U.S. Army Corps of Engineers
Jacksonville District

FINAL SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

Interim Operational Plan (IOP)
for Protection of the Cape Sable Seaside Sparrow

Abstract: This Final Supplemental Environmental Impact Statement (FSEIS) supplements the 2002 Final Environmental Impact Statement (FEIS) for the Interim Operational Plan (IOP) for protection of the Cape Sable seaside sparrow (CSSS), and responds to comments received on the 2006 Draft Supplemental Environmental Impact Statement (DSEIS) coordinated with agencies and the public between July 3 and August 17, 2006. Alternative 7R was the alternative recommended in the 2002 IOP FEIS, coordinated May 4-June 3, 2002. The Record of Decision (ROD) selecting Alternative 7R was signed in July 2002, and the system has been operating under IOP since August 2002. Hydrologic modeling of Alternative 7R was completed in October 2002, after the FEIS and ROD. Because operations under Alternative 7R were similar to those modeled under Alternative 7, agencies generally endorsed Alternative 7R pending later review of model outputs, which were expected to confirm the analysis of impacts. Model results for Alternative 7R were posted to a U.S. Army Corps of Engineers (Corps or USACE) website following the ROD in 2002, but the FEIS was not supplemented at that time. By an order issued in March 2006 by the United States District Court for the Southern District of Florida, Miami Division, resolving a lawsuit by the Miccosukee Tribe regarding the National Environmental Policy Act (NEPA) compliance and other matters related to IOP, the Corps was required to issue a supplement to its 2002 FEIS. This FSEIS discusses IOP Alternative 7R model output, structural features of Alternative 7R, and actual operations since IOP began in 2002. Structural features unique to Alternative 7R include pump stations S-356 and S-332C, degrading 4 miles of L-67 levee extension, and three new impoundment basins at S-332B, C, and D. Construction features of Alternative 7R were first authorized under the Modified Water Deliveries (MWD) Project as described in the 1992 General Design Memorandum (GDM) and Environmental Impact Statement (EIS), and under the C-111 Project as described in the 1994 Integrated General Reevaluation Report and EIS (GRR/EIS). Construction features differ somewhat from the conceptual designs in the referenced reports. The new pump stations were built as interim structures for use in protecting sparrow habitat during the wet seasons, subject to further design in conjunction with associated seepage reservoirs that are being constructed. Alternative 7R incorporated the system operations of Alternative 7 and the Water Control Plan (WCP) for WCA-3A, providing for emergency operations in anticipation of high rainfall events. In conjunction with this supplemental NEPA documentation, the Corps has re-initiated consultation under Section 7 of the U.S. Endangered Species Act (ESA) with the U.S. Fish and Wildlife Service (FWS) for endangered species, including the snail kite and CSSS and received a Biological Opinion (BO) November 17, 2006. In the BO, the FWS concluded that continued operation of IOP Alternative 7R is not likely to jeopardize the continued existence of the CSSS, Everglade snail kite, or wood stork and is not likely to destroy or adversely modify designated critical habitat for the CSSS or Everglade snail kite.

Send your comments to the District Engineer by:
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EXECUTIVE SUMMARY

Background. On February 19, 1999, the U.S. Fish and Wildlife Service (FWS) issued a Final Biological Opinion (BO) under provisions of the Endangered Species Act of 1973, as amended, for actions required to assure the survival of the endangered Cape Sable Seaside Sparrow (CSSS), as affected by operation of components of the Central and Southern Florida (C&SF) Project in Miami-Dade County. The BO required rapid implementation of structural and operational changes to existing operations of the constructed portions of the Modified Water Deliveries (MWD) Project and the Canal-111 (C-111) Project, then operating under Test 7 of the Experimental Program of Water Deliveries to Everglades National Park (ENP). The BO concluded that continuation of Test 7, Phase I operations would cause adverse modification of CSSS critical habitat and would jeopardize its continued existence. The BO presented a Reasonable and Prudent Alternative (RPA) that would avoid jeopardizing the CSSS. The RPA recommended that the following hydrological conditions be met for protection of the CSSS: (1) a minimum of 60 consecutive days of water levels at or below 6.0 feet NGVD would have to be achieved at the NP-205 gauge (sparrow subpopulation "A") between March 1 and July 15; (2) the Corps would have to ensure that 30%, 45%, and 60% of required regulatory releases crossing Tamiami Trail enter ENP east of the L-67 extension in 2000, 2001, and 2002, respectively, or produce hydroperiods and water levels in the vicinity of subpopulations C, E, and F that meet or exceed those produced by the 30%, 45%, and 60% targets; and (3) produce hydroperiods and water levels in the vicinity of subpopulations C, E, and F that equal or exceed conditions that would be produced by implementing the exact provisions of Test 7, Phase II operations (USACE 1995), and implement the entire MWD Project no later than December 2003.

Emergency deviations from Test 7 were authorized in 1998, 1999, 2000, and 2001 by the President's Council on Environmental Quality (CEQ) to allow the Corps to conduct water control operations to protect the CSSS (USACE 1999b, USACE 1999c, and USACE 2000). These Interim Structural and Operational Plans (ISOP) enabled the Corps to maintain water levels, particularly in the western CSSS populations, that would maximize breeding seasons for the sparrow. The 'Structural' part of the ISOP operations included building an interim pump station and a 140-acre impoundment (S-332B west impoundment). Operational changes under ISOP included closing the S-12A, B, and C structures (gates at the southern end of WCA-3A that send water into ENP west of the L-67 extension) sequentially from west to east beginning in November (late rainy season) each year to avoid flooding sparrow breeding habitat of subpopulation "A". To compensate for the closures and prevent excessively high stages in WCA-3A, operational changes were made to allow conveyance of some of the water through the S-333 structure into the L-29 canal and thence down the L-31 North (L-31N) canal and into the new impoundment, from which it could overflow or seep into ENP lands near eastern CSSS populations. This "loop" flow was conceived as a temporary expedient that would not be necessary once the 8.5 Square Mile Area (SMA) and Tamiami Trail features of the MWD Project were built and operational, then expected by the end of 2003.

During implementation of the ISOP, the Corps received confirmation from FWS that producing the hydrologic equivalent of the 30%, 45%, and 60% conditions, as opposed to the actual release percentages, would also meet the FWS RPA conditions until the implementation of MWD. The implemented IOP alternative discussed in this SEIS allows the Corps to meet or provide the hydrologic equivalent of the FWS RPA conditions while managing the system for other C&SF Project authorized purposes including flood control, Everglades restoration, water supply, and recreation. In its Amended BO dated March 28, 2002, FWS agreed that IOP met the intention of the RPA. Section 7 consultation on the CSSS, snail kite, and wood stork was re-initiated with FWS in conjunction with this supplemental NEPA documentation, and formal consultation began on June 30, 2006. A Final BO was issued by FWS on November 17, 2006. This BO replaces the 1999 and 2002 BOs.

After Alternative 7R was selected in 2002, the Miccosukee Tribe filed a lawsuit challenging the Corps' decision to implement IOP, alleging violations of NEPA, ESA, the Administrative Procedures Act (APA), the Fifth Amendment, federal common law (nuisance), the Indian trust doctrine, and the Federal Advisory Committee Act, and also alleging improper delegation of agency authority. Among other objections, the Tribe noted that no model runs for Alternative 7R were available at the time Alternative 7R was recommended in the FEIS, or at the time the ROD was signed. The Tribe also objected to incorporation of elements of the C-111 and MWD Projects without a full description of these structural elements as planned for IOP and the impacts of their construction.

On April 28, 2003, Magistrate Judge O'Sullivan issued a Report and Recommendation recommending dismissal of the Tribe's due process, federal common law nuisance, and Indian Trust Doctrine claims. The Magistrate Judge found that the Administrative Procedure Act provides an effective statutory remedy that precluded the Tribe from bringing a due process claim directly under the U.S. Constitution. The Magistrate Judge also found that the Tribe failed to raise its nuisance claims in accordance with the Federal Tort Claims Act and that there is no waiver of sovereign immunity for Plaintiff to bring a nuisance claim based on federal common law. Lastly, the Magistrate Judge found that the Tribe's Indian Trust Doctrine claim was barred by collateral estoppel. In a previous case, the Court held that "the Indian Trust Doctrine cannot support a substantive claim; rather it provides a basis for determining whether Defendants' alleged conduct constitutes the breach of a duty, which arises from statute, regulation, treaty or other agreement." Judge Moore issued an order adopting the Report and Recommendation on August 6, 2003.

The court ruled in favor of the Corps on the ESA, APA, and FACA claims, but against the Corps with regard to NEPA. While the court did not enjoin the Corps from implementing Alternative 7R, it did order the Corps to supplement its NEPA analysis of Alternative 7R by May 15, 2006, but granted extensions until September 18, and subsequently, December 22.

Alternatives. Beginning in 1999 and continuing through early 2002, a team comprised of representatives from the Corps, South Florida Water Management District (SFWMD), FWS, ENP, Miami-Dade Department of Environmental Resource Management (DERM), Florida Department of Environmental Protection (FDEP), Florida Fish and Wildlife Conservation

Commission (FFWCC), and others developed and evaluated IOP operational alternatives. Both 1995 Base (95Base) conditions and the ISOP 2001 operations were used as bases for comparison.

Six alternative plans were developed and analyzed in the (February 2001) Draft IOP EIS. Following release of the Draft EIS, the Council on Environmental Quality (CEQ), and the Institute for Environmental Conflict Resolution (IECR) facilitated a collaborative interagency team from the Corps, FWS, SFWMD, and ENP to formulate an alternative that met the criteria in the BO while providing for maximum protection of the resource concerns of the interested parties. The plan proposed during this process, Alternative 7, consisted of two different modes of water management operation for SDCS and a structural modification of the L-67 extension levee. The first mode was "No WCA 3A regulatory releases to SDCS" operation in which L-31N canal would be maintained at Test 7, Phase I level when there were no WCA 3A regulatory releases. Citing a concern that maintaining L-31N canal at ISOP level would impact ENP resources, a "No WCA 3A regulatory releases to SDCS" operation was proposed that essentially reverted back to Test 7, Phase I canal level when no regulatory releases were routed through S-333 and S-334 to SDCS. The Corps and SFWMD agreed to incorporate this operation as part of Alternative 7.

The second mode of operations was "WCA 3A regulatory releases to SDCS" operation in which L-31N canal would be lowered to minimize potential flood impacts in SDCS and, at the same time, provide necessary downstream gradient to move WCA 3A regulatory releases through S-333 and S-334. The purpose of routing of regulatory releases (releases needed to lower WCA 3A stages when they exceed that water body's regulation schedule) from WCA 3A to SDCS with lower canal stage in L-31N was to provide sufficient water to be delivered via S-332B to the habitats of sparrow subpopulations E and F, and at the same time minimize potential flooding impacts to 8.5 SMA and agricultural areas adjacent to L-31N canal.

Alternative 7 included a 215-acre retention basin at the S-332B structure, increasing capacity from 140 acres of retention to 355 acres, and operations of this area intended to re-hydrate adjacent CSSS habitat inside ENP were modified to avoid pumping to overflow except under unusual and uncommon circumstances.

Modifications to Alternative 7 were developed in response to comments submitted by the public and cooperators during the 2001 NEPA comment period. The stakeholders, including SFWMD and agricultural interests, commented that the existing capability for flood control in the agricultural and residential areas potentially affected by the project might be adversely affected and must be maintained. With the existing water management infrastructure, the higher L-31N canal stages that would occur under Alternative 7 might not, under certain meteorological conditions, allow for sufficient draw-down of groundwater levels in advance of significant impending storms to meet this criterion. Consequently, Alternative 7 would potentially result in an increased risk of flooding over the then current conditions.

To address this concern, Alternative 7 was adjusted and was described as Alternative 7R. Additional features included in Alternative 7R are components of the C-111 project (S-332B North Seepage Reservoir; S-332B to S-332D Seepage Reservoir; S-332B West Seepage

Reservoir; S-332C Seepage Reservoir; S-332B/C Partial Connector; and Frog Pond Seepage Reservoir) and the MWD project (S-356 Pump Station; and removal of the L-67 Extension Levee). It provided increased capability to draw down groundwater levels while retaining all the sparrow protection features of Alternative 7. The increased capability was obtained by constructing an additional interim pump station (S-332C) and seepage reservoirs along the L-31N canal to supplement the capacity of S-332B to lower canal and groundwater levels. The pump stations draw water out of the canal, thus lowering adjacent groundwater levels. The water is pumped into reservoirs along the eastern boundary of the park. Some of the pumped water would return to the canal, but there is a net gain in lowering canal stages. During non-storm conditions, the pump stations are operated at reduced capacity to maintain a water depth in the reservoirs necessary to create a continuous hydraulic ridge along the park boundary for seepage control. This hydraulic ridge concept was developed in the authorized C-111 project. The pumping would be adjusted seasonally to maintain the desired water conditions in sparrow habitat within ENP conducive to breeding and habitat maintenance. In conjunction with these features along L-31N, the authorized S-356 pump station, a MWD Project feature, was included as part of Alternative 7R. The pump would be constructed in the Tamiami Canal (L-29) at the location shown in the MWD report, where it would be used to collect seepage from ENP along the reach of the L-31N canal, which extends from S-335 to G-211, by pumping water west behind the existing S-334 structure and thence into L-29 and NESRS when conditions permit. Table ES-1 displays the operating parameters for Alternative 7R.

The Corps did not treat the Alternative 7R structural elements, which were authorized features of the MWD and C-111 Projects, as proposed features of Alternative 7R. However, their construction was scheduled in conjunction with evaluation of Alternative 7R, and their construction and operation were addressed in the 2002 FEIS and are addressed in this 2006 Supplement. Pump capacity and systems operations will further be assessed under the Combined Structural and Operational Plan (CSOP) now under development and expected to be implemented upon completion of construction of the MWD Project in 2011.

Environmental Consequences of the Recommended Alternative. The recommended alternative (Alternative 7R) affects hydrology of Northeast Shark River Slough (NESRS), western SRS (WSRS), and WCAs 3A and 3B. The hydrology of WCAs 2A and 2B is also affected, but only to the same degree as it was previously under ISOP. Hydrological effects (better CSSS breeding conditions) are beneficial in NESRS and WSRS as recommended in the FWS BO. Minor adverse effects due to raised water levels may have occurred in the vicinity of tree islands in the southern portions of WCAs 3A and 3B. In addition Alternative 7R has benefited the hydrology of Taylor Slough.

Impacts to vegetation under the recommended alternative are similar to those of the ISOP. Increased ponding depths and hydroperiods in NESRS provide the desired consequence of approaching natural hydrologic conditions more closely, excluding exotic nuisance species, and encouraging natural wetland species. A reduction in annual flooding duration in WSRS is beneficial to native vegetative species. Very slightly increased modeled flood stage and duration in WCAs 2A and 3A appear nearly insignificant in comparison to natural fluctuations and previous operations, except in southern WCA 3A, where some slight increase in stages and durations was predicted. However, the regulation schedule for WCA 3A has not

been changed, and alternative routes were identified and used to route water out of WCA 3A when regulatory releases were called for, without opening the S-12A, B, and C structures during the CSSS nesting season. The Corps notes that undesirably high stages in this area were cited in the large C&SF *Restudy* Report of 1999 as a problem related to compartmentalization of the system that would need resolution under CERP as well as in the MWD Project. Construction of the S-332B seepage reservoir impacted Florida panther habitat, but the nature of the impact and the quality of the habitat are both minimal.

Under complete build-out of the recommended alternative and C-111 Project, no overflows would occur at the S-332B structure once construction of the S-332B north seepage reservoir and the partial S-332B/S-332C connector is complete and when it is practical to do the construction necessary to raise the western levee. Construction of the additional C-111 seepage reservoirs, and their operation under the modified operational plan in conjunction with the existing seepage reservoir, has reduced the potential for overflow in the region and additional construction will further reduce that potential. Since the implementation of IOP in August 2002, there have been four overflow events at the S-332B detention area (two events in 2003 and two events in 2005), but none of the events were considered significant in terms of phosphorus loading.

Areas of Controversy and Unresolved Issues. Few issues remain unresolved with various commenting agencies and other non-governmental groups regarding the proposed project. Potential impacts to tree islands have been minimized to the greatest practicable extent, as have potential water quality impacts due to releases entering ENP. Flooding impacts to residential and agricultural lands above previous levels have not occurred and are not likely to occur in the future with the recommended alternative.

Comments were received from a number of stakeholders regarding the use of the South Florida Water Management Model (SFWMM) for the hydrologic analysis, which uses 2-mile-square grids. This model does not allow for a detailed assessment of small, localized areas that may be affected by the project. However, no better model was available for use during the time frame of development of this project. The Corps is working with the other agencies to implement models that are capable of the resolution appropriate for site-specific analysis. In addition, actual hydrologic data collected during IOP implementation have confirmed the previous modeling predictions.

Pre-storm/storm/storm recovery operations have accounted for only 4% of the total time from IOP implementation in 2002 through 2005 (Appendix C). Initiation of these operations depends on a number of conditions that are determined on a case-by-case basis. The antecedent conditions that trigger storm-related operations include, but are not limited to, pending rainfall events, groundwater table elevation, and canal elevations at the time of the pending rainfall event.

Water managers from the Corps and SFWMD currently coordinate operations on a daily basis or more frequently. In addition, the Corps coordinates as needed with other parties that may be affected by operational decisions. The water managers use actual real-time hydrologic data and weather forecasts to determine appropriate operations.

The U.S. Army Corps of Engineers, Jacksonville District uses the Corps-wide standard software and database structure for real-time water control developed by the Hydrologic Engineering Center (HEC) in Davis, California. Time series hydrometeorologic data are stored, retrieved, and displayed using HEC Data Storage System (DSS) databases and programs.

The Jacksonville District receives data from data collection platforms (DCPs). DCPs are devices installed at remote gauging stations that measure real-time data including surface and ground water elevations, stream stages, reservoir elevations, cumulative precipitation, wind speed and direction, and barometric pressure. Data are transmitted from the DCP via Geostationary Operational Environmental Satellite (GOES) to an earth downlink receiver operated by NOAA/NESDIS in Wallops Island, Virginia.

Automated timed processes also provide provisional near-real-time data needed for operations. Additional data are received through an interagency data exchange program between SFWMD, St. Johns River Water Management District (SJRWMD), Southwest Florida Water Management District (SWFWMD), United States Geological Survey (USGS) and ENP.

A direct link to the National Weather Service, Southeast River Forecast Center is maintained to provide real-time text and graphics products generated by National Weather Service offices. Information includes weather and flood forecasts and warnings, tropical storm information, NEXRAD radar rainfall, graphical weather maps, and more. Selected products are disseminated to area offices in Clewiston, Florida and San Juan, Puerto Rico and posted to internet homepages. Satellite images are also important in making and implementing water management decisions.

A World Wide Web homepage was set up to disseminate hydrologic information and can be accessed at http://www.saj.usace.army.mil/h2o/. In addition, IOP-related documentation can be accessed at http://hpm.saj.usace.army.mil/issueweb/Sparrow/Sparrow_Page.htm.

The Corps continues to monitor the project performance and, after consultation with FWS, ENP and SFWMD will continue to modify operational parameters as required until the full C-111 and MWD Projects are implemented. Monitoring of vegetative communities, water quality, and fish and wildlife communities is ongoing, and any new data will be used to refine water management operations.

This IOP will be superseded after the Record of Decision for the CSOP is signed and when all elements of the MWD Project and the C-111 project are built and capable of operating. Currently, the MWD Project elements are scheduled to be constructed by the end of 2011, and the CSOP Water Control Plan (WCP) is scheduled for Record of Decision in early 2008.

Table ES-1. Alternative 7R Operations.

	No WCA-3A Regulatory Releases to SDCS or Shark River Slough	WCA-3A Regulatory Releases to SDCS
Regulation Schedule	Deviation schedule for WCA-3A (Figure 9), November 2000 WCA-3A interim regulation schedule as specified by USACE including raising Zone D to Zone C from Nov 1 to Feb 11. No deviation proposed in WCA-2A regulation schedule.	Deviation schedule for WCA-3A (Figure 9), November 2000 WCA-3A interim regulation schedule as specified by USACE including raising Zone D to Zone C from Nov 1 to Feb 11. No deviation proposed in WCA-2A regulation schedule.
S-343 A/B and S-344	Closed Nov 1 to July 15 independent of WCA-3A levels.	Closed Nov 1 to July 15 independent of WCA-3A levels.
S-12 A/B/C/D Sandbag culverts under Tram Road by February 1 if necessary.	S-12A closed Nov 1 to Jul 15; S-12B closed Jan 1 to Jul 15; S-12C closed Feb 1 to Jul 15; S-12D no closure dates. Follow WCA-3A regulation schedule after Jul 15. Note: If closure requires regulatory releases to SDCS then switch to operations for regulatory releases to SDCS.	S-12A closed Nov 1 to Jul 15; S-12B closed Jan 1 to Jul 15; S-12C closed Feb 1 to Jul 15; S-12D no closure dates. Follow WCA-3A regulation schedule after Jul 15.
S-333: G-3273 <6.8' NGVD Degrade the lower 4 miles of the L-67 extension	55% of the rainfall plan target to NESRS and 45% through the S-12 structures When WCA-3A is in Zone E1 or above, maximum practicable through S-333 to NESRS per WCA-3A deviation schedule.	55% of the rainfall plan target to NESRS, plus as much of the remaining 45% that the S-12s can't discharge to be passed through S-334 and subject to capacity constraints, which are 1350 cfs at S-333, L-29 maximum stage limit, and canal stage limits downstream of S-334. When WCA-3A is in Zone E1 or above, maximum practicable through S-333 to NESRS per WCA-3A deviation schedule.
S-333: G-3273 >6.8' NGVD	Closed	Match S-333 with S-334 flows.
L-29 constraint	9.0 feet	9.0 feet
S-355A and S-335B	Follow the same constraints as S-333. Open whenever gradient allows southerly flow.	Follow the same constraints as S-333. Open whenever gradient allows southerly flow.
S-337	Water supply	Regulatory releases as per WCA-3A deviation schedule.
S-151	Water supply	Regulatory releases as per WCA-3A deviation schedule.
S-335	Water supply The intent is to limit the volume of water passed at S335 to pre-ISOP conditions and not use S332B, S332C, or S332D or other triggers to pass additional flows. Note: It is recognized that under these conditions operations of S-335 would be infrequent.	When making regulatory releases through S-151, limit S-335 outflows to not exceed inflows from the S-151/S-337 path. Use S-333/S-334 before S-151/S-337/S-335
S-334	Water supply	Pass all or partial S-333 flows depending on stage at G-3273.
S-338	Open 5.8 feet Close 5.5 feet	Open 5.8 feet Close 5.4 feet
G-211 Tailwater constraint 5.3	Open 6.0 feet Close 5.5 feet	Open 5.7 feet Close 5.3 feet

	No WCA-3A Regulatory Releases to SDCS or Shark River Slough	WCA-3A Regulatory Releases to SDCS
S-331	Angel's Criteria – If Angel's well is <5.5 feet, then no limit on S-331 hw level. If Angel's well is 5.5-6.0 feet, S-331 avg. daily is between 5.0 – 4.5 If Angel's well is above 6.0 feet, S-331 avg. daily is between 4.5 – 4.0 until Angel's well is 5.7 feet	Angel's Criteria – If Angel's well is <5.5 feet, then no limit on S-331 hw level. If Angel's well is 5.5-6.0 feet, S-331 avg. daily is between 5.0 – 4.5 If Angel's well is above 6.0 feet, S-331 avg. daily is between 4.5 – 4.0 until Angel's well is 5.7 feet
S-332B Note 1: There will be two 125-cfs pumps and one 75-cfs pump directed to the west seepage reservoir. The remaining two 125-cfs pumps will be directed to the north seepage reservoir. Note 2: A new indicator will be established for Sub-population F. Operations will be modified as necessary to achieve desired habitat conditions consistent with the restoration purposes outlined in the C-111 GRR.	Pumped up to 575 cfs* On 5.0 feet Off 4.7 feet** *Pump to capacity if limiting conditions within the Sparrow habitat are not exceeded. There will be no overflow into ENP when the project (i.e., the S-332B north seepage reservoir and the partial S-332B/S-332C connector) is complete and when it is practical to do the construction necessary to raise the western levee. There may be overflow during emergency events until the project is complete and the western levee is raised. **If, after the first 30 days of operation, there is no observed drawdown at the pump, this stage level will be raised to 4.8 feet	Pumped up to 575 cfs* On 4.8 feet Off 4.5 feet *Pump to capacity if limiting conditions within the Sparrow habitat are not exceeded. There will be no overflow into ENP when the project (i.e., the S-332B north seepage reservoir and the partial S-332B/S-332C connector) is complete and when it is practical to do the construction necessary to raise the western levee. There may be overflow during emergency events until the project is complete and the western levee is raised.
S-332B North Seepage Reservoir	The north reservoir is the new 240-acre reservoir located to the north of the pump station with a weir discharging to the east. Normal operations will be targeted to achieve marsh restoration and phased in over a period of years. However, this provision does not include a requirement to maintain water levels in the reservoirs during dry conditions by bringing water in from outside the drainage basin. This seepage reservoir will have a normal maximum water depth of 2.0 feet. However, if the Corps determines that a flood emergency exists similar to an event like the "No Name" storm, the depth of water would be increased to 4.0 feet when possible.	The north reservoir is the new 240-acre reservoir located to the north of the pump station with a weir discharging to the east. Normal operations will be targeted to achieve marsh restoration and phased in over a period of years. However, this provision does not include a requirement to maintain water levels in the reservoirs during dry conditions by bringing water in from outside the drainage basin. This seepage reservoir will have a normal maximum water depth of 2.0 feet. However, if the Corps determines that a flood emergency exists similar to an event like the "No Name" storm, the depth of water would be increased to 4.0 feet when possible.

	No WCA-3A Regulatory Releases to SDCS or Shark River Slough	WCA-3A Regulatory Releases to SDCS
S-332B West Seepage Reservoir	The west reservoir is the existing 160-acre reservoir and is to the west of the pump station. There will be no overflow into ENP when the project (i.e., the S-332B north seepage reservoir and the partial S-332B/S-332C connector) is complete and when it is practical to do the construction necessary to raise the western levee. There may be overflow during emergency events until the project is complete and the western levee is raised. Normal operations will be targeted to achieve marsh restoration and phased in over a period of years. However, this provision does not include a requirement to maintain water levels in the reservoirs during dry conditions by bringing water in from outside the drainage basin. This seepage reservoir will have a normal maximum water depth of 2.0 feet. However, if the Corps determines that a flood emergency exists similar to an event like the "No Name" storm, the depth of water would be increased to 4.0 feet.	The west reservoir is the existing 160-acre reservoir and is to the west of the pump station. There will be no overflow into the park when the project (i.e., the S-332B north seepage reservoir and the partial S-332B/S-332C connector) is complete and when it is practical to do the construction necessary to raise the western levee. There may be overflow during emergency events until the project is complete and the western levee is raised. Normal operations will be targeted to achieve marsh restoration and phased in over a period of years. However, this provision does not include a requirement to maintain water levels in the reservoirs during dry conditions by bringing water in from outside the drainage basin. This seepage reservoir will have a normal maximum water depth of 2.0 feet. However, if the Corps determines that a flood emergency exists similar to an event like the "No Name" storm, the depth of water would be increased to 4.0 feet.
S332C The S-332C pump capacity is temporary. A new indicator will be established and a new gauge will be installed in the Rocky Glades. Operations will be modified as necessary to achieve desired habitat conditions consistent with the restoration of Taylor Slough based on the C-111 GRR.	Pumped up to 575 cfs* On 5.00 feet Off 4.70 feet** *Pump to capacity unless habitat conditions are not being achieved within the Rocky Glades. There will be no overflow into ENP. **If, after the first 30 days of operation, there is no observed drawdown at the pump, this stage level will be raised to 4.8 feet	Pumped up to 575 cfs* On 4.8 feet Off 4.5 feet *Pump to capacity unless habitat conditions are not being achieved within the Rocky Glades. There will be no overflow into ENP.
S-332C Seepage Reservoir	300 acres with overflow to the east Normal operations will be targeted to achieve marsh restoration and phased in over a period of years. However, this provision does not include a requirement to maintain water levels in the reservoirs during dry conditions by bringing water in from outside the drainage basin. This seepage reservoir will have a normal maximum water depth of 2.0 feet. However, if the Corps determines that a flood emergency exists similar to an event like the "No Name" storm, the depth of water would be increased to 4.0 feet.	300 acres with overflow to the east Normal operations will be targeted to achieve marsh restoration and phased in over a period of years. However, this provision does not include a requirement to maintain water levels in the reservoirs during dry conditions by bringing water in from outside the drainage basin. This seepage reservoir will have a normal maximum water depth of 2.0 feet. However, if the Corps determines that a flood emergency exists similar to an event like the "No Name" storm, the depth of water would be increased to 4.0 feet.

	No WCA-3A Regulatory Releases to SDCS or Shark River Slough	WCA-3A Regulatory Releases to SDCS
S-332B/S-332C Connector	141 acres partial 206 acres full 1,262 acres the land swap Normal operations will be targeted to achieve marsh restoration and phased in over a period of years. However, this provision does not include a requirement to maintain water levels in the reservoirs during dry conditions by bringing water in from outside the drainage basin. This seepage reservoir will have a normal maximum water depth of 2.0 feet. However, if the Corps determines that a flood emergency exists similar to an event like the "No Name" storm, the water depth would be increased to 4.0 feet The Corps, FWS, ENP, and SFWMD will jointly develop a rule for emergency operations that is consistent with C-111 project purposes before the land swap B/C connector is used.	141 acres partial 206 acres full 1,262 acres Normal operations will be targeted to achieve marsh restoration and phased in over a period of years. However, this provision does not include a requirement to maintain water levels in the reservoirs during dry conditions by bringing water in from outside the drainage basin. This seepage reservoir will have a normal maximum water depth of 2.0 feet. However, if the Corps determines that a flood emergency exists similar to an event like the "No Name" storm, the water depth would be increased to 4.0 feet. The Corps, FWS, ENP, and SFWMD will jointly develop a rule for emergency operations that is consistent with C-111 project purposes before the land swap B/C connector is used.
S-332D	Pumped up to 500 cfs from Jul 16 (or the end of the breeding season, as confirmed by FWS) to Nov 31; 325 cfs from Dec 1 to Jan 31; and 165 cfs* from Feb 1 to Jul 15. Meet Taylor Slough Rainfall formula consistent with marsh restoration (No L-31W constraint) On 4.85 feet Off 4.65 feet *New information will be sought to evaluate the feasibility of modifying the 165 cfs constraint	Pumped up to 500 cfs from Jul 16 (or the end of the breeding season, as confirmed by FWS) to Nov 31; 325 cfs from Dec 1 to Jan 31; and 165 cfs* from Feb 1 to Jul 15. Meet Taylor Slough Rainfall formula consistent with marsh restoration (No L-31W constraint) On 4.7 feet Off 4.5 feet *New information will be sought to evaluate the feasibility of modifying the 165 cfs constraint
Frog Pond Seepage Reservoir	810 acres with overflow into Taylor Slough Normal operations will be targeted to achieve marsh restoration and phased in over a period of years. However, this provision does not include a requirement to maintain water levels in the reservoirs during dry conditions by bringing water in from outside the drainage basin. This seepage reservoir will have a normal maximum water depth of 2.0 feet. However, if Corps determines that a flood emergency exists similar to an event like the "No Name" storm, the depth of water would be increased to a maximum of 4.0 feet. However, a depth of 4.0 feet in the Frog Pond is not possible at this time due to the constraint of the S-332D pump station outlet elevation.	810 acres with overflow into Taylor Slough Normal operations will be targeted to achieve marsh restoration and phased in over a period of years. However, this provision does not include a requirement to maintain water levels in the reservoirs during dry conditions by bringing water in from outside the drainage basin. This seepage reservoir will have a normal maximum water depth of 2.0 feet. However, if Corps determines a flood emergency exists similar to an event like the "No Name" storm, the depth of water would be increased to a maximum of 4.0 feet. However, a depth of 4.0 feet in the Frog Pond is not possible at this time due to the constraint of the S-332D pump station outlet elevation.
S-332	Closed	Closed

	No WCA-3A Regulatory Releases to SDCS or Shark River Slough	WCA-3A Regulatory Releases to SDCS
S-175	Closed	Closed
S-194	Open 5.5 feet Close 4.8 feet	Operated to maximize flood control discharges to coast Open 4.9 feet Close 4.5 feet
S-196	Open 5.5 feet Close 4.8 feet	Operated to maximize flood control discharges to coast Open 4.9 feet Close 4.5 feet
S-176	Open 5.0 feet Close 4.75 feet	Open 4.9 feet Close 4.7 feet
S-177	Open 4.2 feet (see S-197 open) Close 3.6 feet	Open 4.2 feet (see S-197 open) Close 3.6 feet
S-18C	Open 2.6 feet Close 2.3 feet	Open 2.25 feet Close 2.00 feet
S-197	If S-177 headwater is greater than 4.1 feet or S-18C headwater is greater than 2.8 feet, open 3 culverts. If S-177 headwater is greater than 4.2 feet for 24 hours or S-18C headwater is greater than 3.1 feet, open 7 culverts. If S-177 headwater is greater than 4.3 feet or S-18C headwater is greater than 3.3 feet, open 13 culverts. Close gates when all the following conditions are met: 1. S-176 headwater is less than 5.2 feet and S-177 headwater is less than 4.2 feet 2. Storm has moved away from the basin 3. After Conditions 1 and 2 are met, keep the number of S-197 culverts open necessary only to match residual flow through S-176. All culverts should be closed if S-177 headwater is less than 4.1 feet after all conditions are satisfied.	If S-177 headwater is greater than 4.1 feet or S-18C headwater is greater than 2.8 feet, open 3 culverts. If S-177 headwater is greater than 4.2 feet for 24 hours or S-18C headwater is greater than 3.1 feet, open 7 culverts. If S-177 headwater is greater than 4.3 feet or S-18C headwater is greater than 3.3 feet, open 13 culverts. Close gates when all the following conditions are met: 1. S-176 headwater is less than 5.2 feet and S-177 headwater is less than 4.2 feet 2. Storm has moved away from the basin 3. After Conditions 1 and 2 are met, keep the number of S-197 culverts open necessary only to match residual flow through S-176. All culverts should be closed if S-177 headwater is less than 4.1 feet after all conditions are satisfied.
S-356	When conditions permit (i.e., G-3273 and L-29 constraints), discharges from S-356 will go into L-29. Pumping will be limited to the amount of seepage into L-31N in the reach between S-335 and G-211. A technical team will evaluate pumping limits and operations. The pumps will be operated accordingly.	When conditions permit (i.e., no S-334 regulatory releases and G-3273 and L-29 constraints), discharges from S-356 will go into L-29. Pumping will be limited to the amount of seepage into L-31N in the reach between S-335 and G-211. A technical team will evaluate pumping limits and operations. The pumps will be operated accordingly.

Note: Pre-storm drawdown will be the same as in the October 01 SDEIS with the additional language.

