action is in compliance with the goals of this E.O.

4.27.29 E.O. 13045, Protection of Children

E.O. 13045, requires each Federal agency to “identify and assess environmental risk and safety risks [that] may disproportionately affect children” and ensure that its “policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks.” This action has no environmental safety risks that may disproportionately affect children. The Proposed Action is in compliance.

4.27.30 E.O. 13186, Responsibilities of Federal Agencies to Protect Migratory Birds

Migratory and resident bird species have been observed within the project area and are likely to use available habitat for foraging, nesting, and breeding. The Proposed Action is not expected to destroy migratory birds, their active nests, their eggs, or their hatchlings. The Proposed Action is in compliance with the goals of this E.O.

4.27.31 Memorandum on Government-to-Government Relations with Native American Tribal Governments 1994

This Presidential Memorandum directs the Federal government to operate within a government-to-government relationship with Federally recognized Native American tribes. The head of each executive department and agency shall be responsible for ensuring that the department or agency operates within a government-to-government relationship with Federally recognized tribal governments. Each executive department and agency shall apply the requirements of the E.O. 12875 (“Enhancing the Intergovernmental Partnership”) and E.O. 12866 (“Regulatory Planning and Review”) to design solutions and tailor Federal programs, in appropriate circumstances, to address specific or unique needs of tribal communities. The Corps has consulted with the Miccosukee Indian Tribe of Florida and the Seminole Tribe of Florida during the NEPA process for the Proposed Action (See **Appendix D**). The Proposed Action is in compliance with the goals of this memorandum.

5.0 LIST OF PREPARERS**TABLE 5-1. TABLE OF PREPARERS**

Name	Organization	Role in EA
Gina Ralph	USACE	Biologist
Melissa Nasuti	USACE	Biologist
Dan Crawford	USACE	Hydrologist
John Zediak	USACE	Water Manager
June Mirecki	USACE	Geologist
Jim Riley	USACE	Water Quality
Mark Shafer	USACE	Water Quality
Dan Hughes	USACE	Archeologist

6.0 PUBLIC INVOLVEMENT

6.1 SCOPING AND EA

A letter dated June 30, 2014 was mailed to stakeholders, soliciting comments for this action. Comments were accepted through July 14, 2014. Comments and responses can be found in **Appendix D, TABLE D-1**. The EA and Draft Finding of No Significant Impact (FONSI) were circulated for a 60 day review period to agencies, organizations, and other interested stakeholders. Comments and responses on the EA and Draft FONSI can be found in **Appendix D, TABLE D-2**. Comments received during this review period were used in determining whether a FONSI is appropriate or an EIS is warranted.

6.2 AGENCY COORDINATION

The Corps is in continuous coordination with other Federal and state agencies, tribal representatives, and members of the general public. This extensive coordination is a result of the magnitude of Corps efforts underway to implement water management strategies in south Florida. All agency coordination letters related to the field test are included in **Appendix D**.

6.3 LIST OF RECIPIENTS

Copies of the June 30, 2014 letter, notice of availability and the EA and Draft FONSI were mailed to the parties listed below. Recipients included Federal and state agencies, tribal representatives and members of the general public. A complete mailing list is available upon request. The EA and Draft FONSI were posted to the internet at the following address under Miami-Dade County and the G-3273 web page:

<http://www.saj.usace.army.mil/About/DivisionsOffices/Planning/EnvironmentalBranch/EnvironmentalDocuments.aspx#Miami-Dade>

<http://www.saj.usace.army.mil/Missions/Environmental/EcosystemRestoration/G3273andS356PumpStationFieldTest.aspx>

List of Recipients

Native American Tribes

Miccosukee Tribe of Indians
Seminole Tribe of Florida

Federal Agencies

National Center for Environmental Health
U.S. Department of Agriculture
U.S. Forest Service
U.S. Department of Commerce
National Oceanic and Atmospheric Administration
Florida Keys National Marine Sanctuary
National Marine Fisheries Service
U.S. Department of Housing and Urban Development
U.S. Department of the Interior
Bureau of Indian Affairs
National Park Service
Biscayne National Park

Everglades National Park
U.S. Fish and Wildlife Service
U.S. Geological Survey
Office of Environmental Policy and Compliance
U.S. Department of Justice
U.S. Department of Transportation
Federal Highway Administration
U.S. Environmental Protection Agency

Federal Government

U.S. Congressmen - Florida Districts 17, 18, 21, 25
U.S. Senators, Florida

State Agencies

Florida Department of Agriculture, Office of Agricultural Water Policy
Florida Department of Environmental Protection
Florida Department of Transportation
Florida Fish and Wildlife Conservation Commission

Florida Keys Aqueduct Authority
 Florida State Clearinghouse
 South Miami-Dade Soil and Water Conservation District
 South Miami-Dade Government Center
 South Florida Regional Planning Council
 Southwest Florida Regional Planning Council
 South Florida Water Management District
 State Historic Preservation Office
 University of Florida Cooperative Extension Office, Homestead, Florida

State Government

Governor's Office

State Representatives

Districts 102, 103, 104, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117 118, 119, 120

State Senators

Districts 33, 34, 35, 36, 38, 39, 40

County Agencies

Miami-Dade County Department of Environmental Resources Management
 Miami-Dade County Park & Recreation
 Miami-Dade County Water & Sewer
 Miami-Dade Water Resources

County Government

Miami-Dade County Board of Commissioners

Municipalities

City of Florida City
 City of Homestead
 Miami-Dade City Planning Department

Libraries

Miami-Dade Public Library, Homestead Branch
 Miami-Dade Public Library, Main Branch

Post Offices

Florida City Post Office
 Homestead Post Office

Groups and Organizations

1000 Friends of Florida
 Airboat Association of Florida
 Audubon of Florida
 Audubon of the Everglades

Broward County Airboat Association
 Clean Water Action
 Coopertown Airboat
 Miami-Dade County Farm Bureau
 Defenders of Wildlife
 Environmental & Land Use Law Center
 Everglades Coordinating Council
 Everglades Foundation
 Everglades Protection
 Florida Atlantic University
 Florida Biodiversity Project
 Florida International University
 Florida Keys Fishing Guides
 Florida Wildlife Federation
 Friends of the Everglades
 Greater Homestead/Florida City Chamber of Commerce
 Izaak Walton League
 Las Palmas Homeowners Association
 National Parks Conservation Association
 Natural Resources Defense Council
 The Nature Conservancy
 Tropical Audubon Society, Inc.
 Trust for Public Land
 Reef Relief
 Sierra Club
 Sierra Club of South Florida
 Sierra Club, Miami Group
 South Florida Ecosystem Restoration Task Force
 Trail Glades Bassmasters
 Wildlife Foundation of Florida
 World Wildlife Federation
 World Wildlife Fund

Businesses

Florida Power and Light
 Everglades Research Group, Inc
 Everglades Safari Park
 Gator Park
 Lehtinen, Vargas and Riedi
 Lewis, Longman and Walker
 MacVicar, Frederico and Lamb
 Milian-Swain and Associates
 Radio One, Pepper Hamilton
 South Miami-Dade News Leader

Individuals

A list of individuals is on file in the Jacksonville District, Planning and Policy Division.

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