

August 2016

Environmental Assessment and Proposed Finding of No Significant Impact

PROPOSED MODIFICATIONS TO OPERATING CRITERIA FOR S-190



Hendry County, Florida



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

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PROPOSED FINDING OF NO SIGNIFICANT IMPACT

PROPOSED MODIFICATIONS TO OPERATING CRITERIA FOR S-190 HENDRY COUNTY, FLORIDA

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

- a. The U.S. Army Corps of Engineers (Corps) has developed recommendations for modifications to the current water operating schedule of Structure 190 (S-190) for purposes of maintaining higher groundwater elevations and increased water storage within the Big Cypress Seminole Indian Reservation (BCSIR). S-190 was added to the Central and Southern Florida (C&SF) Flood Control Project at the request of the U.S. Department of Interior Bureau of Indian Affairs for the sole purpose of protecting the BCSIR from over-drainage. S-190 acts as the primary water discharge structure in the Feeder Canal Basin located in southeastern Hendry County. The two major canals associated with the Feeder Canal Basin are the North Feeder Canal and the West Feeder Canal. These two canals merge in the lower southeastern corner of the basin and discharge south through the S-190 structure into the L-28 Interceptor Canal and eventually Water Conservation Area (WCA) 3A. S-190 maintains optimum upstream water control stages in the North and West Feeder Canals.
- b. Operations in the project area are currently governed by Volume 4 of the C&SF Project for Flood Control and Other Purposes Master Water Control Manual WCAs – Everglades National Park (ENP), and ENP-South Dade Conveyance System, dated January 1996. S-190 is currently operated on either a “high setting” (*i.e.* dry condition: water control elevation of 15.5 feet (ft) National Geodetic Vertical Datum of 1929 [NGVD]) or “low setting” (*i.e.* normal condition: water control elevation of 14.5 ft NGVD) throughout the year. In general, when there is a threat of flooding, the “low setting” is used; otherwise the gate is set at the “high setting.” The Proposed Action will return the operation of S-190 to the original authorized purpose and operating criteria dated 1964. The Proposed Action will consist of maintaining optimal canal levels at 15.5 ft NGVD year round. Specifically, when the S-190 headwater (HW) elevation rises to 15.8 ft NGVD, the gates will open, when the HW elevation rises or fall to 15.5 ft NGVD, the gates will become stationary, and when the HW elevation falls to 15.2 ft NGVD, the gates will close. The intent of these gate operations is to maintain an optimum HW elevation of 15.5 ft NGVD; therefore, some limited operational flexibility of gate opening and closing for maintaining that level will be allowed.
- c. The Proposed Action is in full compliance with the Endangered Species Act and the Fish and Wildlife Coordination Act. The Proposed Action would not adversely affect protected species. The Corps requested written confirmation of Federally listed threatened and endangered species that are either known to occur or are likely to occur within the project

area from the U.S. Fish and Wildlife Service (USFWS) by letter dated February 9, 2015. USFWS provided a revised list of listed species on February 11, 2015. Confirmation of listed species occurred on June 3, 2015 and January 4, 2016. Informal consultation was initiated with USFWS on May 9, 2016 with submission of a complete initiation package. USFWS reviewed the information provided and found that the Proposed Action is not likely to adversely affect any federally listed species or designated critical habitat protected by the Endangered Species Act (ESA) by correspondence dated July 18, 2016. Requirements of Section 7 of the ESA have been fulfilled. The Corps agrees to maintain open and cooperative communication with the U.S. Fish and Wildlife Service and Florida Fish and Wildlife Conservation Commission regarding S-190 operations.

- d. The Corps is coordinating a consistency determination pursuant to the Coastal Zone Management Act through the circulation of this EA. The Corps has determined that the Proposed Action is consistent to the maximum extent practicable with the enforceable policies of Florida's approved Coastal Management Program.
- e. The Proposed Action has been coordinated with the Florida State Historic Preservation Officer (SHPO) and the appropriate federally recognized Tribes in accordance with the National Historic Preservation Act and consideration given under the NEPA. The Corps has determined that the Proposed Action will have no effect to historic properties within the portions of the project area that are located outside of the Big Cypress Seminole Indian Reservation. The Florida SHPO and the Seminole Tribe of Florida have concurred with the determination of no effect. For those portions of the project area that are located within the Big Cypress Seminole Indian Reservation, the Seminole Tribe of Florida's Tribal Historic Preservation Officer has determined that "No Cultural Resources will be Affected" and "No Historic Properties will be Affected" by the Proposed Action, per Cultural Resource Ordinance C01-16 and the ACHP's regulations for the review of undertakings on their tribal lands under Section 106 of the NHPA.
- f. The Proposed Action will not adversely affect water quality and will be consistent with the Clean Water Act.

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

JASON A. KIRK, P.E.
Colonel, U.S. Army
District Commander

Date

**ENVIRONMENTAL ASSESSMENT
ON
PROPOSED MODIFICATIONS TO OPERATING CRITERIA FOR S-190
MIAMI-DADE COUNTY, FLORIDA**

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1 PROJECT PURPOSE AND NEED

1.1 PROJECT BACKGROUND

The Seminole Tribe of Florida (Tribe) is a Federally-recognized Tribe with several reservations in Florida. The Federal Indian trust responsibility is a legally enforceable obligation on the part of the United States to protect Tribal treaty rights, lands, assets, and resources. The Big Cypress Seminole Indian Reservation (BCSIR) located in southeastern Hendry County and northwestern Broward County is a Federal Indian Reservation reserved for the Seminole Tribe as permanent Tribal homelands, and where the Federal government holds title to the land in trust on behalf of the Seminole Tribe.

During droughts in the western U.S. during the 1890s, the U.S. government shipped cattle to Seminole Reservations, including BCSIR. This generated a need for pasture and quality forage. The Seminole Tribe cleared, drained, and planted pasture within portions of BCSIR. Typical water control systems were designed to pump water from rim ditches around pastures and fields to undeveloped native lands. To irrigate, water was pumped from the ground water to fill the rim ditches. In addition, the U.S. Department of Interior Bureau of Indian Affairs (BIA) constructed roads within BCSIR which required drainage access and outlets. The drainage and irrigation features added by BIA and the Seminole Tribe prior to 1964 allowed for small scale flood control efforts, with all water staying on BCSIR.

In 1964, the U.S. Army Corps of Engineers (Corps) and BIA communicated regarding the construction of the Central and Southern Florida (C&SF) Flood Control Project. The BIA expressed concern on drainage conditions on BCSIR to the Corps. The Corps noted that the overall flood hazard would be increased in BCSIR as a result of the construction of the L-28 Interceptor Canal and North and West Feeder Canals due to the confining levees along the east bank of the canals (US Department of Interior Bureau of Indian Affairs letter dated September 18, 1963; US Army Engineer District, Jacksonville, Corps of Engineers dated October 14, 1963). As a result of the C&SF Project the natural sheetflow was greatly disrupted and seasonal wetland hydroperiods have been adversely impacted. Drainage of flood waters via canals during the wet season resulted in drier conditions (deeper water table) during the subsequent dry season. These conditions are worsened during years with below average rainfall. Low dry season water levels are exacerbated by the absence of connections to upstream water reserves and a lack of storage on BCSIR (Sobczak 2002).

In a letter dated October 24, 2011, the Seminole Tribe Water Commission Chairman requested the Corps implement a demonstration project to temporarily modify the operational schedule of Structure 190 (S-190) for a two year period. S-190 acts as the primary water discharge structure in the Feeder Canal Basin (**Figure 1-1**). The three major canals associated with the Feeder Canal Basin are the North Feeder Canal, West Feeder Canal and the L-28 Interceptor Canal. The North Feeder Canal and West Feeder Canal merge in the lower southeastern corner of the basin into the L-28 Interceptor Canal and discharge south through the S-190 structure into Water Conservation Area (WCA) 3A. The proposed two year demonstration project would investigate the effect of changing the S-190 operational criteria by utilizing the existing “high setting” operating range year round (*i.e.* water control elevation of 15.5 National Geodetic Vertical Datum of 1929 [NGVD]), consistent with the C&SF Project for Flood Control and Other Purposes, Part I, Supplement 40, Addendum 1 dated 7 February 1964 (Corps 1964). Modifications to the operating criteria for S-

190 were proposed for purposes of maintaining higher groundwater elevations and increased water storage within the western portion of BCSIR and protection of natural areas directly south of the West Feeder Canal.

Operations for S-190 are currently described in Volume 4 of the C&SF Project for Flood Control and Other Purposes, Master Water Control Manual for the WCAs, Everglades National Park (ENP), and ENP-South Dade Conveyance System (ENP-SDCS) (Corps 1996). Current operating criteria for S-190 differ from that identified within the C&SF Project for Flood Control and Other Purposes, Part I, Supplement 40, Addendum 1 dated February 7, 1964. S-190 is currently operated on either a “high setting” (*i.e.* dry condition: water control elevation of 15.5 feet (ft) NGVD) or “low setting” (*i.e.* normal condition: water control elevation of 14.5 ft NGVD) throughout the year (Corps 1996). In general, when there is a threat of flooding, the “low setting” is used; otherwise the gate is set at the “high setting.” The rationale to change to the current operational schedule was not previously documented. Furthermore, an environmental assessment (EA) was not performed by the Corps prior to 1996 to assess the environmental impact on BCSIR as a result of operational changes identified in the Master Water Control Manual for the WCAs, ENP, and ENP-SDCS, Volume 4 (Corps 1996).

Since 2012, representatives of the Corps, South Florida Water Management District (SFWMD) and Seminole Tribe met at South Florida Ecosystem Restoration Task Force meetings to discuss issues related to the operation of S-190 as part of more comprehensive discussions related to the restoration of the Western Basins and the Seminole Tribe’s request for greater availability and delivery of water to BCSIR. The Draft Mission Statement for the South Florida Ecosystem Restoration Task Force Restoration of the BCSIR Natural Areas and Adjacent Portions of the Big Cypress National Preserve (BCNP) Work Group or “Western Basins Task Force” is:

to identify and recommend to the South Florida Ecosystem Restoration Task Force opportunities to restore ecological and cultural natural areas within the Big Cypress Reservation and adjacent portions of the Big Cypress National Preserve to support the designated uses of water bodies including wetlands [to achieve the goals and objectives of the Seminole Big Cypress Critical Project; and to meet State and Federal permit conditions] (or) [while meeting Tribal Water Quality Standards].

The WCA 3 tributary basins include the C-139, Feeder Canal, L-28 Interceptor and L-28 Gap (located within BCNP) basins, which encompass approximately 440,000 acres located primarily in eastern Hendry County (**Figure 1-1**). These basins are collectively called the Western Basins because they are along the western edge of the Everglades and were historic flow ways to the Everglades. BCSIR is located within the Western Basins and represents approximately 11% of the total area of the Western Basins. Both, water supply and water quality of storm water runoff are challenges facing the development of the Western Basins.

The Corps developed recommendations for modifications to the operating criteria for S-190 in coordination with the SFWMD and Seminole Tribe as a first step in moving toward restoration of the natural system within the Western Basins. The Proposed Action would assist in attaining the Draft Mission Statement of the “Western Basins Task Force” as it would provide action to support the designated uses of wetlands on BCSIR; and would assist in restoration of ecological and cultural natural areas which have been adversely impacted by the cumulative effects of past actions that

increased drainage of the western section of BCSIR during the wet season. Operational modifications to S-190 would result in a permanent change to the Master Water Control Manual for the WCAs, ENP, and ENP-SDCS, Volume 4 (Corps 1996).