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

Note: The Chairman of the Miccosukee Tribe of Indians of South Florida or his designated representatives will monitor the conditions in WCA-3A and other tribal lands and predicted rainfall. If the Tribe determines these conditions indicate jeopardy to the health or safety of the Tribe, the Chairman will make a recommendation to the Corps to change the operations of the S-12 structures or other parts of the system. The Corps will review the data and advise appropriate agencies of the conditions, and the District Commander will personally consult with the Chairman prior to making a decision whether to implement changes to the S-12 operations.

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TABLE OF CONTENTS

APPENDICES

LIST OF FIGURES

(Figures are located at the end of the document)

LIST OF TABLES

Page

LIST OF ACRONYMS

BMP	Best Management Practices
BO	Biological Opinion
C-x	Canal
C&SF	Central and Southern Florida Project
CAR	Coordination Act Report
CEQ	Council on Environmental Quality
cfs	Cubic Feet per Second
Corps	U.S. Army Corps of Engineers (see also USACE)
CSSS	Cape Sable Seaside Sparrow
CSOP	Combined Structural and Operational Plan
DEIS	Draft Environmental Impact Statement
DERM	Department of Environmental Resources Management
DOI	U.S. Department of the Interior
DSEIS	Draft Supplemental Environmental Impact Statement
EA	Environmental Assessment
EAA	Everglades Agricultural Area
EIS	Environmental Impact Statement
ENP	Everglades National Park
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FDACS	Florida Department of Agriculture and Consumer Services
FDEP	Florida Department of Environmental Protection
FDOT	Florida Department of Transportation
FEIS	Final Environmental Impact Statement
FFWCC	Florida Fish and Wildlife Conservation Commission
FONSI	Finding of No Significant Impact
FSEIS	Final Supplemental Environmental Impact Statement
FWS	U.S. Fish and Wildlife Service
G-x	Gauging Station or Culvert Structure
GDM	General Design Memorandum
GRR	General Re-evaluation Report
HTRW	Hazardous, Toxic, and Radioactive Waste
IECR	Institute for Environmental Conflict Resolution
IOP	Interim Operational Plan
ISOP	Interim Structural and Operational Plan
L-x	Levee
LEC	Lower East Coast
MWD	Modified Water Deliveries (to ENP)
NEPA	National Environmental Policy Act
NESRS	Northeast Shark River Slough
NGVD	National Geodetic Vertical Datum
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPS	National Park Service
PL	Public Law
ROD	Record of Decision
RPA	Reasonable and Prudent Alternative
S-x	Pump Station, Spillway, or Culvert
SDCS	South Dade Conveyance System (ENP)
SDEIS	Supplemental Draft Environmental Impact Statement
SFWMD	South Florida Water Management District
SFWMM	South Florida Water Management Model
SMA	Square Mile Area
SRS	Shark River Slough
STA	Stormwater Treatment Area
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
WCA	Water Conservation Area
WCP	Water Control Plan
WQ	Water Quality
WQC	Water Quality Certification
WSRS	Western Shark River Slough

1.0 PURPOSE AND NEED FOR THE CONSIDERED ACTION

1.1 Project Authorization

A minimum schedule of water deliveries from the Central and Southern Florida (C&SF) Project to the Everglades National Park (ENP) was authorized by Congress in 1969 in Public Law (PL) 91-282. Section 1302 of the Supplemental Appropriations Act of 1984 (PL 98-181), passed in December 1983, authorized the U.S. Army Corps of Engineers (Corps), with the concurrence of the National Park Service (NPS) and the South Florida Water Management District (SFWMD), to deviate from the minimum delivery schedule for 2 years in order to conduct an Experimental Program of water deliveries to improve conditions within the ENP. Section 107 of PL 102-104 amended PL 98-181 to allow continuation of the Experimental Program until modifications to the C&SF Project authorized by Section 104 of the ENP Protection and Expansion Act of 1989 (PL 101-229) were completed and implemented. PL 101-229 eventually led to the Modified Water Deliveries (MWD) Report and project that was authorized by PL 101-229 in 1989 (USACE 1992). The last feature of the MWD Project (Tamiami Trail) is currently scheduled to be completed in 2011, and will provide for increased water deliveries to the park through a route that more closely approximates the original historic flow-way down the center of Northeast Shark River Slough (NESRS).

The Modified Water Deliveries to Everglades National Park General Design Memorandum (MWD GDM) and FEIS (Final Environmental Impact Statement) were published in July 1992. The MWD FEIS includes a discussion of the location, capacity, and environmental impacts of the S-356 pump station and degradation of the L-67 levee extension south of Tamiami Trail, along with other recommended features. The Canal-111 (C-111) South Dade County 1994 Integrated General Re-evaluation Report (GRR) and EIS was published in May 1994. This report described a conceptual plan for five pump stations and levee-bounded retention/detention areas to be built west of the L-31N canal between the 8.5 Square Mile Area (SMA) and the Frog Pond to control seepage out of Everglades National Park while providing flood mitigation to agricultural lands east of C-111. The original and current configuration of these structural features is further discussed in the description of IOP Alternative 7R.

Test Iteration 7 of the Experimental Program of Modified Water Deliveries to ENP [herein referenced as the 1995 Base (95Base)] was initiated in October 1995 (USACE 1995). In February 1999, the U.S. Fish and Wildlife Service (FWS) issued a Final Biological Opinion (BO) under provisions of the Endangered Species Act (ESA), which concluded that Test 7, Phase I was jeopardizing the continued existence of the Cape Sable seaside sparrow (CSSS). They further concluded that ultimate protection for the species would be achieved by implementing the MWD Project (PL 101-229) as quickly as possible. In the opinion of FWS, the FWS BO presented a Reasonable and Prudent Alternative (RPA) to Test 7, Phase I of the Experimental Program that would avoid jeopardizing the CSSS during the interim period leading up to completion of the MWD Project. The FWS RPA recommended that certain hydrologic conditions be maintained in the sparrow's breeding habitat to avoid jeopardizing

the continued existence of the species. In January 2000, the Experimental Program was terminated, and in March 2000, Test 7, Phase I was replaced by the Interim Structural and Operational Plan (ISOP) (USACE 2000). The ISOP was designed to meet the conditions of the FWS RPA included in the FWS BO from March 2000 until implementation of the Interim Operational Plan (IOP) in 2002. The Record of Decision (ROD) for IOP was signed in July 2002, and IOP was implemented to continue FWS RPA protective measures for the CSSS until implementation of the Combined Structural and Operational Plan (CSOP). Because of the need to have an operational plan in place prior to the CSSS breeding season, the IOP EIS and ROD were finalized prior to completion of modeling for Alternative 7R. Pursuant to a March 14, 2006 order by the United States District Court for the Southern District of Florida, the Corps is now supplementing its 2002 IOP EIS (Appendix A).

1.2 Project Location

The C&SF system-wide project is located in South Florida and includes portions of several counties as well as portions of the ENP, Big Cypress National Preserve, and adjacent areas (Figure 1). The Corps' June 1992 General Design Memorandum (GDM) titled "Modified Water Deliveries to ENP" defines the project boundary as Shark River Slough and that portion of the C&SF Project north of S-331 to include Water Conservation Area 3 (WCA 3). The major project components of the MWD and C-111 Projects are shown in Figure 2.

1.3 Project Purpose

On February 19, 1999, FWS issued a Final FWS BO for the MWD Project, Experimental Water Deliveries Program, and C-111 Project under provisions of the Endangered Species Act of 1973, as amended. The FWS BO concluded that continuation of Test 7, Phase I operations would cause adverse modification of CSSS critical habitat and would jeopardize the continued existence of the CSSS. Currently, six such CSSS population clusters are known and are distributed within the southernmost portion of the C&SF Project area (Figure 3). The operating criteria for Test 7 were defined in a concurrency agreement between the Corps, ENP, and SFWMD in October 1995 (Figure 4; Table 2.1). Test 7 was to be implemented in two phases. Phase I consisted of operating the structures in place at that time until Phase II structures could be completed. The ultimate goal of Test 7 was to improve the timing, volume, and location of water deliveries to ENP to more closely reflect natural pre-development flows. The FWS BO also concluded that ultimate protection for the CSSS would be achieved by the rapid completion and implementation of the MWD Project. ISOP was designed to take the place of Test 7 until completion and implementation of the IOP. The IOP would avoid jeopardizing the CSSS during the interim period (then anticipated to be 2002 to 2009) leading up to full MWD implementation now expected to be in 2011.

On November 17, 2006, the FWS issued a new BO on IOP. The intent and overall effect of the 2006 BO for the IOP is two-fold: (1) it supersedes the original 1999 final BO for the Corps' Modified Water Deliveries to Everglades National Park project, the Experimental Water Deliveries Program, and the Canal 111 project, and (2) it also supersedes the 2002 amended final BO for the Corps' IOP for protection of the Cape Sable seaside sparrow.

In the opinion of FWS, the FWS 1999 BO presents a RPA to the Experimental Program that would avoid jeopardizing the CSSS. The FWS RPA recommends that the following hydrological conditions be met for protection of the CSSS: (1) A minimum of 60 consecutive days of water levels at or below 6.0 feet NGVD at gauge NP 205 between March 1 and July 15; (2) Ensure that 30%, 45%, and 60% of required regulatory releases crossing Tamiami Trail enter ENP east of L-67 extension, or produce hydroperiods and water levels in the vicinity of subpopulations C, E, and F that meet or exceed those produced by the 30%, 45%, and 60% targets; and (3) Produce hydroperiods and water levels in the vicinity of subpopulations C, E, and F that equal or exceed conditions that would be produced by implementing the exact provisions of Test 7, Phase II operations (USACE 1995). During implementation of the ISOP, the Corps received confirmation from FWS that producing the hydrologic equivalent of the 30%, 45%, and 60% conditions, as opposed to the actual release percentages, would also meet the FWS RPA conditions. Alternative 7R, which was implemented, allows the Corps to meet the FWS RPA conditions and minimize impacts to other natural and human resources, while managing the system for purposes authorized under the C&SF Project.

1.4 Related Environmental Documents

A number of actions relevant to the proposed action have been implemented since the 1983 Experimental Program was authorized. The following list identifies milestones leading up to the proposed action. Some of the key environmental documents relevant to the proposed action are the Final ISOP EA, Final SEIS on the 8.5 SMA, and Test 7 Summary. The Final Environmental Assessment (EA) for the ISOP was issued in March 2000. The Corps is currently operating under the IOP. A critical component to implementing the actions recommended in the FWS BO is the protection of the 8.5 SMA, a residential area located to the east of NESRS and west of L-31N. A Final SEIS was prepared and coordinated in August 2000 for implementation of a preferred alternative that consists of perimeter and interior levees as well as a seepage canal. A new proposed pump station (S-357) located at the southern terminus of the seepage canal will discharge seepage water into a treatment area located south of Richmond Drive in the C-111 project area. The ROD for the 8.5 SMA SEIS was signed on December 6, 2000. After legislative reconsideration and re-authorization of Alternative 6 for the 8.5 SMA in 2003, a second ROD identifying Alternative 6 as the selected plan was signed in 2003. Flood mitigation features of the 8.5 SMA are under construction and are expected to be complete in 2007.

As part of the interagency agreement that accompanied approval of Test Iteration 7 of the Experimental Program of Water Deliveries to ENP, the Corps participated in a monitoring program to determine the ecological and hydrologic benefits of the program. The monitoring program evaluated changes in hydrologic conditions beginning in November 1995 through May 2000. In addition, ecological factors that included freshwater fish and macroinvertebrates, mangrove resident fish, wading birds, CSSS, and American crocodile were monitored to determine the effects of the Test 7 Experimental Program on natural resources in the ENP.

At the December 17, 1999 emergency meeting of the SFWMD Governing Board, the Corps presented the ISOP, which was prepared to modify hydrologic conditions in ENP to avoid jeopardizing the CSSS. In a letter to the Corps dated January 20, 2000, SFWMD stated:

"The ISOP explicitly represents a departure from Test Iteration 7 of the Experimental Program of Water Deliveries to Everglades National Park operating criteria: consequently, the three-party concurrency agreement established for Test Iteration 7 cannot adequately facilitate implementation of the ISOP. Based upon your briefing that the requirements of the biological opinion for the CSSS now supersede the management objectives of the Experimental Program, we realize the Experimental Program has been effectively terminated."

Date	Action
1983	Authorization of the Experimental Program
1989	ENP Protection and Expansion Act of 1989
1990	Draft General Design Memorandum (GDM) on Modified Water Deliveries
1990	Biological Opinion on Modified Water Deliveries
1992	Final GDM on Modified Water Deliveries
1993	Implement Test 6 of the Experimental Program
1994	C-111 General Reevaluation Report
1995	Biological Opinion Test 6, Experimental Program
1995	Extension of Test 6
1995	Implement Test 7, Phase I of the Experimental Program
1995	Initiate Test 7 Hydrologic and Ecological Monitoring
1997	FWS Request Corps to Reinitiate Section 7 Consultation
1998	Implement 1998 Emergency Deviation from Test 7, Phase I
1999	BO on the Experimental Program, Modified Water Deliveries, and C-111 Project
1999	Implement Emergency Deviation from Test 7, Phase I
2000	Implement ISOP 2000 Emergency Deviation
2000	8.5 SMA Plan Final SEIS and ROD
2001	Completion of Test 7 Hydrologic and Ecological Monitoring Report
2001	Implementation of ISOP 2001 Emergency Deviation
2001	Draft EIS for the IOP for Protection of the Cape Sable Seaside Sparrow
2001	Supplemental Draft for the IOP for Protection of the Cape Sable Seaside Sparrow
2002	Amended BO on IOP
2002	Final EIS for the IOP for Protection of the Cape Sable Seaside Sparrow
2002	ROD for the IOP for Protection of the Cape Sable Seaside Sparrow
2003	8.5 SMA Plan 2nd ROD for Alt 6D
2005	Final Revised GRR and SEIS for Tamiami Trail Modifications
2006	Draft SEIS for the IOP for Protection of the Cape Sable Seaside Sparrow
2006	New BO on IOP

At that point, Test Iteration 7 of the Experimental Program was terminated and replaced by the ISOP. An EA was prepared for ISOP 2000, which provided a plan for operations to meet the requirements of the BO during 2000. ISOP 2001 provided for operations of water deliveries to ENP until it was replaced in August 2002.

The Corps issued a Draft EIS for the IOP for the protection of the CSSS in February 2001, which assessed six alternatives. Due to the number of issues that were still unresolved after public coordination of the DEIS, the Corps was directed by the President's Council on Environmental Quality (CEQ) to work collaboratively with the various agencies to formulate a consensus plan that would meet the BO requirements while satisfying other authorized C&SF Project purposes. At the suggestion of the CEQ, the Corps engaged the services of the U.S. Institute for Environmental Conflict Resolution (IECR) to facilitate the development of an improved plan to address FWS concerns. A number of facilitated meetings and teleconferences were held between FWS, ENP, and SFWMD from May through August 2001 to resolve issues regarding the IOP. As a result of this process, an additional alternative (Alternative 7) was developed for review under the NEPA process, and a Supplemental DEIS was issued in October 2001.

During the review process and based on letters from various stakeholders, it was decided to further develop Alternative 7 to provide additional flood control capacity because it appeared that Alternative 7 might result in an increased risk of flooding in agricultural areas located east of the L-31 levee in comparison to present conditions. The Corps, in consultation with FWS, ENP, and SFWMD, determined that construction of previously authorized components of the MWD and C-111 projects would provide flexibility to the system operations to maintain current flood protection capacity, although modeling results for the modified Alternative 7 were not complete, and the preferred alternative evaluated in the Supplemental DEIS, Alternative 7, was adjusted to utilize these components. The modified alternative, Alternative 7R was identified as the recommended plan in the Final EIS. A ROD was signed in July 2002 selecting Alternative 7R as the IOP, which was implemented in August 2002.

After Alternative 7R was selected in 2002, the Miccosukee Tribe filed a lawsuit challenging the Corps decision to implement IOP alleging violations of NEPA, ESA, the Administrative Procedures Act (APA), the Fifth Amendment, federal common law (nuisance), the Indian trust doctrine, the Federal Advisory Committee Act and also alleging improper delegation of agency authority. Among other objections the Tribe noted that no model runs for Alternative 7R were available at the time Alternative 7R was recommended in the FEIS, or at the time the ROD was signed. The Tribe also objected to incorporation of elements of the C-111 and MWD Projects without a full description of these structural elements as constructed and the impacts of their construction. The Court ruled in favor of the Corps on the ESA, APA, and FACA claims but against the Corps with regard to NEPA. While the court did not enjoin the Corps from implementing Alternative 7R, it did order the Corps to supplement its NEPA analysis of Alternative 7R by May 15, 2006, but granted an extension until September 18, and subsequently, December 22, 2006.

A Notice of Intent (NOI) to prepare a Supplemental Draft Environmental Impact Statement (SDEIS) for the IOP was published in the Federal Register (71 Fed. Reg. 26478, May 5,

2006). A Scoping Letter was issued to various stakeholders and interested parties on May 10, 2006 and comments were received through June 10, 2006. Four comments were received from private individuals during scoping. Copies of the scoping documents, comment letters, and mailing list are included in Appendix B.

A Draft Supplemental EIS (DSEIS) was prepared, and a Notice of Availability (NOA) was published in the Federal Register (71, Fed. Reg. 40096, July 3, 2006). The DSEIS was distributed to the public and comments were received until August 17, 2006. A copy of the comment letters and the Corps' response to the comments are included in Appendix I. The Corps re-initiated formal consultation with FWS regarding the CSSS, Everglade snail kite, and wood stork on July 10, 2006, and FWS issued a BO on November 17, 2006.

1.5 Decision to be Made

The Corps is supplementing its previous analysis of Alternative 7R and considering whether to continue operations under Alternative 7R or to implement another alternative.

2.0 ALTERNATIVES

2.1 Background

Under the SEIS, the Corps is considering the previously identified alternatives which were developed by the Corps with input from FWS, Florida Fish and Wildlife Conservation Commission (FFWCC), ENP, SFWMD, Miami-Dade Department of Environmental Resource Management (DERM), Florida Department of Environmental Protection (FDEP), and Florida Department of Agriculture and Consumer Services (FDACS).

RPA Hydrologic Condition Requirements

As discussed in the 2002 EIS, the FWS BO has specific RPA requirements for western and eastern habitats of the CSSS. For the western habitat, it stated that the Corps must prevent water levels at NP 205 from exceeding 6.0 feet NGVD for a minimum of 60 consecutive days between March 1 and July 15 during 80% of all years. For the eastern habitat, the BO requires that the Corps must implement actions that would produce hydroperiods and water levels in the vicinity of CSSS subpopulations C, E, and F equal to or greater than those that would be produced by implementing the exact provisions of Test 7, Phase II. In addition, it specified that the Corps must provide that at least 30%, 45%, and 60% of all regulatory water releases crossing Tamiami Trail enter ENP east of the L-67 extension in 2000, 2001, and 2002, respectively.

With these RPA requirements, the Corps developed RPA100, RPA101, and RPA102 model runs to represent the conditions required by the BO for 2000, 2001, and 2002. These RPAs were replaced by RPA00, RPA01, and RPA02 because of improved operations of S-12 structures, the use of S-355A&B, and adjustment to WCA-2 and WCA-3A regulation schedules. Operational assumptions used in the modeling of these RPAs are listed in Table 2.2.

2.2 Description of Alternatives

Six plans were evaluated in the 2002 EIS, and Alternative 7R was selected. Alternative 7R was an improvement of Alternative 7 which included operation of components of previously approved C-111 and MWD projects to provide additional operational flexibility and was included in the FEIS in 2002. In addition, descriptions and operational components of the ISOP 2000 and ISOP 2001 plans were provided for comparison in the SDEIS (Tables 2.2 and 2.3, respectively). The ISOP 2000 and ISOP 2001 were included to provide a basis of comparison as well as to include an analysis of these plans in the EIS.

Other alternatives have been suggested including returning to Test 7 operations and starting a captive breeding program for the CSSS. These alternatives were considered early in the IOP development process but not supported by the Department of the Interior, the agency with primary responsibility for endangered land species. As determined by the FWS, a return to

Test 7 operations would not be legal as specified in the FWS 1999 BO. A captive breeding program, as suggested by Miccosukee Tribe consultant Will Post, is not supported by other scientists and experts on the CSSS. The Corps notes that captive breeding efforts failed to save the extinct dusky seaside sparrow in spite of heavy investment of resources.

2.2.1 Alternative 1

Alternative 1 (also known as ISOP9dR) represents the model run for ISOP 2001 (Figure 5). The goal of Alternative 1 is to meet the RPA requirements for 2001. The plan is to provide water levels at NP-205 below 6.0 feet NGVD for a minimum of 60 consecutive days between March 1 and July 15, and, at the same time, produce hydrologic equivalence to the RPA hydroperiods that would be produced by implementing Test 7, Phase II in SDCS and discharging increasing percentages of all regulatory releases crossing Tamiami Trail to enter ENP east of the L-67 extension. Operational assumptions used in the modeling of Alternative 1 are listed in Table 2.4. Modeling results indicate that Alternative 1 meets and exceeds the RPA hydroperiod requirements for the eastern sparrow habitat, specifically under the hydroperiod frequencies performance measure. The operational plan for Alternative 1 is described as follows.

In Alternative 1, basic water management operations for flood control and water supply in SDCS have not changed significantly from 95Base (Test 7, Phase I). Canal levels in the northern reach of L-31N from S-331 up to S-334, L-30 from S-335 to S-337, and C-4 are unaffected by operational changes in this alternative. The new components that set Alternative 1 apart from 95Base (Test 7, Phase I) are the regulation schedule deviation for WCA-3A; closure dates for the S-12A, S-12B, S-12C, S-343A, S-343B, and S-344; two new pump stations, S-332B and S-332D; and lower canal levels along the L-31N reach between S-331 and S-176.

To meet the requirement for ensuring that water level stays at or below 6.0 feet NGVD at gauge NP-205 for at least 60 consecutive days, the Corps determined through regional modeling that staggered closures at S-343A and S-343B; S-344; and S-12A, S-12B, and S-12C from November 1 through February 1 and returning these structures to normal operation after July 15 would maximize the potential for nesting success for sparrow subpopulation A. Gauge NP-205 is located in the western marl prairies and is the key station for monitoring water levels in the WSRS.

To achieve the hydrologic equivalence to the hydroperiods required by the FWS BO for the eastern marl prairies (sparrow subpopulation C, E, and F habitats) and at the same time, maintain C&SF Project goals and responsibilities, the Corps proposed to route regulatory releases from WCA-3A, that normally would be discharged directly through the western structures, through S-333 and S-334 structures, down L-31N canal, and into a 160-acre seepage reservoir through S-332B pump. According to the regional modeling using the South Florida Water Management Model (SFWMM), when capacity is available, S-332B must be pumped up to 325 cfs in order to meet the RPA requirements. The routing of WCA-3A waters through SDCS would require the lowering of L-31N canal from S-331 to S-176 and maximizing excess discharges to tide.

2.2.2 Alternative 2

Alternative 2 (Table 2.5) was developed to further improve conditions in the eastern sparrow populations compared to Alternative 1, while also improving environmental conditions within other affected regions of the project area. It was decided that IOP alternatives must be formulated in two phases: Phase 1 of Alternative 2 would be in effect prior to completion of the 8.5 SMA Project, and Phase 2 would take effect once construction of the 8.5 SMA was completed. For the modeling of the IOP, it was assumed that as a result of the implementation of the 8.5 SMA solution, the G-3273 trigger was no longer in effect.

Phase 1 of Alternative 2 (IOP 2b) differs from Alternative 1 in the following ways: IOP 2b includes a deviation to the WCA-2A regulation schedule; the S-343 A and B and S-344 structures would close 2 months later on January 1; S-12A would close 1 month later on December 1; S-12D would close from February 1 to July 15; the schedule for S-333 would vary; and the pumping schedules for S-332B and S-332D would change.

Phase 2 of Alternative 2 (IOP 2) differs from Alternative 1 by allowing S-333 to deliver water to NESRS via L-29 at a rate up to its structural capacity when the G-3273 gauge is higher than 6.8 feet, closing the S-334 structure during regulatory releases from S-333, and incorporating the same changes as Phase 1 (IOP 2b) at S-332B and S-176.

2.2.3 Alternative 3

Alternative 3 (Table 2.6) also has two phases for the same purpose as Alternative 2, with Phase 1 being implemented prior to the 8.5 SMA Project completion and Phase 2 being implemented after completion of the 8.5 SMA Project.

Phase 1 of Alternative 3 (IOP 2a) is similar to Phase 2 of Alternative 2 (IOP 2) with one exception: S-333 would be closed when the G-3273 gauge is higher than 6.8 feet. Phase 2 of Alternative 3 (IOP 2) is the same as Phase 2 for Alternative 2.

2.2.4 Alternative 4

Alternative 4 (Table 2.7) (IOP 3 and IOP 3a) is also implemented in two phases and is similar to Alternative 2 (IOP 2 and IOP 2a) with the exception that the S-12 structures A, B, C, and D and the S-343A and B, and S-344 structures would be closed earlier in the year, from November 1 through July 15. IOP 3a would be implemented as Phase 1, and IOP 3 would be implemented as Phase 2.

2.2.5 Alternative 5

Alternative 5 (Table 2.8) (IOP 4 and IOP 4a) resembles Alternative 1 to a greater degree than do either Alternative 2 or Alternative 3 since this alternative was developed after ISOP9dR

was produced. Phase 1 of Alternative 5 and Alternative 1 differ only regarding the S-332B pumping schedule and the S-176 schedule. Phase 2 also includes the removal of the G-3273 trigger.

2.2.6 Alternative 6

Alternative 6 (Table 2.9) is identical to Alternative 5 with two exceptions: an additional 215-acre seepage reservoir was added with an emergency overflow weir designed to flow east towards L-31N canal and maximum pumping is limited to 250 cfs at the S-332B pump station (Figure 4). The purpose of adding a new 240-acre reservoir is to minimize direct weir overflow into ENP. By reducing pumping from 325 cfs to 250 cfs, potential weir overflow would be reduced. According to the regional modeling from SFWMM version 3.8, pumping up to 250 cfs at S-332B would still meet and exceed RPA hydroperiod requirements for subpopulations E and F. The size of the first seepage reservoir is approximately 140 acres. Field data suggest that in the dry season, the existing 140-acre seepage reservoir can seep up to 190 cfs, and in the wet season, the seepage rate is reduced to about 120 cfs. Based on these field data and limited and preliminary sub-regional modeling, the combined 355-acre seepage reservoir was projected to be able to seep over 250 cfs of discharge from S-332B without direct weir overflow into the park from normal operations. Once the new seepage reservoir was built, a more accurate rate of seepage would be obtained. The additional seepage reservoir location was north of the current seepage reservoir. It was designed with an overflow weir on the east side to allow for potential overflow back into L-31N canal. Although the existing seepage reservoir could be affected by the combined operation at these two seepage reservoirs, the north-south orientation of the new reservoir would be more conducive to seepage to ENP. Furthermore, the depth of the new reservoir is more than twice that of the existing reservoir. A table comparing SFWMM cell size and the current and proposed seepage reservoirs is shown below.

	Area (acres)
2-mile x 2-mile cell	2,560
1st seepage reservoir	140
2nd seepage reservoir	215

The seepage reservoirs were not modeled explicitly because of the limitation of the SFWMM version 3.8. However the amount of water being delivered to the modeled cell is correct. According to the model algorithm, SFWMM basically spreads inflow from S-332B pump over an entire grid cell. In terms of evaluating long-term hydrologic impacts associated with overland flow, the model is an appropriate tool to use in the determination of water management operations that would produce hydroperiods that would meet the RPA requirements. Modeling results indicate that Alternative 6 would meet and exceed the RPA hydroperiod requirements for the eastern sparrow habitat. Detailed operational assumptions used in the regional water management modeling of Alternative 6 are listed in Table 2.9.

2.2.7 Alternative 7

Alternative 7 (Table 2.10) represents the IOP consensus proposal from the Corps, ENP, USFWS, and SFWMD collaborative process. Its most important feature that sets it apart from other alternatives is the dual mode of water management operations. In addition, Alternative 7 has three structural modifications.

Dual Mode of Operations

The dual mode of operations was derived by recognizing some fundamental operational issues in the plan. When the S-12 discharges are seasonally restricted in order to decrease impacts to western sparrow habitats, the potential exists to increase water levels in WCA-3A. The ISOP addressed this by moving some of the regulatory releases that cannot be passed through S-12D into the SDCS via the L-29 borrow canal rather than directly onto western sparrow habitats. To mitigate for the increased inflow to the SDCS, the ISOP canal stages in the SDCS are lowered relative to Test 7, Phase I of the Experimental Water Deliveries. However, in the ISOP, these mitigation actions are implemented regardless of whether or not flow from WCA-3A is entering the SDCS. According to the Department of the Interior (Coordination Act Report, p.126-129), these continuously lowered canal stages adversely impacted wetlands near L-31N. Alternative 7 addresses this concern by mitigating for the increased flow into the SDCS only when that action is occurring. This operational philosophy results in the operational rule set in Table 2.10.

The first mode of the operation rule set of Alternative 7 is designated as “No WCA-3A regulatory releases to SDCS” operation. During these times, the L-31N canal would be maintained at Test 7, Phase I level when there are no WCA-3A regulatory releases. This operation was proposed to address the concern from the U.S. Department of the Interior (DOI) that maintaining L-31N canal at ISOP level would impact park resources in NESRS.

The second set of operational rules that would apply when water is flowing from WCA-3A down and around the SDCS is called "WCA-3A regulatory releases to SDCS." During this operational phase, levels in L-31N canal would be lowered to minimize potential flood impacts in SDCS and at the same time provide necessary downstream gradient to move some of WCA-3A regulatory releases through S-333/S-334, down through L-31N canal and to the S-332B pump station. The purpose of routing the regulatory releases from WCA-3A to S-332B seepage reservoir is to produce the hydrologic equivalence to the RPA hydroperiods in the habitats of sparrow subpopulations C, E, and F to provide adequate hydration in these habitats until MWD is operational. Because the SFWMM cannot simultaneously simulate two different modes of water management operations that depend on hydrologic conditions in WCA-3A, Alternative 7 was modeled in two separate runs. Hence, the model run simulating the "No WCA-3A regulatory releases to SDCS" is ALT7a and the "WCA-3A regulatory releases to SCDS" is ALT7b.

New Structural Features

The structural modifications in Alternative 7 include degrading the lower 4 miles of the L-67 extension levee and constructing an additional 215-acre seepage reservoir at S-332B.

The degradation of the lower 4 miles of the L-67 extension levee would allow water from NESRS to flow into the northern part of Shark River Slough and the northern habitat area of sparrow subpopulation E. According to the DOI, degrading the lower section of the L-67 extension would enhance hydroperiods in CSSS subpopulation E and water flows and volumes in Shark River Slough and its estuaries. Various lengths of the degradation were proposed and only 2-, 4-, and 6-mile sections were evaluated. Degrading a 4-mile section was selected based on the results of the modeling that show a potential hydroperiod improvement in the western part of NESRS with minimum impact to ground water level in and around 8.5 SMA.

Building an additional seepage reservoir of 215 acres at S-332B would avoid direct overflow into ENP. The current seepage reservoir (in 2002) was about 140 acres and had an average seepage rate of about 120 cfs during the wet season and about 190 cfs during the dry season. Cumulatively, both the existing 140-acre seepage reservoir and the new 215-acre detention (total of 355 acres) are 2.5 times larger than the existing seepage reservoir, and the new seepage reservoir is more than twice as deep as the original reservoir. It is reasonable to estimate that the combined seepage reservoirs of 355 acres would seep at least 250 cfs more than the amount needed to meet the RPA targets without direct weir overflow. In addition, the new seepage reservoir weir would be constructed to overflow to the east, not into the ENP. With the additional seepage reservoir and the reduction of pumping at S-332B from 325 cfs to 250 cfs, the potential for and frequency of weir overflow into the park during normal operations would be significantly reduced. Overflow into ENP under pre-storm/storm/storm recovery operation would depend on several factors whose recurrence frequency cannot be predicted reliably. These factors include but are not limited to:

- Rainfall recurrence probability;
- Antecedent stages in canals;
- Groundwater or surface water levels;
- Antecedent rainfall.

Although the Corps can estimate the recurrence frequency of a given rainfall event based on long-term meteorological records, it cannot predict the other three conditions with confidence. Therefore, it is difficult to project the frequency or duration of such overflow events. However, during the 31-year period of record, there were 44 tropical storms that could have triggered the pre-storm operations, but only if other antecedent conditions were appropriate. The pre-storm operation was not modeled in the regional simulation of Alternatives 7a and 7b, but the modeling results indicate that during the 31-year period of record, the L-31N canal stage above S-174 would exceed 5.1 feet 2% of the time, at which time S-332B would be triggered to pump up to 500 cfs, causing weir overflow into the park.

The current S-333 structure can pass 1,350 cfs, and no modifications to the structure are currently anticipated. During development of Alternative 7 as described in the 2002 FEIS, a modification to the S-333 structure was proposed that would increase the capacity to 2,000 cfs to allow more water into NESRS. Due to the proposed elimination of this station with future restoration measures, the modifications were subsequently removed. The operational constraints are still the 6.8 feet NGVD trigger at G-3273 and 9.0 feet NGVD canal level in L-29. However, the 6.8-foot level at G-3273 tends to override the 9.0-foot canal level in L-29. The highest level reached in the canal was 7.92 feet NGVD on June 20, 2005, caused primarily by unusually excessive rainfall for that time of the year. Detailed operational assumptions used in the water management simulation of Alternatives 7a and 7b are shown in Table 2.10.

As an integral part of IOP Alternative 7, S-335 would continue its primary function as a supplemental water delivery structure with no change in operational triggers from Test 7, Phase I of the Experimental Water Deliveries Program except when making S-151 regulatory releases. This operational decision should be based on first meeting the priority given to S-334 and then matching flow through S-335 with inflows from S-151 and S-337. Stage and flow hydrographs at S-335 for the period of record from January 1984 to June 2001 are shown on page A-93 of the SDEIS Engineering Appendix. From reviewing and analyzing these hydrographs, the interagency team recognized that capacity for flow from S-335 into SDCS has not increased and concluded that any change in capacity would be designated for routing WCA-3A regulatory releases.

2.2.8 Alternative 7R

Because Alternative 7R is the current operational plan, implemented after the ROD was signed in 2002, it is the default No Action alternative. A return to Test 7 operations, as suggested by the Miccosukee Tribe in the past is not an alternative because it would result in jeopardy to the CSSS. Alternative 7R (Figure 6; Table 2.11) evolved to overcome concerns regarding Alternative 7. Alternative 7, while trying to meet environmental objectives, has the primary goal of routing regulatory releases from WCA-3A through SDCS to the sparrow habitats on the eastern side of the ENP. Construction of the S-356 pump station adds flexibility into the IOP operations. The flexibility includes the ability to return ENP seepage back to NESRS, as well as help manage high canal levels. The operation first proposed (and modeled) was turning on the pump when the tailwater stage (i.e., L-31N) reached 5.8 feet, and turning it off at a tailwater elevation of 5.5 feet. The pumping was also limited to periods when the stages at G-3273 were below the flood protection level. Even though the regional modeling for South Florida is limited to a single mode of operation, Alternative 7 had to be simulated in two separate runs to bracket the range of hydrological impacts to WCA, ENP, and SDCS.