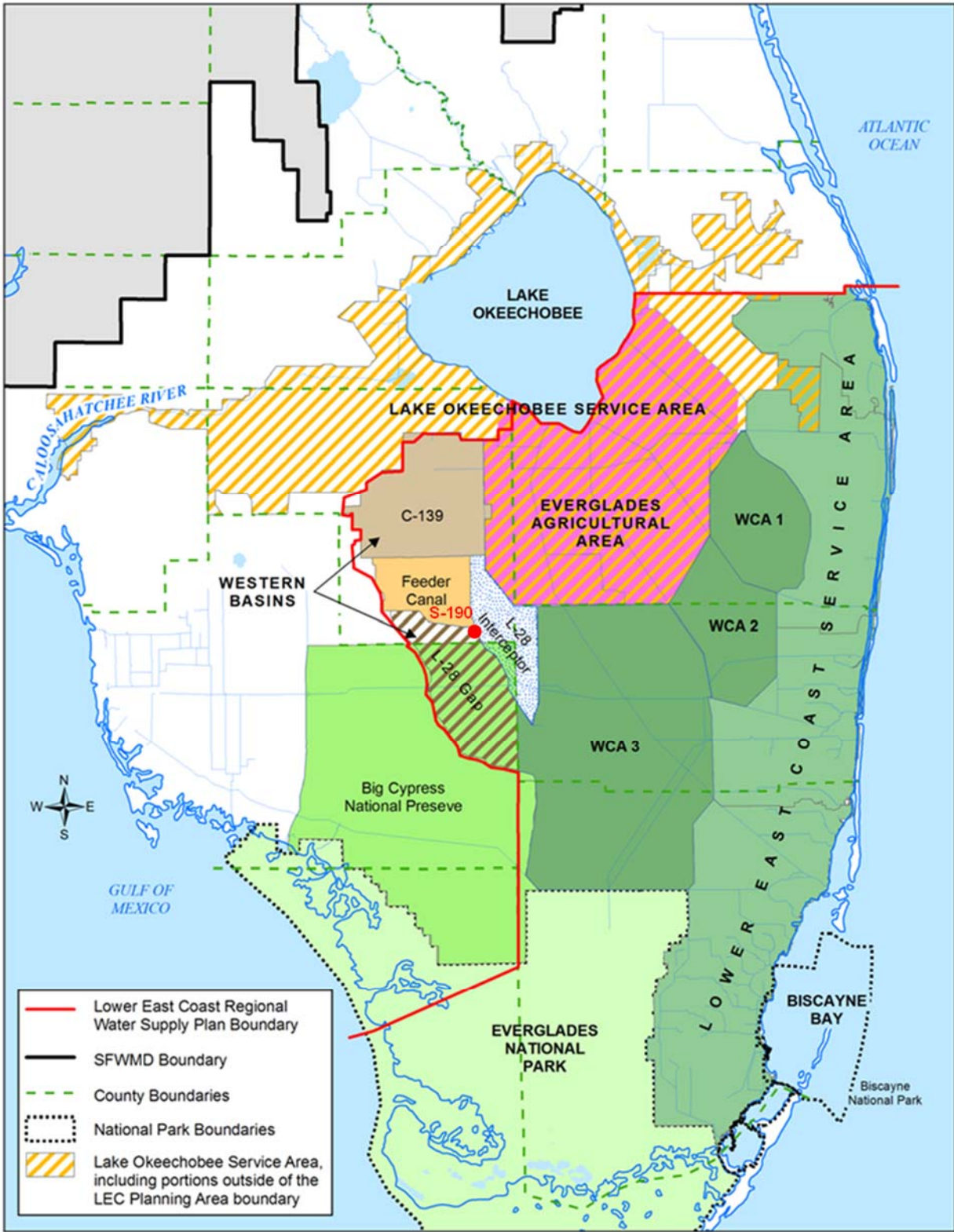


FIGURE 1-1. EVERGLADES AGRICULTURAL AREA, WESTERN BASINS, AND SURROUNDING BASINS

1.2 PROJECT AUTHORITY

The C&SF Project was initially authorized by the Flood Control Act of 1948, Public Law 80-858, approved June 30, 1948. The remaining works of the Comprehensive Plan were authorized by the Flood Control Act of 1954, Public Law 83-780, approved September 3, 1954. The Flood Control Act of 1948 and the Flood Control Act of 1954 specifically recognized that the plan of improvement would require refinement and that modifications within the scope and purpose of the authorization, could be made at the discretion of the Chief of Engineers. The 1954 authorization included the L-28 Levee and its related appurtenant structures (*i.e.* S-190).

Design revisions to the L-28 Interceptor and Feeder Canals were noted within the C&SF Project for Flood Control and Other Purposes, Part I, Supplement 40, Addendum 1 dated February 7, 1964 in response to expressed concerns by the Bureau of Indian Affairs (*US Department of Interior Bureau of Indian Affairs letter dated September 18, 1963; US Army Engineer District, Jacksonville, Corps of Engineers dated October 14, 1963*) regarding the possibility of over drainage of BCSIR. At that time, the Seminole Indian Agency of the BIA expressed concerns with the possibility of over-drainage of BCSIR due to the lack of a water control structure. A restudy occurred and determined that minor damage from over-drainage might occur if control was not provided. A structure (designated S-190) was therefore proposed about 1.2 miles downstream of the junction of the North and West Feeder Canals to allow the maintenance of more desirable stages in the upper reaches of the canal as long as the available ground water supply would permit (Corps 1964). The above referenced correspondence between the Corps and BIA regarding design revisions was provided as reference from the Seminole Tribe by letter dated March 30, 2012 and appears in **Appendix B**. Additional information concerning structures within the project area may be found within the C&SF Project for Flood Control and Other Purposes, Part I Agricultural and Conservation Areas, Supplement 40 (Pt I Supplement 40), Detailed Design Memorandum (DDM) Levee 28 (L-28) Interceptor and Feeder Canals, including Addendum 1, dated August 23, 1963, for the design of L-28 Interceptor Canal downstream of S-190, design of S-190, as well as the designs for the North Feeder Canal and West Feeder Canal upstream of S-190 and associated structures. Design revisions in Addendum 1 of Part 1, Supplement 40 of the C&SF Project identified a control structure (*i.e.* S-190) to be located in the L-28 Interceptor Canal downstream of the junction of the North and West Feeder Canals that would serve to prevent over drainage of BCSIR with gates opening at 15.8 ft NGVD, closing at 15.2 ft NGVD, with and an optimum headwater (HW) elevation of 15.5 ft NGVD (Corps 1964).

1.3 PROJECT LOCATION

S-190 is the primary discharge structure in the Feeder Canal Basin located in southeastern Hendry County. The Feeder Canal Basin is located west of WCA 3A, southwest of the Everglades Agricultural Area (EAA), and north of the BCNP (**Figure 1-1**). The northwest section of BCSIR is situated within the Feeder Canal Basin and accounts for approximately 77% of the Basin. The BCSIR includes approximately 52,338 acres located in Hendry and Broward Counties (Seminole Tribe 2012). The southern boundary of BCSIR is formed by the Hendry-Collier County line and the BCNP. The eastern boundary of BCSIR is the L-28 Borrow Canal which connects directly to WCA 3A via the S-140 pump station. The southeastern boundary of BCSIR is formed by the lands of the Miccosukee Tribe of Indians of Florida (Miccosukee Tribe) and includes State managed lands. The western and northern boundaries are private lands managed for agriculture and recreation.

An extensive drainage canal system operated by the SFWMD impacts the eastern side of BCSIR and runs directly through BCSIR in an east-west and north-south orientation in the western-central section of the reservation. S-190 is located in the L-28 Interceptor Canal, directly south of the junction of the North Feeder Canal and West Feeder Canal.

Within BCSIR, over 14,000 acres have been set aside as natural/native area. This area is directly south of the West Feeder Canal, and comprises the total area west of S-190 and the L-28 Interceptor Canal to the southern boundary of BCSIR. Also within BCSIR, north of the West Feeder Canal and west of the North Feeder Canal are wetland areas and the Tribe's Critical Restoration Project (**Section 4.22**) basins.

1.4 PROJECT NEED OR OPPORTUNITY

The Corps developed recommendations for modifications to the operating criteria for S-190 in coordination with SFWMD and the Seminole Tribe. The overarching project need is to decrease wet season surface water losses from BCSIR by returning S-190 to its original authorized design criteria. The Seminole Tribe identified the need for an evaluation of the current S-190 operating criteria by letter dated August 1, 2014 (**Appendix B**). Comments from the August 1, 2014 letter are briefly summarized below:

- Current S-190 operations have resulted in releases of restorative seasonal rainfall, which prevents aquifer recharge, and disrupts the natural wetland hydroperiod within BCSIR. Modifications to the current operating criteria are needed to protect surface water and groundwater levels on the western side of BCSIR. The BCSIR has Water Entitlement Rights. Before the Seminole Tribe can utilize the water in the western reaches of BCSIR, current S-190 operations cause the release of this water to the south before it can be stored and utilized by the Seminole Tribe.
- Modifications to the current operating criteria for S-190 are needed to further enhance operations of the Seminole Tribe Critical Restoration Project (Corps 1999a). The Critical Restoration Project (**Section 4.22**) currently is impacted by over drainage of the western basins when S-190 is maintained at a lower stage.
- Over drainage resulting from current S-190 operations has resulted in effects to fish and wildlife resources and shifts in vegetation communities within BCSIR and the native area which is bordered on the east by the L-28 Interceptor Canal and to the north by the West Feeder Canal. Wetland hydroperiods have been altered from a natural timing and duration of inundation.

1.5 AGENCY OBJECTIVES

The objective of this EA and proposed Finding of No Significant Impact (FONSI) is to evaluate alternative operating criteria for S-190. Operational modifications to S-190 would result in a permanent change to the Master Water Control Manual for the WCAs, ENP, and ENP-SDCS, Volume 4 (Corps 1996).

Objectives of the Proposed Action include modifications to the current operating criteria for S-190 to:

- Uphold the Federal Indian trust responsibility to protect the Seminole Tribe’s Tribal treaty rights, lands, assets, and resources;
- Prevent over drainage of BCSIR by modifying the current S-190 operating criteria to be consistent with the C&SF Project for Flood Control and Other Purposes, Part I, Supplement 40, Addendum 1 dated 7 February 1964 (Corps 1964);
- Maintain higher groundwater elevations and increase water storage within the western portion of BCSIR;
- Restore a more natural wetland hydroperiod on BCSIR and its Native Area south of the West Feeder Canal and north of BCNP;
- Enhance the operation of the Critical Restoration Project (**Section 4.22**) which is impacted by groundwater levels controlled by the operation of S-190.

1.6 RELATED ENVIRONMENTAL DOCUMENTS

The Corps has identified a number of reports relevant to the Proposed Action:

- Central and Southern Florida Project For Flood Control and Other Purposes, Part I, Supplement 40 – Detail Design Memorandum, Levee 28 Interceptor and Feeder Canals, U.S. Army Corps of Engineers, Jacksonville, Florida, August 23, 1963.
- Central and Southern Florida Project For Flood Control and Other Purposes, Part I, Addendum 1 to Supplement 40 – Design Revisions – Levee 28 Interceptor and Feeder Canals, U.S. Army Corps of Engineers, Jacksonville, Florida, February 7, 1964.
- Operations and Maintenance Manual, Central and Southern Florida Flood Control Project, Volume II, 1968.
- Central and Southern Florida Project for Flood Control and Other Purposes Master Water Control Manual Water Conservation Areas – Everglades National Park, and Everglades National Park-South Dade Conveyance System (Volume 4), U.S. Army Corps of Engineers, Jacksonville District, January 1996.