As a result of discussions addressing comments received regarding IOP Alternative 7, the agency principals agreed to recommend an action plan that would incorporate adaptive management, planning-to-construction engineering, and flexible water management operations. The key element that would allow this new method of solving problems in South

Florida would require construction of the S-356 pump station (an authorized MWD project) and the S-332C seepage reservoir (authorized C-111 project). The S-356 pump station location was adjusted slightly to minimize wetland impacts and impacts to fiber optic cable in the L-29 levee right-of-way associated with the original location specified in MWD General Design Memorandum. Its primary function in this IOP is to collect seepage in L-31N canal north of G-211 and discharge it into L-29 canal only when G-3273 is below 6.8 feet NGVD. This seepage management plan would reduce flooding impacts to South Dade agricultural and urban areas due to the movement of seepage water from ENP into L-31N canal. In addition, the agricultural stakeholders expressed a desire to continue the use of S-356 when G-3273 is above 6.8 feet NGVD. This poses a problem to the residents of the 8.5 SMA because, when G-3273 is above 6.8 feet NGVD, any additional water to L-29 could adversely affect the area.

Building additional seepage reservoirs (S-332B N, S-332B to S-332D, and Frog Pond) would avoid direct overflow into ENP. The current seepage reservoir (constructed in 2000) was about 140 acres and had an average seepage rate of about 120 cfs during the wet season and about 190 cfs during the dry season. Cumulatively, the new detentions (approximately 3,765 acres) are more than 10 times larger than the previous seepage reservoir. Therefore, the potential for and frequency of weir overflow into ENP during normal operations would be significantly reduced. Overflow into the park under pre-storm/storm/storm recovery operation would depend on several factors whose recurrence frequency cannot be predicted reliably. These factors include but are not limited to:

- Rainfall recurrence probability;
- Antecedent stages in canals;
- Groundwater or surface water levels;
- Antecedent rainfall.

Although the Corps can estimate the recurrence frequency of a given rainfall event based on long-term meteorological records, it cannot predict the other three conditions with confidence. Therefore, it is difficult to project the frequency or duration of such overflow events. During the 31-year period of record, there were 44 tropical storms that could have triggered the pre-storm operations, such as but not limited to high groundwater levels, but only if other antecedent conditions were present. The pre-storm operation was not modeled in the regional simulation of Alternative 7R, but the modeling results indicate that during the 31-year period of record, the L-31N canal stage above S-174 would exceed 5.1 feet 2% of the time, at which time S-332B would be triggered to pump up to 500 cfs, causing weir overflow into the park.

The current S-333 structure design discharge capacity is 1,350 cfs. No modifications to the structure are currently anticipated. During development of Alternative 7R, a modification to the S-333 structure was proposed that would have increased the design discharge capacity to 2,000 cfs to allow more water into NESRS. Due to the proposed elimination of this structure with future restoration measures, the modifications were subsequently removed. The operational constraints are still the 6.8 feet NGVD trigger at G-3273 and 9.0 feet NGVD canal level in L-29. However, the 6.8-foot level at G-3273 tends to override the 9.0-foot canal level in L-29. The highest level reached in the canal was 7.92 feet NGVD on June 20, 2005, caused primarily by unusually excessive rainfall for that time of the year.

As an integral part of IOP Alternative 7R, S-335 would continue its primary function as a supplemental water deliveries structure with no change in operational triggers from Test 7, Phase I of the Experimental Water Deliveries Program except when making S-151 regulatory releases. This operational decision should be based on first meeting the priority given to S-334 and then matching flow through S-335 with inflows from S-151 and S-337. Stage and flow hydrographs at S-335 for period of record from January 1984 to June 2001 are shown on page A-93 of the SDEIS Engineering Appendix. From reviewing and analyzing these hydrographs, the interagency team recognized that capacity for flow from S-335 into SDCS has not increased and concluded that any change in capacity would be designated for routing WCA-3A regulatory releases.

New Structural Features

C-111 Features

The seepage reservoirs (C-111 components) were designed to be pumped to a maximum depth of 2 feet except in flood emergencies, when the depth could be increased to 4 feet. Once complete, there would be no direct overflow to ENP. Normal operations of the S-332B, S-332C, and S-332D pump stations would be targeted to achieve marsh restoration with the proposed east-west gradient once all land acquisition, construction, and testing have been completed and final gradient parameters have been determined.

Construction of the C-111 detention/retention area reservoirs on all available lands that had been acquired for the C-111 Project was accelerated in 2002 to provide for increased capability to maintain flood control in the C-111 basin in conjunction with the operational changes for protection of the CSSS included in Alternative 7R (IOP) (Figure 7). The increased capability is provided by the S-332B and S-332C pump stations and associated seepage reservoirs along the L-31N canal to lower canal and groundwater levels east of the borrow canal. The pump stations draw water out of the canal, thus lowering adjacent groundwater levels. The water is pumped into reservoirs along the eastern boundary of the park. Some of the pumped water would return to the canal, but there is expected to be a net gain in lowering canal stages. During non-storm conditions, the pump stations would be operated at reduced capacity to maintain a water depth in the reservoirs necessary to create a continuous hydraulic ridge along the park boundary for seepage control. This hydraulic ridge concept was developed in the authorized C-111 Project, and use of the C-111 Project features in this manner under Alternative 7R are consistent with the C-111 authorized project design and purposes.

S-332B North Seepage Reservoir. The north reservoir is the new 215-acre reservoir located to the north of the pump station with a weir discharging to the east. Two 125-cfs pumps will be directed into this reservoir. Normal operations will be targeted to achieve marsh restoration over a period of years. However, this provision does not include a requirement to maintain water levels in the reservoirs during dry conditions by bringing water in from outside the drainage basin. This seepage reservoir will have a normal maximum water depth

of 2.0 feet. If the Corps determines that a flood emergency exists similar to an event like the "No Name" storm, the depth of water would be increased to 4.0 feet when possible.

S-332B to S-332D Seepage Reservoir. This reservoir would incorporate the S-332B West Seepage Reservoir and extend south tying into the L-31W levee in the northern part of the Frogpond (1,262 acres). This feature required the Congressional approval of the land swap of lands owned by ENP with the SFWMD. A contingency plan was developed in case the land swap did not happen in time. This contingency plan would use available lands and incrementally build this seepage reservoir.

S-332B West Seepage Reservoir. The west reservoir is the existing 140-acre reservoir and is to the west of the pump station. Two 125-cfs pumps and one 75-cfs pump will be directed into this reservoir. There will be no overflow into the park when the project (i.e., the S-332B north seepage reservoir and the partial S-332B/S-332C connector) is complete and when it is practical to do the construction necessary to raise the western levee. There may be overflow during emergency events until the project is complete and the western levee is raised. Normal operations are the same as with S-332B West.

S-332C Seepage Reservoir. The S-332C Seepage Reservoir is 278 acres with overflow to the east. The S-332C pump capacity is temporary. A new indicator will be established and a new gauge will be installed in the Rocky Glades. Operations will be modified as necessary to achieve desired habitat conditions consistent with the restoration of Taylor Slough based on the C-111 GRR. Normal operations are the same as with S-332B West.

S-332 B/C Partial Connector. The S-332B/C partial connector will consist of 182 acres. Currently, the Corps has constructed 124 acres of a partial offset connector (Figure 7). To-date, real estate issues prevented the entire 182-acre offset connector from being constructed, but issues have since been resolved and construction will be completed in 2008. Normal operations are the same as with S-332B West.

Frog Pond Seepage Reservoir. The Frog Pond Seepage Reservoir is 2,200 acres with overflow into Taylor Slough. The S-332D pump station would be directed into the north end of the Frog Pond reservoir. This station pumps up to 500 cfs from July 16 (or the end of the breeding season, as confirmed by FWS) to November 30; 325 cfs from December 1 to January 31; and 165 cfs* from February 1 to July 15. Discharge is set to meet the Taylor Slough rainfall formula consistent with marsh restoration (No L-31W constraint). The pump triggers are 4.85 feet on, 4.65 feet off. New information will be sought to evaluate the feasibility of modifying the 165-cfs constraint. Normal operations are the same as with S-332B West. This seepage reservoir will have a normal maximum water depth of 2.0 feet. However, if the Corps determines that a flood emergency exists similar to an event like the "No Name" storm, the depth of water would be increased to a maximum of 4.0 feet. A depth of 4.0 feet in the Frog Pond is not possible at this time due to the constraint of the S-332D pump station outlet elevation.

Marsh Operations

One of the operational features developed during the IOP plan formulation process and included in Alternative 7R is what is now referred to as "marsh operations" and defines operating parameters for the S-332B North and West seepage reservoirs, the S-332C seepage reservoir, the S-332B/S-332C Connector, and associated pump stations. This feature was included to achieve a balance between flood control, restoration of marsh habitat in ENP, and meeting the RPA criteria in the FWS B.O. It should be noted that deviations from the 2' default for marsh operations were developed after the IOP was implemented in 2002.

Under the current plan, operation of these reservoirs will be targeted to achieve marsh restoration and will have maximum depths of 2.0 feet. However, if the Corps determines that a flood emergency exists similar to an event like the "No Name storm", the depth of water would be increased to a maximum of 4 feet. The S-332B pump station will pump to capacity (575 cfs) if limiting conditions within the sparrow habitat are not exceeded. Once the S-332B North Seepage Reservoir and S-332B/S-332C Connector were completed, there would be no overflow into the Park.

The Corps considered "marsh operation criteria" to include operation at the 2-foot default reservoir depth, as well as the flexibility to vary from this depth as testing and new parameters are developed by the interagency team. The development and evaluation of new information is intended to assist the Corps and interagency team in determining the marsh operation component of the next operating plan, the Combined Structural and Operational Plan (CSOP).

Staff from ENP initially provided the Corps proposed criteria to be considered for marsh operations. Further evaluation through the interagency CSOP team resulted in necessary refinements to the initially proposed criteria. The tentatively preferred marsh operations developed through the CSOP interagency team relax the IOP's 2-foot maximum depth criteria for the detention areas and raises it up to 2.5 feet. This is in conjunction with proposed operations under normal conditions that allow S-332B and S-332C pump stations to pump into the detention areas based on the gradient and water levels between the marsh in ENP and the detention areas. The target gradient is based on measured water levels ¼ mile and 4 miles from the detention areas. The gradient, or change in water level, should be less than 0.4 feet per mile. Pumping into the detention area can be continued until this gradient is exceeded. At this point, pumping would be reduced to a level that would maintain the target gradient or stages exceed 2.5 feet in the detention areas. The tentatively preferred operations developed in the CSOP process also includes an override for these marsh operations based upon levels in the canal to provide for continued pumping into the detention areas in order to maintain flood control in the developed areas east of the canal and to reduce discharges south through the C-111 into Barnes Sound. The Corps intends to begin field testing these proposed operational criteria to provide the information necessary to extrapolate model output to more accurately reflect actual conditions produced in the system under these operations. The Corps is currently operating the C-111 detention areas at the 2-foot maximum depth and has installed the monitoring gages in the ENP required to test these operations. To monitor marsh effects of stage changes in the detention areas, the Corps, in coordination with other agencies, plans to begin testing at stages varying from the 2-ft default and working towards the operational criteria developed in CSOP while targeting the 0.4 foot per mile gradient between the detention areas and adjacent marsh. This testing will be coordinated and congruent with the

build out of the full detention areas included in Alt7R. Completion of the build out of the C-111 detention areas included in Alt7R is contingent on Congressional funding and is currently scheduled for construction after FY 2008.

"Mod Waters" Features

Two features previously developed as part of the "Mod Waters" project are important components of the IOP plan: the S-356 pump station and degradation of the lower 4 miles of the L-67 extension levee. These components were described in the 1992 GDM for Mod Waters.

Removal of L-67 Extension Levee. The Mod Waters report proposed to degrade a section of the L-67 extension levee to allow free flow of water from WSRS into NESRS. This would restore full interaction between WSRS and NESRS, restoring the area to a more natural state. The lower 4 miles of the L-67 extension were degraded and the resulting fill material was placed in the borrow canal.

Under IOP, the degradation of the lower 4 miles of the L-67 extension levee would allow water from NESRS to flow into the northern part of Shark River Slough and northern habitat area of sparrow subpopulation E. According to DOI, degrading the lower section of the L-67 extension would enhance hydroperiods in CSSS subpopulation E and water flows and volumes in Shark River Slough and the Shark River Slough estuaries. Various lengths of the degradation were proposed and only 2-, 4-, and 6-mile sections were evaluated. Degrading a 4-mile section was selected based on the results of the modeling that show a potential hydroperiod improvement in the western part of NESRS with minimum impact to ground water level in and around the 8.5 SMA.

S-356 Pump Station. The S-356 pump station was designed to pump water from the L-31N canal into the L-29 canal, thereby returning seepage water that would have entered L-31N from park lands west of L-31N from L-29 southward to the flood mitigation area. Higher stages in NESRS would increase seepage into the L-31N canal, adversely affecting flood control in the adjacent basin and downstream. The S-356 pump station was designed to maintain the L-31N canal reach from Tamiami Trail south to the S-331 pump station. S-356 was initially designed to pump up to 988 cfs because it would also have moved increased seepage into the 8.5 SMA area resulting from increased flows to NESRS up L-31N and west into L-29 canal to return this seepage to NESRS. Under the 1992 selected plan, the 1992 Mod Waters GDM visualized utilizing S-356 to draw water pumped from the 8.5 SMA by S-357 into the L-31N canal, from where it could be pumped by S-356 back into the L-29 canal and the NESRS south of Tamiami Trail. After relocation of the 8.5 SMA S-357 pump station to a site south of Richmond Drive, with drainage of 8.5 SMA seepage water to the south, the remaining capacity or need was estimated to be reduced to 500 cfs.

Under IOP, S-356 would collect seepage (primarily from the west - WCA-3B and NESRS) along the reach of the L-31N canal that extends from structures S-335 to G-211, and the L-30 canal (WCA-3B and the Pennsuco Wetlands) by pumping water west into L-29 borrow canal

and NESRS when conditions permit. The groundwater gradient in this area is predominantly from NESRS towards the east. To ensure urban stormwater would not be pulled in from the east (C-4 basin) by the S-356 into ENP, its operation would be limited to times when the G-211, S-336, S-335, etc. are closed. During modeling for IOP, only a capacity of 500 cfs was determined necessary. The function of the S-356 pump station under IOP is consistent with the authorized purpose of managing seepage into the reach of L-31N from Tamiami Trail to the S-331 structure.

S-356 pump station operational guidance is based on the modeling output recommendations. The SFWMM model simulates the collection/return of seepage lost to the east through L-31N by estimating the seepage rate using an empirical relationship based on stage differences across the levee. S-356 pumping rates in the model are based upon this empirical calculation using a daily time step. This type of empirically based seepage calculation cannot be directly translated to operational criteria for the field. Consequently, additional information is necessary to further develop the relationship between the data available for hydrologic parameters and seepage losses, as needed for operational criteria that can be utilized by field personnel. Field tests were identified as an additional tool to assist in the determination of the appropriate pumping rates under various conditions. As additional understanding of the hydrologic system response to S-356 pump operations is developed, operational flexibility will be exercised as needed.

Operational guidance for S-356 will use the recommended plan operational criteria as a starting point, and field tests will be conducted to further define and refine such criteria. Consequently, a series of tests during the dry and wet season are necessary to aid refining these criteria. Test details will be developed by the S-356 Team, who will be responsible to implement and analyze test results, accordingly. The S-356 Team will develop the objectives and criteria for each test. The S-356 Team will collaborate to implement at least one test during FY-07. The S-356 Team Chair will be the Corps and will include the following agencies and stakeholders: SFWMD, USFWS, ENP, FDEP, FDOT and Miccosukee Tribe. The team will meet on an as needed basis. The Corps, as Chair, will be responsible to setup conference call number or meetings as necessary to fulfill the goal. Anticipated constraints must be addressed early and effectively by the team prior test being implemented. Unanticipated constraints to a test already developed and/or under implementation must be resolved by the team in a timely manner prior making a decision.

During the implementation of each test, the team will meet on a daily basis or as necessary to discuss status and preliminary results. Adjustments to the test during implementation may be needed and may be made as determined by the team.

After implementation of each test, the team will gather the data obtained, perform analysis and a final report be issued. In the report, a recommendation will be made for implementation of refined operational guidance or further testing.

The recommendation in the report should include the relationship between the data available for hydrologic parameters and seepage losses that will govern operations for the S-356 pump station. This report should also include if seasonal adjustments are warranted.

It is anticipated that use of total capacity of the S-356 pump station will result in larger change of elevations but the magnitude of the change will be uncertain until field tests are performed. Full coordination between the entire S-356 Team must continue and rates of changes will be monitored to ensure there will be no adverse effects on the C&SF project authorized purposes and potential endangered species nesting.

2.3 Selection of Recommended Alternative

The currently recommended alternative (Alternative 7R) was selected during the collaborative conflict resolution process by the Corps, SFWMD, USFWS, and ENP based on its ability to satisfy the project purpose to the greatest degree while providing flexibility in reducing other potential impacts to the human environment. Alternative 7R was selected in 2002 when the ROD was signed.

2.4 Status of the Recommended Alternative

Current Status of C-111 Project Features

The C-111 Project modifications were authorized as an addition to the C&SF Project in WRDA 1996 to protect the natural values associated with ENP while maintaining flood damage reduction within the C-111 basin east of L-31N and C-111. The authorized plan outlined in the 1994 C-111 GRR consisted of both structural and non-structural components. Non-structural components of the plan included acquisition of more than 11,866 acres of land within the Frog Pond and Rocky Glades areas. Structural components of the plan consisted of the construction or modification of nine canals and construction of a continuous detention/retention area to be constructed along the L-31N canal along with a series of pump stations. The 1994 plan included a detention/retention area that would be utilized for temporary storage of excess flood water before discharge to Taylor Slough. The 1994 plan called for a series of pump stations, the S-332's (S-332 at 165 cfs and S-332A, B, C, and D at 300 cfs capacity each, and S-332E at 50 cfs). S-332 would discharge directly into Taylor Slough from the L-31W borrow canal. S-332A would discharge west of the S-332D Tieback levees directly into ENP. S-332B, C, and D would pump into the detention/retention area that lies between the agricultural areas on the east and ENP on the west. S-332E would be in the lower part of the C-111 basin and be used to re-hydrate the Southern Glades lands. A battery of culverts and an overflow spillway were to be constructed along the western levee of the detention/retention area. Pumping of water into the detention/retention area would reduce the slope of the groundwater gradient from the high water conditions within ENP and the L-31N canal, thereby reducing seepage losses from the adjacent wetlands within ENP and providing for higher stages and longer hydroperiods in the area north of Taylor Slough and the Rocky Glades area west of L-31N. The re-direction of water to Taylor Slough through the detention/retention area was also designed to reduce discharges through the S-176 structure to the lower C-111 and out to tide at Barnes Sound. The C-111 plan included other project features to improve conditions in Taylor Slough and the eastern panhandle of ENP, such as replacement of the State Road 9336 bridge over Taylor Slough within ENP, a canal

connection from C-111 to the L-31W BC just north of S-175 to provide flows to S-332, plugging of canals C-109 and C-110, and removal of the C-111 canal spoil mounds on the south side of the canal along its most southerly reach.

Construction of the C-111 Project modifications has been underway since the initial authorization in 1996 in accordance with the pace of authorized land acquisition required for the project and funding from Congress. The Taylor Slough Bridge replacement was the first feature constructed. The bridge replacement was designed to achieve a more even spatial distribution of the increased water flow to Taylor Slough to be provided by the C-111 Project modifications (S-332 series of pump stations). Removal of the C-111 spoil mounds was subsequently completed to allow water to overflow the canal bank in the panhandle area and contribute towards reductions in the frequency of S-197 openings. Backfilling of C-109 was accomplished by FDOT as mitigation for their widening of US-1. Construction of pump station S-332D was competed in 199 and discharged directly into the L-31W borrow canal.

Current Status of Marsh Operations

The Corps is currently implementing marsh operations and operating the C-111 reservoirs at the 2-foot default depth. Monitoring equipment has been installed at the wells constructed for this purpose. Conditions will be observed under various hydrologic conditions under the 2-foot operating parameters. Monitoring will continue as the operating criteria are adjusted and evaluated for system response as we move toward the proposed CSOP operational criteria with a maximum depth of 2.5 feet while targeting the 0.4-foot per mile gradient between the detention areas and the adjacent marsh. The Corps will monitor the effects of marsh operations on water levels in the ENP in coordination with the other agencies. The testing will use adaptive management and flexible water management operations to evaluate various pumping rates and water levels.

Not all of the features of the C-111 reservoirs have been constructed, due to real estate issues. The northern and southern sections of the S-332B/S-332C Connector have been built, but the real estate for the middle section has only recently been acquired by the local sponsor. The SFWMD is required to certify adequate real estate interests for construction of the federal project, but they were unable to certify lands for certain portions of the project until Congressional action in 2006 allowed for the transfer of lands from the ENP to SFWMD.

Monitoring well installation was delayed due to difficulties in acquiring special use permits for installation. Although the wells were finally installed in February-March 2004, the subsequent hurricane seasons of 2004 and 2005 prevented the SFWMD from installing the monitoring equipment. The Corps worked along with the USGS and had the monitoring equipment installed by July 1, 2006, and testing protocol is being developed currently. The testing will be coordinated with the build out of the detention basins (to be completed in 2011). The results of the testing will determine the marsh operations criteria under the remainder of IOP and determine if any changes would be appropriate for CSOP.

The Corps, along with the interagency team, will work to develop and evaluate operational guidance based on field tests. This testing will be developed by the team, who will be

responsible to implement and analyze test results. The team will develop the objectives and criteria for each test. The team will meet on as needed basis. Adjustments to the tests during implementation may be needed and may be made as determined by the team.

It is recognized that new technical information may be developed as this plan is implemented and that observed results may differ from predicted results. Considering this, it may be necessary to adjust operations to address the new information or observed results to achieve better performance for environmental restoration and protection, to ensure the health, safety, and well being of the general public.

Current Status of the "Mod Waters" Components

The S-355 A/B pump structures were built in approximately 1995 but have not yet been operated. FDEP approval for the S-355 A/B operations was originally issued under a FDEP program that was phased out and replaced with another program. The Corps is in the process of getting FDEP approval under the new program. As described in the 1992 GDM, structures S-335 A/B would enable water to be pumped out of WCA-3B into NESRS and constructed to allow east-west vehicular traffic, particularly from the Miccosukee Tribe, access across the spillway bridge. The structures would be adjusted to pass 55% of the total computed water deliveries to NESRS in conjunction with S-333 operations. Their role under the IOP operating plan remains the same.

The lower 4 miles of the L-67 levee extension was removed in 2002. The 1992 GDM authorized the removal of the entire extension with the purpose of restoring the hydrologic connection between SRS and ENP. Under IOP, this hydrologic connection enhances hydroperiods in CSSS subpopulation E as well. When the L-67 structural details and operations are finalized, the Corps will apply for FDEP approval to operate those structures.

The S-356 pump station was built approximately at the location specified in MWD GDM (the footprint was adjusted to minimize wetland impacts and minimize impacts to fiber optic cable located in the L-29 levee right-of-way). The Corps initially applied for operational authorization from FDEP to operate the S-356 pump station in accordance with the operational parameters included in the IOP 2002 FEIS that when conditions permit (i.e., no S-334 regulatory releases and G-3273 and L-29 constraints), discharges from S-356 will go into L-29, pumping would be limited to the amount of seepage into L-31N in the reach between S-335 and G-211, and a technical team would evaluate pumping limits and operations. FDEP responded with a draft request (December 2002) for additional information (RAI) primarily concerned with hydrology issues. The draft RAI resulted in a series of ongoing technical discussions concerning the S-356 operations, and the proposed operations table was revised to address most of the water source concerns identified in the draft FDEP RAI. The proposed operational adjustments conceptually addressed most of the DOI concerns about water quality, but FDEP required reasonable assurance that water quality conditions would not be degraded by operation of the S-356 pump station. The concern is that over-pumping (beyond recycling ENP/WCA seepage water) of S-356 could draw urban runoff water from the east into the relatively pristine ENP. Tests of the S-356 pump station are necessary during the wet season to refine and/or confirm the effectiveness of the proposed operational constraints to

ensure that undesirable (water quality) urban runoff water or groundwater is not drawn into S-356 and subsequently discharged into ENP. Wet season pump tests cannot be conducted until the 8.5 SMA flood mitigation feature is constructed and operational. Until that time, some dry season tests will be conducted to gain more information on this issue. Dry season tests cannot provide the reasonable assurance necessary for FDEP to issue operational water quality certification (WQC), but will provide other useful information concerning the operation of this pump station.

Since early 2005, there have been several attempts to perform an S-356 pump test. Details of the S-356 test protocol are included in Appendix C. The first pumping test was initiated on August 1, 2006 and continued until August 8, 2006. The Corps is currently processing and evaluating the data from this effort. Preliminary results show that the observed maximum change in elevation in L-29 canal and L-31N canal was approximately 0.3 feet and 0.5 feet, respectively. In addition, the observed maximum change in elevation in NESRS was approximately 0.1 feet. The maximum allowed pump capacity for this test was 250 cfs, which is nearly half of the total capacity of the pump station.

2.4 Comparison of Alternatives

The alternatives were previously compared in Section 4.0, "Environmental Consequences" of the 2002 Final EIS. Evaluation is this document is limited to the Recommended Alternative 7R and effects of the recommended plan to date.

Table2. 1 Description of 95 Base Simulation

	95Base Modified 2 (Test 7, Phase I)
Regulation Schedule	C&SF regulation schedules prior to ISOP.
S-343 A/B and S-344	Per the above WCA-3A regulation schedule
S-12 A/B/C/D	Operated according to current regulation schedule, which includes rainfall plan target. Split 10/20/30/40 percent west to east
S-333: G-3273 <6.8'	S-333 open to deliver 55 percent of Shark River Slough target flows as per rainfall plan target (rainfall formula + WCA-3A regulatory discharge)
S-333: G-3273 >6.8'	S-333 closed
L-29 constraint	8.0 ft
S-355A&B	Regulatory releases are constrained by L-29 and G-3273 triggers. Dry Wet Open 8.50 8.50 Close 6.50 6.50
S-337	Water supply only
S-151	Per the above WCA-3A regulation schedule
S-334	Closed
S-332B	Non-existent
S-332B Seepage Reservoir	Non-existent
S-332D	Non-existent
S-332	Operated according to Taylor Slough rainfall plan with 465-cfs capacity, subject to 165-cfs limitations from Mar 1 to Jul 15
S-175	Dry Wet Open 4.7 4.7 Close 4.3 4.3
S-194	Dry Wet Open 5.3 5.3 Close 4.8 4.8
S-196	Dry Wet Open 5.3 5.3 Close 4.8 4.8
S-176	Dry Wet Open 5.00 5.00 Close 4.75 4.75
S-18C	Dry Wet Open 2.6 2.6 Close 2.3 2.3

Notes:

1. South Florida Water Management Model (SFWMM) version 3.8 was used in continuous simulation mode (31-year simulation using 1965 to 1995 climatic data set) to simulate 95Base Modified 2.

2. No changes to operational criteria of 95Base Modified 2 (includes Test 7, Phase I criteria) for structures not listed in the table above.

Table 2. 2 Description of Reasonable and Prudent Alternatives

	RPA 00	RPA 01	RPA 02
Regulation Schedule	Deviation schedule for WCA-3A as specified by USACE including raising Zone D to Zone C from Nov 1 to Feb 11. No deviation in WCA-2A regulation schedule.	Deviation schedule for WCA-3A as specified by USACE including raising Zone D to Zone C from Nov 1 to Feb 11. No deviation in WCA-2A regulation schedule.	Deviation schedule for WCA-3A as specified by USACE including raising Zone D to Zone C from Nov 1 to Feb 11. No deviation in WCA-2A regulation schedule.
S-343 A/B and S-344	Closed Nov 1 to July 15 independent of WCA-3A levels.	Closed Nov 1 to July 15 independent of WCA-3A levels.	Closed Nov 1 to July 15 independent of WCA-3A levels.
S-12A/B/C/D	S-12A closed Nov 1 to Jul 15; S-12B closed Jan 1 to Jul 15; S-12 C closed Feb 1 to Jul 15; S-12D operated normally according to WCA-3A schedule. For the remainder of the year, S-12A, B, and C followed the same schedule.	S-12A closed Nov 1 to Jul 15; S-12B closed Jan 1 to Jul 15; S-12C closed Feb 1 to Jul 15; S-12D operated according to WCA-3A schedule. Remainder of the year, S-12A, B, and C followed the same schedule.	S-12A closed Nov 1 to Jul 15; S-12B closed Jan 1 to Jul 15; S-12C closed Feb 1 to Jul 15; S-12D operated according to WCA-3A schedule. Remainder of the year, S-12A, B, and C followed the same schedule.
S-333: G-3273 <6.8'	55% of the rainfall plan target to NESRS, plus as much of the remaining 45% that the S-12s can't discharge to be passed through S-334; and subject to capacity constraints, which are 1350 cfs at S-333, L-29 max. stage limit and canal stage limits downstream of S-334.	55% of the rainfall plan target to NESRS, plus as much of the remaining 45% that the S-12s can't discharge to be passed via S-334; and subject to capacity constraints, which are 1350 cfs at S-333, L-29 maximum stage limit, and canal stage limits downstream of S-334.	55% of the rainfall plan target to NESRS, plus as much of the remaining 45% that the S-12s can't discharge to be passed via S-334; and subject to capacity constraints, which are 1350 cfs at S-333, L-29 maximum stage limit, and canal stage limits downstream of S-334.
S-333: G-3273 >6.8'	Pass 30% of regulatory discharge through S-333 subject to S-333 design capacity (1350 cfs)	Pass 45% of regulatory discharge through S-333 subject to S-333 design capacity (1350 cfs)	Pass 60% of regulatory discharge through S-333 subject to S-333 design capacity (1350 cfs)
L-29 constraint	9.0 ft	9.0 ft	9.0 ft
S-355A&B	Regulatory releases are constrained by L-29 and G-3273 triggers. Dry Wet Open 8.50 8.50 Close 6.50 6.50	Regulatory releases constrained by L-29 and G-3273 triggers. Dry Wet Open 8.50 8.50 Close 6.50 6.50	Regulatory releases constrained by L-29 and G-3273 triggers. Dry Wet Open 8.50 8.50 Close 6.50 6.50
S-337	Water supply only	Water supply only	Water supply only
S-151	Per WCA-3A regulation schedule.	PerWCA-3A regulation schedule.	PerWCA-3A regulation schedule.
S-334	Water supply only	Water supply only	Water supply only
S-332D	Pumped up to 500 cfs design capacity from Aug 1 to Jan 31 and to 165 cfs from Feb 1 to Jul 31. Dry Wet On 5.00 5.00 Off 4.80 4.80	Pumped to 500 cfs design capacity from Aug 1 to Jan 31; 165 cfs from Feb 1 to Jul 31. Dry Wet On 5.00 5.00 Off 4.80 4.80	Pumped up to 500 cfs design capacity from Aug 1 to Jan 31; to 165 cfs from Feb 1 to Jul 31. Dry Wet On 5.00 5.00 Off 4.80 4.80
S-332	Closed	Closed	Closed
S-175	Closed	Closed	Closed
S-194	Dry Wet Open 5.3 5.3 Close 4.8 4.8	Dry Wet Open 5.3 5.3 Close 4.8 4.8	Dry Wet Open 5.3 5.3 Close 4.8 4.8
S-196	Dry Wet Open 5.5 5.5 Close 4.8 4.8	Dry Wet Open 5.5 5.5 Close 4.8 4.8	Dry Wet Open 5.5 5.5 Close 4.8 4.8
S-176	Dry Wet Open 5.2 5.2 Close 5.0 5.0	Dry Wet Open 5.2 5.2 Close 5.0 5.0	Dry Wet Open 5.2 5.2 Close 5.0 5.0
S-18C	Dry Wet Open 2.6 2.6 Close 2.3 2.3	Dry Wet Open 2.6 2.6 Close 2.3 2.3	Dry Wet Open 2.6 2.6 Close 2.3 2.3

Table 2. 3 Description of ISOP 2000

	ISOP-9d (ISOP 2000)
Regulation Schedule	Deviation schedules for WCA-2A (S-11A, B, C structures closed) and WCA-3A as specified by USACE
S-343 A/B and S-344	Closed Jan 1 to Jul 15 independent of WCA-3A levels
S-12 A/B/C/D	S-12A closed Dec 1 to Jul 15; S-12B closed Jan 1 to Jul 15; S-12C,D closed Feb 1 to Jul 15; Follow WCA-3A regulation schedule as in 95 Base for remainder of year
S-333: G-3273 <6.8'	Maximum possible discharge subject to S-333 design capacity (1350 cfs) and limited to sum of NESRS rainfall plan targets plus outflow through S-334
S-333: G-3273 >6.8'	Maximum possible discharge subject to S-333 design capacity (1350 cfs) and limited to outflow through S-334
L-29 Constraint	9.0 ft
S-355A&B	Not modeled
S-337	Regulatory releases as per WCA-3A deviation schedule
S-151	Per the above WCA-3A regulation schedule
S-334	Passes S-333 regulatory release to SDCS
S-332B	Pumped up to 325 cfs Dry Wet On 4.70 4.70 Off 4.20 4.20
S-332B Seepage Reservoir	Not modeled
S-332D	Pumped up to 500 cfs from Jul 16 to Nov 31; 325 cfs from Dec 1 to Jan 31; and 165 cfs from Feb 1 to Jul 15 Dry Wet On 5.00 4.50 Off 4.80 4.00
S-332	Closed
S-175	Closed
S-194	Operated to maximize flood control discharges to coast Dry Wet Open 4.70 4.70 Close 4.20 4.20
S-196	Operated to maximize flood control discharges to coast Dry Wet Open 4.70 4.70 Close 4.20 4.20
S-176	Dry Wet Open 4.70 4.70 Close 4.50 4.50
S-18C	Dry Wet Open 2.25 2.25 Close 2.00 2.00

Table 2. 4 Description of Alternative 1 - ISOP 2001

	ISOP-9dR (ISOP 2001)
Regulation Schedule	Deviation schedule for WCA-3A as specified by USACE including raising Zone D to Zone C from Nov 1 to Feb 11. No deviation in WCA-2A regulation schedule.
S-343 A/B and S-344	Closed Nov 1 to Jul 15 independent of WCA-3A levels
S-12 A/B/C/D	S-12A closed Nov 1 to Jul 15; S-12B closed Jan 1 to Jul 15; S-12C closed Feb 1 to Jul 15; S-12D was operated normally according to WCA-3A schedule. For the remainder of the year, S-12A, B, and C followed the same regulation schedule.
S-333: G-3273 <6.8'	55% of the rainfall plan target to NESRS, plus as much of the remaining 45% that the S-12s can't discharge to be passed through S-334; and subject to capacity constraints, which are 1350 cfs at S-333, L-29 maximum stage limit, and canal stage limits downstream of S-334.
S-333: G-3273 >6.8'	No discharge to NESRS; release 55% of the rainfall plan target, plus as much of the remaining 45% that the S-12s can't discharge through S-333 and S-334, subject to capacity constraints.
L-29 Constraint	9.0 ft
S-355A&B	Not modeled
S-337	Regulatory releases as per WCA-3A deviation schedule
S-151	Per the above WCA-3A regulation schedule
S-334	Same as in 95Base except that it also may pass all or part of S-333 releases to the SDCS, depending on stage at G-3273
S-332B	Pumped up to 325 cfs from Jun through Jan; and 125 cfs from Feb through May Dry Wet On 4.70 4.70 Off 4.20 4.20
S-332B Seepage Reservoir	160 acres with emergency overflow
S-332D	Pumped up to 500 cfs from Jul 16 to Nov 31; 325 cfs from Dec 1 to Jan 31; and 165 cfs from Feb 1 to July 15 Dry Wet On 5.00 4.50 Off 4.80 4.00
S-332	Closed
S-175	Closed
S-194	Operated to maximize flood control discharges to coast Dry Wet Open 4.70 4.70 Close 4.20 4.20
S-196	Operated to maximize flood control discharges to coast. Dry Wet Open 4.70 4.70 Close 4.20 4.20
S-176	Dry Wet Open 4.70 4.70 Close 4.50 4.50
S-18C	Dry Wet Open 2.25 2.25 Close 2.00 2.00

Table 2. 5 Description of Alternative 2

	Alternative 2	
Treatment	**Phase 1**	**Phase 2**
	IOP 2b	**IOP 2**
Regulation Schedule	Deviation schedules for WCA-2A (S-11 A,B,C structures closed) and 3A as specified by USACE	Deviation schedules for WCA-2A (S-11 A,B,C structures closed) and 3A as specified by USACE
S-343 A/B S-344	Closed Jan 1 to July 15 independent of WCA-3A levels	Closed Jan 1 to July 15 independent of WCA-3A levels
S-12 A/B/C/D	S-12A closed Dec 1 - Jul 15; S-12B closed Jan 1 - Jul 15; S-12 C,D closed Feb 1 - Jul 15; Follow WCA-3A regulation schedule as in 95 Base for remainder of year	S-12A closed Dec 1 to Jul 15; S-12B closed Jan 1 to Jul 15; S-12 C,D close Feb 1 to Jul 15; Follow WCA-3A regulation schedule as in 95 Base for remainder of year
S-333: G-3273 <6.8'	55% of the rainfall plan target to NESRS, plus as much of the remaining 45% that the S-12s can't discharge to be passed through S-334 and subject to capacity constraints, which are 1350 cfs at S-333, L-29 maximum stage limit, and canal stage limits downstream of S-334.	S-333 open to deliver 55% of Shark River Slough target flows as per rainfall plan target (rainfall formula + WCA-3A regulatory discharge).
S-333: G-3273 >6.8'	No discharge to NESRS; release 55% of the rainfall plan target, plus as much of the remaining 45% that the S-12s can't discharge through S-333 and S-334, subject to capacity constraints.	Maximum possible discharge subject to S-333 design capacity (1350 cfs) with G3273 trigger removed.
L-29 Constraint	9.0 ft	9.0 ft
S-337	Regulatory releases as per WCA-3A deviation schedule	Regulatory releases as per WCA-3A deviation schedule
S-151	Regulatory releases as per WCA-3A deviation schedule	Regulatory releases as per WCA-3A deviation schedule
S-334	Passes S-333 regulatory release to SDCS	Closed
S-332B	Pumped up to 375 cfs On at 4.7, Off at 4.2	Pumped up to 325 cfs; On at 4.5, Off at 4.0
S-332B Seepage Reservoir	160 acres with emergency overflow	160 acres with emergency overflow
S-332D	Pumped up to 500 cfs design capacity from Aug 1 to Nov 30; 325 cfs from Dec 1 to Dec 31; 165 cfs from Jan 1 to Jul 31. Dry-On at 5.0, Off at 4.8; Wet-On at 4.5, Off at 4.0.	Pumped up to 500 cfs design capacity from Aug 1 to Nov 30; 325 cfs from Dec 1 to Jan 31; 165 cfs from Feb 1 to Jul 31. Dry-On at 5.0, Off at 4.8; Wet-On at 4.5, Off at 4.0.
S-332	Closed	Closed
S-175	Closed	Closed
S-194 S-196	Operated to maximize flood control discharges to coast; Dry- Open at 4.7, Close at 4.2; Wet- Open at 4.7, Close at 4.2.	Operated to maximize flood control discharges to coast; Dry- Open at 4.7, Close at 4.2; Wet- Open at 4.7, Close at 4.2.
S-176	Dry-Open at 4.7, Close at 4.5; Wet-Open at 4.7, Close at 4.5.	Dry-Open at 5.0, Close at 4.75; Wet-Open at 5.0, Close at 4.75.
S-18C	Dry-Open at 2.25, Close at 2.0; Wet-Open at 2.25, Close at 2.0.	Dry-Open at 2.25, Close at 2.0; Wet-Open at 2.25, Close at 2.0.