An EA was not performed by the Corps prior to 1996 to assess the environmental impact on BCSIR as a result of operational changes identified in the Master Water Control Manual for the WCAs, ENP, and ENP-SDCS, Volume 4 (Corps 1996).

1.7 DECISIONS TO BE MADE

This EA and proposed FONSI evaluates whether to modify the current operating criteria for S-190. The No Action Alternative and other reasonable alternatives are studied in detail to determine the Preferred Alternative, reference **Section 2.0**. The adoption of the Preferred Alternative is the primary decision that must be made.

1.8 SCOPING AND ISSUES

This EA and proposed FONSI will be circulated for a 60 day review period to agencies, organizations and other interested stakeholders. Comments received during this review period will be used in determining whether a FONSI is appropriate or an Environmental Impact Statement is warranted. Comments received during the review period will be addressed and included in the final document.

1.9 PERMITS, LICENSES, AND ENTITLEMENTS

The Proposed Action requires a Coastal Zone Management Act (CZMA) consistency determination (**Appendix C**). The Corps is coordinating a consistency determination pursuant to CZMA through the circulation of this EA. The Corps normally obtains water quality certification from the delegated authority prior to constructing civil works projects. This project does not include any construction activities so the Corps anticipates that water quality certification will not be required for any of the proposed changes to operations.

2 ALTERNATIVES

2.1 DESCRIPTION OF ALTERNATIVES

Alternative descriptions presented in the following sections consist of variations on operating criteria for S-190. This section describes in detail the No Action Alternative, the Preferred Alternative and other reasonable alternatives that were studied in detail. Alternatives differ based on the optimum canal elevation and time of the year that the optimum canal elevation is maintained (*i.e.* seasonal variations in canal operating stages). The design HW and tailwater conditions for S-190 are 16.6 ft NGVD and 16.1 ft NGVD, respectively (Corps 1964). Alternatives were formulated to stay within the range of design HW and tailwater elevations of the structure to ensure consistency with hydraulic design and remain well below the storm design condition.

The SFWMD supports the objective of modifying the current S-190 operating criteria to utilize the existing “high setting” operating range year round (*i.e.* water control elevation of 15.5 ft NGVD), consistent with the C&SF Project for Flood Control and Other Purposes, Part I, Supplement 40, Addendum 1 dated 7 February 1964 (Corps 1964). However, the proposed operating range as defined in Alternative 2, does not include a “low setting” to ensure that excess water from a large rainfall event could be removed in the event that the situation may arise. Therefore, during the planning stages of the project, SFWMD suggested to include a description of how to operate S-190 before, during, and after predicted large rainfall events. Language with respect to pre-storm draw downs was included in Alternatives 3, 4, and 5.

2.1.1 Alternative 1: No Action Alternative

The No Action Alternative, Alternative 1, consists of current S-190 operations as defined within the C&SF Project for Flood Control and Other Purposes, Master Water Control Manual for the WCAs, ENP, and ENP-SDCS, Volume 4 dated June 1996.

Operations: The structure will be operated on either a low or a high setting, through automatic controls as follows:

- (1) During the normal condition, the low setting is used. When the HW elevation rises to 14.8 feet NGVD, the gates will open at six inches per minute but the maximum gate opening will be limited to the amounts shown on the “Limiting Gate Opening” curve. When the HW elevation rises or falls to 14.5 feet NGVD, the gates will become stationary. When the HW elevation fall to 14.2 feet NGVD, the gates will close at six inches per minute.
- (2) During the dry condition, the high setting is used. When the HW elevation rises to 15.8 feet NGVD, the gates will open at six inches per minute. When the HW elevations rise or fall to 15.5 feet NGVD, the gates will become stationary. When the HW elevation fall to 15.2 feet NGVD, the gates will close at six inches per minute.
- (3) During low water periods, releases will be made to meet downstream irrigation requirements even though necessary releases will violate the optimum HW criteria.

Constraints: To meet structural and stability requirements, the maximum allowable hydrostatic head on the structure should not be allowed to exceed 7.5 ft. NGVD, with a HW elevation of 15.5 feet NGVD, and a tailwater elevation of 8.0 ft. NGVD.

2.1.2 Alternative 2: Maintain Optimum Canal Stages of 15.5 feet NGVD

Operations for S-190 under Alternative 2 are intended to meet the operations described in the C&SF Project for Flood Control and Other Purposes, Part 1, Supplement 40, Addendum 1, dated February 7, 1964, as well as provide operational flexibility with respect to key project goals, such as flood control and sustaining the groundwater levels to minimize over-drainage.

Operations: The structure will be operated through automatic controls as follows:

During normal operations, when the HW elevation rises to 15.8 ft., NGVD, the gates will open. When the HW elevation rises or falls to 15.5 ft., NGVD, the gates may become stationary. When the HW elevation falls to 15.2 ft., NGVD, the gates will close. The intent of these gate operations is to maintain an optimum HW elevation of 15.5 ft., NGVD; therefore, some limited operational flexibility of gate opening and closing for maintaining that level will be allowed.

The maximum gate opening will be limited to the amounts shown on the "Limiting Gate Opening" curve.

Constraints: To meet structural and stability requirements, the maximum allowable hydrostatic head on the structure should not be allowed to exceed 7.5 ft., NGVD, with a HW elevation of 15.5 ft. NGVD, and a tailwater elevation of 8.0 ft., NGVD.

Refer to **Appendix A**.

2.1.3 Alternative 3: Maintain Optimum Canal Stages of 15.5 feet NGVD and includes Special Conditions

Operations for S-190 under Alternative 3 are intended to meet the operations described in the C&SF Project for Flood Control and Other Purposes, Part 1, Supplement 40, Addendum 1, dated February 7, 1964, as well as provide operational flexibility with respect to key project goals, such as flood control and sustaining the groundwater levels to minimize over drainage.

Operations: The structure will be operated on either normal operational range or low operational range, through automatic controls or by human operation (either remotely or by on-site operation) or a combination of both as follows:

Normal Operations: During all times, except the special conditions described below, S-190 will be operated using the normal operational range to maintain the daily average stage between 15.8 and 15.2 feet NGVD to the extent that the capacity of S-190 allows.

Special Conditions:

1. **Pre-Storm Drawdown:** With an overall basin drainage rate of about one inch per day and the considerable storage afforded in the undeveloped areas within the S-190 watershed, pre-storm drawdowns are expected to be required infrequently. The following Pre-Storm Drawdown criteria are intended to ameliorate risk of impacts to water supply due to drawdown. The low range of 14.8 to 14.2 ft. NGVD may be used in anticipation of a large rainfall event. The drawdown will be limited to when the Quantitative Precipitation Forecast (QPF) from SFWMD equals or exceeds an areal average 3 inches in one day or an areal average of 6 inches in three days. The Seminole Tribe may request a pre-storm drawdown if the criteria are met or exceeded. A pre-storm drawdown shall not be initiated without a documented request from the Seminole Tribe. S-190 shall be operated at the low range within 24 hours of receiving the request. The Seminole Tribe may request a termination of the drawdown at any time. S-190 shall be returned to the normal range within 24 hours of receiving the request.
2. **Large Rainfall Event:** The following Large Rainfall Event criteria are intended to ameliorate the risk of impacts to water supply from the low range used to increase discharges at S-190 in response to large rainfall events. The low range of 14.8 to 14.2 ft. NGVD may be used if a large rainfall event has impacted the basin and the daily discharge at S-190 equals or exceeds 500 cfs. The Seminole Tribe may request the use of the low range when the criteria are met or exceeded. The low range for a large rainfall event shall not be used without a documented request from the Seminole Tribe. S-190 shall be operated at the low range within 24 hours of receiving the documented request.
3. **Recovery:** The following Recovery criteria are intended to ameliorate risk of impacts to water supply from the use of the low range once the effects of the large rainfall event have ended. S-190 will be returned to the normal range of 15.8 to 15.2 ft. NGVD within 24 hours of the daily discharge falling below 500 cfs. The Seminole Tribe of Florida may request early termination of the low range. S-190 shall be returned to the normal range within 24 hours.
4. **Coordination:** For all Pre-Storm Drawdown, Large Rainfall Event, and Early Termination requests will originate solely from the Seminole Tribe and shall be submitted via email or facsimile to SFWMD. The low operational range shall not be used unless the Seminole Tribe requests use. The SFWMD shall implement all requested changes from the normal range to the low range, or from the low range to the normal range, within 24 hours of receiving the documented request from the Seminole Tribe by email or facsimile.

The maximum gate opening will be limited to the amounts shown on the "Limiting Gate Opening" curve.

Constraints: To meet structural and stability requirements, the maximum allowable hydrostatic head on the structure should not be allowed to exceed 7.5 ft. NGVD, with a HW elevation of 15.5 ft. NGVD and a tailwater elevation of 8.0 ft. NGVD.

2.1.4 Alternative 4: Maintain Optimum Canal Stages of 15.8 feet NGVD and includes Special Conditions

Implementation of Alternative 4 would represent a variation of Alternative 3. Alternative 4 would maintain an optimum canal elevation of 15.8 ft. NGVD and includes special conditions as described under Alternative 3.

Operations: The structure will be operated on either normal operational range or low operational range, through automatic controls or by human operation (either remotely or by on-site operation) or a combination of both as follows:

Normal Operations: During all times, except the special conditions described below, S-190 will be operated using the normal operational range to maintain the daily average stage between 16.0 and 15.4 feet NGVD to the extent that the capacity of S-190 allows.

The maximum gate opening will be limited to the amounts shown on the "Limiting Gate Opening" curve.

Constraints: To meet structural and stability requirements, the maximum allowable hydrostatic head on the structure should not be allowed to exceed 7.5 ft. NGVD, with a HW elevation of 15.8 ft. NGVD and a tailwater elevation of 8.3 ft. NGVD.

2.1.5 Alternative 5: Maintain Optimum Canal Stages of 16.0 feet NGVD and includes Special Conditions

Implementation of Alternative 5 would represent a variation of Alternative 3. Alternative 5 would maintain an optimum canal elevation of 16.0 ft. NGVD and includes special conditions as described under Alternative 3.

Operations: The structure will be operated on either normal operational range or low operational range, through automatic controls or by human operation (either remotely or by on-site operation) or a combination of both as follows:

Normal Operations: During all times, except the special conditions described below, S-190 will be operated using the normal operational range to maintain the daily average stage between 16.2 and 15.6 feet NGVD to the extent that the capacity of S-190 allows.

The maximum gate opening will be limited to the amounts shown on the "Limiting Gate Opening" curve.

Constraints: To meet structural and stability requirements, the maximum allowable hydrostatic head on the structure should not be allowed to exceed 7.5 ft. NGVD, with a HW elevation of 16.0 ft. NGVD and a tailwater elevation of 8.5 ft. NGVD.

2.2 ISSUES AND BASIS FOR CHOICE

In coordination with SFWMD and Seminole Tribe, the Corps developed recommendations for modifications to the current operating criteria for S-190 as defined in the C&SF Project for Flood Control and Other Purposes, Master Water Control Manual for the WCAs, ENP and ENP-SDCS, Volume 4 (Corps 1996). The alternatives described in **Section 2.1** were formulated, considered and evaluated based on achievement of project objectives. Potential environmental effects (benefits and impacts) and effects to other resources were also evaluated. Alternative 2 has been identified as the Preferred Alternative by the Seminole Tribe.

Objectives of the Proposed Action are included in **Section 1.5**. Alternative 2 best accomplishes these objectives by upholding the Federal Indian trust responsibility to protect the Seminole Tribe's Tribal treaty rights, lands, assets and resources, by reducing over drainage of BCSIR, and by balancing ecosystem restoration objectives of the S-190 operations evaluation while maintaining other Federally authorized C&SF Project purposes. Alternative 2 does not include operating criteria with respect to pre-storm drawdowns; therefore lowering the operational range in the event of large rainfall would require an emergency deviation request to the Corps. This information has been communicated numerous times to the Seminole Tribe and SFWMD and both the Seminole Tribe and SFWMD understand the process to request an Emergency Deviation.

2.3 ALTERNATIVES ELIMINATED FROM DETAILED EVALUATION

No Alternatives were eliminated from detailed evaluation. Alternative 2, Alternative 3, Alternative 4, and Alternative 5 are considered feasible and were carried forward for detailed evaluation within **Section 4.0**.

2.4 PREFERRED ALTERNATIVE(S)

Based upon the effects analysis conducted within this EA, utilizing the best available information and applying best professional judgment, Alternative 2 is the Preferred Alternative as it modifies the current S-190 operating criteria to be consistent with the C&SF Project for Flood Control and Other Purposes, Part I, Supplement 40, Addendum 1 dated 7 February 1964 (Corps 1964). This plan is expected to best meet the project objectives by upholding the Federal Indian trust responsibility to protect the Seminole Tribe's Tribal treaty rights, lands, assets and resources, by reducing over drainage of BCSIR, increasing groundwater levels and water storage within the BCSIR, and restoring more natural wetland communities while minimizing any associated negative effects within the project area. Summary details of the Preferred Alternative are listed below:

- S-190 would be operated to maintain optimum upstream water control stages in the North and West Feeder Canals.
- S-190 would be operated to maintain an optimum year round canal stage elevation of 15.5 ft NGVD.

3 AFFECTED ENVIRONMENT

3.1 GENERAL ENVIRONMENTAL SETTING

BCSIR is located in south Florida in Hendry and Broward Counties. The majority of the land (>75%) in BCSIR is in a natural condition with major habitat types of freshwater marsh, wet prairie, cypress and shrub swamp and mixed wetland forests. Less than 20% of the total land area in BCSIR is designated for agricultural use and pastures. In addition, the C&SF Project created several major canals that traverse BCSIR. Watershed diversion and drawdown of the water table has had widespread impacts on entire cypress strands and wet prairie communities. The L-28 Interceptor Canal, whose HWs begin in the agricultural areas to the north and west of BCSIR, traverse through BCSIR into BCNP, traverses through and discharges into the Miccosukee Federal Indian Reservation and ultimately flows into the WCA 3 and ENP.

3.2 CLIMATE

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

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

High evapotranspiration rates in south Florida roughly equal annual precipitation. Evapotranspiration removes between 70% and 90% of the rainfall in undisturbed south Florida wetlands (Duever et. al 1994). Evaporation from open water surfaces peak annually in the late spring when temperatures and wind speeds are high and relative humidity is low. Evaporation is lowest during the winter when the temperatures and wind speeds are low (Duever et. al 1994). Mean monthly temperatures range from a low of 63° F (17°C) in January to a high of 85 ° F (29°C) in August (Thomas 1974). Infrequently, freezing temperatures and frost occur when arctic air masses follow winter cold fronts into the area.

3.3 GEOLOGY AND SOILS

The geologic composition, or lithology, of rock and sediments underlying the Western Basins consists of sequences of marginal marine and some freshwater limestones interlayered with sandy units deposited during successive rising and falling sea levels. The shallow subsurface geology to

100 ft below land surface) consists of the following units, from oldest to youngest (**FIGURE 3-1**): 1) the Ochopee Member of the Tamiami Formation; 2) the Pinecrest Member of the Tamiami Formation; and 3) undifferentiated quartz sands and minor limestone (Reese and Cunningham, 2000). The Ochopee Member is a regionally extensive marine sand and limestone with abundant mollusk fossils, deposited in a tropical carbonate ramp environment. The Pinecrest Member consists of quartz sands and mollusk fossils that was deposited in a marine shelf environment. In some areas of central Hendry County, lithologies of the two members cannot be differentiated, or the Pinecrest Member does not separate the deeper Ochopee Member from the overlying undifferentiated sand and limestone. In these conditions, rock units are known collectively as the Tamiami Formation (Reese and Cunningham 2000). The lithologic characteristics of the undifferentiated sand and limestone unit varies throughout the BCSIR. A weathered limestone “caprock” is exposed widely at the surface in Basin 4, and contains solution cavities and vugs that allow for rapid drainage (USACE 2009a).

The sediments of the Tamiami Formation include two aquifers. The unconfined water table aquifer occurs within the undifferentiated sand and limestone, or uppermost portions of the Ochopee Member. The Gray Limestone Aquifer occurs within the deeper portions of the Ochopee Member. The two aquifers are separated by a “leaky” confining unit (or semi-confining unit). Cores taken near the West Feeder Canal indicate that the top of the semi-confining unit occurs at depths between 6 ft and 30 ft below land surface (Reese and Cunningham, 2000). In areas where the Pinecrest Member does not have a significant clay component, there is good hydrologic connection between the water table aquifer and the Gray Limestone aquifer, and together they behave as an unconfined aquifer (Schlumberger Water Services, 2014). In areas where the Pinecrest Member consists of sand, clayey sand, mudstone and clay (and hence reduced hydrologic connection between the two aquifers), the Gray Limestone Aquifer is semi-confined (Reese and Cunningham 2000).

Hydrologic parameter data (such as hydraulic conductivity values) are limited in the project area. Calculated permeability values in Basin 4 are variable but range between 1.6 to 214 ft/day based on infiltrometer tests and constant head recharge tests (USACE 2009a). Calculated permeability values in Basins 2 and 3 also were variable but range between 0.9 and 407 ft/day based on constant head recharge tests (USACE 2009b). Most of these tests were conducted on samples obtained between approximately 2 and 30 ft below land surface, in highly to moderately weathered limestone and caprock. Hydrologic parameters were determined in aquifer performance tests conducted within the BCSIR, but these data (Reese and Cunningham 2000) were obtained from highly transmissive zones in the lower portions of the Gray Limestone Aquifer at depths of approximately 50 to 135 ft below land surface, and so are not relevant to surface hydrologic conditions. The deeper, highly transmissive zones of the Gray Limestone Aquifer serve as the potable water supply for BCSIR.

Soils within BCSIR are most recently described in the 2012 Seminole Tribe Wildlife Conservation Plan (Seminole Tribe of Florida 2012). The General Soil Map for Hendry County depicts six soil map units occurring on the Hendry County portion of BCSIR (Belz et. al 1990). All are described, to varying degrees, as being nearly level, poorly drained and sandy. The Holopaw-Basinger Association (HBA) and the Riviera-Hallandale-Boca Association (RHB) appear to be the most prevalent within BCSIR, followed by the Hallandale-Riviera-Holopaw Association (HRH). The

Ochopee-Rock Outcrop Association (ORO) and the Boca-Riviera-Pineda Association (BRP) appear to comprise minor map unit occurrences along the northern boundary of BCSIR and the Margate Association, if it occurs on BCSIR at all (Belz et al. 1990), occupies only a small portion of the Hendry County property.

The HBA, forms a band running through much of the central part of BCSIR and appears to be associated primarily with improved and unimproved pastures. In its native condition, HBA supports chalky bluestem (*Andropogon virginicus*), cypress (*Taxodium* spp.), pickerelweed (*Pontederia cordata*), slash pine (*Pinus elliottii*) and cabbage palm (*Sabal palmetto*). Thick stands of cypress, sawgrass (*Cladium jamaicense*) and other grasses and sedges predominate in wetter areas (Belz et al. 1990).

The HRH and RHB Associations appear to underlay virtually all of the Native Area in the southwestern portion of BCSIR. Pine flatwood communities in the Native Area appear to occur primarily on HRH Association, while the cypress community in the Native Area appears to occur primarily on RHB Association. Belz et al. (1990) note that RHB association is typically covered with water three to seven months of the year.

A small area in the northwestern portion of BCSIR is underlain by ORO Association and appears to support citrus groves. In its native condition, ORO is most often associated with pine flatwoods and slough and marsh plant communities. A small area categorized as wetlands hardwood forest is associated with the citrus groves occurring on this soil association.

A small area identified as BRP Association appears to occur along the north central boundary of BCSIR in an area utilized for improved pasture, and a mixture of hammocks and hardwoods and mixed conifer. Both the native vegetation expected to occur on these soils, and their agricultural capability as defined by (Belz et al. 1990), are consistent with the reported land use and cover types.

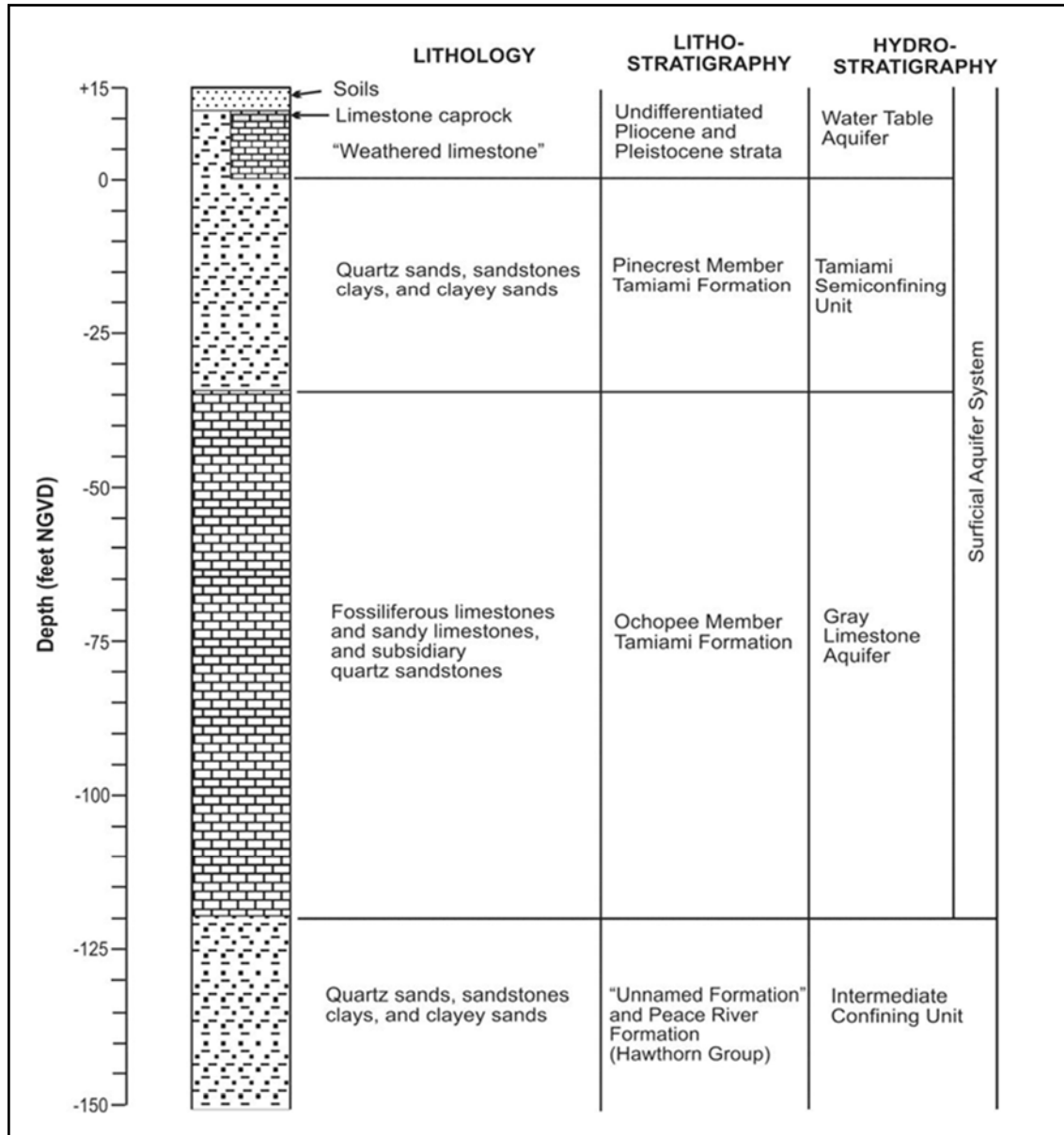


FIGURE 3-1. SUMMARY OF HYDROGEOLOGY ON BCSIR (SOURCE SCHLUMBERGER WATER SERVICES 2014)

3.4 STUDY AREA LAND USE

The WCA 3 tributary basins include C-139, Feeder Canal, L-28 Interceptor and L-28 Gap (located within BCNP) basins, which encompass approximately 440,000 acres located primarily in eastern Hendry County (Figure 1-1). These basins are collectively called the Western Basins. Generally, lands within these basins have three classifications: 1) agricultural (vegetable, sugarcane and citrus); 2) cow-calf operations; and 3) wetlands and native areas. Agricultural land dominates the C-139 and Feeder Canal Basins. The L-28 Interceptor Basin land use is split between wetlands and agriculture. The L-28 Gap Basin consists almost entirely (98%) of wetlands. Urban land

classifications occupy 4% of the C-139 Basin (USACE 2014). Land use for the project area is described in **Figure 3-2** and **Figure 3-3**.