Table 2. 6 Description of Alternative 3

	Alternative 3	
Treatment	**Phase 1**	**Phase 2**
	IOP 2a	**IOP 2**
Regulation Schedule	Deviation schedules for WCA-2A (S-11 A,B,C structures closed) and 3A as specified by USACE.	Deviation schedules for WCA-2A (S-11 A,B,C structures closed) and 3A as specified by USACE.
S-343 A/B S-344	Closed Jan 1 to July 15 independent of WCA-3A levels.	Closed Jan 1 to July 15 independent of WCA-3A levels.
S-12 A/B/C/D	S-12A closed Dec 1 to Jul 15; S-12B closed Jan 1 to Jul 15; S-12 C,D close Feb 1 to Jul 15; Follow WCA-3A regulation schedule as in 95 Base for remainder of year	S-12A closed Dec 1 - Jul 15; S-12B closed Jan 1 - Jul 15; S-12 C,D closed Feb 1 - Jul 15; Follow WCA-3A regulation schedule as in 95 Base for remainder of year
S-333: G-3273 <6.8'	S-333 open to deliver 55% of Shark River Slough target flows as per rainfall plan target (rainfall formula + WCA-3A regulatory discharge).	S-333 open to deliver 55% of Shark River Slough target flows as per rainfall plan target (rainfall formula + WCA-3A regulatory discharge).
S-333: G-3273 >6.8'	S-333 closed	Maximum possible discharge subject to S-333 design capacity (1350 cfs) with G3273 trigger removed.
L-29 Constraint	9.0 ft	9.0 ft
S-337	Regulatory releases as per WCA-3A deviation schedule	Regulatory releases as per WCA-3A deviation schedule
S-151	Regulatory releases as per WCA-3A deviation schedule	Regulatory releases as per WCA-3A deviation schedule
S-334	Closed	Closed
S-332B	Pumped up to 325 cfs; On at 4.5, Off at 4.0	Pumped up to 325 cfs; On at 4.5, Off at 4.0
S-332B Seepage Reservoir	160 acres with emergency overflow	160 acres with emergency overflow
S-332D	Pumped up to 500 cfs design capacity from Aug 1 to Nov 30; 325 cfs from Dec 1 to Jan 31; 165 cfs from Feb 1 to Jul 31. Dry-On at 5.0, Off at 4.8; Wet-On at 4.5, Off at 4.0.	Pumped up to 500 cfs design capacity from Aug 1 to Nov 30; 325 cfs from Dec 1 to Jan 31; 165 cfs from Feb 1 to Jul 31. Dry-On at 5.0, Off at 4.8; Wet-On at 4.5, Off at 4.0.
S-332	Closed	Closed
S-175	Closed	Closed
S-194 S-196	Operated to maximize flood control discharges to coast; Dry- Open at 4.7, Close at 4.2; Wet-Open at 4.7, Close at 4.2.	Operated to maximize flood control discharges to coast; Dry- Open at 4.7, Close at 4.2; Wet-Open at 4.7, Close at 4.2.
S-176	Dry-Open at 5.0, Close at 4.75; Wet-Open at 5.0, Close at 4.75.	Dry-Open at 5.0, Close at 4.75; Wet-Open at 5.0, Close at 4.75.
S-18C	Dry-Open at 2.25, Close at 2.0; Wet-Open at 2.25, Close at 2.20.	Dry-Open at 2.25, Close at 2.0; Wet-Open at 2.25, Close at 2.20.

Table 2. 7 Description of Alternative 4

	Alternative 4	
Treatment	**Phase 1**	**Phase 2**
	IOP 3a	**IOP 3**
Regulation Schedule	Deviation schedules for WCA-1, 2A and 3A as specified by USACE.	Deviation schedules for WCA-1, 2A and 3A as specified by USACE.
S-343 A/B S-344	Closed Nov 1 to July 15 independent of WCA-3A levels.	Closed Nov 1 to July 15 independent of WCA-3A levels.
S-12 A/B/C/D	S-12A, B, C and D closed Nov 1 to Jul 15; Follow WCA-3A regulation schedule as in 95 Base for remainder of year	S-12A, B, C and D closed Nov 1 to Jul 15; Follow WCA-3A regulation schedule as in 95 Base for remainder of year
S-333: G-3273 <6.8'	S-333 open to deliver 55% of Shark River Slough target flows as per rainfall plan target (rainfall formula + WCA-3A regulatory discharge).	S-333 open to deliver 55% of Shark River Slough target flows as per rainfall plan target (rainfall formula + WCA-3A regulatory discharge).
S-333: G-3273 >6.8'	S-333 closed	Maximum possible discharge subject to S-333 design capacity (1350 cfs) with G3273 trigger removed.
L-29 Constraint	9.0 ft	9.0 ft
S-337	Regulatory releases as per WCA-3A deviation schedule	Regulatory releases as per WCA-3A deviation schedule
S-151	Regulatory releases as per WCA-3A deviation schedule	Regulatory releases as per WCA-3A deviation schedule
S-334	Closed	Closed
S-332B	Pumped up to 325 cfs; Dry-On at 4.5, Off at 4.0; Wet-On at 4.5, Off at 4.0.	Pumped up to 325 cfs; Dry-On at 4.5, Off at 4.0; Wet-On at 4.5, Off at 4.0.
S-332B Seepage Reservoir	160 acres with emergency overflow	160 acres with emergency overflow
S-332D	Pumped up to 500 cfs design capacity from Aug 1 to Nov 30; 325 cfs from Dec 1 to Jan 31; 165 cfs from Feb 1 to Jul 31. Dry-On at 5.0, Off at 4.8; Wet-On at 4.5, Off at 4.0.	Pumped up to 500 cfs design capacity from Aug 1 to Nov 30; 325 cfs from Dec 1 to Jan 31; 165 cfs from Feb 1 to Jul 31. Dry-On at 5.0, Off at 4.8; Wet-On at 4.5, Off at 4.0.
S-332	Closed	Closed
S-175	Closed	Closed
S-194 S-196	Operated to maximize flood control discharges to coast; Dry-Open at 4.7, Close at 4.2; Wet-Open at 4.7, Close at 4.2.	Operated to maximize flood control discharges to coast; Dry-Open at 4.7, Close at 4.2; Wet-Open at 4.7, Close at 4.2.
S-176	Dry-Open at 5.0, Close at 4.75; Wet-Open at 5.0, Close at 4.75.	Dry-Open at 5.0, Close at 4.75; Wet-Open at 5.0, Close at 4.75.
S-18C	Dry-Open at 2.25, Close at 2.0; Wet-Open at 2.25, Close at 2.0.	Dry-Open at 2.25, Close at 2.0; Wet-Open at 2.25, Close at 2.0.

Table 2. 8 Description of Alternative 5

	Alternative 5	
Treatment	**Phase 1**	**Phase 2**
	IOP 4a (ISOP 9dR1)	**IOP 4 (ISOP 9dR2)**
Regulation Schedule	No deviation schedules for WCA-2A. Deviation schedule for WCA-3A as specified by USACE including raising Zone D to Zone C from Nov 1 to Feb. 11.	No deviation schedules for WCA-2A. Deviation schedule for WCA-3A as specified by USACE including raising Zone D to Zone C from Nov 1 to Feb. 11.
S-343 A/B S-344	Closed Nov 1 to July 15 independent of WCA-3A levels.	Closed Nov 1 to July 15 independent of WCA-3A levels.
S-12 A/B/C/D	S-12A closed Nov 1 to Jul 15; S-12B closed Jan 1 to Jul 15; S-12 C,D close Feb 1 to Jul 15; Follow WCA-3A regulation schedule as in 95 Base for remainder of year	S-12A closed Nov 1 to Jul 15; S-12B closed Jan 1 to Jul 15; S-12 C,D close Feb 1 to Jul 15; Follow WCA-3A regulation schedule as in 95 Base for remainder of year
S-333: G-3273 <6.8'	55% of the rainfall plan target to NESRS, plus as much of the remaining 45% that the S-12s can't discharge to be passed through S-334 and subject to capacity constraints, which are 1350 cfs at S-333, L-29 maximum stage limit, and canal stage limits downstream of S-334.	55% of the rainfall plan target to NESRS, plus as much of the remaining 45% that the S-12s can't discharge to be passed through S-334 and subject to capacity constraints, which are 1350 cfs at S-333, L-29 maximum stage limit, and canal stage limits downstream of S-334.
S-333: G-3273 >6.8'	No discharge to NESRS; release 55% of the rainfall plan target, plus as much of the remaining 45% that the S-12s can't discharge through S-333 and S-334, subject to capacity constraints.	Maximum possible discharge subject to S-333 design capacity (1350 cfs) with G3273 trigger removed.
L-29 Constraint	9.0 ft	9.0 ft
S-337	Regulatory releases as per WCA-3A deviation schedule	Regulatory releases as per WCA-3A deviation schedule
S-151	Regulatory releases as per WCA-3A deviation schedule	Regulatory releases as per WCA-3A deviation schedule
S-334	Same as 95Base except that it also may pass all or part of S-333 releases to the SDCS, depending on stage at G-3273.	Closed
S-332B	Pumped up to 500 cfs from Aug-Jan; 325 cfs in Feb, Jun, and July; and 125 cfs Mar-May; Dry-On at 5.0, Off at 4.3; Wet-On at 4.7, Off at 4.0.	Pumped up to 500 cfs from Aug-Jan; 325 cfs in Feb, Jun, and July; and 125 cfs Mar-May; Dry-On at 5.0, Off at 4.3; Wet-On at 4.7, Off at 4.0.
S-332B Seepage Reservoir	160 acres with emergency overflow.	160 acres with emergency overflow.
S-332D	Pumped up to 500 cfs design capacity from July 16 to Nov 30; 325 cfs Dec 1 to Jan 31; 165 cfs from Feb 1 to Jul 15. Dry-On at 5.0, Off at 4.8; Wet-On at 4.7, Off at 4.2.	Pumped up to 500 cfs design capacity from July 16 to Nov 30; 325 cfs Dec 1 to Jan 31; 165 cfs from Feb 1 to Jul 15. Dry-On at 5.0, Off at 4.8; Wet-On at 4.7, Off at 4.2.
S-332	Closed	Closed
S-175	Closed	Closed
S-194 S-196	Operated to maximize flood control discharges to coast; Dry-Open at 4.7, Close at 4.2; Wet-Open at 4.7, Close at 4.2.	Operated to maximize flood control discharges to coast; Dry-Open at 4.7, Close at 4.2; Wet-Open at 4.7, Close at 4.2.
S-176	Dry-Open at 4.85, Close at 4.65; Wet-Open at 4.8, Close at 4.7.	Dry-Open at 4.85, Close at 4.65; Wet-Open at 4.8, Close at 4.7.
S-18C	Dry-Open at 2.25, Close at 2.0; Wet-Open at 2.25, Close at 2.0.	Dry-Open at 2.25, Close at 2.0; Wet-Open at 2.25, Close at 2.0.

Table 2. 9 Description of Alternative 6

	Alternative 6
Regulation Schedule	Deviation schedule for WCA-3A as specified by USACE including raising Zone D to Zone C from Nov 1 to Feb 11. No deviation in WCA-2A regulation schedule.
S-343 A/B and S-344	Closed Nov 1 to July 15 independent of WCA-3A levels.
S-12 A/B/C/D	S-12A closed Nov 1 to Jul 15; S-12B closed Jan 1 to Jul 15; S-12C closed Feb 1 to Jul 15; S-12D operated according to WCA-3A regulation schedule. Follow WCA-3A regulation schedule after Jul 15.
S-333: G-3273 <6.8'	55% of the rainfall plan target to NESRS, plus as much of the remaining 45% that the S-12s can't discharge to be passed through S-334 and subject to capacity constraints, which are 1350 cfs at S-333, L-29 maximum stage limit, and canal stage limits downstream of S-334.
S-333: G-3273 >6.8'	No discharge to NESRS; release 55% of the rainfall plan target, plus as much of the remaining 45% that the S-12s can't discharge through S-333 and S-334, subject to capacity constraints.
L-29 Constraint	9.0 ft
S-355A&B	Dry Wet Open 8.50 8.50 Close 6.50 6.50
S-337	Regulatory releases as per WCA-3A deviation schedule.
S-151	Regulatory releases as per WCA-3A deviation schedule.
S-334	Same as in 95Base except that it also may pass all or part of S-333 releases to the SDCS, depending on stage at G-3273.
S-332B	Pumped up to 250 cfs from Jun through Feb; and 125 cfs from Mar through May. Dry Wet On 5.00 4.70 Off 4.30 4.00
S-332B Seepage Reservoir	400 acres with minimum overflow (if any)
S-332D	Pumped up to 500 cfs from Jul 16 to Nov 31; 325 cfs from Dec 1 to Jan 31; and 165 cfs from Feb 1 to Jul 15. Dry Wet On 5.00 4.70 Off 4.80 4.20
S-332	Closed
S-175	Closed
S-194	Operated to maximize flood control discharges to coast. Dry Wet Open 4.70 4.70 Close 4.20 4.20
S-196	Operated to maximize flood control discharges to coast. Dry Wet Open 4.70 4.70 Close 4.20 4.20
S-176	Dry Wet Open 4.85 4.80 Close 4.65 4.70
S-18C	Dry Wet Open 2.25 2.25 Close 2.00 2.00

Table 2. 10 Description of Alternative 7

	Alternative 7a	Alternative 7b
	No WCA-3A Regulatory Releases to SDCS or Shark River Slough	**WCA-3A Regulatory Releases to SDCS**
Regulation Schedule	Deviation schedule for WCA-3A as specified by USACE including raising Zone D to Zone C from Nov 1 to Feb 11. No deviation in WCA-2A regulation schedule.	Deviation schedule for WCA-3A as specified by USACE including raising Zone D to Zone C from Nov 1 to Feb 11. No deviation in WCA-2A regulation schedule.
S-343 A/B and S-344	Closed Nov 1 to July 15 independent of WCA-3A levels.	Closed Nov 1 to July 15 independent of WCA-3A levels.
S-12 A/B/C/D	S-12A closed Nov 1 to Jul 15; S-12B closed Jan 1 to Jul 15; S-12C closed Feb 1 to Jul 15; S-12D no closure dates. Follow WCA-3A regulation schedule after Jul 15. Note: If closure requires regulatory releases to SDCS, switch to operations for regulatory releases to SDCS.	S-12A closed Nov 1 to Jul 15; S-12B closed Jan 1 to Jul 15; S-12C closed Feb 1 to Jul 15; S-12D no closure dates. Follow WCA-3A regulation schedule after Jul 15.
S-333: G-3273 <6.8' NGVD Degrade the lower 4 miles of the L-67 extension	55% of the rainfall plan target to NESRS and 45% through the S-12 structures.	55% of the rainfall plan target to NESRS, plus as much of the remaining 45% that the S-12s can't discharge to be passed through S-334 and subject to capacity constraints, which are 1350 cfs at S-333, L-29 maximum stage limit, and canal stage limits downstream of S-334.
S-333: G-3273 >6.8' NGVD	Closed	Match S-333 with S-334 flows
L-29 Constraint	9.0 ft	9.0 ft
S-355A&B	Follow the same constraints as S-333. Open whenever gradient allows southerly flow.	Follow the same constraints as S-333. Open whenever gradient allows southerly flow.
S-337	Water Supply	Regulatory releases as per WCA-3A deviation schedule.
S-151	Water Supply	Regulatory releases as per WCA-3A deviation schedule.
S-335	<u>Water Supply</u> Allow releases through S-335 if there is downstream capacity consistent with pre-ISOP op. "Downstream capacity" would not include capacity created by pumping at S-332B or S-332D and not trigger opening S-18C at 2.6. Note: It is recognized that under these conditions, operations of S-335 would be infrequent.	When making regulatory releases through S-151, match S-335 outflows with inflows from S-151 and S-337 Use S-333/334 before S-335
S-334	Closed	Pass all or partial S-333 flows Depending on stage at G-3273
S-338	Open 5.8 Close 5.5	Open 5.8 Close 5.4
G-211	Open 6.0 Close 5.5	Open 5.7 Close 5.3

	Alternative 7a	Alternative 7b
	No WCA-3A Regulatory Releases to SDCS or Shark River Slough	**WCA-3A Regulatory Releases to SDCS**
S-331	Angel's Criteria – If Angel's well is <5.5 feet, then no limit on S-331 hw level. If Angel's well is 5.5-6.0 feet, S-331 avg. daily is between 5.0 – 4.5. If Angel's well is above 6.0 feet, S-331 avg. daily is between 4.5 – 4.0 until Angel's well is 5.7.	Angel's Criteria – If Angel's well is <5.5 feet, then no limit on S-331 hw level. If Angel's well is 5.5-6.0 feet, S-331 avg. daily is between 5.0 – 4.5. If Angel's well is above 6.0 feet, S-331 avg. daily is between 4.5 – 4.0 until Angel's well is 5.7.
S-332B Note 1: There would be two 125-cfs pumps and one 75-cfs pump directed to the second detention basin. The remaining two 125-cfs pumps would be directed to the first detention basin. If possible, the 75-cfs pump would be designed so that it can be directed to either basin. Note 2: A new indicator would be established for subpopulation F and a new gauge would be installed about ½ mile west of the weir on the western edge of the retention area. Pumping would cease after 180 days of above ground hydroperiod at the new gauge during a year that runs from July 15 to July 14. After water levels recede below ground, pumping can be resumed at a rate that maintains water elevations below ground at the gauge until the beginning of the next year.	Pumped up to 250 cfs* from Jun through Feb; and 125 cfs from Mar through May. On 5.0 Off 4.7** *This pumping rate is based on the assumption that there would be no overflow into the park. If there is overflow into the park, the pumping rate would be adjusted. **If, after the first 30 days of operation, there is no observed drawdown at the pump, this stage level would be raised to 4.8.	Pumped up to 250 cfs* from Jun through Feb; and 125 cfs from Mar through May. On 4.8 Off 4.5 *This pumping rate is based on the assumption that there would be no overflow into the park. If there is overflow into the park, the pumping rate would be adjusted to eliminate overflow.
S-332B Seepage Reservoir	400 acres with no overflow to the west.	400 acres with no overflow to the west.
S-332D	Pumped up to 500 cfs from Jul 16 (or the end of the breeding season, as confirmed by FWS) to Nov 31; 325 cfs from Dec 1 to Jan 31; and 165 cfs* from Feb 1 to Jul 15. Meet Taylor Slough rainfall formula (No L-31W constraint) On 4.85 Off 4.65 *New information would be sought to evaluate the feasibility of modifying the 165-cfs constraint	Pumped up to 500 cfs from Jul 16 (or the end of the breeding season, as confirmed by FWS) to Nov 31; 325 cfs from Dec 1 to Jan 31; and 165 cfs* from Feb 1 to Jul 15. Meet Taylor Slough rainfall formula (No L-31W constraint) On 4.7 Off 4.5 *New information would be sought to evaluate the feasibility of modifying the 165-cfs constraint
S-332	Closed	Closed
S-175	Closed	Closed

	Alternative 7a	Alternative 7b
	No WCA-3A Regulatory Releases to SDCS or Shark River Slough	**WCA-3A Regulatory Releases to SDCS**
S-194	Open 5.5 Close 4.8	Operated to maximize flood control discharges to coast Open 4.9 Close 4.5
S-196	Open 5.5 Close 4.8	Operated to maximize flood control discharges to coast Open 4.9 Close 4.5
S-176	Open 5.0 Close 4.75	Open 4.9 Close 4.7
S-177	Open 4.2 (see S-197 open) Close 3.6	Open 4.2 (see S-197 open) Close 3.6
S-18C	Open 2.6 Close 2.3	Open 2.25 Close 2.00
S-197	If S-177 headwater is greater than 4.1 or S-18C headwater is greater than 2.8 open 3 culverts. If S-177 headwater is greater than 4.2 for 24 hours or S-18C headwater is greater than 3.1 open 7 culverts. If S-177 headwater is greater than 4.3 or S-18C headwater is greater than 3.3 open 13 culverts. Close gates when all the following conditions are met: 1. S-176 headwater is less than 5.2 and S-177 headwater is less than 4.2 2. Storm has moved away from the basin 3. After Conditions 1 and 2 are met, keep the number of S-197 culverts open necessary only to match residual flow through S-176. All culverts should be closed if S-177 headwater is less than 4.1 after all conditions are satisfied.	If S-177 headwater is greater than 4.1 or S-18C headwater is greater than 2.8 open 3 culverts. If S-177 headwater is greater than 4.2 for 24 hours or S-18C headwater is greater than 3.1 open 7 culverts. If S-177 headwater is greater than 4.3 or S-18C headwater is greater than 3.3 open 13 culverts. Close gates when all the following conditions are met: 1. S-176 headwater is less than 5.2 and S-177 headwater is less than 4.2 2. Storm has moved away from the basin 3. After Conditions 1 and 2 are met, keep the number of S-197 culverts open necessary only to match residual flow through S-176. All culverts should be closed if S-177 headwater is less than 4.1 after all conditions are satisfied.

Table 2. 11 Description of Alternative 7R

	No WCA-3A Regulatory Releases to SDCS or Shark River Slough	WCA-3A Regulatory Releases to SDCS
Regulation Schedule	Deviation schedule for WCA-3A (Figure 9), November 2000 WCA-3A interim regulation schedule as specified by USACE including raising Zone D to Zone C from Nov 1 to Feb 11. No deviation in WCA-2A regulation schedule.	Deviation schedule for WCA-3A (Figure 9), November 2000 WCA-3A interim regulation schedule as specified by USACE including raising Zone D to Zone C from Nov 1 to Feb 11. No deviation in WCA-2A regulation schedule.
S-343 A/B and S-344	Closed Nov 1 to July 15 independent of WCA-3A levels.	Closed Nov 1 to July 15 independent of WCA-3A levels.
S-12 A/B/C/D Sandbag culverts under Tram Road by February 1 if necessary.	S-12A closed Nov 1 to Jul 15; S-12B closed Jan 1 to Jul 15; S-12C closed Feb 1 to Jul 15; S-12D no closure dates. Follow WCA-3A regulation schedule after Jul 15. Note: If closure requires regulatory releases to SDCS, switch to operations for regulatory releases to SDCS.	S-12A closed Nov 1 to Jul 15; S-12B closed Jan 1 to Jul 15; S-12C closed Feb 1 to Jul 15; S-12D no closure dates. Follow WCA-3A regulation schedule after Jul 15.
S-333: G-3273 <6.8' NGVD Degrade the lower 4 miles of the L-67 extension	55% of the rainfall plan target to NESRS and 45% through the S-12 structures. When WCA-3A is in Zone E1 or above, maximum practicable through S-333 to NESRS per WCA-3A deviation schedule.	55% of the rainfall plan target to NESRS, plus as much of the remaining 45% that the S-12s can't discharge to be passed through S-334 and subject to capacity constraints, which are 1350 cfs at S-333, L-29 maximum stage limit, and canal stage limits downstream of S 334. When WCA-3A is in Zone E1 or above, maximum practicable through S-333 to NESRS per WCA-3A deviation schedule.
S-333: G-3273 >6.8' NGVD	Closed	Match S-333 with S-334 flows
L-29 Constraint	9.0 ft	9.0 ft
S-355A&B	Follow the same constraints as S-333. Open whenever gradient allows southerly flow.	Follow the same constraints as S-333. Open whenever gradient allows southerly flow.
S-337	Water Supply	Regulatory releases as per WCA-3A deviation schedule.
S-151	Water Supply	Regulatory releases as per WCA-3A deviation schedule.
S-335	Water Supply The intent is to limit the volume of water passed at S335 to pre-ISOP conditions and not use S332B, S332C, or S332D or other triggers to pass additional flows. Note: It is recognized that under these conditions, operations of S-335 would be infrequent.	When making regulatory releases through S-151, limit S-335 outflows to not exceed inflows from the S-151/S-337 path. Use S-333/S-334 before S-335/S 151/S-337.
S-334	Water Supply	Pass all or partial S-333 flows, depending on stage at G-3273.
S-338	Open 5.8 Close 5.5	Open 5.8 Close 5.4
G-211 Tailwater Constraint 5.3	Open 6.0 Close 5.5	Open 5.7 Close 5.3

	No WCA-3A Regulatory Releases to SDCS or Shark River Slough	WCA-3A Regulatory Releases to SDCS
S-331	Angel's Criteria – If Angel's well is <5.5 feet, then no limit on S-331 hw level. If Angel's well is 5.5-6.0 feet, S-331 avg. daily is between 5.0 – 4.5. If Angel's well is above 6.0 feet, S-331 avg. daily is between 4.5 – 4.0 until Angel's well is 5.7.	Angel's Criteria – If Angel's well is <5.5 feet, then no limit on S-331 hw level. If Angel's well is 5.5-6.0 feet, S-331 avg. daily is between 5.0 – 4.5. If Angel's well is above 6.0 feet, S-331 avg. daily is between 4.5 – 4.0 until Angel's well is 5.7.
S-332B Note 1: There will be two 125-cfs pumps and one 75-cfs pump directed to the west seepage reservoir. The remaining two 125-cfs pumps will be directed to the north seepage reservoir. Note 2: A new indicator will be established for subpopulation F. Operations will be modified as necessary to achieve desired habitat conditions consistent with the restoration purposes outlined in the C-111 GRR.	Pumped up to 575 cfs* On 5.0 Off 4.7** *Pump to capacity if limiting conditions within the Sparrow habitat are not exceeded. There will be no overflow into the park when the project (i.e., the S-332B north seepage reservoir and the partial S-332B/S-332C connector) is complete and when it is practical to do the construction necessary to raise the western levee. There may be overflow during emergency events until the project is complete and the western levee is raised. **If, after the first 30 days of operation, there is no observed drawdown at the pump, this stage level will be raised to 4.8.	Pumped up to 575 cfs* On 4.8 Off 4.5 *Pump to capacity if limiting conditions within the Sparrow habitat are not exceeded. There will be no overflow into the park when the project (i.e., the S-332B north seepage reservoir and the partial S-332B/S-332C connector) is complete and when it is practical to do the construction necessary to raise the western levee. There may be overflow during emergency events until the project is complete and the western levee is raised. .
S-332B North Seepage Reservoir	The north reservoir is the new 240-acre reservoir located to the north of the pump station with a weir discharging to the east. Normal operations will be targeted to achieve marsh restoration and phased in over a period of years. However, this provision does not include a requirement to maintain water levels in the reservoirs during dry conditions by bringing water in from outside the drainage basin. This seepage reservoir will have a normal maximum water depth of 2.0 feet. However, if the Corps determines that a flood emergency exists similar to an event like the "No Name" storm, the depth of water would be increased to 4.0 feet when possible.	The north reservoir is the new 240-acre reservoir located to the north of the pump station with a weir discharging to the east. Normal operations will be targeted to achieve marsh restoration and phased in over a period of years. However, this provision does not include a requirement to maintain water levels in the reservoirs during dry conditions by bringing water in from outside the drainage basin. This seepage reservoir will have a normal maximum water depth of 2.0 feet. However, if the Corps determines that a flood emergency exists similar to an event like the "No Name" storm, the depth of water would be increased to 4.0 feet when possible.

	No WCA-3A Regulatory Releases to SDCS or Shark River Slough	WCA-3A Regulatory Releases to SDCS
S-332B West Seepage Reservoir	The west reservoir is the existing 160-acre reservoir and is to the west of the pump station. There will be no overflow into the park when the project (i.e., the S-332B north seepage reservoir and the partial S-332B/S-332C connector) is complete and when it is practical to do the construction necessary to raise the western levee. There may be overflow during emergency events until the project is complete and the western levee is raised. Normal operations will be targeted to achieve marsh restoration and phased in over a period of years. However, this provision does not include a requirement to maintain water levels in the reservoirs during dry conditions by bringing water in from outside the drainage basin. This seepage reservoir will have a normal maximum water depth of 2.0 feet. However, if the Corps determines that a flood emergency exists similar to an event like the "No Name" storm, the depth of water would be increased to 4.0 feet.	The west reservoir is the existing 160-acre reservoir and is to the west of the pump station. There will be no overflow into the park when the project (i.e., the S-332B north seepage reservoir and the partial S-332B/S-332C connector) is complete and when it is practical to do the construction necessary to raise the western levee. There may be overflow during emergency events until the project is complete and the western levee is raised. Normal operations will be targeted to achieve marsh restoration and phased in over a period of years. However, this provision does not include a requirement to maintain water levels in the reservoirs during dry conditions by bringing water in from outside the drainage basin. This seepage reservoir will have a normal maximum water depth of 2.0 feet. However, if the Corps determines that a flood emergency exists similar to an event like the "No Name" storm, the depth of water would be increased to 4.0 feet.
S332C The S-332C pump capacity is temporary. A new indicator will be established and a new gauge will be installed in the Rocky Glades. Operations will be modified as necessary to achieve desired habitat conditions consistent with the restoration of Taylor Slough based on the C-111 GRR.	Pumped up to 575 cfs* On 5.00 Off 4.70** *Pump to capacity unless habitat conditions are not being achieved within the Rocky Glades. There will be no overflow into the park. **If, after the first 30 days of operation, there is no observed drawdown at the pump, this stage level will be raised to 4.8.	Pumped up to 575 cfs* On 4.8 Off 4.5 *Pump to capacity unless habitat conditions are not being achieved within the Rocky Glades. There will be no overflow into the park.
S-332C Seepage Reservoir	300 acres with overflow to the east Normal operations will be targeted to achieve marsh restoration and phased in over a period of years. However, this provision does not include a requirement to maintain water levels in the reservoirs during dry conditions by bringing water in from outside the drainage basin. This seepage reservoir will have a normal maximum water depth of 2.0 feet. However, if the Corps determines that a flood emergency exists similar to an event like the "No Name" storm, the depth of water would be increased to 4.0 feet.	300 acres with overflow to the east Normal operations will be targeted to achieve marsh restoration and phased in over a period of years. However, this provision does not include a requirement to maintain water levels in the reservoirs during dry conditions by bringing water in from outside the drainage basin. This seepage reservoir will have a normal maximum water depth of 2.0 feet. However, if the Corps determines that a flood emergency exists similar to an event like the "No Name" storm, the depth of water would be increased to 4.0 feet.