Forest communities, including 4,359 acres of upland and 33,738 acres of wetland forested areas comprise approximately 70% of BCSIR’s surface area. Small islands of forested communities are scattered throughout a portion of BCSIR. The BCSIR also includes the Native Area, a 14,000 acre forested area contiguous to BCNP, which comprises roughly 25% of BCSIR’s surface area in its southwestern quadrant. Open water areas consist primarily of canals and occupy less than 2% of the area. Invasive exotics include, but are not likely limited to, Brazilian pepper and Melaleuca and occur on at least 4% of BCSIR. . Approximately 19% of BCSIR is in some form of agricultural land use. Improved pastures constitute approximately 14% of BCSIR. Cattle grazing is an important land use of BCSIR. Approximately 26 grazing operators run cattle on BCSIR rangelands (reported in 2012). Cattle density is approximately 1 cow per 8 acres (Seminole Tribe 2014). Approximately 6% of BCSIR is reserved for agriculture (row crops and groves).

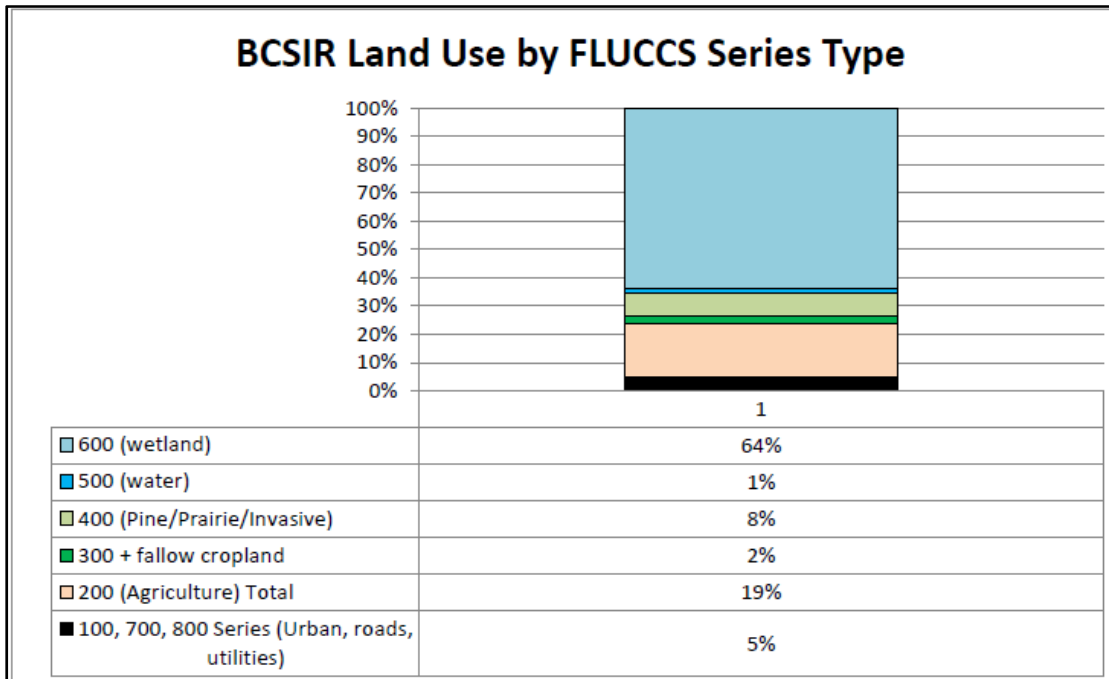


FIGURE 3-2. BCSIR LAND USE BY FLUCCS SERIES TYPE

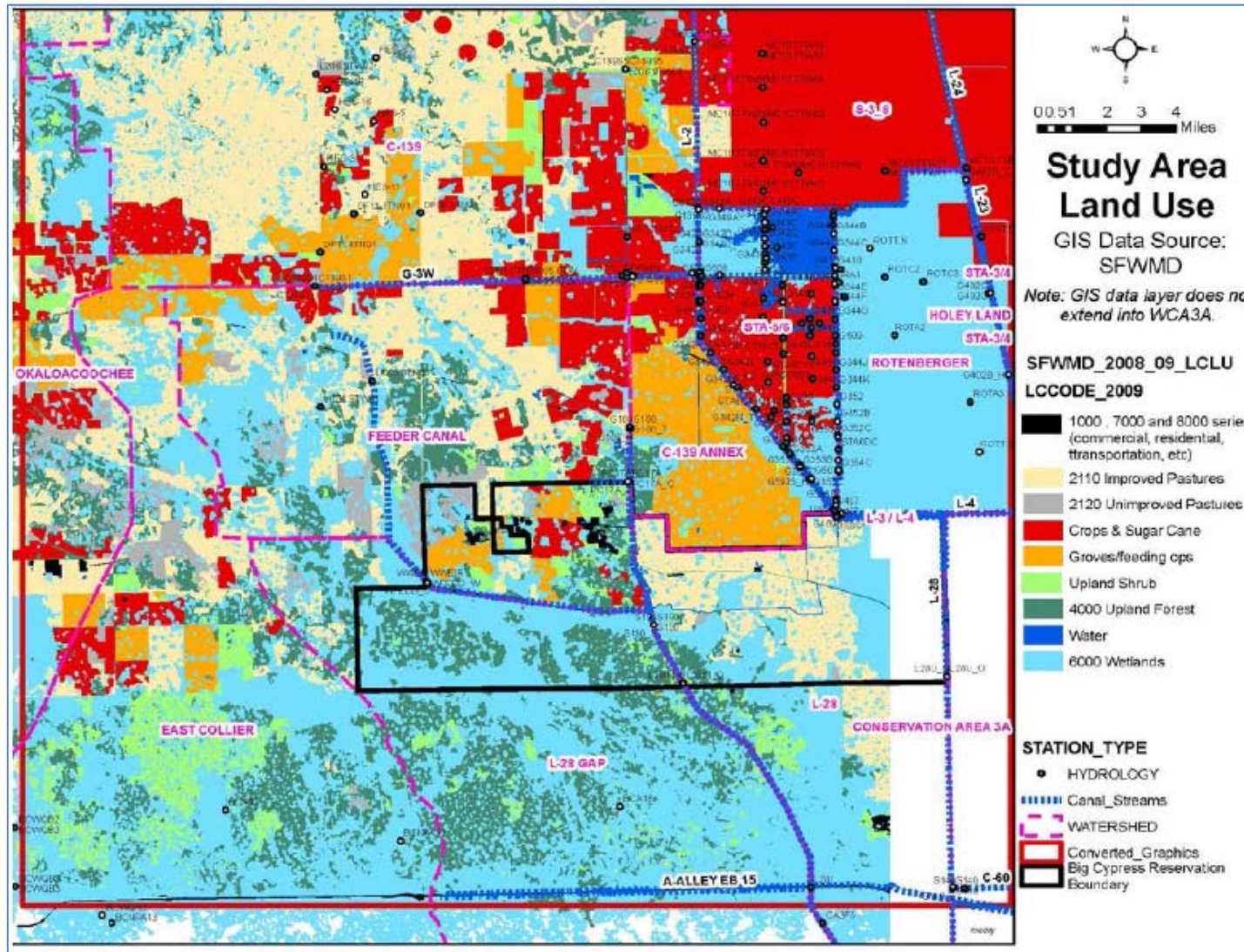


FIGURE 3-3. STUDY AREA LAND USE

Located directly north of BCSIR are several properties currently under agricultural use by adjacent landowners. The PC-17A structure maintains control of canal levels in the South Boundary Canal west of its connection with the North Feeder Canal (Reference **Section 3.5**) and is located north of BCSIR. Historically, JW McDaniel Sr., Inc. (McDaniel) was the primary landowner served by the PC-17A structure and operated the PC-17A via a cooperative and mutually beneficial agreement with the Central and Southern Flood Control District, and subsequently SFWMD (SFWMD 2014). Land ownership changes have resulted in two additional significant landowner interests draining to this structure: McDaniel Reserve Holdings, LLC (Garcia) and Florida Power & Light (FPL). In 2004, McDaniel sold approximately 3,126 acres of land (“SW 3126”) on the east side of Hendry County Road to Garcia. In 2011, Garcia sold the “SW 3126” land to FPL. In 2013, McDaniel sold approximately 9,500 acres of land east of Country Road 833 to Garcia and approximately 4,692 acres of land (“NW 4692”) west of Country Road 833 to FPL which resulted in FPL owning a total of approximately 7,818 acres. Adjoining the FPL land, McDaniel retains ownership of approximately 4,000 acres for their family homesteads and livestock pastures (SFWMD 2014). Land use on the Garcia property includes citrus groves and row crops which includes green beans, bell peppers, sweet peppers, potatoes and organic produce. The following map (**Figure 3-4**) illustrates current land ownership directly north of BCSIR.