	No WCA-3A Regulatory Releases to SDCS or Shark River Slough	WCA-3A Regulatory Releases to SDCS
S-332B/S-332C Connector	141 acres partial 206 acres full 1,262 acres with the land swap Normal operations will be targeted to achieve marsh restoration and phased in over a period of years. However, this provision does not include a requirement to maintain water levels in the reservoirs during dry conditions by bringing water in from outside the drainage basin. This seepage reservoir will have a normal maximum water depth of 2.0 feet. However, if Corps determines that a flood emergency exists similar to an event like the "No Name" storm, the depth of water would be increased to 4.0 feet. The Corps, FWS, ENP, and SFWMD will jointly develop a rule for emergency operations that is consistent with C-111 project purposes before the land swap B/C connector is used.	141 acres partial 206 acres full 1,262 acres with the land swap Normal operations will be targeted to achieve marsh restoration and phased in over a period of years. However, this provision does not include a requirement to maintain water levels in the reservoirs during dry conditions by bringing water in from outside the drainage basin. This seepage reservoir will have a normal maximum water depth of 2.0 feet. However, if Corps determines that a flood emergency exists similar to an event like the "No Name" storm, the depth of water would be increased to 4.0 feet. The Corps, FWS, ENP, and SFWMD will jointly develop a rule for emergency operations that is consistent with C-111 project purposes before the land swap B/C connector is used.
S-332D	Pumped up to 500 cfs from Jul 16 (or the end of the breeding season, as confirmed by FWS) to Nov 31; 325 cfs from Dec 1 to Jan 31; and 165 cfs* from Feb 1 to Jul 15. Meet Taylor Slough rainfall formula consistent with marsh restoration (No L-31W constraint) On 4.85 Off 4.65 *New information will be sought to evaluate the feasibility of modifying the 165 cfs constraint.	Pumped up to 500 cfs from Jul 16 (or the end of the breeding season, as confirmed by FWS) to Nov 31; 325 cfs from Dec 1 to Jan 31; and 165 cfs* from Feb 1 to Jul 15. Meet Taylor Slough rainfall formula consistent with marsh restoration (No L-31W constraint) On 4.7 Off 4.5 *New information will be sought to evaluate the feasibility of modifying the 165 cfs constraint.
Frog Pond Seepage Reservoir	810 acres with overflow into Taylor Slough Normal operations will be targeted to achieve marsh restoration and phased in over a period of years. However, this provision does not include a requirement to maintain water levels in the reservoirs during dry conditions by bringing water in from outside the drainage basin. This seepage reservoir will have a normal maximum water depth of 2.0 feet. However, if Corps determines that a flood emergency exists similar to an event like the "No Name" storm, the depth of water would be increased to a maximum of 4.0 feet. However, a depth of 4.0 feet in the Frog Pond is not possible at this time due to the constraint of the S-332D pump station outlet elevation.	810 acres with overflow into Taylor Slough Normal operations will be targeted to achieve marsh restoration and phased in over a period of years. However, this provision does not include a requirement to maintain water levels in the reservoirs during dry conditions by bringing water in from outside the drainage basin. This seepage reservoir will have a normal maximum water depth of 2.0 feet. However, if Corps determines a flood emergency exists similar to an event like the "No Name" storm, the depth of water would be increased to a maximum of 4.0 feet. However, a depth of 4.0 feet in the Frog Pond is not possible at this time due to the constraint of the S-332D pump station outlet elevation.
S-332	Closed	Closed
S-175	Closed	Closed

	No WCA-3A Regulatory Releases to SDCS or Shark River Slough	WCA-3A Regulatory Releases to SDCS
S-194	Open 5.5 Close 4.8	Operated to maximize flood control discharges to coast Open 4.9 Close 4.5
S-196	Open 5.5 Close 4.8	Operated to maximize flood control discharges to coast Open 4.9 Close 4.5
S-176	Open 5.0 Close 4.75	Open 4.9 Close 4.7
S-177	Open 4.2 (see S-197 open) Close 3.6	Open 4.2 (see S-197 open) Close 3.6
S-18C	Open 2.6 Close 2.3	Open 2.25 Close 2.00
S-197	If S-177 headwater is greater than 4.1 or S-18C headwater is greater than 2.8 open 3 culverts. If S-177 headwater is greater than 4.2 for 24 hours or S-18C headwater is greater than 3.1 open 7 culverts. If S-177 headwater is greater than 4.3 or S-18C headwater is greater than 3.3 open 13 culverts. Close gates when all the following conditions are met: 1. S-176 headwater is less than 5.2 and S-177 headwater is less than 4.2 2. Storm has moved away from the basin 3. After Conditions 1 and 2 are met, keep the number of S-197 culverts open necessary only to match residual flow through S-176. All culverts should be closed if S-177 headwater is less than 4.1 after all conditions are satisfied.	If S-177 headwater is greater than 4.1 or S-18C headwater is greater than 2.8 open 3 culverts. If S-177 headwater is greater than 4.2 for 24 hours or S-18C headwater is greater than 3.1 open 7 culverts. If S-177 headwater is greater than 4.3 or S-18C headwater is greater than 3.3 open 13 culverts. Close gates when all the following conditions are met: 1. S-176 headwater is less than 5.2 and S-177 headwater is less than 4.2 2. Storm has moved away from the basin 3. After Conditions 1 and 2 are met, keep the number of S-197 culverts open necessary only to match residual flow through S-176. All culverts should be closed if S-177 headwater is less than 4.1 after all conditions are satisfied.
S-356	When conditions permit (i.e., G-3273 and L-29 constraints), discharges from S356 will go into L-29. Pumping will be limited to the amount of seepage into L-31N in the reach between S-335 and G-211. A technical team will evaluate pumping limits and operations. The pumps will be operated accordingly.	When conditions permit (i.e., no S-334 regulatory releases and G-3273 and L-29 constraints), discharges from S356 will go into L-29. Pumping will be limited to the amount of seepage into L-31N in the reach between S-335 and G-211. A technical team will evaluate pumping limits and operations. The pumps will be operated accordingly.

Note: Pre-storm drawdown will be the same as in the October 01 SDEIS with the additional language….

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

Note: The Chairman of the Miccosukee Tribe of Indians of South Florida or his designated representatives will monitor predicted rainfall and conditions in WCA-3A and other tribal lands. If the Tribe determines these conditions indicate jeopardy to the health or safety of the Tribe, the Chairman will make a recommendation to the Corps to change the operations of the S-12 structures or other parts of the system. The Corps will review the data and advise the appropriate agencies of the conditions, and the District Commander will personally consult with the Chairman prior to making a decision whether to implement changes to the S-12 operations.

3.0 AFFECTED ENVIRONMENT

The Affected Environment described previously in the FEIS dated May 2002 provides a description of the existing conditions at the time the proposed project was evaluated and still serves as the basis for comparison. The information is incorporated by reference and is available for review http://hpm.saj.usace.army.mil/issueweb/Sparrow/fiopeis.htm.

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4.0 ENVIRONMENTAL CONSEQUENCES

4.1 Climate

Alternative 7R (Recommended Alternative)

Alternative 7R would not have any effect on climate. However, between 2002 and 2006, rainfall in South Florida was characterized by a number of major storm events, particularly in the summer and fall of 2004 and 2005. In September, October, and December 2002, the Corps implemented three pre-storm operations. In 2003, pre-storm events occurred earlier in the year, with events in April, May, June, and September. In 2004, four major hurricanes affected Florida, including the South Florida area. This pattern was repeated in 2005, with three major hurricanes directly affecting South Florida. The year 2006 did not experience the heavy rainfall and active hurricane season that characterized the previous two years.

4.2 Geology and Soils

Alternative 7R (Recommended Alternative)

There would be no significant impacts to geology or soils with Alternative 7R. Alternative 7R would require some excavation with construction of a 240-acre seepage reservoir. However, exposure of the soils would be short-term, and impacts would be minor and temporary. Appropriate erosion and sedimentation control measures would be incorporated and applied to construction efforts. Additional construction occurred during installation of the two pump stations and the impoundments. These changes are documented in the Clean Water Act Section 404 (b)(1) Evaluation concurrently with Alternative 7R.

4.3 Hydrology

To help demonstrate the changes to hydrology and performance measures, a large number of color figures were provided in the previous NEPA documents. Additional figures of interest are provided on the Cape Sable Seaside Sparrow Issues Homepage (http://hpm.saj.usace.army.mil/issueweb/Sparrow/Sparrow_Page.htm).

One of the performance measures of interest in the WCA is the number of weeks the water depth would be greater than 2.5 feet (relative to the average ground elevation). When reviewing this performance measure, it is important to remember that there are 1612 weeks in the modeling period of record (1965-1995). Under RPA02, for example, there were 566 weeks with depths greater than 2.5 feet, compared to 519 weeks for the 95BaseMod2 condition, and 475 weeks for Alternative 1 condition in southern WCA 3A. The goal for this performance measure is to decrease the number of weeks water depth is greater than 2.5 feet. Specific hydrographs for WCA 3A are included in Appendix D of this document.

Reasonable and Prudent Alternative (RPA)

The RPA, as given, could not be directly implemented because releases from S-333 are currently limited by high stage criteria at G-3273. Furthermore, higher canal stages in L-31N, as envisioned in Test 7, Phase II, depended upon the full use of the S-332D pump station. However, under the FWS BO, pumping volume at S-332D pump station was limited during the nesting season (165 cfs instead of 500 cfs). For example, the maximum stage reached in cell R17C27 would have been about 0.48 foot higher under RPA02 (7.16 feet) compared to the 95BaseMod2 condition (6.65 feet). It should also be noted that increasing the flows southward down L-31N not only raises the canal pump criteria, but results in higher stages compared to simply raising the canal pump criteria alone. Under ISOP, additional water is moved down L-31N to help meet the S-333 release requirements. Under the RPA02, slightly more water would enter L-31N due to increased seepage from the higher stages in NESRS. When not limited by structural capacity, the target flows for RPA02 were 60% of the regulatory release through S-333 into NESRS. Although the RPAs could not be directly implemented, several RPAs were modeled to determine the desired hydrologic characteristics in the sparrow regions. RPA02 best represents the hydrologic requirements for all sparrow subpopulations. Detailed descriptions of the RPA model runs can be found on the Corps' web site (http://hpm.saj.usace.army.mil/issueweb/Sparrow/Sparrow_Page.htm under "RPA Modeling".

Alternative 2

NESRS. Phase 1 of Alternative 2 is IOP 2b. The effect of Phase 1 on the hydrology (water levels in the NESRS) is similar to the 95BaseMod and essentially the same as Alternative 1.

Phase 2 of Alternative 2 is IOP2. This plan removes the G-3273 trigger. Under the other alternatives, this trigger either closes S-333 or routes flood discharges through S-334. By removing the trigger, discharges to NESRS from S-333 via L-29 and the Tamiami Trail culverts can be made when G-3273 is above 6.8 feet. For this alternative, the hydrology of the area changes because discharges through S-333 increase in some years. Annual average ponding depth increased by 0.5 foot during the wettest 15% of the time. Removing the trigger on S-333 would increase water to NESRS by 115,000 acre-feet/year. The hydroperiod as well as the mid-to-lower flow ranges show no significant change. CSSS subpopulation E shows a significant increase during the discontinuous hydroperiod in wet years but no adverse impact from consecutive dry days during the nesting season. CSSS subpopulation B shows no significant change. CSSS subpopulation F shows a dramatic increase during the discontinuous hydroperiod in wet years, but has an adverse impact from consecutive dry days during the nesting season.

WSRS. The effect of Phase 1 of Alternative 2 on the hydrology (water levels in the WSRS) is similar to Alternative 1, except that the 6.0 feet criteria at NP-205 would be exceeded six times compared to five times for Alternative 1.

Phase 2 of Alternative 2 does not change how the S-12s are operated, but there is a reduction in the annual volume of flow because more flow is passed down the NESRS side from S-333 via L-29 and the Tamiami Trail culverts (with trigger removed). The difference is about 53,000 acre-feet (339,000 vs. 286,000 acre-feet). The 6.0 feet criteria at NP-205 would still be violated six times compared to five times for Alternative 1.

WCA-1. WCA-1 would not be impacted by Alternative 2. Wet and dry season hydrologic characteristics would not change to any great degree.

WCA-2A and 2B. There is a change in the operation of these areas. Alternative 2 results in higher stages in WCA-2A and WCA-2B compared to Alternative 1 and 95BaseMod. In WCA-2A, stage will increase about 0.4 to 1.3 feet, resulting in about 63 additional weeks with depths greater than 2.5 feet. In WCA-2B, stage will increase about 0.2 to 0.8 foot, resulting in an increase of more than 450 weeks over the 3-year period with depths greater than 2.5 feet.

WCA-3A and 3B. In WCA-3A and 3B, there is an increase in the number of weeks with depths greater than 2.5 feet (13 weeks) in the high stage criteria for Phase 1 of Alternative 2 compared to Alternative 1 and 95BaseMod. For Phase 2 of Alternative 2, operation of S-333 changes with removal of the G-3273 gauge trigger results in a slight reduction (4 weeks) in weeks with depths greater than 2.5 feet.

Taylor Slough. The effect of Alternative 2 (Phases 1 and 2) on the hydrology of Taylor Slough is similar to Alternative 1 and the 95BaseMod.

Lower East Coast Area. The effect of Alternative 2 (Phases 1 and 2) on the hydrology of the Lower East Coast Area is similar to the 95BaseMod. However, in one cell (R20C28) there was an increase of about 0.75 foot in the stage at the highest 10^{th} percentile in Phase 1.

8.5 SMA. The effect of Phase 1 of Alternative 2 on the hydrology (water levels in 8.5 SMA) is the same as Alternative 1 and 95BaseMod. Phase 2 of Alternative 2 removes the trigger that would limit the operation of S-333 and allows greater discharges to NESRS. With the 8.5 SMA project completion, the higher water levels in NESRS would not impact the 8.5 SMA. However, without the project, the duration of flooding would increase from about 1% to 10% of the time.

Biscayne Bay. Phase 1 of Alternative 2 would affect the hydrology of Biscayne Bay by increasing the wet season flows by about 20,000 acre-feet/year and the dry season flows by about 29,000 acre-feet. Phase 2 of Alternative 2 would affect the hydrology of Biscayne Bay by increasing the wet season flows by about 24,000 acre-feet/year and the dry season flows by about 6,000 acre-feet/year.

Florida Bay. Phase 1 of Alternative 2 would reduce flows to Florida Bay only slightly during June and July, but Phase 2 of Alternative 2 would reduce the flows by about 10 to 15% during June, July, and August.

Alternative 3

NESRS. The effect of Phase 1 of Alternative 3 (IOP 2a) on the water levels in NESRS is similar to the 95BaseMod and essentially the same as Alternative 1.

Phase 2 of Alternative 2 is IOP2. This plan removes the G-3273 trigger, which under the other alternatives either closes S-333 or routes the discharge (flood discharges) through S-334. With the trigger gone, discharges to NESRS from S-333 via L-29 and the Tamiami Trail culverts can be made when G-3273 is above 6.8 feet. For this alternative, the hydrology of the area changes because the discharges through S-333 increase in some years. Annual average ponding depth increased by 0.5 foot during the wettest 15% of the time. Removing the trigger on S-333 would increase water to NESRS by approximately 107,000 acre-feet/year. The hydroperiod, as well as the mid-to-lower flow ranges, shows no significant change. CSSS subpopulation E shows a significant increase during the discontinuous hydroperiod in wet years but no adverse impact from consecutive dry days during the nesting season. CSSS subpopulation B shows no significant change. CSSS subpopulation F shows a dramatic increase during the discontinuous hydroperiod in wet years, but has an adverse impact from consecutive dry days during the nesting season.

WSRS. Phase 1 of Alternative 3 discharges about 26% more flow into WSRS compared to Phase 2. Phase 2 of Alternative 3 removes the trigger stage on S-333 resulting in an increase of flow into NESRS and a decrease of flow into the WSRS. However, the 6.0 feet criteria at NP-205 would be violated six times compared to five times for Alternative 1.

WCA-1. WCA-1 would not be impacted by Alternative 3. Wet and dry season hydrologic characteristics would not change to any great degree.

WCA-2A and WCA-2B. There is a change in the operation of these areas compared to Alternative 1 and 95BaseMod, which results in higher stages in WCA-2A and WCA-2B. In WCA-2A, stage will increase from about 0.4 to 1.3 feet, resulting in about 63 additional weeks with depths greater than 2.5 feet. In WCA-2B, stage will increase from about 0.2 to 0.8 feet, resulting in an increase of more than 450 weeks over the 3-year period with depths greater than 2.5 feet.

WCA-3A and WCA-3B. For Phase 1 of Alternative 2, there is an increase in the number of weeks (46 weeks) with depths greater than 2.5 feet in the high stage criteria in WCA-3A compared to Alternative 1 and 95BaseMod. For Phase 2 of this alternative, operation of S-333 changes with removal of the G-3273 gage trigger results in a small reduction (27 weeks) in weeks with depths greater than 2.5 feet.

Taylor Slough. The effect of Alternative 3 (Phases 1 and 2) on the hydrology of the Taylor Slough area is minimal and similar to Alternative 1 and the 95BaseMod conditions.

East Coast Agricultural Area. The effect of Alternative 3 (Phases 1 and 2) on the hydrology of the East Coast Agricultural Area is negligible. However, in two cells (R20C28 and

C16R29) there were increases of about 0.7 foot in the stage at the highest 10th percentile in Phase 1.

8.5 SMA. The effect of Phase 1 of Alternative 3 on the hydrology (water levels in 8.5 SMA) is the same as Alternative 1 and 95BaseMod. Phase 2 of Alternative 3 removes the trigger that would limit the operation of S-333 and allows greater discharges to the NESRS. With the 8.5 SMA project completion, the higher water levels in NESRS would not impact the 8.5 SMA. However, without the project, the duration of flooding would increase from about 1% to 10%.

Biscayne Bay. Phase 1 of Alternative 3 would affect the hydrology of Biscayne Bay by increasing the wet season flows by about 13,000 acre-feet/year; the dry season flows would be about the same. Phase 2 of Alternative 3 would affect the hydrology of Biscayne Bay by increasing the wet season flows by about 24,000 acre-feet/year and the dry season flows by about 6,000 acre-feet/year.

Florida Bay. Similar to RPA102, Phase 1 of Alternative 3 would reduce flows during June, July, and August by about 10 to 20%. Phase 2 of Alternative 3 would reduce flows by about 10 to 15% during June, July, and August.

Alternative 4

NESRS. The effect of Phase 1 of Alternative 4 (IOP 3a) on the hydrology (water levels in the NESRS) is similar to the 95BaseMod and essentially the same as Alternative 1.

Phase 2 of Alternative 4 is IOP3. This plan removes the G-3273 trigger and discharges to NESRS from S-333 via L-29 and the Tamiami Trail culverts. For this alternative, the hydrology of the area changes because the discharges through S-333 increase in some years. Annual average ponding depth increased by 0.5 feet during the wettest 15% of the time. Removing the trigger on S-333 would increase water to NESRS by approximately 109,000 acre-feet/year. The hydroperiod, as well as the mid-to-lower flow ranges, show no significant change. CSSS subpopulation E shows a significant increase during the discontinuous hydroperiod in wet years but no adverse impact from consecutive dry days during the nesting season. CSSS subpopulation B shows no significant change. CSSS subpopulation F shows a dramatic increase during the discontinuous hydroperiod in wet years, but also a significant adverse impact from consecutive dry days during the nesting season.

WSRS. Under Phase 1 of this alternative, the overall flow to the area is slightly reduced because of the early S-12 closures. In Phase 2, this impact is increased because the stage duration is decreased from 73 to 67%. The wet season stages are reduced by about 0.25 feet, and dry downs (stages < -1 foot) are increased from 172 to 195 events. With the earlier closing of the S-12s, the dry season flows are reduced to 10% compared to all other alternatives.

The number of predicted failures at NP-205 is five, which is the same as Alternative 1. Unlike Alternative 1, the S-343 (A&B), S-344, and all S-12s would be closed from November

1 until July 15. Also, unlike Alternative 1, the complete closure of the WCA-3A outlets into WSRS would have significant impacts within WCA-3A (addressed below).

WCA-1. WCA-1 would be impacted by Alternative 4. An increase of 0.2 foot in the regulatory schedule resulted in a high frequency of depths greater than 2.5 feet.

WCA-2A and WCA-2B. Compared to Alternative 1 and 95BaseMod, there is a change in the operation of these areas resulting in higher stages in WCA-2A and WCA-2B. In WCA-2A, stage will increase about 0.4 to 1.3 feet, resulting in approximately 63 additional weeks with depths greater than 2.5 feet. In WCA-2B, stage will increase about 0.2 to 0.8 feet, resulting in an increase of more than 450 weeks with depths greater than 2.5 feet.

WCA-3A and WCA-3B. The combination of earlier closure of the S-12s and not passing water to L-31N dramatically increases the stages in the south and south-central areas of WCA-3A. For Phase 1, depths greater than 2.5 feet increase by about 90 weeks for the south region (only RPA102 was worse) and by 72 weeks in the south-central region compared to Alternative 1 and the 95BaseMod. For Phase 2, depths greater than 2.5 feet increase by about 24 weeks for the south region and by about 37 weeks in the south-central region compared to Alternative 1 and the 95BaseMod. Most of the highest stage increases (0.5 to 1.0 foot) occurred in wet years like 1995. In WCA-3B, the stage increases were not significant, however weeks with depths greater than 2.5 feet increased from 2 to 6 weeks for Phases 1 and 2 compared to Alternative 1 and the 95BaseMod.

Taylor Slough. The effect of Alternative 4 (Phases 1 and 2) on the hydrology of the Taylor Slough area is minimal and similar to Alternative 1 and the 95BaseMod conditions.

East Coast Agricultural Area. Alternative 4 shows no significant changes to stages in the subject area.

8.5 SMA. The effect of Phase 1 of Alternative 4 on the hydrology (water levels in 8.5 SMA) is the same as Alternative 1 and 95BaseMod. Phase 2 of Alternative 4 removes the trigger that would limit the operation of S-333 and allows greater discharges to NESRS. With the 8.5 SMA project completion, the higher water levels in NESRS would not impact the 8.5 SMA. However, without the project, the duration of flooding would increase from about 1% to 10%.

Biscayne Bay. Phase 1 of Alternative 4 would affect the hydrology of Biscayne Bay by increasing the wet season flows by about 14,000 acre-feet/year, and the dry season flows would be about the same. Phase 2 of Alternative 4 would affect the hydrology of Biscayne Bay by increasing the wet season flows by about 26,000 acre-feet/year and the dry season flows by about 9,000 acre-feet/year.

Florida Bay. Phase 1 of Alternative 4 would reduce flows to Florida Bay during June, July, and August by about 10 to 25%. Phase 2 of Alternative 4 would reduce the flows by about 10 to 15% during June, July and August. With the earlier closures of the S-12s and not passing S-333 releases to L-31N, the Phase 1 flows to Florida Bay are significantly less in several months when compared to Alternative 1. Phase 2 flows to Florida Bay are slightly more than

Alternative 1 during October and November, but slightly less than Alternative 1 in June and July. The Phase 1 and 2 flows to Whitewater Bay, via SRS, are less than Alternative 1 during November through February. These areas have already been subject to reduced flows due to the implementation of ISOP and closing on November 1 would further increase the adverse impact on salinity.

Alternative 5

NESRS. Phase 1 of Alternative 5 is similar to Alternative 1 with regard to impacts on NESRS, except there is about a 0.1 foot decrease in stage for about 30% of the time. One of the primary differences between this alternative and Alternatives 2, 3, and 4 was allowing S-12D to remain open all year. In Phase 2 (as in the other alternatives), the constraint at G-3273 is removed. Annual average ponding depth increased by 0.5 feet during the wettest 15% of the time. Removing the trigger on S-333 would increase water to NESRS by approximately 103,000 acre-feet/year. The hydroperiod, as well as the mid-to-lower flow ranges, show no significant change.

Unlike Alternative 1, Alternative 5 also changes the pump criteria in L-31N to improve the hydrologic characteristics for the eastern sparrow regions. This is most noticeable in CSSS subpopulation F which shows a dramatic increase during the discontinuous hydroperiod in wet years, but a less adverse impact from consecutive dry days during the nesting season compared to Alternatives 2, 3, and 4. CSSS subpopulation E shows a significant increase during the discontinuous hydroperiod in wet years with no adverse impact from consecutive dry days during the nesting season. CSSS subpopulation B shows no significant change.

WSRS. Alternative 5 is similar to Alternative 1 with regard to impacts to WSRS. The proposed closing schedule for the S-12 structures in Alternative 5 is the same as in Alternative 1. The number of predicted failures (five) in the 3-year period of record at NP-205 is the same as with Alternative 1 and RPA130.

WCA-1. WCA-1 would not be impacted by Alternative 5. Neither wet nor dry season hydrologic conditions would change from Alternative 1 or the 95BaseMod.

WCA-2A and WCA-2B. Alternative 5 does not significantly change the hydrologic characteristics of either WCA-2A or WCA-2B from Alternative 1 or the 95BaseMod.

WCA-3A and WCA-3B. The preliminary stage duration curves indicate that Phase 2 of Alternative 5 would slightly increase water levels by about 0.2 foot, resulting in an increase in depths greater than 2.5 feet for 25 weeks out of the 1,612 weeks modeled in WCA-3A compared to Alternative 1 and Phase 1. However, the total number of weeks is still less than or equal to the 95BaseMod condition. Similarly, a stage increase of about 0.3 foot (closer to NSM stages) occurred in WCA-3B without significant increase to depths greater than 2.5 feet. The final model runs are expected to show a decrease in water levels from Alternative 1 and Phase 1.

Taylor Slough. The effect of Alternative 5 is essentially the same as Alternative 1.

East Coast Agricultural Area. Alternative 5 shows no significant pattern changes to the stages in the subject area.

8.5 SMA. The effect of Alternative 5 is the same as Alternative 1.

Biscayne Bay. The effect of Alternative 5 is negligible compared to Alternative 1.

Florida Bay. The effect of Alternative 5 is similar to Alternative 1 in this area, but Alternative 5 has about 10% less flow during the months of June, July, and August.

Alternative 6

Alternative 6 is essentially the same as Alternative 5 except for the addition of a 240-acre seepage reservoir at S-332B to supplement the existing 160-acre reservoir.

NESRS. There are no proposed changes that would affect NESRS. Alternative 6 is expected be similar to Alternative 1 with regard to impacts to NESRS. In Phase 2 (as in the other alternatives), the constraint at G-3273 would be removed. However, the addition of a 240-acre seepage reservoir at S-332B would change the amount of overflow potentially impacting the CSSS subpopulations E and F. The increase in size of the seepage reservoir would significantly reduce weir overflow of water pumped from S-332B.

WSRS. There are no proposed changes that would affect WSRS. Alternative 6 is expected to be similar to Alternative 1 with regard to impacts to WSRS. The proposed closing schedule for the S-12 structures is the same for Alternative 6. As with Alternative 1, this schedule would attempt to dry the area out by March 1, but five periods of less than 60 days below 6.0 feet at NP-205 are predicted.

WCA-1. There are no proposed changes to the operations of WCA-1; it is not expected be impacted by Alternative 6.

WCA-2A and WCA-2B. There are no proposed changes to the operations of WCA-2A or 2B; they are not expected be impacted by Alternative 6.

WCA-3A and WCA-3B. There are no proposed changes to the operations of WCA-3A or 3B; they are not expected be impacted by Alternative 6.

Taylor Slough. The effect of Alternative 6 is expected to be essentially the same as Alternative 5.

East Coast Agricultural Area. Alternative 6 should show no significant pattern changes to the stages in the subject area.

8.5 SMA. The effect of Alternative 6 would be the same as Alternative 5 in this area.

Biscayne Bay. The effect of Alternative 6 would be negligible compared to Alternative 5.

Florida Bay. The effect of Alternative 6 is the same as Alternative 5 in this area.

Alternative 7

Since Alternative 7 represents a dual-mode operation (i.e., changing between two L-31N canal levels depending on hydrologic conditions), it could not be modeled directly using the SFWMM version 3.8. To evaluate the results of this alternative, the model was run in both modes (i.e., no passing of flood flows down L-31N with higher pumping triggers and passing of flood flows down L-31N with lower pumping triggers). These two model runs, termed ALT7a and ALT7b, represent the range of potential impacts associated with either mode. Performance measures that show both wet and dry year effects can be further evaluated knowing the dry years would be more indicative of the model run termed ALT7a, and the wet years would be more indicative of the model run termed ALT7b. The actual benefit or impact would be represented between the two extremes in some areas or would represent only one extreme in other areas. For example, in WCA-3A, the true impact would be the same as ALT7b (since water would be moved to L-31N and no other changes would affect this region). As another example, the true impact in the eastern sparrow regions would more likely be the average effect of both ALT7a and ALT7b.

It should be noted that the model runs termed ALT7a and ALT7b do not represent a two-phase implementation, but rather an attempt to provide the range of effects of the dual-mode operation of L-31N in Alternative 7. In many areas, there is little difference between the two model runs in that, together, they represent the effects of the range of operations in Alternative 7.

NESRS. Alternative 7 is similar to Alternative 1 in regard to impacts to NESRS (SDEIS A-62); however, Alternative 7 has five fewer dry-downs over the 31-year period compared to Alternative 1. Alternative 7 supplies about 133,000 acre-feet/year into NESRS, whereas Alternative 1 and RPA02 supply 126,000 and 210,000 acre-feet/year, respectively (SDEIS A-87). Although the amount delivered into NESRS is less than RPA02, Alternative 7 would not cause the significant flooding impacts to the 8.5 SMA that could occur with RPA02 .

No significant differences are shown between Alternative 7 and Alternative 1 in CSSS subpopulations B, D, and E (SDEIS A-72 to A-75 and A-78 to A-83). In those cases, Alternative 7 meets or exceeds the requirements of RPA02. In subpopulations C and F (SDEIS A-75 to A-77 and A-84 to A-86), Alternative 7 average stages, durations, and discontinuous hydroperiods of ALT7a and ALT7b would be slightly less than Alternative 1 but would still meet or exceed the RPA02 requirements.

WSRS. Alternative 7 would result in slightly wetter conditions compared to Alternative 1 with regard to impacts to WSRS (SDEIS A-64 and A-65). Although the closing schedule for the S-12 structures is similar to Alternative 1, about an additional 36,000 acre-feet of water would be passed through the region from WCA-3A (SDEIS A-87).

The stages and stage duration of Alternative 7 (both ALT7a and ALT7b) are similar to Alternative 1 and show conditions drier than those of RPA02 (SDEIS A-66 to A-71), which is an improvement in this indicator region. The number of predicted nesting failures (five) in the 31-year period of record at NP-205 is the same as for Alternative 1 and RPA02.

WCA-1. Alternative 7 would not impact WCA-1 (SDEIS A-48 and A-49). Neither wet nor dry season hydrologic conditions would change from Alternative 1.

WCA-2A and WCA-2B. Alternative 7 would not significantly change the hydrologic characteristics of either WCA-2A or WCA-2B compared to Alternative 1.

WCA-3A and WCA-3B. The preliminary stage duration curves indicate that Alternative 7 would be similar to Alternative 1 for ALT7b, which represents moving water to L-31N from WCA-3A during high stages (SDEIS A-54 to A-57). Without moving the water to L-31N, there would be an increase in the number of weeks of high stages in WCA-3A; however, there would likely be a decrease in the weeks of high stages as shown by ALT7b. In WCA-3B, there is likely to be a slight reduction in the number of weeks of high stages (SDEIS A-58 and A-59).

Taylor Slough. The effect of Alternative 7 is essentially the same as Alternative 1.

East Coast Agricultural Area. SFWMM analysis of Alternative 7 shows no significant pattern in changes to the stages in the subject area (SDEIS A-92). Alternative 7 shows no increases in the peak stage values. However, comments received on behalf of the Greater Homestead/Florida City Chamber of Commerce indicated that operating levels for structures serving the L-31N canal would be raised from 0.2 to 0.5 foot above current operating levels, which could lead to higher water tables in the area adjacent to the canal. As previously mentioned, the SFWMM predicts changes over 2-mile square grids, so localized higher groundwater tables would not necessarily be evident. Based on this information, water levels in these areas could be higher with Alternative 7 than with ISOP 2001 during high rainfall periods.

8.5 SMA. The effect of Alternative 7 is the same as Alternative 1 in this area.

Biscayne Bay. The effect of Alternative 7 is negligible to Biscayne Bay areas when compared to Alternative 1, except for the South Bay region. In South Bay, there is likely to be a slight decrease (compared to Alternative 1) of about 26,000 acre-feet/year in surface flows. However, this would still represent more freshwater flow than the 1995 Base condition.

Florida Bay. The effect of Alternative 7 would be similar to Alternative 1. ALT7a shows less flow during all months, whereas ALT7b shows about the same flow for all months. Considering the average of ALT7a and ALT7b, there is likely to be only a slight reduction in flows into Florida Bay.

Alternative 7R (Recommended Alternative)

Alternative 7R has a dual-mode operation in L-31N; hence trigger levels at key structures vary according to whether or not water is being passed from WCA-3A into L-31N. Although some structure trigger levels in South Dade are somewhat higher than the existing condition and slightly higher than the 1995 Base, more storage (in the form of seepage reservoirs) is provided in Alternative 7R. At the completion of construction, no overflow would be passed from the seepage reservoirs to ENP.

The seepage reservoirs (initially S-332B West and S-332C) began operations with a default set of Marsh Operations that had general agreement from all agencies. Although the seepage reservoirs were designed to hold up to 4 feet of water for normal operations, a normal maximum depth of 2 feet was used unless severe storm conditions (with heavy rainfall) occurred in the area, at which time a maximum depth of 4 feet would be used. By limiting the normal maximum depth to 2 feet, there would be no weir overflow from S-332B West to ENP. Neither S-332C nor S-332B North had facilities to make direct releases to ENP. After full build-out of the S-332B West and S-332C reservoirs, no direct overflow would enter ENP via the seepage reservoirs (as stated in the previous paragraph). It should be noted that the modeling runs for Alternative 7R assume that the full 1,262-acre S-332B/C connector, including the land swap area, has been constructed and that a continuous detention area was constructed from S-332B North to the Frog Pond. The land swap increases the detention area from the approximately 700 acres provided by S-332B North, S-332B West, and S-332C to approximately 1,700 acres.

In Alternative 7R, pre-storm drawdown would be similar to Alternative 7 except for operations related to other than named events. For those events, SFWMD would monitor antecedent conditions, groundwater levels, and rainfall. If these conditions indicate a strong likelihood of flooding, SFWMD would make a recommendation to the Corps to initiate pre-storm drawdown or otherwise alter system-wide operations from those contained in Table 2.11. A description of the pre-storm/storm/storm recovery operations is included in Appendix C (Engineering Appendix). The appendix also includes a summary of pre-storm operations from the June 2002-October 2005 period during IOP operations.

NESRS. Modeling results showed that Alternative 7R hydrologic effects were similar to those of Alternative 1 in NESRS. Pumping at the newly constructed S-356 structure was limited to values that did not show impact in the 8.5 SMA. The excess water pumped from L-31N (north of G-211) into NESRS provided an improvement in high canal stages during the wettest 5% of the time.

Modeling results showed that Alternative 7R met the requirements of the RPA in CSSS subpopulations E and F by increasing the discontinuous hydroperiod while maintaining sufficient dry conditions during the nesting season. The S-332D seepage reservoirs slightly decreased the stages in the CSSS subpopulation C with a concurrent reduction during the nesting season. However, if an increase in stages in subpopulation C is desired by FWS, culverts could be used to increase the stages in L-31W, thereby improving the conditions

subpopulation C. The S-332D seepage reservoirs slightly decreased the stages in CSSS subpopulation D, but conditions were still drier than the 95 Base conditions.