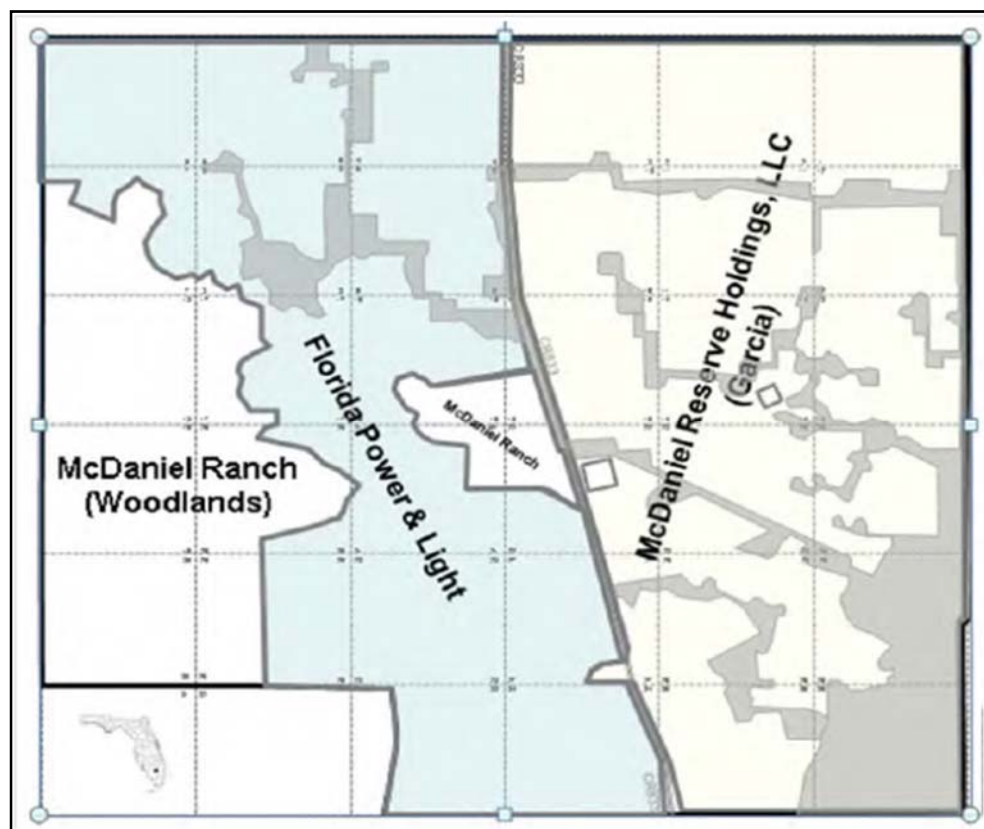


FIGURE 3-4. CURRENT LANDOWNERSHIP OF MCDANIEL RANCH PROPERTY LOCATED DIRECTLY NORTH OF BCSIR (SOURCE SFWMD 2014) AND WEST OF THE NORTH FEEDER CANAL

3.5 HYDROLOGY

3.5.1 Feeder Canal Basin and Big Cypress Seminole Indian Reservation

The BCSIR is located in the Feeder Canal Basin watershed which, historically, has been influenced by water levels in the EAA to the north and northeast, natural and agricultural systems to the west, Big Cypress Swamp to the west and south, and the Greater Everglades to the east and south. The hydrology of south Florida, including BCSIR, has been modified by the construction of the C&SF Project. Prior to construction of C&SF Project features, natural flow traversed into and through the northern and western portion of BCSIR and flowed overland in a southeast direction through the present day Native Area south of the West Feeder Canal, through the present day BCNP and Addition Lands. The C&SF Project has been operating as per the original design documentation and is effective in conveying water off of BCSIR.

The U.S. Geological Survey (USGS) has collected data for development of a water budget at BCNP from 2007-2010 (Shoemaker et al. 2011). Evapotranspiration rate, precipitation, and water availability data were collected at five stations located within pine uplands, wet prairies, marsh, cypress swamp, and dwarf cypress communities. None of the stations were located within BCSIR or were on developed land use types including pasture and citrus groves; however, the data presented in provide a point of reference for the estimates of precipitation and evapotranspiration within the surrounding project area.

TABLE 3-1. ACTUAL EVAPOTRANSPIRATION, PRECIPITATION AND AVAILABLE WATER IN BIG CYPRESS PRESERVE PLANT COMMUNITIES (SOURCE SHOEMAKER ET. AL. 2011)

Component	Year 1	Year 2	Year 3	Mean
Dwarf Cypress				
Total rainfall, mm/(in)	1,448 (57.0)	1,219 (48.0)	1,270 (50.0)	1,312 (51.7)
Total evapotranspiration, mm/(in)	976 (38.4)	1,075 (42.3)	959 (37.8)	1,003 (39.5)
Available water, mm/(in)	471 (18.6)	144 (5.7)	311 (12.2)	309 (12.2)
Wet Prairie				
Total rainfall, mm/(in)	1,448 (57.0)	1,219 (48.0)	1,270 (50.0)	1,312 (51.7)
Total evapotranspiration, mm/(in)	1,017 (40.0)	1,019 (40.1)	1,106 (43.5)	1,047 (41.1)
Available water, mm/(in)	430 (16.9)	201 (7.9)	164 (6.5)	265 (10.4)
Cypress Swamp				
Total rainfall, mm/(in)	1,600 (63.0)	1,194 (47.0)	1,372 (54.0)	1,389 (54.7)
Total evapotranspiration, mm/(in)	1,179 (46.4)	1,115 (43.9)	1,025 (40.4)	1,106 (43.6)
Available water, mm/(in)	421 (16.6)	79 (3.1)	347 (13.7)	282 (11.1)
Pine Upland				
Total rainfall, mm/(in)	1,524 (60.0)	1,118 (44.0)	1,219 (48.0)	1,287 (50.7)
Total evapotranspiration, mm/(in)	876 (34.5)	909 (35.8)	996 (39.2)	927 (36.5)
Available water, mm/(in)	648 (25.5)	209 (8.2)	223 (8.8)	360 (14.2)
Marsh				
Total rainfall, mm/(in)	1,651 (65.0)	1,346 (53.0)	1,321 (52.0)	1,439 (56.7)
Total evapotranspiration, mm/(in)	816 (32.1)	840 (33.1)	1,068 (42.0)	908 (35.7)
Available water, mm/(in)	835 (32.5)	506 (19.9)	253 (10.0)	531 (20.9)

Hydrology within BCSIR has most recently been described in Seminole Tribe Schlumberger Water Services (2014) and the Modeling Documentation Report (MDR; **Appendix D**). Schlumberger Water Services (2014) evaluated data from four pairs of shallow (water table aquifer) and deep (Gray Limestone Aquifer) wells located on or near BCSIR to evaluate the hydrologic connection between surface water and groundwater. Hydrographs generated from wells open to the water table aquifer showed rapid rises in water levels, often 0.5 feet/day or greater, in response to rainfall events, and subsequent declines in water levels an order of magnitude slower (0.04 to 0.07 ft per day) (Schlumberger Water Services, 2014). On the west side of BCSIR, water level changes in the water table aquifer (HES-27S) and the Gray Limestone Aquifer trend together, suggesting that hydrologic connection (or lack of confinement) exists between the two water bearing units. In addition, water levels in the water table aquifer consistently remained over 2 ft below land surface over the monitored period during 2010 and 2011 and did not rise to within 10 inches of the land surface (21.1 ft NGVD) during the wet season

(**Figure 3-5**). On the east side of BCSIR, water levels in the water table aquifer (HE-862) and the Gray Limestone Aquifer (HE-861) responded differently, with Gray Aquifer water levels showing greater variation. This condition suggests upper confinement of the Gray Limestone Aquifer. In addition, water levels in the water table aquifer (HE-862) reached or exceed land surface (14.2 ft NGVD) most years from early 2000 through early 2014 (Schlumberger Water Services 2014) (**Figure 3-5**). In general, groundwater levels in the water table aquifer and Gray Limestone Aquifer either track each other closely (*i.e.*, are within 0.5 ft or less of each other) or the Gray Limestone Aquifer water levels are much lower and more variable (Schlumberger Water Services 2014).

In the MDR (**Appendix D**), groundwater level data were collected at five locations (**FIGURE 3-7**) adjacent to the Feeder Canal Basin for the period of October 2013 to January 2015. These data were analyzed to characterize the groundwater-surface water interactions in the area. Continuous groundwater level data (WLRs) and canal stage hydrographs in these areas are shown in **FIGURE 3-8** and **FIGURE 3-9**. The relationships are summarized as follows.

FIGURE 3-8 shows the hydrographs for WLR2 and WLR3 wells and canal stages (S-190 HW) in the Feeder Canal Basin. WLR2 is approximately 0.7 miles north of the West Feeder Canal, and WLR3 is less than 0.1 mile from the West Feeder Canal downstream of the West Feeder weir at a land elevation of approximately 16.8 ft NGVD. The base of WLR3 is at 15.7 ft NGVD, therefore no groundwater levels less than 15.7 ft are recorded by WLR3. Overall, WLR2 and WLR3 hydrographs trend similarly and for the most part overlap each other. Therefore, groundwater level responses for these two wells can be considered similar.

Throughout the period of record, all hydrographs fluctuated considerably, generally dropping in the dry season and rising in the wet season. Canal stages and groundwater levels decreased at approximately the same rate during the dry season when S-190 gates were not operated. During the wet season, groundwater levels increased via Critical Restoration Project pumping and rainfall; the canal stages were held between 15.5 ft and 15.8 ft by virtue of S-190 gate openings. At the end of August 2014, the S-190 HW level was drawn down with gate operations although rainfall continued. A corresponding ground water level decrease is observable in WLR2 and WLR3. Canal stages influenced the nearby groundwater levels, and regional trends also played a role in the control of groundwater levels in the water table aquifer.

FIGURE 3-9 shows the hydrographs for wells WLR4 and WLR5, and canal stages (S-190 HW) in the Feeder Canal Basin. WLR4 and WLR5 are located approximately one-half mile west of the North Feeder Canal at a land elevation of approximately 18.3 ft NGVD (**FIGURE 3-7**). The base of WLR5 is at 16.1 ft NGVD, therefore no groundwater levels less than 16.1 ft are recorded by WLR5. Overall, WLR4 and WLR5 hydrographs trend similarly and although very little overlapping occurs, the two hydrographs differ by only a fraction of a foot apart from each other. Therefore, groundwater level responses for these two wells are similar.

Similar trends are observed in the hydrographs from wells WLR4 and WLR5, although the head difference between the WLR4 and WLR5 wells and canal are slightly greater than those of the WLR2 and WLR3 wells and canal, particularly in the dry season. Throughout the period of record, all stages fluctuated considerably, generally dropping in the dry season and rising in the wet

season. Canal stages and groundwater levels decreased at approximately the same rate during the dry season when S-190 gates were not operated. During the wet season, groundwater levels increased via Critical Restoration Project pumping and rainfall; the canal stages were held between 15.5 ft and 15.8 ft by virtue of S-190 gate openings. At the end of August 2014, the S-190 HW level was drawn down with gate operations although rainfall continued. A corresponding groundwater level decrease is observable in WLR5 (WLR4 data was missing during the wet season). Canal stage may have influenced the nearby groundwater levels, and regional trends also played a role in the control of groundwater levels in the water table aquifer.

There are limited long-term data on groundwater levels within the project area. Long-term groundwater level trends are best described by well HE-826, which is located on the eastern side of BCSIR near County Road 833 (Snake Road). Data from December 6, 1977 through October 28, 1982 and from March 15, 1988 through present are available. An approximate 3.5 foot annual variation in groundwater levels is observed within the earliest data with water levels rising close to land surface during the wet season. Much greater seasonal variation in groundwater levels (up to 5.5 ft) is observed from March 1998 through June 2003 with overall groundwater levels only occasionally approaching land surface (14.41 ft NGVD) (**Figure 3-6**). Less seasonal variation in groundwater levels is observed from June 2003; however, overall high groundwater levels are present, once again approaching land surface during the wet season. Groundwater level changes may be related to canal stage north of Snake Road or changes in agricultural pumping in farm fields to the north. The high dry season surface water levels from 2003 onwards may be related to the pumping of water into the canal system at the G-409 pump station (Schlumberger Water Services 2014).

Schlumberger Water Services (2014) has computed a water balance for the Feeder Canal Basin. Schlumberger Water Services (2014) notes that the overall water budget for BCSIR appears to be balanced as the difference between canal outflows and inflows, and is roughly equal to (of the same order of magnitude) the estimated surface water runoff based on available water data (precipitation minus actual evapotranspiration rate) for BCNP area. There is no net change in storage over the course of the year. Any net infiltration of water to the water table (*i.e.* recharge), is balanced by some discharge or off-site flow. The primary discharge is presumably to drainage ditches and canals during the wet season.

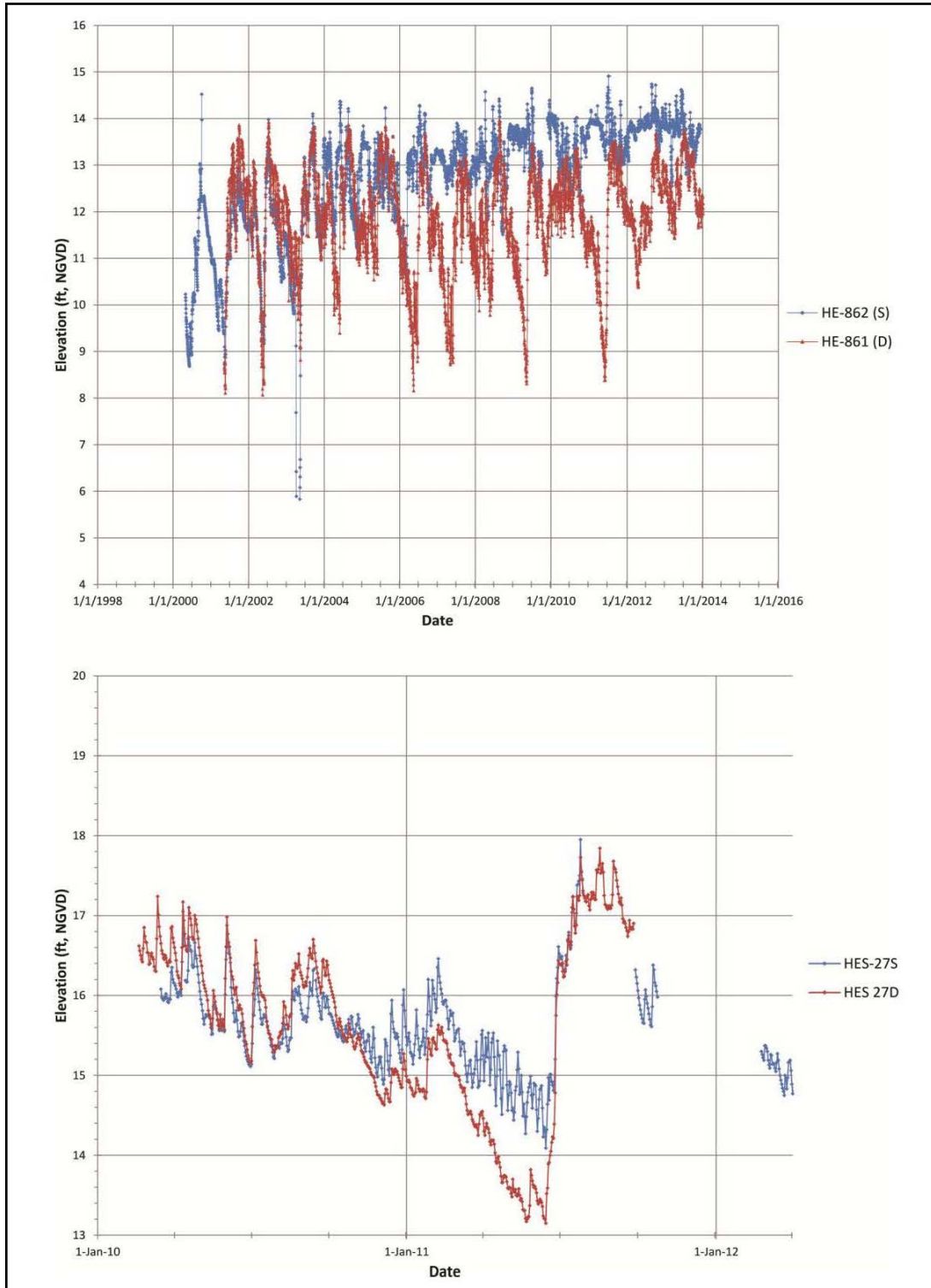


FIGURE 3-5. HYDROGRAPHS OF WATER TABLE AQUIFER (S) AND GRAY LIMESTONE AQUIFER (D) FOR WELL PAIRS HE-862 AND HE-861, AND HE-27S AND HES-27D, LOCATED ON THE EASTERN AND WESTERN SIDES OF THE BIG CYPRESS SEMINOLE INDIAN RESERVATION (SOURCE SCHLUMBERGER WATER SERVICES 2014)

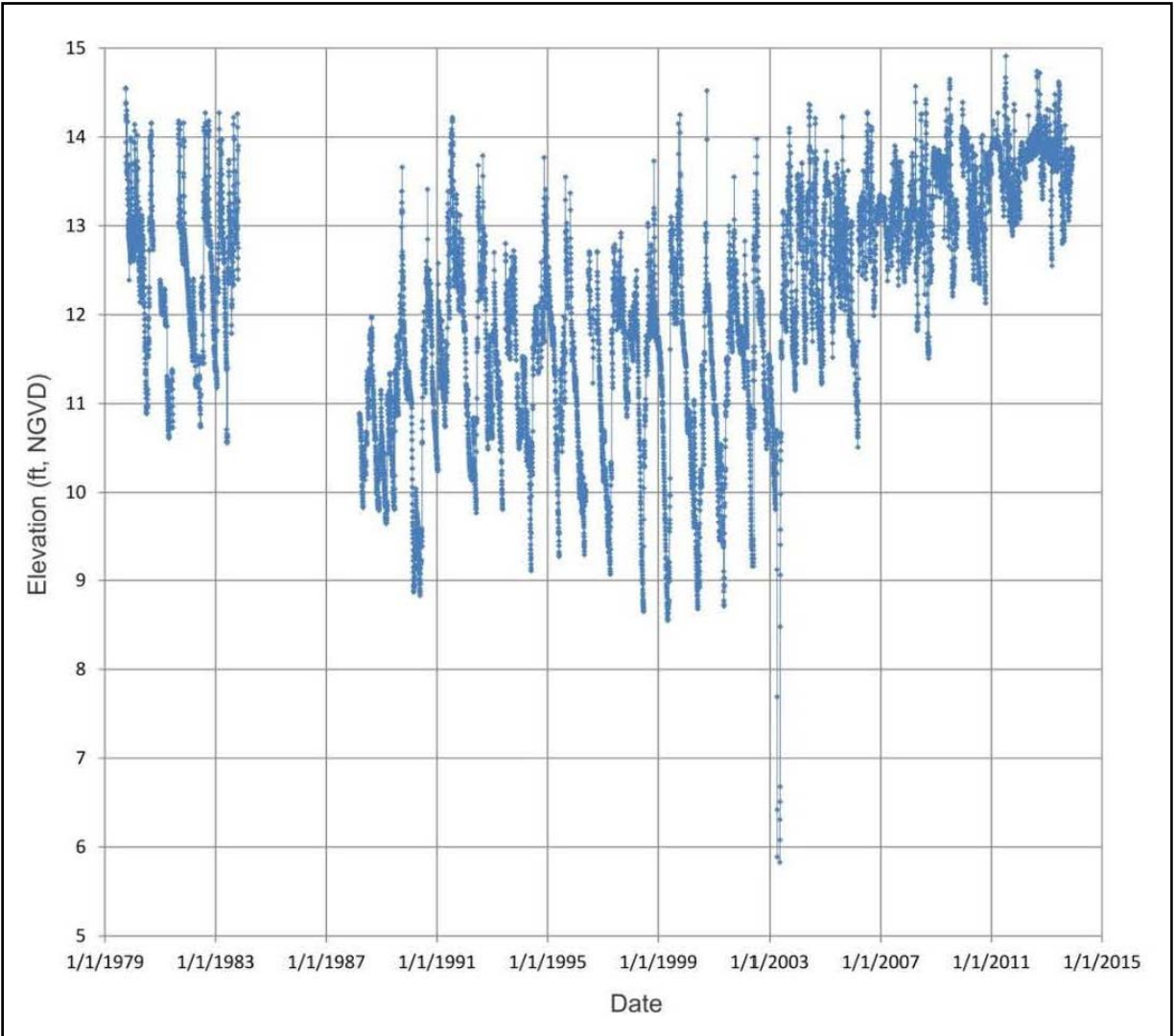


FIGURE 3-6. HYDROGRAPH OF WATER TABLE AQUIFER WELL HE-862 (LAND SURFACE ELEVATION REPORTED TO BE 14.42 FT NGVD)