WSRS. Alternative 7R would not affect flows into WSRS due to the operations of the WSE Lake Okeechobee schedule and the operational considerations of Miccosukee Tribal recommendations. No increases in the discontinuous hydroperiod or number of nesting season failures during the critical nesting period of the CSSS subpopulation A were evident during modeling runs.

WCA-1. Modeling results for Alternative 7R showed no impact in WCA-1.

WCA-2A and WCA-2B. Modeling results for Alternative 7R showed no impact in WCA-2A or WCA-2B.

WCA-3A and WCA-3B. Model runs of Alternative 7R predicted no significant increase over existing conditions in stages over 2.5" or longer stage durations in eastern or southern WCA-3A. No significant changes were noted in WCA-3B.

Weekly stage duration curves and weekly high/low water depth criteria exceedence hydrographs for indicator regions 14 and 19 are included in Appendix D. Alternative 7R was higher by less than 1% when comparing the number of weeks (over the 30-year period of record) that Alternative 7R would have exceeded the 2.5-feet target maximum compared to Alternative 1 (ISOP 2001) in indicator region 14. The performance of Alternative 7R was similar in indicator region 19. Comparisons to pre-ISOP operations are not valid because those operations were determined by FWS to cause a jeopardy opinion for the CSSS.

Figure 8 provides a comparison of elevation data (presented as an average of gauges 63, 64, and 65) and rainfall between August 2002 and February 2006 (under IOP operations). The same elevation data is superimposed over the WCA-3A regulatory schedule in Figure 9. Although water elevations exceeded maximum levels in the regulatory schedule, these elevations were a result of heavy localized rainfall events and not specific operations associated with IOP.

Taylor Slough. Under Alternative 7R, the effect of pumping into seepage reservoirs from S-332D slightly increased the average and dry season stages in Taylor Slough. The high stage conditions exhibited no change. Should it become necessary, as determined by ENP, culverts could be used to increase the stages in L-31W to improve stages in Taylor Slough.

East Coast Agricultural Area. The highest stages in L-31N canal above the S-176 structure were modeled to be similar to existing conditions for the wettest 2% of the time (when stages were above 5.0 feet.). Average to wet years produced higher stages similar to the 95 Base conditions. Only one indicator cell (from the model) showed a peak stage increase of 0.2 foot, while no other significant peak stage increases were noted. Because no clear trend in stage increase occurred in the region, monitoring and operational testing for a single cell (north and east of S-176) would be sufficient to deal with the potential issue.

8.5 SMA. Alternative 7R, as modeled, produced conditions similar to Alternative 1 since the pumping limitation at G-3273 is still used to restrict releases into NESRS. Neither modeling cell (representing 8.5 SMA in the model) showed stage increases.

Biscayne Bay. With the higher L-31N trigger levels in Alternative 7R (in the southern reach), flows to Biscayne Bay were reduced over other alternatives in the southern part of the bay (closer to target). However, the rest of the Biscayne Bay areas had slight increases.

Florida Bay. With the exception of October and November, flows southward into Florida Bay under Alternative 7R either slightly increased or were similar to the Alternative 7 conditions. Flows westward through SRS showed improvement.

WCA-3A Operations during IOP

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

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

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

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

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

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

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

2. Column 2 operations will be used to offset or mitigate for adverse effects on WCA-3A related to actions taken to protect CSSS subpopulation A. Column 2 operations will

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

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

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

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

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

IOP WCA-3A Operational Summary

The following summaries of the 2002, 2003, and 2004 IOP periods are based on a simplified account of flows via the S-12A, B, C, and D; S-333; and S-334 structures. FWS, NPS, and SFWMD reviewed the spreadsheet utilized to develop the following summary during an interagency phone conference on August 7, 2003. The group agreed that a simplified method was adequate.

In addition to the accounting, a weekly operational phone conference is held each Tuesday afternoon or whenever requested by FWS or NPS to review operations.

November 1, 2002 – July 15, 2003 IOP WCA-3A Operational Summary

WCA-3A reached a high stage of 10.98 feet NGVD in mid-September 2002, declining to 10.37 feet NGVD by November 1 when S-12A was closed. Gradually, S-12B and S-12C were closed, with only S-12D remaining open through the dry season. During the period WCA-3A was in Zone E1, approximately 13,800 acre-feet were released from WCA-3A via S-333. At the start of this wet season, WCA-3A transitioned rapidly from 9.44 feet on May 26 (Zone E1), to 9.64 feet on May 27 (Zone C), to 9.86 feet on June 2 (Zone B), to 10.09 feet on June 10 (Zone A). WCA-3A remained in Zone A through July 15. From May 30

through July 22, had the S-12s been fully opened, it is estimated that the S-12s could have passed a weekly average of 1,750 cfs. Therefore, the total amount of flow that was not passed due to the closure of the S-12A-C was 10,600 acre-feet.

Using the bank account analogy, this year there was a surplus of 3,200 acre-feet during the regulatory release period when structures S-12A, B, and C were closed because releases during Zone E1 (13,800 acre-feet) exceeded the deficit (10,600 acre-feet).

IOP 2002

Structure	Closed	Open	Closed
S-12A	Oct 31, 2002	July 22 ,2003	Oct 31, 2003
S-12B	Nov 12, 2002	July 16, 2003	Dec 29, 2003
S-12C	Nov 13, 2002	June 27, 2003	Jan 05, 2004
S-12D	Open	Open	May 26, 2004
S-343A&B	Oct 31, 2002	July 25, 2003	Oct 31, 2003
S-344	Oct 31, 2002	July 25, 2003	Oct 31, 2003

1 Nov 2003 – 15 Jul 2004 IOP WCA-3A Operational Summary

WCA-3A reached a high stage of 11.54 feet-NGVD on September 29, 2003 declining to 11.05 feet-NGVD by October 31 when S-12A was closed. S-12B closed in December, S-12C in January, and S-12D by May 2004. WCA-3A was above the regulation schedule and called for maximum releases from October 31 until November 26 and remained in Zone C until December 8, 2004.

Column 2 regulatory releases to the SDCS were made from November 1 through December 31, 2003 and transitioned to water supply by first week in January 2004.

WCA-3A was in Zone E1 from March 1 to 21, 2004. During the period in Zone E1, S-334 was opened minimally for water supply to the SDCS. The discharges from S-333 were utilized to maintain the hydration of NESRS. WCA-3A remained in Zone E through the dry season until the week of July 3, 2004 when stages re-entered Zone E1. No additional Zone E1 releases were made due to the drier-than-normal start of the wet season.

The S-12s were transitioned from opened to closed at the end of the regulatory period over a span of 5 weeks during the remainder of December until January 5, 2004. Discharges from the S-11 structures (regulatory outlets for WCA-2A) were reduced to minimize impacts on WCA-3A from about mid-September onward. Therefore, the closing of the S-12s were transitioned even past the period during which WCA-3A stages declined below Zone C to compensate for the S-11 discharges. This was discussed with concurrence from FWS and NPS. This strategy reduced the peak stages in WCA-3A.

Also during the period that WCA-3A was in Zone E, the Lake Okeechobee Water Supply/Environmental (WSE) regulation schedule was in a temporary deviation to attempt to lower stages in the lake. With concurrence from NPS, some water was routed from Lake

Okeechobee via WCA-3A to NESRS via S-333 with no residual changes to the level in WCA-3A.

Using the bank account analogy, Column 2 operations were not utilized during the period that WCA-3A was in Zone E1 between 1 November 2003 and 15 July 2004; therefore, no deficit or accrual was recorded.

IOP 2003

Structure	Closed	Open	Closed
S-12A	Oct 31, 2003	Aug 26, 2004	Oct 31, 2004
S-12B	Dec 29, 2003	Aug 27, 2004	Dec 06, 2004
S-12C	Jan 05, 2004	Aug 10, 2004	Dec 13, 2004
S-12D	May 26, 2004	Aug 10, 2004	Jan 07, 2005
S-343A&B	Oct 31, 2003	Aug 26, 2004	Oct 31, 2004
S-344	Oct 31, 2003	Aug 26, 2004	Oct 31, 2004

November 1, 2004 – July 15, 2005 IOP WCA-3A Operational Summary

WCA-3A reached a high stage of 11.74 feet NGVD on October 15, 2004 declining to 11.40 feet NGVD by October 31 when S-12A was closed. S-12B and C were closed in December and S-12D by January 2005. WCA-3A was above the regulation schedule and called for maximum releases from October 31 until the week of November 21 and remained in Zone C until December 3, 2004. The WCA-3A stage continued to decline due to a rainfall deficit and was 9.13 feet NGVD by May 2, 2005. Stages increased to 9.59 feet NGVD on May 5, 2005 then declined to 9.22 feet NGVD by May 29. From May 30, stages increased, reaching a peak of 11.71 feet NGVD on July 16. There was above average rainfall in June; therefore, early opening of the S-12 was requested and granted for opening on June 22, 2005.

IOP 2004

Structure	Closed	Open	Closed
S-12A	Oct 31, 2004	Jun 22, 2005	Nov 15, 2005
S-12B	Dec 06, 2004	Jun 22, 2005	
S-12C	Dec 13, 2004	Jun 22, 2005	
S-12D	Jan 07, 2005	Mar 31, 2005	
S-343A&B	Oct 31, 2004		Nov 01, 2005
S-344	Oct 31, 2004		Nov 01, 2005

4.4 Water Quality

Alternative 7R (Recommended Alternative).

Alternative 7R would not result in adverse impacts to water quality. With Alternative 7R, S-332B would pump 250 cfs from June through February, but only when this pumping would not cause overflow into ENP. If it is determined that overflow would occur, the pumping

volume would be adjusted. Alternative 7R would attenuate water quality impacts from the increased pumping and subsequent overflow by construction of the C-111 structures. The additional seepage capacity would help reduce weir inflows and provide additional treatment area. Over the 31-year period of record, there were 44 tropical storms that could have triggered the pre-storm operations, and then only if the canal stage, groundwater, surface water, or antecedent rainfall warranted. As indicated by the overflow events of September and October 2000, it is unlikely that these events would violate the flow-weighted average for total phosphorus concentrations entering Taylor Slough.

IOP 2002-2006

The system has been managed under the WCA-3A Regulation Schedule and IOP since it was implemented in August 2002. Water quality has been monitored extensively to ensure that the system is operating under the parameters of the Settlement Agreement in United States v. SFWMD, in particular legal requirements for ENP at SRS and Taylor Slough. No significant change in phosphorus load for the inflow structures to the SRS, Taylor Slough, and Coastal Basins occurred during IOP; however, there have been occurrences of increases in phosphorus concentrations for some of the SRS inflow structures.

The flows entering SRS have been in compliance with interim discharge limits for phosphorus from 2002 to include the most recently calculated flow-weighted concentration (2005). The long-term concentration limit (to be in force December 31, 2006) was not met during this time period for 2003 and 2005, but was attained for 2004. The phosphorus compliance target values for SRS are based on the total flow during the water year. The formula to determine this compliance target for SRS is flow-dependent (see appendices of the Settlement Agreement). High flows (wet year) through SRS compliance structures (S-333, S-12A, S-12B, S-12C and S-12D) tend to lower the phosphorus target number, while the phosphorus target number is higher during a dry year. The other compliance requirement is that no more than a fixed percentage of total samples may exceed the maximum total phosphorus concentration in a given 12-month period.

Discharges to Taylor Slough and the Coastal Basins have been in compliance with the Settlement Agreement requirements for the period of discussion (August 2002-May 2006). The Settlement Agreement establishes the method for determining non-degradation of Taylor Slough and the Coastal Basins regarding total phosphorus, and requires compliance be determined on a regular basis (flow-weighted concentration determined on a yearly basis with the water year ending September 30) and compared to a fixed number. The Settlement Agreement also requires that no more than 53.1% of the individual samples exceed 10 ppb for total phosphorus. The flow-weighted phosphorus target (long-term discharge limit) is 11 ppb, which is compared to the flow-weighted concentration (Figures 10 and 11).

There were four overflow events at the S-332B detention area (two events in 2003 and two events in 2005), but none were considered significant in terms of phosphorus loading. Yearly flows into Taylor Slough and the Coastal Basins are on the order of approximately 3,000,000 acre-feet. The first discharge on May 30, 2003 was a single day event that resulted in an overflow volume of 36.46 acre-feet. During the weeks prior to and after the overflow event,

phosphorus levels of 12 to 10 ppb were measured at the emergency weir sample location that overflows into ENP. The second event on September 30, 2003 was a single day event that resulted in an overflow volume of 143 acre-feet. Phosphorus levels did not exceed 7 ppb prior to the event, and the sample collected the day of the overflow event measured 12 ppb. The first overflow event in 2005 (August 26 to September 5) was associated with Hurricane Katrina and resulted in an overflow volume of 9,270 acre-feet for the 11-day period. This overflow event occurred due to instrumentation failure likely caused by the hurricane, and the overflow event was stopped within one day of confirming that the overflow was occurring. Phosphorus levels for inflow samples taken in the canal at the S-332B pump station during the first 2005 overflow event were all below 7 ppb. The second overflow event in 2005 occurred for approximately 1 hour on December 13, 2005 and resulted in an overflow volume of 0.07 acre-feet. Due to the short duration of the overflow, no sample was collected. However, data collected at the canal the following day indicated phosphorus concentrations at or below 10 ppb.

The C-111 features have been operated during the IOP period in accordance with FDEP Emergency Order 9. When CSOP operations receive final approval, the FDEP instrument for water quality certification will shift from Emergency Order 9 to the CERPRA permit. The Corps will also obtain FDEP approval for the operations of the S-355A&B structures. FDEP approval for the S-355A&B operations was originally issued under a FDEP program that was phased out and replaced with another program. The Corps is in the process of getting FDEP approval under the new program.

Taylor Slough and Coastal Basins. Once the C-111 detention basin is fully constructed and operational, it is expected that less seepage water from ENP will reach the L-31N canal. Seepage water from ENP is generally understood by all parties to be cleaner than the L-31N canal water. This may result in less dilution of the L-31N canal water from the cleaner ENP seepage input. Due to the reduction of ENP seepage input to the L-31N canal, the L-31N water quality may be degraded to some degree. However, overflows into ENP from the C-111 detention system from S-332B to S-332C will not be allowed under the present construction configuration except under extreme environmental conditions.

From 2002 to the present (October 2006), overflows from S-332B have been minor (flow quantities) relative to the other components of the system monitored for settlement agreement compliance for Taylor Slough and the Coastal Basins. The specifics for S-332B overflows into ENP are presented in the previous section. Once the C-111 system is fully built-out, surface discharges into ENP from the S-332B to S-332C part of the system are very unlikely to occur. Since surface water overflow from the fully built-out C-111 detention system (S-332B through S-332C) to ENP is extremely unlikely, the composition of the L-31N canal water quality should not be an issue relative to potential surface water discharges.

During the prior NEPA process, DOI expressed concern with surface water overflow into ENP from the C-111 basin (Taylor Slough is the receiving water body). The Corps recognizes there is a future potential for degraded water quality in the L-31N canal based on the likelihood of increased population density/urbanization in the vicinity of the L-31N drainage zone and reduced seepage from ENP. The Corps staff position is that the water

quality in the C-111/Coastal Basin area is generally not a problem at this time. It is recognized that extremely high rainfall events can mobilize large quantities of nutrients into the L-31N canal under some conditions. Regardless of whether a cost-effective phosphorus reduction system can be incorporated within the fully built-out C-111 detention system, the risk of surface water overflows from this detention system onto ENP lands is low based on Corps modeling and best professional judgment. Since surface water discharge into ENP is unlikely, the fact that low-level phosphorus removal has not been cost-effectively demonstrated at this point is not a concern for this feature.

Shark River Slough. As previously stated, the flows entering SRS under IOP since 2002 have been in compliance with interim discharge limits for phosphorus. The most recent (2005) yearly interim concentration was 9.4 ppb, which is the same as the limit calculated in accordance with the Settlement Agreement guidance. The long-term concentration limit was not met during this time period for water years 2003 and 2005, but was attained for 2004 and it is expected to be met in the future. Nutrient loading problems in WCA-3A and other C&SF features upstream of the SDCS (the IOP project area) cannot be addressed by IOP. Operational adjustments within the IOP project area can shift nutrient loads within the limits of many constraints (i.e., flooding concerns, endangered species concerns, water supply concerns, recreational concerns, minimum deliveries/desired deliveries to ENP, etc.). Please see Figures 12-14 (page 7 extracts from the Settlement Agreement Compliance reports for January-March 2004 and January-March 2005). By observing the period of record from May 2002 until the present, noting the SRS settlement agreement report graphics that present the 12-month moving average (navy blue line), no discernable pattern is seen that indicates increased nutrient loading or concentration during the IOP period. Therefore, Alternative 7R is not expected to be the causal agent that will adversely affect water quality in SRS.

It should be noted that IOP (or any other operational plan) could cause an undesirable release of nutrients within WCA-3A into the water column for subsequent transfer into ENP SRS. This would occur when stages within WCA-3 become too low, resulting in dry-outs, subsequent oxidation, and release of accumulated nutrients into the water column from the accumulated organic material. Model predictions for Alternative 7R and the first years of experience indicate that IOP is not causing stages in WCA-3 to be lower than previous operational regimes. It is more likely that water levels in the C&SF have been influenced by the rainfall caused by the Atlantic Multi-decadal Oscillation (AMO). According to NOAA, the AMO has a strong effect on Florida rainfall. Rainfall in Central and South Florida becomes more plentiful when the Atlantic is in its warm phase, and droughts and wildfires are more frequent in the cool phase.

4.5 Flood Control

Alternative 7R (Recommended Alternative)

Additional flood storage capacity at under the C-111 project would enable Alternative 7R to reduce the potential for the higher canal stage which could lead flooding in excess of existing levels. The effect of Alternative 7R on the hydrology (water levels in 8.5 SMA) is anticipated to be higher than existing conditions but similar to 1995 Base conditions.

IOP Performance 2002 to 2006

To evaluate the performance of IOP during high water events in South Dade, the actual stage in the three reaches of L-31N during IOP operations was reviewed. These reaches were selected for review since they directly represent the operations of the primary water control features that provide water management of stages between the natural areas (in ENP) and the developed areas (including agriculture). The discussion below references observed data and modeled data as presented in Figures 15-20.

Upper Reach of L-31N. The predicted (or modeled) stages in the upper reach of L-31N show that stages generally vary between 4.0 feet (during dry times) to occasional peaks of about 6.5 feet, with a maximum of about 7.4 feet (in 1981 due to Hurricane Dennis). One month following the 1981 Hurricane Dennis peak, a smaller peak of approximately 6.5 feet occurred due to Hurricane Gert. Figure 15 shows the predicted (modeled) stages from 1965-1995.

By reviewing the observed stages shown in Figure 16, the same pattern is apparent, although on a different time scale (August 2002-May 2006). Again, the stages generally vary between 4.0 feet (during dry times) to occasional peaks of about 6.5 feet, with a maximum of about 7.4 feet (in 2005 due to Hurricane Katrina). This comparison of predicted stages to observed results shows a striking similarity and indicates that stages predicted by IOP modeling have been accurate for both wet and dry times. The 2005 Hurricane Dennis (not the same as the 1981 Hurricane Dennis) caused a peak similar to the 1981 peak caused by Hurricane Gert. Clearly, the predicted high stages in L-31N, and therefore, the predicted flood control capabilities, are consistent with the actual management of the canal levels.

Middle Reach of L-31N. The predicted (or modeled) stages in the middle reach of L-31N (Figure 17) show stages generally vary between 3.5 feet (during dry times) to occasional peaks of about 6.5 feet, with a maximum of about 7.8 feet (in 1981 due to Hurricane Dennis).

The observed stages in the middle reach of L-31N (Figure 18) show stages generally vary between 4.0 feet (during dry times) to about 6.5 feet, with a maximum of about 7.4 feet (in 2005 due to Hurricane Katrina). In this reach, it appears the actual operations are similar with extremes slightly better (not as low and not as high) than the predicted stages.

Lower Reach of L-31N. The predicted (or modeled) stages in the lower reach of L-31N (Figure 19) show stages generally vary between 3.5 feet (during dry times) to occasional peaks of about 6.0-6.5 feet, with a maximum of about 7.8 feet (in 1981 due to Hurricane Dennis).

The headwaters of the S-176 structure are essentially the same as the headwaters of S-174 (Figure 20). The observed stages in the middle reach of L-31N (Figure 18) show stages generally vary between 3.5 feet (during dry times) to about 5.0 feet, with a maximum of about 6.7 feet (in 2005 due to Hurricane Katrina). In this reach, it appears the actual operations are similar with extremes slightly better (not as low and not as high) than the predicted stages.

Summary. The actual flood control capability within IOP is consistent with the modeling results. The observed high stages in the L-31N canal system are maintained at levels similar to or slightly below the high stages predicted by IOP modeling.

4.6 Wetlands

Alternative 7R (Recommended Alternative)

With Alternative 7R, there would be direct wetland fill due to construction of the tieback levees associated with the seepage reservoirs and construction of the S-356 pump station. Wetland impacts from these structures were previously quantified in the 1994 C-111 GRR and the 1992 MWD GDM, and 404(b)1 evaluations were conducted and included in the respective reports. However, the footprint (and direct wetland impacts) of the L-31 W tieback levee increased due to the need for additional storage capacity. Originally, the tieback levee was to fill 14 acres of wetlands. Subsequent design changes would require 23 acres of direct fill. However, construction of the S-332D tieback levee would require less wetland fill (12 acres as opposed to 14 acres in the 1994 GRR) than originally thought.

The S-356 pump station was originally designed to permanently fill 15.7 acres of wetlands and temporarily fill 3.2 acres of wetlands. The pump station was subsequently re-designed to avoid impacts to wetlands and an existing boat ramp, reducing the direct fill of wetlands to 0.1 acre.

Wetlands within the proposed seepage reservoirs would be also impacted. The 1,370-acre South Detention Area (SDA) was identified in the 1994 C-111 GRR, but three new reservoirs were subsequently developed to provide additional retention: the 1,180-acre North Detention Area (NDA), the 2,526-acre Frogpond Detention Area (FDA), and the 230-acre C-111 Partial Connector Detention Area. In total, 5,306 acres of short-hydroperiod wetlands would be impounded with full build-out of C-111 (included in IOP Alternative 7R).

Once complete, the C-111 Project is expected to provide benefit to 1,155 square miles of wetlands in ENP, including 128 square miles in Taylor Slough and 1,027 square miles in SRS (USACE 1994). Wetlands in NESRS, The Rocky Glades, and the western marl prairies are expected to benefit from the restoration of more natural hydroperiods with Alternative 7R. Restoration of the natural hydroperiods and burning patterns would result in more historic vegetation within these wetlands. Increased flooding in southern WCA-3B and WCA-2A may contribute to negative wetland impacts. As previously discussed in Section 4.3, hydrologic conditions since the implementation of IOP in August 2002 were as predicted with the previous model runs.

4.7 Vegetation

Alternative 7R (Recommended Alternative)

Vegetation change occurs slowly in response to subtle hydrologic changes. The differences among the alternatives that the IOP team considered are generally not great, and in most cases

far less than the differences between *any* IOP alternative and the target for natural system restoration known as "NSM." IOP has only been in implementation of its first phase for 4 years, and as noted in this EIS, with the exception of 2003, they have been wetter than average.

NESRS. Increases in ponding depths and hydroperiod duration associated with Alternative 7R should benefit vegetative communities in NESRS and the northeastern marl prairies by restoring longer and more natural hydrologic regimes to the area. Over-drainage in the peripheral wetlands along the eastern flank of NESRS has resulted in shifts in community composition, invasion by exotic woody species, and increased susceptibility to fire (USFWS 1999a,b). Increases in ponding depths and hydroperiod duration associated with Phase 2 operations should help to reverse these trends by reducing tree island susceptibility to fire, restoring deeper water habitats required for slough/open water marsh communities, and reducing the amount of available habitat for less-flood-tolerant exotic tree species.

A Phase 2 operation, representing a change in operational constraints, could be implemented when the flood mitigation facilities for the 8.5 SMA are in place. At the time, the stage constraint at G-3273 would no longer be valid. Operations of the S-333, S-355s, and S-356 structures, under initial operations, are constrained by a stage of 6.8 feet at G-3273. After the G-3273 constraint is removed, those structures will still be constrained by stage in L-29, for highway safety considerations, but will be used more often.

WSRS and Western Marl Prairies. The WSRS area is primarily influenced by S-12 structure operations. Consequently, any changes in WSRS hydroperiods and resulting shifts in vegetative communities would be similar under any alternative. Alternative 7R would result in a reduction of annual flooding duration in WSRS and the western marl prairies relative to 95 Base conditions. Alternative 7R should have a beneficial effect on the western short-hydroperiod marl prairies by producing shorter hydroperiods that would benefit marl prairie vegetation. The westernmost S-12 structures (A, B, and C) would be closed November 1, January 1, and February 1, respectively through July 15. S-12D, which has the least impact of the western sparrow habitats, would remain operational year-round to allow excess water to leave the WCAs.

WCA 2. In comparison to 95 Base conditions, Alternative 7R would not produce significant increases in the duration of high stage events in WCA-2B. Historically, WCA-2B has suffered from lowered water levels and resulted in heavy melaleuca infestations throughout the area (USACE 1999a). According to FWC, the majority of melaleuca stands have been eliminated from WCA-2B. Increases in the duration of high stage events in WCA-2B could benefit vegetative communities by preventing re-establishment of melaleuca in the area. In recent years, WCA-2B has suffered from extreme high water conditions. In the past, high water levels have severely damaged native willow communities that provide nesting and roosting for snail kites and wading birds.

Under Alternative 7R modeling results showed no significant increase in hydroperiods in WCA-2A compared to base. There was an increase in the wettest 10^{th} percentile of years, but it was not very large.

WCA-3A and WCA-3B. Alternative 7R would provide hydrologic relief to NESRS and WSRS without excessive ponding in WCA-3A. S-12D would remain operational and provide an important conduit for excess rainfall inundating WCA-3A during wet years without causing higher water elevations in the western sparrow habitat. Currently, the two most significant causes of habitat degradation in WCA-3A are flood damage to tree islands in the northeastern and southwestern portions of WCA-3A and the loss of peat soils, marshes, and tree islands in the northern portions of WCA-3A as a result of drought conditions and resulting wildfires. Alternative 7R would have some adverse effect on vegetation throughout WCA-3A, particularly to tree islands and vegetation in the southern marshes. Although closure of the S-12 structures would, by itself, contribute to additional ponding in WCA-3A, the routing of excess water would be achieved through the S-333 structure. Figure 8 previously described in Section 4.3 shows elevations during IOP operations between August 2002 and February 2006. High water elevations during this time (as well as pre-IOP) have resulted in some damage to tree island vegetation, but it is likely that this damage would have occurred with any of the alternatives. The Corps, in compliance with the 1999 BO, has initiated vegetative monitoring within the project area (including WCA-3A), but no reports are currently available, although FWS indicated in their 2006 BO that preliminary data from vegetation monitoring within southern WCA-3A suggests that the vegetation community continues to change from *Eleocharis* wet prairie vegetation communities to open water slough communities.

Although WCA-3B is drier than pre-drainage conditions, tree islands in this area have remained largely un-impacted from flooding. Alternative 7R would not have adverse effects on vegetation throughout WCA-3B.

Eastern Marl Prairies and Taylor Slough. Alternative 7R would impact vegetation in the eastern marl prairie and Taylor Slough, higher flows from S-332B, C, and D should increase the beneficial hydrologic impacts to the region.

Florida Bay. Wet season flows dominate the average annual freshwater flow volumes for all of the alternatives and 95BaseMod conditions. There are no substantial differences between any of the previously evaluated alternatives in average annual or monthly freshwater flow volumes towards Florida Bay, and none of the alternatives would substantially increase or decrease freshwater flows towards Florida Bay relative to 95BaseMod conditions. Consequently, Alternative 7R is not expected to produce substantial changes in the Florida Bay salinity regime or significant impacts to mangrove or seagrass communities.

4.8 Fish and Wildlife

Alternative 7R (Recommended Alternative)

Alternative 7R would increase hydroperiod duration and ponding depths in NESRS and is expected to benefit aquatic organisms. Populations of marsh fishes are expected to increase with increased hydroperiod duration and an increase in available habitat. Longer maintenance of dry season refugia is expected to increase survival over the dry season. Wading bird

populations are expected to benefit from enhancement and expansion of foraging habitat and increases in the aquatic prey base. Increased hydroperiods and the associated reduction in fire frequency are expected to benefit tree island nesting habitat. Similarly, alligators are expected to benefit from the expansion and enhancement of habitat and increases in the prey base. Increases in hydroperiods are also expected to increase alligator abundance, nesting efforts, and nesting success.

Currently, the Rocky Glades/eastern marl prairies are among the most degraded aquatic habitats within the southern Everglades (USACE 1999a). Alternative 7R would provide some benefit for the northern Rocky Glades and northern Taylor Slough by increasing hydroperiod duration and ponding depths. Alternative 7R would not produce measurable changes in the central and lower portions of Taylor Slough. In general, increases in hydroperiod duration and ponding depths are expected to benefit fish and wildlife habitat by restoring more natural hydroperiods and reducing woody plant invasion and fire frequency in the northern Rocky Glades. Expansion of aquatic habitat and longer maintenance of dry season solution-hole refugia are expected to increase the aquatic prey base and improve foraging habitat for wading birds. Increases in hydroperiods are also expected to increase alligator abundance, nesting efforts, and nesting success.

During ISOP implementation in 2000, the occurrence of wading bird nests increased to 39,480, an increase of 40% over the previous year (FWS 2001). Increased nesting in WCA-3, ENP, and Florida Bay were primarily responsible, although there was a substantial decrease of nesting in WCA-1.

In comparison to 95 Base conditions, Alternative 7R would not produce significant increases in the frequency and depth of high water events in WCA-2A. Alternative 7R would provide benefit to the northern Rocky Glades and northern Taylor Slough (similar to the other alternatives) without substantially adversely affecting habitats located in WCA-2A or WCA-3B because of the continuous pumping of S-12D.

4.9 Protected Species

In accordance with the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 1531 *et seq.*) and Section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*), the Department of the Interior prepared a Planning Aid Letter and a Coordination Act Report for the IOP alternatives. A separate Coordination Act Report was prepared by the Florida Fish and Wildlife Conservation Commission under the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 1531 *et seq.*). These documents were including in the 2002 FEIS and are incorporated here by reference.

On April 2, 2002, the Corps received a Final Amended BO from FWS on the IOP for protection of the CSSS. It should be noted that only the recommended alternative, Alternative 7R, was addressed by FWS in the document. In the amendment, FWS concurs that Alternative 7R is not likely to adversely affect the CSSS, wood stork, or eastern indigo snake, and that it would not introduce any additional effects to these species that were not previously considered in the February 19, 1999 BO.

ESA consultation was formally reinitiated by the Corps on July 7, 2006, and the FWS issued a BO on the IOP on November 17, 2006. After reviewing the status of the Cape Sable seaside sparrow, Everglade snail kite, and wood stork; the environmental baseline for the action area; the effects of the proposed action; and the cumulative effects, it is the FWS's biological opinion that IOP, as proposed, is not likely to jeopardize the continued existence of the Cape Sable seaside sparrow, Everglade snail kite, or wood stork and is not likely to destroy or adversely modify designated critical habitat for the Cape Sable seaside sparrow or Everglade snail kite.

CSSS

The Cape Sable seaside sparrow is one of eight extant subspecies of seaside sparrow in North America. Its distribution is limited to the short-hydroperiod wetlands at the bottom of the greater Everglades system, on the southern tip of mainland Florida. The Cape Sable seaside sparrow was first provided protection when it was listed on March 11, 1967, under the Endangered Species Preservation Act of 1967 (32 FR 4001). That protection was continued under the Endangered Species Conservation Act of 1969 and the Act. The sparrow and all other species listed under the Endangered Species Conservation Act were the first species protected under the Act of 1973, as amended, and all of these species were given the 'endangered' designation.

CSSS Critical Habitat

Critical habitat for the Cape Sable seaside sparrow was designated on August 11, 1977 (42 FR 42840). Currently, the critical habitat includes areas of land, water, and airspace in the Taylor Slough vicinity of Collier, Miami-Dade, and Monroe Counties. Much of this area is within the boundaries of ENP. Because this was one of the first critical habitat designations under the Act, there were no primary constituent elements defined. The designated area encompasses about 197,260 acres (79,828 ha), and includes portions of subpopulations B through F. Subpopulation A is the only area occupied by sparrows that does not have associated designated critical habitat.

Because the majority of designated critical habitat lies within Everglades National Park, there have been relatively few impacts. However, about 471.5 acres (190.8 ha) of critical habitat were altered during construction of the S-332 B detention areas and a portion of the B-C connector. No other permanent alteration of critical habitat is known. Degradation of critical habitat has resulted from flooding within the area of subpopulation D, and frequent fires and woody vegetation encroachment in overdrained areas near sparrow subpopulations C and F. Degradation of these habitats is not permanent, and they may improve through restoration efforts. The current critical habitat designation includes many areas of habitat that are not suitable for sparrows, including the pinelands and abandoned agricultural areas. The 471.5 acres (190.8 ha) of impacts to critical habitat occurred within abandoned agricultural areas that did not closely resemble suitable sparrow habitat.

On October 31, 2006, the FWS proposed revisions to a critical habitat designation for the Cape Sable seaside sparrow. The proposed revision will reduce the total acreage of critical habitat from 197,260 acres to approximately 156,350 acres. The FWS proposes to designate seven units as critical habitat for the sparrow in southern Florida, which includes critical habitat for subpopulation A that previously was not designated. On November 13, 2006, the Corps and the Service agreed via a conference call that proposed Cape Sable seaside sparrow critical habitat (October 31, 2006; 71 FR 63980) would not be adversely modified or destroyed by the proposed continuation of IOP, although an additional 171.5 acres of C-111 features remains to be constructed within CSSS critical habitat (Figure 21).

Reasonable and Prudent Alternatives

The FWS BO presented the FWS RPA to the Experimental Program that would avoid jeopardizing the CSSS. The BO recommended that the selected IOP produce the following hydrological conditions for protection of the CSSS: (1) a minimum of 60 consecutive days of water levels at or below 6.0 feet NGVD at NP-205 between March 1 and July 15; (2) ensure that 30%, 45%, and 60% of required regulatory releases crossing the Tamiami Trail enter ENP east of L-67 extension (or produce hydroperiods and water levels in the vicinity of CSSS subpopulations C, E, and F that meet or exceed those produced by the 30%, 45%, and 60% targets); and (3) produce hydroperiods and water levels in the vicinity of CSSS subpopulations C, E, and F that equal or exceed conditions that would be produced by Test 7, Phase II operations. ISOP 2000, ISOP 2001, and Alternative 7 meet or exceed 60 consecutive days of water levels at or below 6.0 feet NGVD at NP-205 in 25 of the 31 years (81% of the years) comprising the simulation period. (Alternative 4, described in the February 2001 DEIS, is the only alternative that meets the recommendation of 84% in 26 of the 31 years). All of the alternatives meet or exceed the 30%, 45%, and 60% targets and meet or exceed conditions that would be produced by Test 7, Phase II operations. Other alternatives have been suggested including returning to Test 7 operations and starting a captive breeding program for the CSSS. Returning to Test 7 operations was considered early in the IOP development process but not supported by the Department of the Interior, the agency with primary responsibility for endangered land species. As determined by the FWS, a return to Test 7 operations would not be legal as specified in the FWS 1999 BO. A captive breeding program was also suggested but not supported by the FWS and other experts on the CSSS.

Alternative 7R (Recommended Alternative)

Subpopulation A - Cape Sable Seaside Sparrow

All of the previously evaluated project alternatives produce approximately the same number of consecutive days of water levels at or below 6.0 feet NGVD at NP-205 between March 1 and July 15. Alternative 7R met this target in 25 of the 31 years comprising the simulation period. In comparison, 95BaseMod conditions meet or exceed this target in 23 of the 31 years that were simulated. Alternative 7R would result in a reduction of annual flooding duration in the CSSS subpopulation A's western marl prairie habitat relative to 95BaseMod conditions. Alternative 7R should have a beneficial effect on the western sparrow habitat by producing

shorter hydroperiods that would benefit short-hydroperiod marl prairie vegetation in the vicinity of CSSS subpopulation A.

Subpopulation B - Cape Sable Seaside Sparrow

Alternative 7R would not produce changes in the average hydroperiods or ponding depths in the vicinity of CSSS subpopulation B. This subpopulation is considered to be outside the influence of water management operations due to its location compared to 95 Base conditions. Consequently, Alternative 7R is not expected to alter the status of CSSS subpopulation B.

Subpopulations C, E, and F - Cape Sable Seaside Sparrow

Alternative 7R meets the FWS RPA recommendation for production of the 30%, 45%, and 60% regulatory release conditions. Alternative 7R would produce larger increases in annual average ponding depths and hydroperiod duration in the vicinity of CSSS subpopulation E compared to 95BaseMod conditions. It is expected to provide the greatest beneficial effects for the eastern marl prairies by restoring longer, more natural hydrologic regimes to the area.

Alternative 7R meets the FWS RPA recommendation for implementation of Test 7, Phase 2 conditions in the vicinity of CSSS subpopulations C, E, and F, and would provide some benefit for CSSS subpopulations C, E, and F by increasing hydroperiods in the Rocky Glades. Alternative 7R would not produce measurable changes in the central and lower portions of Taylor Slough.

Subpopulation D - Cape Sable Seaside Sparrow

Alternative 7R would not produce changes in the average hydroperiods or ponding depths in the vicinity of CSSS subpopulation D compared to 95 Base conditions. Consequently, Alternative 7R is not expected to alter the status of CSSS subpopulation D.

IOP 2002-2006

During the seven-year period from 2000 to present, the target of 60 continuous days with water levels below ground was met in 4 of the years, and was not met in three of the years. Naturally occurring rainfall events caused the failures to meet the targets in all three years. In two of the years when the target was not met, failure resulted from mid-season rainfall events that caused water levels to temporarily exceed 6.0 ft (1.8 m) by less than 0.20 ft (6 cm), and water levels subsequently receded to less than 6.0 ft (1.8 m) after several days. Under these conditions, about 30 percent of potential habitat would have remained dry. While these types of rainfall events can cause increased predation risk to nests and increase the risk of flooding (Lockwood et al. 1997, Pimm et al. 2002), they would not be expected to result in widespread nest failure (USFWS 2006). In the third year when targets were not met (2003), two late-dry-season rainfall events raised water levels above 6 ft (1.8 m), and then continued rain prior to July 15 prevented stages from dropping below 6 ft (1.8 m). Some portion of the habitat remained dry during these conditions.

According to the FWS, the fluctuation in the size of sparrow subpopulation A under ISOP and IOP at least partially reflected the variability in environmental conditions that occurred (USFWS 2006). Rainfall during the breeding season may continue to impact sparrows, but the operation of IOP does not appear to exacerbate these impacts. The fact that the sparrow population has been capable of increasing following low counts suggests that this subpopulation remains resilient.

Previous ISOP and IOP operations have resulted in improved hydrologic conditions within eastern sparrow subpopulations C and F because of the S-332 detention areas (ENP 2005). These detention areas have reduced the overdrying of potential sparrow habitat in these areas by reducing seepage out of ENP. This has likely reduced the risk of damaging wildfires, though the degree of risk reduction cannot be quantified. The operation of these features has also had the effect of causing more natural responses to rainfall events. There is some small degree of associated risk to sparrow nesting resulting from increased effect of rainfall on surface water levels within marl prairies, but we believe this risk is insignificant and discountable. The operation of the S-332 detention areas has also had indirect effects on sparrow habitat. Based on the results of IOP to date, improved hydroperiods over the next 4 years are expected to continue to support self-sustaining marl prairie vegetation in conditions favorable for sparrows, and increased hydroperiods are expected to reduce the spread of encroaching woody vegetation within areas that were previously overdrained. However, overflows from the detention areas, though infrequent, are expected to contribute to unfavorable vegetation in local areas that result from increased nutrient levels in water that overflows the weirs. These effects are not expected to be significant. While there may have been some benefit, effects of IOP on subpopulation E have been relatively small, and are expected to continue to be minor for the next 4 years.

Monitoring Efforts

The CSSS is present in six subpopulations in short-hydroperiod freshwater wetlands of South Florida, primarily within the boundaries of ENP (Figure 22). ENP staff first undertook a comprehensive survey of the CSSS in 1981, which was repeated in 1992 and each subsequent year in conjunction with a contract with Dr. Stuart Pimm of Duke University. The CSSS breeding season extends from March until the rainy season begins, usually in June. Successful breeding requires that breeding season water levels remain at or below ground level in the breeding habitat. It also depends on maintenance of a short-hydroperiod vegetative community devoid of woody species.

One of the large subpopulations (subpopulation A), thought to be critical to the existence of the CSSS, is located in WSRS immediately in the path of water discharges from WCA-3A through the S-12 structures. Unusually intense and unseasonable rainy periods during the winters of 1992/93 and 1993/94 caused prolonged flooding in subpopulation A, with the result that little or no breeding there was possible during the 1993 and 1994 sparrow breeding seasons. The flooding of the habitat by direct rainfall was increased by discharges of water through the S-12s needed to meet the water regulation schedule for WCA-3A. This is reflected in the dramatic reduction of CSSS detected in subsequent surveys in subpopulation A. As a consequence, FWS issued a BO in 1999 providing recommendations to the Corps on

how water levels must be controlled in nesting habitat so that the existence of CSSS would not be jeopardized. The Corps responded by developing changes in water management operations through two iterations of what was called the ISOP in 2000 and 2001, culminating in IOP in 2002, which has been in effect ever since. The goals are to keep subpopulations (particularly subpopulation A) dry during the breeding season and to keep the habitat for the subpopulations B, C, D, E, and F from excessive drying to prevent un-natural fire frequencies.

It was recognized in the BO that there could be times when unseasonable rainfall events could overwhelm the ability of the water management system to provide the necessary dry conditions. A protocol was developed to allow the Corps to document that all stipulated water management operations had been carried out, but had been unsuccessful due to abnormally high local rainfall. This has happened twice since 1999 (2003 and 2005). The population estimates developed for the various subpopulations by Dr. Pimm and ENP staff are shown below. It should be noted that the estimates for a particular year have relevance for potential breeding and this would be reflected in the estimates during the following year.

Since implementation of IOP, FWS recommendations for protection of CSSS were met in 2004 and 2006. Direct rainfall on subpopulation A prevented meeting the requirements for 2003 and 2005. This contributes to the lack of recovery of subpopulation A. Another factor in lack of recovery is change in vegetative structure resulting from physical damage during the high water events of 1993 and 1994 and a shift in the vegetative community dominants away from the historic species. This phenomenon is being studied by Dr. Michael Ross of the Florida Institute of Technology (FIT) and Dr. James Snyder of USGS in a monitoring study funded by the Corps.

Cape Sable Seaside Nesting

	Subpopulation					
Year	**A**	**B**	**C**	**D**	**E**	**F**
1981	2688	2352	432	400	672	112
1992	2608	3184	48	112	592	32
1993	432	2464	0	96	320	0
1994	80	2224	-	-	112	-
1995	240	2128	0	0	352	0
1996	384	1888	48	80	208	16
1997	272	2832	48	48	832	16
1998	192	1808	80	48	912	16
1999	400	2048	144	176	768	16
2000	448	1824	112	64	1040	0
2001	128	2128	96	32	848	32
2002	96	1904	112	0	576	16
2003	128	2368	96	0	592	32
2004	16	2784	128	0	640	16
2005	96	2272	80	48	576	32
2006	112	2080	160	0	704	32

FWS Conclusion

Based on the best currently available scientific information, FWS determined that Alternative 7R represented an additional RPA for water management actions to avoid jeopardy to the CSSS, and would not destroy or adversely modify designated critical habitat. Specifically, Alternative 7R must be implemented in combination with all other RPA components contained in the February 19, 1999 BO with the exception of component #6, requiring the completion and operation of MWD by 2011. Since Alternative 7R addresses only the water management needs of the CSSS, all other RPA requirements contained in the February 19, 1999 BO continued to apply. During the current NEPA process, the Corps worked closely with the FWS on preparing the Biological Assessment and data needs for the FWS evaluation and BO. During these discussions, the FWS clearly stated that maintaining and restoring CSSS subpopulation A is essential to maintaining the overall sparrow population. This is due to its potential to support a large number of sparrows and its separation from the other populations reduces the risk of loss from catastrophic events. On November 17, 2006, the FWS issued a BO evaluating the past, current, and projected future impacts to the CSSS due to continued operation of IOP. In the 2006 BO, the FWS concludes:

> *The continued operation of IOP for 4 years is expected to remain consistent with the RPA in the 1999 biological opinion. Accordingly, we anticipate reduced water levels during sparrow nesting season to a level that will allow adult sparrow pairs to complete one or two successful clutches in most years. This level of nesting is sufficient to maintain subpopulation A for the remainder of IOP. Rainfall events are expected to continue to affect the hydrologic conditions within subpopulation A during the nesting season, but IOP protections are sufficient to minimize the detrimental effects of these rainfall events on sparrow reproduction over the period. IOP operations are also expected to maintain hydrologic conditions to support suitable sparrow habitat within portions of subpopulation A that are sufficient to maintain the subpopulation. Large increases in the number of sparrows within subpopulation A or large improvements in the condition of habitat in the area are not expected to occur under IOP. However, the continued operation of IOP, designed to avoid jeopardizing the Cape Sable seaside sparrow, is anticipated to sustain subpopulation, A which is necessary for overall population health. Some improvements to hydrologic conditions within sparrow subpopulations C and F are expected to result in improved habitat conditions and possibly larger numbers of sparrows. There are few effects of IOP to other sparrow subpopulations. In total, the impacts from IOP over the next 4 years are not anticipated to appreciable reduce the likelihood of survival and recovery of the sparrow.*
>
> *Construction of IOP features will result in impacts to 171.5 acres (69.4 ha) of sparrow designated critical habitat, but this is not expected to result in destruction or adverse modification. Improvements in habitat conditions within limited areas of critical habitat within sparrow subpopulations C and F are likely. No other effects to critical habitat are expected.*

Incidental Take

The FWS anticipates incidental take of Cape Sable seaside sparrows will be difficult to detect and it is unlikely that injury or mortality of individual sparrows or losses of sparrow nests will be documented. However, some level of take of this species, in the form of harassment resulting from construction activities associated with the S-332 detention features, harm resulting from habitat changes, and injury or death of adult and young sparrows, including nestlings is anticipated.

Eastern marl prairies Harassment of sparrows as a result of disturbance from construction equipment and human activity may occur within 0.3 miles (500 m) of construction activities associated with the S-332 detention area features. The precise impact of this activity is difficult to measure, although the Service roughly anticipates that when construction is occurring, up to two pairs of sparrows per year for the next 4 years may be harassed. This level of take will be exceeded if the footprint of the construction area increases. The Construction Monitoring Plan should avoid all additional impacts to sparrows and nests near construction.

Operation of the S-332 structures may result in flooding of sparrow nests that occur within 0.6 miles (1 km) of the S-332 detention areas, either because of increased water levels resulting from seepage or from overflow from the detention areas directly into sparrow habitat within ENP. This will result in loss of the contents of all nests within 0.6 miles (1 km) of S-332, estimated to be to 8 eggs/nestlings per year. Operation of the detention areas that result in transition from groundwater conditions to surface water conditions beyond 0.6 miles (1 km) from the detention areas prior to June 1 will result in incidental take not exempted in this opinion. In addition, operations that increase surface water levels by greater than 3.9 inches (10 cm) beyond 0.6 miles (1 km) from the detention areas will exceed incidental take. These measures are intended to prevent exceeding a level of incidental take roughly estimated to be equivalent to the contents of up to two sparrow nests per year within sparrow subpopulations C and F that may result from operations of the S-332 detention areas.

Western marl prairie Information from various sources identifies different amounts of potential and available habitat in the western marl prairies. To date, there is still limited detailed information about the condition and susceptibility to flooding within all portions of this area.

The FWS anticipates that a maximum of 66 square miles (17,094 ha) of potential and historic sparrow habitat may be subject to flooding during the nesting season near subpopulation A due to water releases. This area corresponds to 60 percent of potential sparrow habitat within the area of subpopulation A. Any adult birds that have territories within the 66 square miles (17,094 ha) would be impacted by water levels too high to allow breeding or by lower fecundity associated with nest abandonment. Likewise, injury or death to juvenile sparrows or eggs could result from pump discharges that raise the water level above existing nests.

Currently an estimated 110 square miles (70,400 acres) of potential sparrow habitat is available in the western marl prairies. Although not all 110 square miles (70,400 acres) may

actually be suitable for nesting, the habitat that is suitable for the sparrow is contained within this acreage. IOP would result in a minimum of 44 square miles (28,160 acres, or 40 percent of the total) of potential nesting habitat that is not flooded and available for sparrow nesting for at least 60 continuous days from March 1 through July 15 in 8 out of every 10 years.

Quantifying the precise impact on sparrows is difficult because of monitoring limitations. The FWS roughly estimates that up to 10 percent of sparrow pairs will continue to establish breeding territories within the 66 square miles (17,094 ha) of potential habitat that is subject to flooding under IOP, and these pairs will experience lower rates of nest success over the next 4 years. In addition, the FWS roughly estimates that the contents (eggs and/or nestlings) of 50 percent of nests within the flooded 66 square miles (17,094 ha) will be lost in each of the next 4 years. FWS believes nesting initiation and nest flooding in the 66 square miles (17,094 ha) will be low because there is habitat adjacent to the flooded area that some sparrows can use, and we do not expect sparrows that initiate nesting activity in areas subject to flooding will continue to attempt nesting in these areas after water levels rise. They may either cease nesting or may move to adjacent areas that are not as flood-prone.

Furthermore, there is enough available sparrow habitat within the 40 percent of potential habitat that will be available for the next 4 years to support over 500 pairs, or a population of 1,000 birds at a density of approximately 1 pair per 0.08 square miles (50 acres). However, because it cannot be predicted which portion of the available suitable habitat (the 60 percent vs. the 40 percent) an individual bird will nest in, it is anticipated that incidental take will occur each time the 66 square miles (42,240 acres) are flooded over the next 4 years. More specifically, if more than 66 square miles (42,240 acres) of habitat are unavailable for nesting sufficient to maintain the subpopulation (fewer than 60 consecutive days with water levels below ground surface at NP-205) due to water releases in any one year, then incidental take will be exceeded.

IOP operations allow water releases into subpopulation A beginning on July 15 of each year. Because sparrows may nest through August, release of water through the S-12 structures is expected to increase the rate of nest failure for any nests that are active on July 15. In most years, water levels are already high within subpopulation A by July 15, nesting activity is likely reduced, and nest success rates during this period will be low due to increased depredation rates. However, FWS expects that water releases will cause increases in water depths that will result in injury to or death of sparrow eggs or nestlings that are active on July 15, although this will be difficult to measure and not significant.

The 1999 biological opinion did not include any incidental take after calendar year 1999 because a sufficient amount of breeding habitat was available to allow sparrows to nest successfully. The incidental take for sparrows that is provided in the 2006 BO does not represent an assessment of increased impacts to the sparrows that results from IOP, and only reflects a reassessment of the amount of take that is likely to occur under IOP based on new information about sparrow ecology and improved sparrow monitoring that has occurred since 1999. The FWS believes that this level of incidental take is consistent with the protections provided in the RPA of the 1999 biological opinion and continues to allow for a self-sustaining sparrow subpopulation in this area.

Snail Kite

The Everglade snail kite is one of three subspecies of snail kite, a wide-ranging New World raptor found primarily in lowland freshwater marshes in tropical and subtropical America from Florida, Cuba, and Mexico south to Argentina and Peru. The Everglade subspecies occurs in Florida and Cuba, though only the Florida population is listed. The Florida population was first listed under the Endangered Species Preservation Act in 1967, and protection was continued under the Endangered Species Conservation Act of 1969. The Everglade snail kite, and all other species listed under the Endangered Species Conservation Act were the first species protected under the Act of 1973, as amended, and all of these species were given the 'endangered' status. Recently, the FWS announced that is plans to conduct a 5-year status review of a number of species including the Everglade snail kite. The purpose of the review is to ensure that current listing classifications are accurate and will consider scientific data that have become available since the most recent status review.

Critical Habitat

Critical habitat for the Everglade snail kite was designated in 1977. The designation identified nine units of critical habitat that included two small reservoirs, the littoral zone of Lake Okeechobee, and areas of Everglades marshes within the WCAs and ENP. In total, about 841,635 acres (340,598 ha) were included in the designation. Since that time, the FWS has consulted on the loss of 18.66 acres (7.55 ha) of critical habitat in a construction project. Construction of C&SF infrastructure resulted in impacts to less than 20 acres (8.1 ha) of critical habitat. A FWS biological opinion addressed the effects of construction of the Miccosukee Tribe's Government Complex Center on critical habitat, which resulted in loss of 16.88 acres (6.83 ha) of critical habitat. In addition, the FWS has consulted on impacts to 88,000 acres (35,612 ha) of critical habitat resulting from prolonged flooding and temporary degradation of critical habitat because of prescribed fire. In addition to these projects, degradation of snail kite critical habitat has occurred because of the effects of long-term hydrologic management and eutrophication. While it is not possible to accurately estimate the changes that have occurred within each unit, about 40 percent of the original designation is estimated to be in a degraded condition for snail kite nesting and foraging relative to when it was designated in 1977.

Alternative 7R (Recommended Alternative)

Restoration of longer, more natural hydroperiods in SRS and peripheral wetlands is expected to improve snail kite habitat in ENP by creating more favorable conditions for apple snails according to modeling data. Average annual flooding duration and ponding depths in WCA-2 are not significantly different for Alternatives 5 and 6; however, evaluation of previous IOP alternatives showed they would produce substantial increases in the frequency and depth of high water events in WCA-2A compared to 95BaseMod conditions. Increases in flooding may result in the loss of some small trees and the conversion of some long-hydroperiod marshes to unvegetated open water habitat. Consequently, these alternatives would have a negative impact on snail kite foraging and nesting habitat in WCA-2A. Modeling results

showed that average annual flooding duration and ponding depths in WCA-2 with Alternative 7R are improved when compared to 95BaseMod.

Operational implementation of Alternative 7R could adversely affect snail kites and designated snail kite critical habitat in WCA 3A but would not likely jeopardize the species. As stated in the 2002 Final Amended B.O., the FWS anticipated that Alternative 7R would result in incidental take in the form of "harm" resulting from significant habitat modification or degradation that results in death or injury to individual snail kites by impairing essential breeding and foraging patterns measured by the frequency and duration of high-water events.

IOP 2002-2006

In the 2002 it was believed that IOP would not relieve high water levels that have caused declines in the condition of nesting and foraging habitat in WCA-3A, one part of the snail kite's range. It does not appear that IOP has resulted in significant reductions in hydroperiods to date, and it is the FWS believes that IOP may result in habitat degradation resulting from high water levels over the next 4 years. From about 1993 to present, which coincides with Test 7 of the Experimental Program and subsequent ISOP and IOP operations, WCA-3A stages have shown relatively little annual variation compared to the previous decades, with an annual average stage of about 9.5 ft (2.9 m). In addition, stages in WCA-3A have exceeded 10.5 ft (3.2 m) in 10 of the past 13 years, while there were only about 4 occurrences of stages exceeding 10.5 ft (3.2 m) during the 40-year period from 1953 to 1993. Stages in 1994, 1995, and 1999 also exceeded 11.5 ft (3.5 m), and are the three highest stages within the period of record (USFWS 2006). Preliminary data from vegetation monitoring within southern WCA-3A suggests that the vegetation community continues to change from *Eleocharis* wet prairie vegetation communities to open water slough communities, and the FWS believes this trend is likely to continue during the next 4 years to some degree, which could affect foraging habitat, apple snail abundance, and the woody vegetation that kites use for nesting and perch-hunting. The FWS does not, however, expect these changes over the next 4 years to have significant long term impacts to the health of snail kites. In addition, habitat changes that have occurred are reversible through favorable hydrological conditions.

The 0.5-ft (15 cm) reduction in the bottom zone (zone E) of the WCA-3A regulation schedule, termed Zone E1, was first incorporated into the WCA-3A deviation schedule under ISOP and subsequently included in IOP. This change resulted in greater reduction in WCA-3A stages prior to the wet season, and was intended to help offset the effects of reduced outflows through the S-12 structures that resulted from closures in the dry season and early wet season. While this new zone may have helped to achieve the desired result of reducing high water impacts that could result from S-12 closures during the early wet season, it likely resulted in detrimental impacts to snail kite nesting and foraging within WCA-3A. During the years of IOP and ISOP operations, the low stages (as indicated by gauge 3A-28) that have occurred have reached about 8.4 ft (2.6 m), with the exception of 2003, when the low reached 8.9 ft (2.7 m). In the six years prior to IOP, the low stages at gauge 3A-28 had been above about 8.9 ft (2.7 m) at their lowest point. A difference of 0.5 ft (15 cm) is not large. However, depending on where kites choose to nest, this difference could have a notable impact on how hydrologic conditions change near kite nests during the spring recession. Kites' reliance on

the area immediately around the nest for foraging and capturing sufficient prey to feed nestlings during the 2 months of the nestling period make them vulnerable to rapidly changing hydrologic conditions.

Monitoring Efforts

Since 1995, the Corps has funded a program with Dr. Wiley Kitchens of USGS and the University of Florida to monitor nesting effort and success of snail kites in the WCAs. The objectives are to track the numbers and success of kite nesting activities in WCA-3A as part of an on-going demographic study of the kite over its range and to try to understand the environmental variables related to successful breeding. The Corps is also providing funding to Dr. Kitchens to monitor vegetation responses to altered hydrologic regimes in WCA-3A in areas of traditional kite nesting and foraging habitat, in accordance with recommendations in the 2002 BO on IOP.

The snail kite population in Florida progressively and dramatically decreased between 1999 and 2002 from approximately 3400 to 1700 birds in response to the moderately severe regional drought of 2000/2001. Survival of both juveniles and adults rebounded shortly after the drought, but the number of young produced has not recovered from a sharp decrease that preceded the drought. Population size estimates of abundance between 2002 and 2003 suggest a possible stabilization at approximately 1500-1600 birds. Although the population size estimates of 1700 for 2004 and 2005 are slightly higher than both 2002 and 2003, this is not thought to be statistically significant. Nesting activity is summarized below for the 3 full years since implementation of IOP.

		Active Nests	Successful Nests	Young Fledged
2003	WCA-3A	82	28	37
	WCA-3B	2	0	0
	ENP			
	Elsewhere*	65	19	29
2004	WCA-3A	48	19	25
	WCA-3B	6	3	4
	ENP			
	Elsewhere*	51	21	36
2005	WCA-3[a]	12	0	0
	WCA-3B	0		
	ENP	0		
	Elsewhere*	107	23	39
2006**	WCA-3A	62	11	11
	WCA-3B	17	3	3
	ENP	23	14	22
	Elsewhere*	73	15	27

* WPB, Lake Kiss., Lake E Toho., Lake O, St Johns Marsh, Lake Toho., Lake Istokpoga, WCA-2A, WCA-2B, WCA-1, BCNP.

** Preliminary results

In 2005, nesting success was lower than during any other year between 1992 and 2005. Historically, nests in WCA-3A have fledged, proportionally, the large majority of young in the region. No young were fledged out of WCA-3A in 2005. Dr. Kitchens believes that this trend of lowered regional reproduction is a cause of concern regarding the sustainability of the population.

Preliminary results indicate that successful nesting in WCA-3A has occurred in 2006, and nesting is taking place south of the Tamiami Trail in areas where previous nesting has been limited (Figure 23). So far, 2006 has not had the heavy rainfall and hurricanes that characterized the past 2 years.

The persistence of the snail kite in Florida is thought to depend principally on the large wetlands present in the WCAs. Current water regulation schedules shorten the window of time during which kites can breed. To date, most concern and interest regarding potential impacts to kites have focused on the higher water levels and hydroperiods occurring during IOP. Dr. Kitchens and his research team feel that management activities associated with attempting to mitigate potential high water level impacts may well have potentially amplified those detrimental impacts to kite nesting and foraging activities. For example, in addition to the negative effect on reproduction, the rapid water level recession rates from the elevated stage schedule between February and July, intended to mitigate the extended hydroperiods and excessive depths between September and December, present extreme foraging difficulties to both juvenile and adult kites.

To summarize, Dr. Kitchens believes there are four major potentially adverse effects associated with current water regulation schedules:

1. Given the high water levels early in the nesting season, birds are initiating nests in upslope shallower sites. Given the necessity to initiate rapid recession rates to meet the target schedule and avoid the impacts of sustained higher water levels, breeding adults may not be able to raise their young before the water levels reach a critical low below which snail availability to kites is drastically reduced.
2. Under the current regulation schedule, there is a high likelihood that the water levels in WCA-3A will fall below the critical threshold (below which foraging success is severely reduced) for an extended period of time. Concerning this latter point, Dr. Kitchens recommends that the water levels at gauging station 3AS3W1 should not fall below 9 feet for any prolonged period of time (< 3 weeks).
3. In addition, extended flooding resulting either from weather conditions, IOP, or both from September to January appears to be shifting plant communities from wet prairies to sloughs, which is detrimental from the snail kite perspective because snail availability to kites is lower in slough than in wet prairies.
4. Finally, preliminary evidence suggests that apple snail recruitment may be favored when water levels at station 3AS3W1 are maintained at around 9.4 feet from February to April.

There is a delicate trade-off between low and high water, and timing seems to be critical. Drying events following managed recessions (e.g., 2001, 2004, and 2006) have the potential to induce mortality of adults and juveniles, whereas repeated and extended flooding tends to result in long-term degradation of the habitat, which also reduces reproduction and hinders kite recovery.

WCA-3A is the largest and most consistently utilized (as measured by numbers of birds observed during annual surveys from 1970 to 1994) of the designated Critical Habitat for the kites. Snail kites have increasingly moved their nesting activity to areas of higher elevations in WCA-3A over the past two decades, presumably as the traditional nesting vegetation has been degraded by sustained high water levels due to water management practices. Higher water levels have resulted in the conversion of wet prairies (preferred foraging habitat for kites) to aquatic sloughs in selected sites in that area, along with losses of interspersed herbaceous and woody species essential for nesting habitat. Hydrological modeling of Alternative 7R in 2002 indicated that implementing the project could result in excessive ponding and extended hydroperiods that could further degrade nesting and foraging habitat. While the impacts of IOP Alternative 7R might adversely affect a significant portion of the Critical Habitat, FWS determined in 2002 that it is not likely to result in jeopardy to the snail kite and recommended a number of reasonable and prudent measures to minimize impacts of incidental take of snail kites. Among the terms of this document are requirements for: (1) tracking the yearly status of the snail kite and any vegetative shifts that may occur within snail kite habitats, and (2) determining the number of snail kites initiating nesting in the action area and the success rate of those nesting efforts each year. The Florida Cooperative Fish and Wildlife Research Unit is currently under contract by the Corps to satisfy the monitoring requirements. The vegetative monitoring part of this work expires in 2006, but is expected to be extended. Specifically, it addresses the concern that Alternative 7R could adversely affect the structure and function of vegetation communities in WCA-3A, portions of which are designated Critical Habitat of the snail kite. The principal concern is that the habitat quality, and thus the carrying capacity, of WCA-3A is already seriously degraded. Although still preliminary, the studies tend to confirm these concerns. Since 2002, kite production in WCA-3A has dramatically dropped, having produced no kites in 2005. This coincides with successive annual shifts (2002, 2003, 2004, and 2005) in community types within the slough/prairies at sites reported in 2002 to be prime areas of snail abundance, and thus kite foraging, in WCA-3A. The conversion trend from emergent prairies/sloughs to deep water sloughs is certainly degradation in habitat quality for the kites. Habitat quality in WCA-3A is changing progressively and dramatically to less desirable habitat in this critical area, and this conversion is rapid, with changes evident in just 1 year. Continuation of the monitoring protocol would allow these changes to be tracked for indications of rebound or continued degradation, as well as to help sort out the effects of hurricanes from those that might be due to IOP.

FWS Conclusion

In the 2006 BO, the FWS concludes:

Continued IOP operations are expected to result in continued habitat degradation within WCA-3A, which has been one of the most significant areas of kite habitat within the past 30 years. In addition, IOP operations are expected to result in reduced nest success of kites within WCA-3A, reduced foraging habitat suitability, and reduced abundance of the kite's primary prey. These impacts are expected to limit population growth and possibly cause further reductions in the overall kite population. However, because snail kites are long-lived, have high rates of adult survival, and continue to successfully nest in other portions of their range in southern Florida, these impacts are not anticipated to appreciably reduce the likelihood of survival and recovery of the species in the wild.

Degradation of designated critical habitat within WCA-3A is expected to continue under IOP, but this is reversible with improved hydrologic conditions. No permanent loss of critical habitat is expected.

Incidental Take

In the February 19, 1999 BO, FWS concluded that the snail kite would be adversely affected by the C&SF Project operations, at that time known as Test 7, Phase I, of the Experimental Program of Water Deliveries to ENP. No incidental take of snail kites was anticipated; however, the incidental take analysis was developed based on the premise that the original RPA would be implemented. The original RPA would have eliminated detrimentally deep water levels and long hydroperiods in southern and eastern WCA-3A, as water was shifted from WCA-3A in order to meet the RPA targets for water releases east of the L-67 Extension. The recommended alternative, Alternative 7R was proposed as the biological equivalent for providing the same protection to the CSSS as would the water management provisions of the original RPA. Alternative 7R would not provide the same relief in terms of hydrologic improvements to the southern and eastern portions of WCA-3A as would the original RPA.

In the November 17, 2006 BO, the FWS determined that incidental take would occur with continued IOP operations. The incidental take would occur in the form of reduced ability to forage because of habitat changes with high water levels and injury or death of nestlings and eggs due to rapid dry-season recession rates that occur under the current WCA-3A regulation schedule and IOP. It is difficult to estimate the number of eggs and nestlings that will be impacted because the number of nests is variable among years and because many nests remain undetected by monitoring crews. The FWS expects that incidental take will occur when water levels within southern WCA-3A (as measured at gauge 3A-28) recede by more than 1 ft (0.3 m) during the period from February 1 to May 1 in each of the next 4 years. The amount of incidental take in the form of injury or death of snail kite nestlings and eggs will increase as the amount of recession from February 1 to May 1 increases. The level of incidental take will be exceeded if stages in WCA-3A recede by more than 1.7 ft (0.51 m) from February 1 through May 1 of any year. Instead of utilizing the 5-year rolling average of water levels at two indicator regions to determine incidental take as in the 2002 biological opinion, the approach in this biological opinion will allow for real time monitoring versus assessing incidental take over a longer period.

While it will not be possible to accurately account for a number or proportion of kite nests affected, the FWS roughly estimates this level of incidental take may result in a net increase in failure of up to 40 percent of nests within southern WCA-3A in any one year above typical range-wide levels during favorable conditions (roughly 40 percent).

The FWS does not expect this level of impact each year that IOP operations are in place, and in most years, the nest failure rate within WCA-3A is expected to be less. The overall rates of failure in each year will be affected by hydrologic conditions prior to the kite breeding season, rainfall patterns during the breeding season, and water regulation. Under some hydrologic conditions, kite nest success may be favorable under IOP operations.

Wood Stork

The U.S. breeding population of the wood stork was federally listed under the Act as endangered on February 28, 1984 (USFWS 1984). No critical habitat has been designated for the wood stork; therefore, none will be affected.

Alternative 7R (Recommended Alternative)

Within WCA-3A, Alternative 7R is expected to result in continued high water levels during the wet season and early dry season, followed by a rapid spring recession and rapidly increasing stages in the early wet season. These effects result in relatively high abundance of wood stork prey because of high stages and long hydroperiods, and these prey would become available to storks at a rapid rate in the late dry season. Because the WCA-3A deviation schedule results in an increased rate of recession beginning on February 1, availability of prey to storks early in their nesting season prior to February 1 may be limited in WCA-3A. The expected effect of this condition would be later initiation of nesting or reduced rates of nest initiation in those colonies closely associated with WCA-3A (L-28 Crossover, Jetport, and others).

Within the vicinity of western ENP and lower Shark River Slough, Alternative 7R would result in early recession rates within the short-hydroperiod marshes south of Tamiami Trail that result from the closures of the S-12 and S-343 structures. This would tend to result in early initiation of nesting within these areas, but the limited water deliveries into Shark River Slough in the dry season may result in reduced amounts of potential foraging habitat for colonies closely associated with this region (Paurotis Pond) especially during dry years.

In most years within the vicinity of NE Shark Slough, Alternative 7R would result in reduced stages during the dry season because of constraints on inflows. This may cause increased recession rates in the vicinity resulting in a reduction in the amount of suitable foraging habitat available near the end of stork nesting in the late dry season when stages in that area reach their lowest levels. In addition, reduced flows may result in the risk of drying below the Tamiami West stork colony that would cause increased nest depredation rates and risk of nest abandonment, particularly in drier-than-average years. The close proximity of the colony to the L-29 canal helps to reduce the risk of drying below the colony because canal stages tend to be maintained at a relatively stable level throughout the dry season.

Modeling indicates that Alternative 7R occasionally results in increased water levels in NE Shark Slough during the spring dry season. These conditions presumably occur when stages are sufficiently low that the G-3273 constraint does not restrict inflows, and water from WCA-3A is diverted into NE Shark Slough through the S-333 structure. In these cases, water levels within NE Shark Slough, in the immediate vicinity of the Tamiami West stork colony, rise by up to one foot during the period when storks are nesting and when water levels are generally receding throughout the system. This results in an artificial reversal and would cause a reduction in stork foraging conditions in areas near the colony, and may be significant enough to cause colony abandonment. Modeling indicates that these conditions may occur at a frequency of about one out of every 4 years. Because the foraging radius of the Tamiami West colony includes parts of WCA-3A and WCA-3B, ENP, the Pennsuco Wetlands, and urban areas, sufficient foraging opportunities may remain in other areas to offset the poor foraging conditions that result from IOP in NE Shark Slough, but some reduction in foraging opportunities is expected.

The 356 pump operations are expected to directly affect hydrologic conditions at the Tamiami West colony and in the area immediately around the colony, although the precise impacts are not clear and will vary based on conditions at the time. The on/off pump operation criteria may result in a locally flashy hydropattern in the area of the colony, which may affect local foraging opportunities. In addition, if operated at the 500 cfs maximum pump capacity, the operations may cause water levels to rise in NE Shark Slough. Modeling suggests that the pump does not have large effects on hydropatterns in NE Shark Slough. The Corps will coordinate closely with the FWS to assess conditions prior to future tests, develop the test protocol, and establish parameters to ensure no adverse affects.

Modeling of Alternative 7R shows little effect on the hydrologic conditions within WCA-3B, and consequently, no effects on stork foraging are expected in this region.

IOP 2002-2006

Monitoring Efforts

Since 1986, the Corps has funded a program with Dr. Peter Frederick of the University of Florida to monitor nesting effort and success of wading birds, including wood storks, in the WCAs. The objectives are to track the demographics of the various species and to try to understand the environmental variables related to successful breeding. The program includes aerial surveys to identify locations of wading bird nesting colonies each year as they develop and to estimate the number of nests produced by each wading bird species. Ground surveys by airboat are conducted in colonies that contain wood storks to estimate nesting success (young fledged) in a sub-set of marked nests. Nesting effort (number of nests) of wood storks from 2001 to 2005 in the various named colonies in the WCAs and just south of WCA-3B in ENP is summarized below.

Colony Name	2001	2002	2003	2004	2005
Tamiami West (NESRS)	1400*	350-400*	350-400*	50	200*
2B Melaleuca (WCA-2A)	50				
Crossover (WCA-3A)	400	76*	40	150*	0
Jetport (WCA-3A)		550*	375	0	0
Mud East (WCA-3A)				100-130	20
Jetport South (WCA-3A)				29	
WCA-1	16		0		24

* Some nests successfully fledged young

In 2001, overall wood stork nesting effort in the WCAs was greater than had previously been seen since the mid-1970s and 10% greater than 2000, another banner year. As in 2000, the storks nested in February and were able to fledge large numbers of young prior to the onset of rains. Overall stork nesting in the Everglades during 2001 was 3.4 times the 10-year running average, 2.9 times the 5-year average, and more than 10 times the average from the late 1980s. Wood stork nesting success was best at the Tamiami West colony, where about 900 young were estimated to have survived. The Crossover colony was completely abandoned, most likely as a result of a strong drying trend in WCA-3A.

In 2002, wood storks had generally high nesting success at all colonies. The number of storks nesting within the WCAs was 2.9 times the average of the previous five years and 3.7 times the average of the previous 10 years. Many large groups of juvenile storks were seen throughout early summer foraging in the WCAs, Big Cypress National Preserve, and the Everglades Agricultural Areas.

In 2003, nesting effort in the WCAs was 2.1 times the average of the previous 5 years and 3.9 times the average of the previous 10 years, but large numbers of these nests were abandoned. These failures can be attributed in large part to heavy rainfall, particularly in late March. The nest success rate at Tamiami West was 31% lower than in 2002, generally occurring early in the nesting season, during March.

In 2004, wood storks initiated nesting somewhat late even by the standards of the previous 20 years, and these birds began abandoning nests in response to heavy rainfall in early March. However, there was no evidence of abandonment at the Crossover colony, and the birds there appeared to have fledged substantial numbers of young.

In 2005, nests were largely unsuccessful as a result of stable or rising water levels during March due to unseasonable rainfall. Tamiami West had a maximum of 25-35 successful nests.

In summary, wood stork nesting success during the 3 full years of IOP implementation was mixed, with meteorological events overcoming any hydrological effects of water management operations.

FWS Conclusion

FWS anticipates that Alternative 7R is not likely to cause additional effects to the wood stork beyond those analyzed in its February 19, 1999 BO. Accordingly, the February 19, 1999 BO and incidental take statement will continue to provide FWS recommendations for compliance with the Endangered Species Act, and the wood stork will not be considered further. On November 17, 2006, the FWS issued a BO evaluating the past, current, and projected future impacts to the wood stork due to continued operation of IOP. In the 2006 BO, the FWS concludes:

> *Impacts to wood stork foraging and nesting are likely to occur under IOP resulting from reductions in foraging habitat suitability and potential increased risk of depredation within some stork colonies. These effects are not expected to appreciably reduce the likelihood of survival and recovery of the species in the wild.*

Incidental Take

The FWS anticipates incidental take of wood storks will be difficult to detect for the following reasons: wood storks are highly mobile and may occupy any of a number of breeding colonies. Because they occupy remote areas, it is unlikely that injury or mortality of individual storks will be detected. However, the following level of take of this species, in the form of harm resulting from reduced ability to forage successfully because of habitat changes, and injury or death of adult and young storks, including nestlings is anticipated.

Because the IOP will result in a variety of hydrologic changes across the landscape that will be difficult to distinguish from environmental factors, it is difficult to estimate incidental take. The FWS anticipates that take in the form of harm, resulting from reductions in foraging habitat suitability will result in injury or death of up to six wood stork eggs or nestlings during each of the next 4 years.

This level of incidental take will be exceeded if IOP results in an increase in water depth of more than 8 inches (20 cm) across an area of greater than 16 square miles (41 square km) from December 15 through May 1 within the core foraging area of any active wood stork colony.

Florida Panther

Alternative 7R (Recommended Alternative)

The Florida panther occurs primarily in upland habitats. Hydrologic effects of the alternatives are expected to be limited to existing or historic wetlands and are not expected to have significant effects on the upland habitats preferred by this species. However, a component of Alternative 7R involves construction of a 240-acre seepage reservoir consisting of former agricultural lands lying immediately northeast of the existing West Water Detention Area. The site extends north from the vicinity of the S-332B discharge pipes to Hamlin Mill Road,

and the eastern and southern boundaries are fenced with three-strand barbed wire fencing. The land is largely in the early stages of old field succession with a margin of tall, dense grasses and woody shrubs. Other than old truck-farm fields, the area includes two mango groves. An approximately 26-acre fenced grove in the east central portion of the area is relatively well-manicured, with no ground or shrub layer and orderly rows of mature mango trees forming a closed canopy. An approximately 60-acre site in the northwest corner consists of smaller mango trees, more open canopy, and an overgrown, weedy shrub layer.

Fresh panther tracks were identified in November 2000 along a farm dirt roadway in the northeast corner of the proposed site. The panther database revealed two records of panthers located in the project area. Both were of panther #16, which was originally collared in 1986 and died in early 2000. The habitats of potential panther utilization are the two mango grove areas, which could serve primarily as movement corridors. The area in question is on the fringe of the panther habitat, and construction of the seepage reservoir would not likely significantly affect the panthers (S. Bass, personal communication with J. Moulding). However, any loss of panther habitat should be carefully considered.

FWS concurred in the 2002 amended BO that although some loss of panther habitat would occur with construction of the reservoir, panther habitat in adjacent areas within ENP should realize an overall ecological improvement. In the 2006, the Corps has determined that the proposed IOP may affect, but is not likely to adversely affect the endangered Florida panther and the FWS concurred with this determination..

Eastern Indigo Snake

Alternative 7R (Recommended Alternative)

The eastern indigo snake occurs primarily in upland habitats. Hydrologic effects of the Alternative 7R is expected to be limited to existing or historic wetlands and are not expected to have significant effects on the upland habitats preferred by this species. Consequently, no adverse effects to the eastern indigo snake are expected as a result of Alternative 7R. In both the 2002 amended BO and the 2006 BO, FWS concurred that the recommended alternative, Alternative 7R, is not likely to adversely affect the eastern indigo snake.

4.10 Air Quality

There have been no impacts to air quality with the implementation of Alternative 7R.

4.11 Noise

There has been no significant impact to noise levels with the implementation of Alternative 7R. The ambient noise levels with the system operations have been minor.

4.12 Aesthetics

There has been no significant impact to aesthetics with implementation of Alternative 7R.

4.13 Recreation

There has been no impact to recreation with the implementation of Alternative 7R.

4.14 Land Use

There has been no significant impact to land use with implementation of Alternative 7R.

4.15 Socioeconomics

There has been no adverse socioeconomic impact with the implementation of Alternative 7R.

4.16 Agriculture

There has been no adverse impact to agriculture with the implementation of Alternative 7R. As presented previously in this document (see Section 4.5, Flood Control), the actual flood control capability within IOP is consistent with the previous modeling results. The observed high stages in the L-31N canal system are maintained at levels similar to or slightly below the high stages predicted by IOP modeling.

4.17 Hazardous, Toxic, and Radioactive Materials

Implementation of Alternative 7R had no impact on hazardous, toxic, or radioactive materials because no such materials were identified in the project construction footprint prior to onset of construction.

4.18 Cultural Resources

There were no impacts to cultural resources from implementing Alternative 7R.

4.19 Cumulative Impacts

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

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

This project contains components of the MWD and C-111 projects, which would restore to the extent practicable a portion of the Everglades ecosystem. This effort is also tied into the Central and Southern Florida Flood Control Project Comprehensive Restudy, now referred to as the Comprehensive Everglades Restoration Project (CERP). Table 4.1 lists several other

past, current, and projected efforts that cumulatively affect the Southeastern Florida/Southern Everglades regional environment.

Collectively, all the actions listed in Table 4.1 are needed to achieve the greatest possible hydrologic restoration of the southern Everglades. Virtually all the actions were incorporated into the CERP analysis, which was designed to consider the entire South Florida ecosystem. In doing so, the hydrologic conditions of the area were modeled on a broad scale. In the hydrologic modeling analysis, a set of performance measures was applied to ecological targets to determine the restoration benefits of the hydrologic improvements. The CERP analysis also included some fundamental assumptions about the future status of the on-going projects (pre-CERP projects) within the ecosystem prior to completing the CERP modeling. No adverse environmental impacts were identified.

However, as previously described, the implementation of ISOP and IOP has resulted in temporary adverse impacts to the snail kite and upland islands in WCA 3A, due to ponding of water (stage and duration increases in the southern part of WCA-3A) when the S-12 gates are closed to protect Cape Sable seaside sparrow subpopulation "A". The conditions should be improved with full implementation of MWD including conveyance features to move water from WCA-3A to WCA-3B and thence southward into the Everglades. Wetlands would also be impacted under full IOP build-out, but a far greater area of Everglades wetlands would be improved. Over 5,000 acres of short-hydroperiod wetlands would be impounded with full buildout of the C-111 project, but implementation would eventually provide benefit to over 1,000 square miles in the Everglades system.

4.20 Incomplete or Unavailable Information

The analysis provided in Section 4.0, Environmental Consequences, of this document are based on current (October 2006) knowledge of physical and biological conditions in the project area and on projections of most probable future conditions as indicated by hydrologic models. It is recognized that new technical information may be developed as the selected plan is implemented and that observed results may differ from predicted results. Considering this, it may be necessary to adjust operations to address the new information or observed results to achieve better performance for environmental restoration and protection to ensure the health, safety, and well-being of the general public and affected individuals.

4.21 Unavoidable Adverse Impacts

Unavoidable adverse impacts could occur with Alternative 7R. Under extraordinary and uncommon conditions, impacts to water quality below pump station S-332B might occur with overflow, but overflow impacts to water quality have been minor during the period between 2002 and 2006. In addition, impacts to water quality would be minimized upon completion of the S-332B north seepage reservoir and partial S-332B/S-332C connector under Alternative 7R. The detention of excess water in the WCAs could also occur with Alternative 7R, and would likely continue without full implementation of the MWD project. The impacts of this detention could include loss of tree island vegetation and associated wildlife, adverse impacts to snail kite nesting and critical habitat, and adverse impacts to wood storks.

Table 4. 1 Projects with Cumulative Effects on Southeastern Florida, Southern Everglades Regional Environment

Project	Responsible Agency	Status	Type of Action
Past Actions			
Modified Water Deliveries to Everglades National Park - Raising Tigertail Camp	ENP/ USACE	Complete	Construction
Experimental Program of Water Deliveries to Everglades National Park - Test Iterations 1-5 (Shark River Slough)	USACE/ SFWMD	Replaced by Test 6	Operations
Experimental Program of Water Deliveries to Everglades National Park - Test Iteration 6 (Taylor Slough)	USACE/ SFWMD	Replaced by Test 7	Operations
Experimental Program of Water Deliveries to Everglades National Park - Test Iteration 7 (modified Taylor Slough)	USACE/ SFWMD	Suspended by "jeopardy" opinion on sparrow	Operations
Experimental Program of Water Deliveries - Emergency Deviation from Test Iteration 7, Interim Structural and Operational Plan	USACE/ SFWMD	1999, 2000 Seasons	Operations – 2000
Canal-111 – Taylor Slough Bridge Improvements	USACE/ SFWMD	Compete-improved conveyance of water down Taylor Slough	Construction
Interim Structural and Operational Plan (ISOP) for Protection of the Cape Sable Seaside Sparrow	USACE	Superseded by "IOP"	Operations-2001
Current Actions			
Interim Operational Plan (IOP) for Protection of the Cape Sable Seaside Sparrow	USACE	Current operational plan	Operations
Modified Water Deliveries to Everglades National Park - Conveyance between WCW-3A and WCA-3B (Conveyance and Seepage Control Project	USACE	Proposed in original Mod Waters, proposed under CSOP	Proposed construction
Modified Water Deliveries to Everglades National Park - 8.5 Square Mile Area	USACE	Under construction; Approved 2003	Construction of flood mitigation – seepage control
South Dade (C-111) Project	USACE		
East Coast Buffer/Water Preserve Areas Project	SFWMD	In planning under CERP Broward County WPA	Construction: will reduce stormwater discharge into WCA-3A
Future Actions			
Comprehensive Everglades Restoration Plan	USACE/ SFWMD		
Combined Structural and Operational Plan (CSOP)	USACE		
Everglades National Park General Management Plan	ENP		

Source: U.S. Army Corps of Engineers

4.22 The Relationship between Local Short-Term Uses of Man's Environment and Maintenance of Long-Term Productivity

The proposed operations were developed in response to the February 1999 FWS BO for the MWD project, Experimental Program, and C-111 Project. The proposed IOP is designed to avoid jeopardizing the CSSS, a federally endangered species occurring within ENP, during the interim period leading up to completion of the MWD Project. The short-term uses of the environment with this project are greatly justified by the potential long-term benefit to this species.

4.23 Irreversible and Irretrievable Commitments of Resources

The proposed operations would be in effect only until the full MWD and C-111 Projects are completed and are not expected to be in place until 2011. The irreversible and irretrievable commitment of resources would occur with the conversion of native vegetation and habitat including wetlands with construction of the various pump stations and reservoirs. Loss of marginal Florida panther habitat and CSSS designated Critical Habitat would occur with implementation of Alternative 7R.

4.24 Energy Requirements and Conservation Potential

Energy use of the recommended plan would be minimal, and energy requirements for implementing any of the project alternatives would be similar. Conservation potential for any of the alternatives would be minimal.

4.25 Environmental Commitments

The Corps will continue to operate the water control structures as authorized and approved. The Corps will continue to consult with FWS, ENP, SFWMD, FFWCC, and other federal, state, local, tribal, and private interests to improve and modify the operations as circumstances dictate. The Corps will incorporate any commitments required by the appropriate regulatory agencies identified during the NEPA and ESA processes. The Corps will re-evaluate the operational parameters of the selected alternative as information becomes available and will coordinate with the interested parties previously mentioned with any modifications.

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5.0 COMPLIANCE WITH FEDERAL STATUTES, EXECUTIVE ORDERS, AND POLICIES

5.1 Archeological and Historic Preservation Act and National Historic Preservation Act

Archival research and consultation with the State Historic Preservation Officer (SHPO) have been completed in accordance with the National Historic Preservation Act, as amended; the Archeological and Historic Preservation Act, as amended; and Executive Order 11593. The project would not affect historic properties included in or eligible for inclusion in the National Register of Historic Places. The project is in compliance with each of these federal laws. The project and Corps determination of no effect has also been coordinated with the Miami-Dade County Historic Preservation Officer.

5.2 Clean Air Act

The affected air-shed is not a non-compliance area. No air quality permits would be required. This SEIS has been coordinated with concerned agencies, including the U.S. Environmental Protection Agency (EPA), other stakeholder agencies, and the public, and is in full compliance with Section 309 of the Clean Air Act.

5.3 Clean Water Act

The net result of proposed operations under the recommended alternative is an improvement in hydropatterns in NESRS due to improved water deliveries and partially degrading the L-67 extension levee, while excessively high water stages near the western CSSS populations would continue to be avoided. A 404(b)1 evaluation of wetlands impacts due to filling in the L-67 extension canal was included in the 1992 EIS on Modified Water Deliveries to Everglades National Park (Mod Waters, USACE 1992). Construction of the S-332B and C seepage reservoirs was included in the May 1994 EIS on the C-111 General Re-evaluation Report (USACE 1994) and the January 2002 Environmental Assessment on the C-111 GRR Supplement (USACE 2002). However, the berms associated with these seepage reservoirs had to be raised in order to achieve the needed capacity, so direct wetland impacts increased slightly. Therefore, a 404(b)1 analysis is required for this action and is included in Appendix E.

The Corps is in compliance with the Clean Water Act (CWA). The Corps will continue to coordinate with the State to obtain necessary water quality certification pursuant to Section 401 of the CWA. The state, under the present program, usually uses a CERPRA permit as the vehicle for certification but has used Emergency Order Number 9 for the current IOP authorization under Section 401 of the CWA. The Corps also obtains CWA Section 402 non point source discharge permits for construction activities and plans to obtain permits from the state under its delegated program for any remaining construction activities. The C-111 features have been operated during the IOP period in accordance with FDEP Emergency

Order 9. When CSOP operations receive final approval, the FDEP instrument for water quality certification will shift from Emergency Order 9 to the CERPRA permit. The Corps will also obtain FDEP approval for the operations of the S-355A/B structures. FDEP approval for the S-355A/B operations was originally issued under an FDEP program that was phased out and replaced with another program. The Corps is in the process of getting FDEP approval under the new program.

5.4 Endangered Species Act (ESA)

On April 2, 2002, the Corps received an amendment to the February 19, 1999 BO which states that IOP Alternative 7R is not likely to adversely affect the CSSS, wood stork, or eastern indigo snake, and that it would not introduce any additional effects to these species that were not previously considered in the 1999 BO. Although there would be some loss of Florida panther habitat due to construction of the S-332B seepage reservoir, ENP would realize an overall ecological improvement. Therefore, FWS determined that IOP Alternative 7R is not likely to adversely affect the Florida panther.

FWS states that although Alternative 7R would adversely affect the snail kite and designated snail kite habitat, it is not likely to jeopardize the continued existence of the species or result in the destruction or adverse modification of the designated critical habitat. The terms and conditions of the incidental take are included in the Final Amended BO.

The Corps has remained in close coordination with FWS on the species subject to consultation since 2002. Monitoring is underway as required under the Amended BO of April 2002. The Corps has not identified any adverse effects on species or their critical habitats resulting from water management operations during the period between August 2, 2002, when operations under IOP began, and the present. (Refer to species discussions under Environmental Effects for specific information.)

On October 31, 2006, the FWS proposed revisions to a critical habitat designation for the CSSS (71 Fed. Reg. 63980, October 31, 2006). The proposed revision would reduce the total acreage of critical habitat from 197,260 acres to approximately 156,350 acres. The FWS also proposes to designate additional critical habitat for the CSSS which includes area for subpopulation A that was previously not designated. On November 13, 2006, the Corps and FWS agreed via teleconference that proposed CSSS critical habitat would not be adversely modified or destroyed by the proposed continuation of IOP.

In conjunction with this supplemental NEPA documentation, the Corps has re-initiated consultation under Section 7 of the U.S. Endangered Species Act with FWS for endangered species, including the snail kite and CSSS, and received a BO on November 17, 2006. In the BO, FWS concluded the following:

Cape Sable seaside sparrow

The continued operation of IOP for 4 years is expected to remain consistent with the RPA in the 1999 biological opinion. Accordingly, we anticipate reduced water levels during sparrow

nesting season to a level that will allow adult sparrow pairs to complete one or two successful clutches in most years. This level of nesting is sufficient to maintain subpopulation A for the remainder of IOP. Rainfall events are expected to continue to affect the hydrologic conditions within subpopulation A during the nesting season, but IOP protections are sufficient to minimize the detrimental effects of these rainfall events on sparrow reproduction over the period. IOP operations are also expected to maintain hydrologic conditions to support suitable sparrow habitat within portions of subpopulation A that are sufficient to maintain the subpopulation. Large increases in the number of sparrows within subpopulation A or large improvements in the condition of habitat in the area are not expected to occur under IOP. However, the continued operation of IOP, designed to avoid jeopardizing the Cape Sable seaside sparrow, is anticipated to sustain subpopulation, A which is necessary for overall population health. Some improvements to hydrologic conditions within sparrow subpopulations C and F are expected to result in improved habitat conditions and possibly larger numbers of sparrows. There are few effects of IOP to other sparrow subpopulations. In total, the impacts from IOP over the next 4 years are not anticipated to appreciable reduce the likelihood of survival and recovery of the sparrow.

Construction of IOP features will result in impacts to 171.5 acres (69.4 ha) of sparrow designated critical habitat, but this is not expected to result in destruction or adverse modification. Improvements in habitat conditions within limited areas of critical habitat within sparrow subpopulations C and F are likely. No other effects to critical habitat are expected.

<u>Everglade snail kite</u>

Continued IOP operations are expected to result in continued habitat degradation within WCA-3A, which has been one of the most significant areas of kite habitat within the past 30 years. In addition, IOP operations are expected to result in reduced nest success of kites within WCA-3A, reduced foraging habitat suitability, and reduced abundance of the kite's primary prey. These impacts are expected to limit population growth and possibly cause further reductions in the overall kite population. However, because snail kites are long-lived, have high rates of adult survival, and continue to successfully nest in other portions of their range in southern Florida, these impacts are not anticipated to appreciably reduce the likelihood of survival and recovery of the species in the wild.

Degradation of designated critical habitat within WCA-3A is expected to continue under IOP, but this is reversible with improved hydrologic conditions. No permanent loss of critical habitat is expected.

<u>Wood stork</u>

Impacts to wood stork foraging and nesting are likely to occur under IOP resulting from reductions in foraging habitat suitability and potential increased risk of depredation within some stork colonies. These effects are not expected to appreciably reduce the likelihood of survival and recovery of the species in the wild.

After reviewing the status of the Cape Sable seaside sparrow, Everglade snail kite, and wood stork; the environmental baseline for the action area; the effects of the proposed action; and the cumulative effects, it is the Service's biological opinion that IOP, as proposed, is not likely to jeopardize the continued existence of the Cape Sable seaside sparrow, Everglade snail kite, or wood stork and is not likely to destroy or adversely modify designated critical habitat for the Cape Sable seaside sparrow or Everglade snail kite.

The Corps has determined that IOP will have no effect on the endangered red-cockaded woodpecker (*Picoides borealis*) and the endangered Okeechobee gourd (*Cucurbita okeechobeensis* ssp. *okeechobeensis*). The Corps has determined that the proposed IOP may affect, but is not likely to adversely affect the endangered West Indian manatee (*Trichechus manatus latirostris*) or its designated critical habitat, the endangered Florida panther (*Puma* [=*Felis*] *concolor coryi*), the threatened bald eagle (*Haliaeetus leucocephalus*), the endangered American crocodile (*Crocodylus acutus*) or its designated critical habitat, the threatened eastern indigo snake (*Drymarchon corais couperi*), or the threatened Garber's spurge (*Chamaesyce garberi*). The FWS concurred with these determinations.

The Corps will comply with the terms and conditions of the November 17, 2006 BO. Therefore, this project is in full compliance with the ESA, and coordination documents are included in Appendix F.

5.5 Federal Water Project Recreation Act; Land and Water Conservation Fund Act

No public recreational facilities would be impacted under any alternative considered in this document. IOP operations are specified as complying with this law.

5.6 Fish and Wildlife Coordination Act

Reports were prepared by the Department of the Interior (U.S. Fish and Wildlife Service, National Park Service, Everglades National Park) and the Florida Fish and Wildlife Conservation Commission in compliance with this law. The DOI Coordination Act Report (CAR) and its Addendum, provided to the Corps on August 2, 2001, were included in the 2002 Final EIS as Appendix C. The CAR discussed ISOP operations as well as the alternatives proposed in the 2002 Final EIS for the IOP. The CAR provided analyses that support the opinion of these DOI agencies that ISOP operations may not have fully met 2000 and 2001 RPA targets, and that overflow of the S-332B weir under ISOP and some IOP alternatives may have led or do lead to introduction of unacceptably high levels of nutrients into the park, or lead to changes in dominant vegetation. After development of Alternative 7R, the FWS was provided to the Corps on April 19, 2002. Although modeling results for Alternative 7R were not available at that time, the FWS stated that this alternative was likely to comply with existing water management requirements for the CSSS and minimize adverse effects to other listed species and other natural resources as compared to the draft IOP EIS alternatives. Pursuant to coordination with FWS during the SEIS process, the Corps continues to rely on the CAR included in the 2002 EIS.

5.7 Farmland Protection Policy Act

This FSEIS addresses operational changes of an existing system of levees, canals, and structures. Only the new detention area has the potential to affect farmland. The lands recommended for construction of the additional detention areas at S-332B, S-332C and S-332D were previously classified as Statewide Unique Farmlands (rock-plowed lands with a 12-month growing season). However, they were acquired by SFWMD as authorized under the C-111 Project (USACE 1994), and are part of the "C-111 buffer area." While SFWMD continues to lease some of this land for farming, its ultimate fate (removal from agricultural use) has already been determined. No further adverse effects to farmlands would occur as a result of building additional detention areas now as recommended in Alternative 7R of this operational plan. Therefore, re-coordination with the Natural Resources Conservation Service is not necessary. The recommended alternative is in compliance.

5.8 National Environmental Policy Act (NEPA)

A DEIS for the IOP was coordinated with the public and agencies beginning on February 23, 2001, and a SDEIS was circulated for a period of 45 days, beginning with publication of the Notice of Availability in the Federal Register and ending on November 26, 2001. A Final EIS was prepared and coordinated in full compliance with NEPA, and a Record of Decision (ROD) was signed in July 2002.

Due to the recent ruling in the United States District Court, Southern District of Florida, the Corps has been ordered to prepare a Supplemental EIS and include modeling results for the recommended plan that were not available at the time the FEIS was published and the ROD was signed. A DSEIS was prepared to satisfy the requirements of the order. The DSEIS for the IOP was coordinated with the public and agencies beginning on June 30, 2006, and the DSEIS was circulated for a period of 45 days, beginning with publication of the Notice of Availability in the Federal Register and ending on August 14, 2006. Comments received on the DSEIS and responses prepared by the Corps are included in Appendix I. Agency and public coordination has been completed, and this Final SEIS was prepared. Therefore, the plan is in full compliance with NEPA.

5.9 Coastal Zone Management Act

The DSEIS was coordinated with the Florida Department of Community Affairs, the State clearinghouse for Coastal Zone Management Plan consistency review. The plan has been determined to be consistent with this Act, and therefore is in full compliance.

5.10 Resource Conservation and Recovery Act and Toxic Substances Management Act

No items regulated under these laws or other laws related to hazardous, toxic, or radioactive waste substances have been discovered. None are considered likely to exist in the project area, including the proposed seepage reservoirs.

5.11 Executive Order 11988 -- Floodplain Management

Executive Order 11988 directs federal agencies to avoid siting projects in floodplains and to avoid inducing further development of flood-prone areas. All considered alternatives, including the no-action alternatives and recommended alternatives in the ISOP and the IOP, are in compliance with this Executive Order. T he proposed operational changes continue to reduce hazards and risks associated with floods; minimize the impact of floods on human safety, health, and welfare; and restore and preserve the natural and beneficial uses of the base floodplain.

5.12 Executive Order 11990 -- Protection of Wetlands

Executive Order 11990 directs federal agencies to avoid developing or siting projects in wetlands. The recommended alternative is in full compliance. Recommended alternative operations would reduce seepage of groundwater away from wetlands along the eastern Everglades boundary and would partially rehydrate wetlands in CSSS populations E and F during the rainy season, while providing for adequate water level controls for western CSSS populations during the nesting season. Additionally, the southernmost 4 miles of the L-67 levee extension was degraded, returning the levee footprint to wetlands.

5.13 Executive Order 12898 --Environmental Justice

Executive Order 12787 directs federal agencies to provide for full participation of minorities and low-income populations in the federal decision-making process, and further directs agencies to fully disclose any adverse effects of plans and proposals on minority and low-income populations. The IOP is in full compliance. The operations of the structures discussed herein, in addition to providing acceptable protection to populations of the CSSS, would benefit all population groups of southern Miami-Dade County by providing flood damage reduction, drinking water supply protection, and restoration of wetlands and other natural resources inside and outside ENP.

5.14 Memorandum on Government-to-Government Relations with Native American Tribal Governments

This 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 Executive Orders 12875 ("Enhancing the Intergovernmental Partnership") and 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 during the IOP process. Efforts have been made to coordinate with the Miccosukee Tribe with regards to water releases and closures of the S-12 structures as well as during this NEPA process. Coordination letters are included in Appendix G.

6.0 PUBLIC INVOLVEMENT

The various agencies, affected stakeholders, and interested members of the community were allowed opportunities to provide input during the NEPA process. A number of public and plan development workshops were held to elicit input from interested parties. Table 6.1 provides a list of announcements, interagency coordination, and public workshops conducted throughout this process. A summary of the scoping process was included in Section 1.5.

Table 6. Public Involvement Summary

Action	Location	Date
NOI Published in Federal Register	NA	13 August 1999 (Volume 64, Number 156)
Scoping Letter Mailed	NA	26 October 1999
Scoping Meeting	Homestead, FL	16 November 1999
1st Round of Modeling Posted on the Corps Website	NA	24 March 2000
Interagency Meeting	Ft. Lauderdale, FL	10 April 2000
Public Workshop	Homestead, FL	25 April 2000
2nd Round of Modeling Posted on the Corps Website	NA	28 April 2000
Interagency Meeting	Ft. Lauderdale, FL	15 May 2000
3rd Round of Modeling Posted on the Corps Website	NA	31 May 2000
Public Workshop	Homestead, FL	7 June 2000
Public Workshop	Homestead, FL	30 January 2001
Public Workshop	Homestead, FL	20 June 2001
Presentation to the Governing Board of the SFWMD	West Palm Beach, FL	12 July 2001
Public Workshop	Miami, FL	16 July 2001
Stakeholder Outreach	Homestead, FL	20 July 2001
Stakeholder Outreach	Jacksonville, FL	13 August 2001
Stakeholder Outreach	Ft. Lauderdale, FL	22 August 2001
Public Workshop	Homestead, FL	29 October 2001
NOI Published in Federal Register	NA	5 May 2006
Scoping Letter Mailed	NA	10 May 2006
NOA Published in Federal Register	NA	30 June 2006

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7.0 DISTRIBUTION

A list of agencies, organizations, and private individuals that will be sent a copy of the Final SEIS is attached.

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8.0 LIST OF PREPARERS

Table 8. 1 List of Preparers

Name	Affiliation	Role
Dr. Jon Moulding, Ph.D.	USACE	Document Review
Ms. Barbara Cintron	USACE	Document Management and Review
Mr. Daniel Crawford	USACE	Hydrologic Modeling
Dr. Richard Punnett, Ph.D.	USACE Contractor	Hydrologic Modeling
Ms. Kimberley Taplin	USACE	History of Project, Marsh Operations, Collaborative Process
Mr. Trent Ferguson	USACE	Engineering Design
Mr. Luis Alejandro	USACE	Hydrologic Review
Mr. Andy Ashley	USACE	Engineering Design
Mr. James Riley	USACE	Water Quality Review
Mr. Martin Gonzalez	USACE	C-111 Project History
Ms. Brooks Moore	USACE	Document Review
Mr. P. (Brice) McKoy	USACE	MWD Project Review
Mr. Lee Swain	Dial Cordy and Associates Inc.	Impact Analysis, Document Preparation
Ms. Connie Steen	ANAMAR Environmental Consulting, Inc.	Document Review
Ms. Michelle Rau	ANAMAR Environmental Consulting, Inc.	Document Review

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9.0 CONCLUSIONS

The consensus Recommended Alternative meets the requirements set forth in the 1999 Final Biological Opinion needed to assure the survival of the endangered Cape Sable Seaside Sparrow. The Recommended Alternative meets or exceeds the anticipated benefits of the 30%, 45%, and 60% targets in NESRS and meets or exceeds conditions that would be produced by Test 7, Phase II operations along the eastern side of the ENP. The recommendations provided by the FWS' Final Coordination Act Report (CAR) (FWS 2001) were incorporated into the recommended alternative design.

Flow reductions at the S-12A, B, and C structures protect the nesting season of the Western CSSS Subpopulation. Delivering excess WCA-3A water (regulatory flows) to NESRS (up to the maximum allowed by G-3273 constraint) and then to S-332B retention area induce the necessary hydroperiod improvements to protect the Eastern CSSS Subpopulation habitat. The performance of the Recommended Alternative is clearly superior (compared to the other alternatives) in the eastern ENP habitat for the CSSS Subpopulation F - not only minimizing the fire risk, but improving the hydroperiod for the marl prairie vegetation habitat that is favorable for sparrow nesting. Maintenance of this habitat requires an average annual hydroperiod between 60 and 180 days. Modeling predicts that Alternative 7R will produce a 115-day hydroperiod, while the hydroperiods of the other alternatives ranged from 95 days (Alts 3 and 4) to 50 days for Alt 7b. The modeled 10-day hydroperiod for the Base Condition indicates a severely overdrained condition, so the Recommended Alternative also provides ecosystem restoration benefits for this historically marl prairie region. The S-332 retention system (S-332B North, S-332B West, S-332B/S-332C Connector, S-332C, S-332D North and S-332D) will be constructed and there will be no overflow into the Park when the project is complete and when it is practical to do the construction necessary to raise the western levee of S-332B. There may be overflow during emergency events under limited circumstances described in the Pre-storm/Storm/Storm Recovery Operations until the project is complete and the western levee is raised. The S-332 reservoir system provides a continuous north-south hydraulic ridge between ENP wetlands and the L31N canal to reduce seepage to the east out of ENP in order to maintain the necessary hydroperiod in sparrow habitat. The initial marsh operations included a maximum depth of two feet in the S-332 retention system, except under extreme storm conditions.

Future improvements to the marsh operations and S-356 operations are anticipated after operational data and experience are acquired, testing of the S-356 structure is accomplished, and an evaluation of the data can be completed. Alternative 7R accommodates the diverse interests to the extent possible within the capabilities of the existing system while integrating new information as it becomes available. Additionally, improvements to the available numerical hydrologic models would be used for future modeling efforts, and the Corps would use a more collaborative approach to reach consensus with other agencies on future projects. On this basis, the FWS concurred in 2002 that Alternative 7R, the recommended alternative, was acceptable. Since IOP was implemented in 2002, measured hydrologic data have shown that the model predictions were reasonably accurate.

Alternative 7R incorporates principles of flexible and sound water management capable of adapting to severe storms, to unusual wet or day weather, and to new information from real-time monitoring of actual conditions. The flexibility provided by Alternative 7R and the principles of adaptive management incorporated in Alternative 7R provides advantages over the prior operation plans. Given the constraints of the current project features and requirements under the ESA that water management operations not jeopardize the continued existence of the endangered Cape Sable Seaside Sparrow or its critical habitat, Alternative 7R provides the best practicable means to avoid and/or minimize adverse impacts.

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11.0 INDEX

FIGURES

APPENDICES