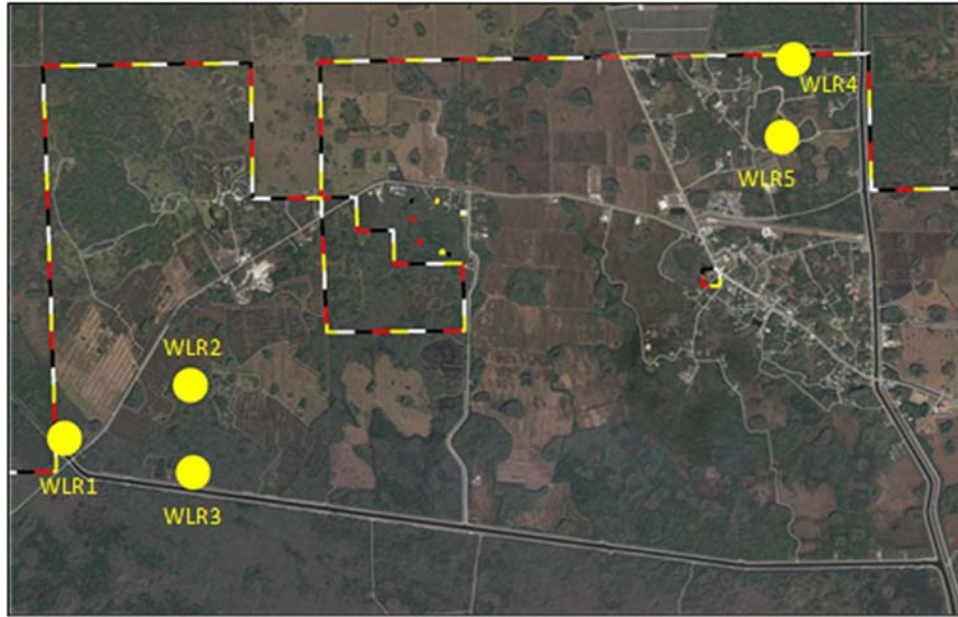


FIGURE 3-7. LOCATION OF WATER LEVEL RECORDERS (WLR) IN THE STUDY AREA

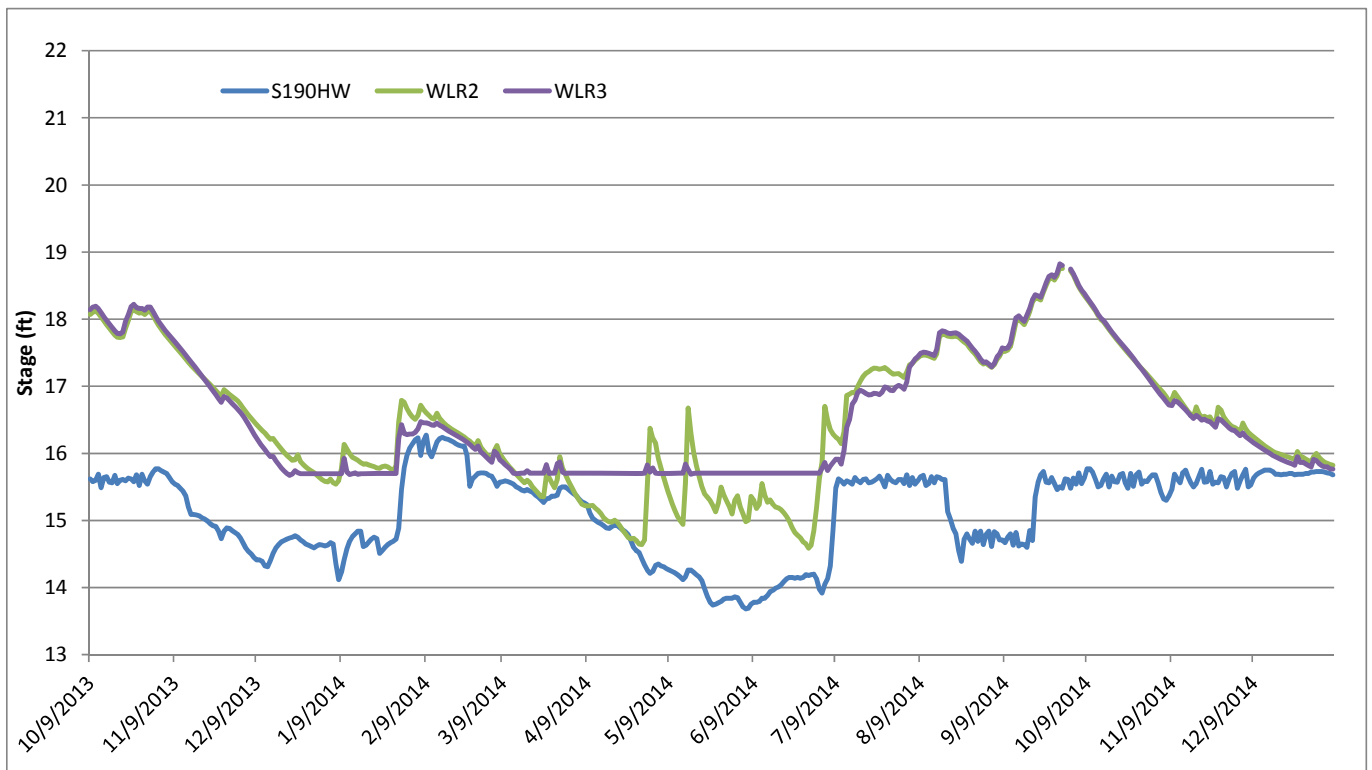


FIGURE 3-8. HYDROGRAPH OF WATER TABLE AQUIFER WELLS WLR2, WLR3 AND S-190 HEADWATERS

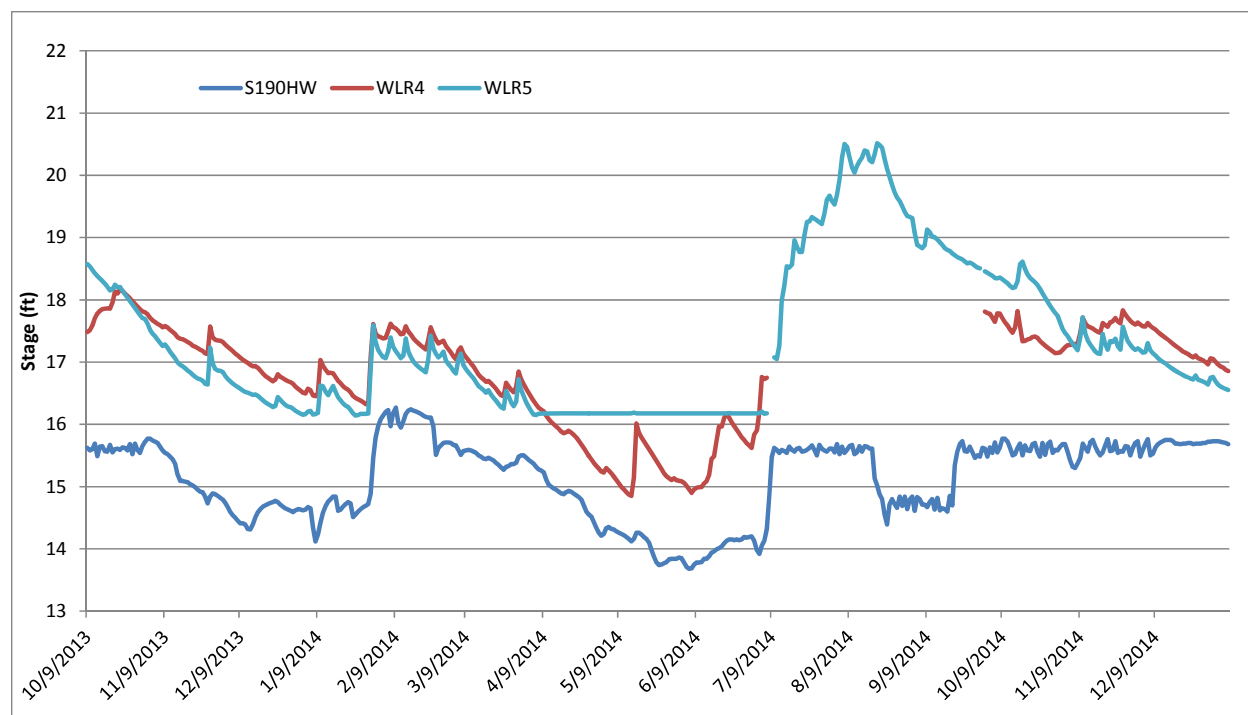


FIGURE 3-9. HYDROGRAPH OF WATER TABLE AQUIFER WELLS WLR4, WLR5 AND S-190 HEADWATERS

3.5.2 L-28 Triangle

The L-28 Triangle (Triangle) area is located within the L-28 Interceptor Basin, entirely within the boundaries of the Miccosukee Tribe's Alligator Alley Reservation and encompasses 7,830 acres of Tribal lands and approximately 230 acres of BCNP (**Figure 1-1**). The L-28 Triangle area is confined on the north by Interstate 75, the west by the L-28 Interceptor Canal and the BCNP, and the east by the L-28 Canal.

The L-28 Interceptor Canal is bounded by levees on both sides and maintains no direct connection to wetlands in the Triangle. Within the L-28 Triangle Area, the L-28 Canal is bounded on the east side by a confining levee separating the wetlands of the L-28 Triangle from WCA 3A. Wetlands interior to the L-28 Triangle maintain a connection to the L-28 Canal along the west side of the L-28 Canal. The L-28 Canal terminates at the southern tip and is not connected to the L-28 Interceptor Canal. Historically, the S-140 pump station maintained flood protection within the Triangle. A weir was installed in 2009 within the L-28 Canal and immediately south of Interstate 75 to restrict regional pumping and maintain water levels within the Triangle.

3.5.3 WCA 3

Levees and canals constructed during the last 60 years under the C&SF Project have divided the former Everglades into areas designated for development and areas for fish and wildlife benefits, natural system preservation and water storage. The natural areas consist of the three WCAs located north of Tamiami Trail. The largest WCA is WCA 3, which is divided into two parts, 3A and 3B. WCA 3 is approximately 40 miles long from north to south and covers approximately 915 square

miles. Ground elevations slope southeasterly one to three ft in ten miles ranging from 13 ft NGVD in northwest WCA 3A to 6 ft NGVD in southeast WCA 3B. The area is enclosed by approximately 111 miles of levees. An interior levee system across the southeastern corner of the area constrains sheet flow into the eastern WCA 3B. The upper pool, WCA 3A, provides an area of approximately 752 square miles for storage of excess water from WCA-2A; rainfall excess from approximately 750 square miles in Collier and Hendry counties (through Mullet Slough), and from 71 square miles of the former Davie agricultural area lying east of S-9 in Broward County; and excess water from a 208 square mile agricultural drainage area of the Miami Canal and other adjacent EAA areas to the north. WCA 3A provides water supply to the Lower East Coast (LEC) of Florida, as well as the SDCS, in accordance with the WCA 3A Regulation Schedule; and also provides water supply to ENP in accordance with the Rainfall Formula and the WCA 3A Regulation Schedule, collectively referred to as the Rainfall Plan (USACE, 2006).

Stage variability within WCA 3 typically follows an annual cycle or hydroperiod. Surface water stages vary seasonally with high stages occurring in the late fall and early winter followed by low stages at the beginning of the wet season (typically late May or early June). The cycle is driven primarily by rainfall, though it is also heavily influenced by water management operations designed to maintain congressionally authorized C&SF Project purposes, including water supply to LEC and ENP and flood protection to the adjacent EAA and LEC, as well as protection for tropical cyclones and other extreme storm events. The annual cycle permits the storage of runoff during the wet season and the release of stored water to ENP during the dry season and maintains elements of the habitat essential to fish and wildlife. The distribution of water for flood control and water supply varies seasonally.

Overall, surface water stage decreases from northwest to southeast within WCA 3, consistent with the general direction of surface water flow and prevailing topography within WCA 3 (USGS, 2016). Water depth typically is between one-half to two and a half feet, with the shallower waters in the lower elevations in the southeastern portions of WCA 3. Groundwater in WCA 3 generally flows from the northwest to the southeast, with extensive seepage beneath the eastern and southern levees, particularly along the L-30 (southeast corner of WCA 3B; DRI/Cardno-Entrix, 2014). However, the direction of groundwater flow may be locally influenced by rainfall, drainage canals or well fields. Fluctuations in groundwater levels are seasonal.

3.5.4 Big Cypress National Preserve

The BCNP spans approximately 1,205 square miles from southwest of Lake Okeechobee to the Ten Thousand Islands in the Gulf of Mexico. The BCNP was originally created in 1974 by Public Law 93-440 and subsequently expanded in 1988 by the Big Cypress National Preserve Addition Act. Thus, the BCNP was established to protect natural and recreational values of the Big Cypress watershed to allow for continued traditional uses, such as hunting, fishing, and oil and gas production, and to provide an ecological buffer zone and protect the water supply to ENP. BCNP is a large, flat area with maximum elevations of 22 ft NGVD in the northern region which gradually slope south to sea level in the BCNP coastal region along the Gulf of Mexico.

The L-28 Levee presently separates WCA 3A and the BCNP. The L-28 Interceptor drainage system (*i.e.* L-28 Interceptor Canal, West Feeder Canal and North Feeder Canal) is a major disturbance to a number of natural flowways (*i.e.* Kissimmee Billy Strand, Cowbell Strand, Dark

Strand, Canoe Lake Strand and California slough) within the Northeast Addition Lands of BCNP that lie directly south of the West Feeder Canal and west of the L-28 Interceptor Canal. Sobczak (2002) suggests that these natural areas experience shallower and less frequent surface water inundation relative to pre-drainage conditions.

Surface water flows from BCNP are introduced to WCA 3A from Mullet Slough. WCA 3A is also hydrologically connected to BCNP through three degraded gaps along the northern tie-back of the L-28 Levee and seasonally through water management operations of S-343A, S-343B and S-344 along the southern L-28 Levee. Surface water flows are introduced to the L-28 Canal from these three structures with the upstream inflows to BCNP from the L-28 gaps directed south to the Tamiami Trail section between the Forty-mile bend (located west of S-12A) and Fifty-mile bend. Tamiami Trail and Loop Road, which include bridges and culvert connections to allow southerly flow west of Forty-mile bend, also affect surface water flows within southern BCNP.

3.6 REGIONAL WATER MANAGEMENT OPERATIONS

BCSIR is located in the Feeder Canal Basin watershed which has been historically influenced by water levels in EAA to the north and northeast, the Big Cypress Swamp to the west and south, and the Greater Everglades to the east and south. The two major canals associated with the Feeder Canal Basin are the North Feeder Canal and the West Feeder Canal. The North Feeder Canal defines the eastern basin boundary. The West Feeder Canal defines the southern basin boundary. These two canals merge in the lower southeastern corner of the Feeder Canal Basin and discharge south through the S-190 structure and into the L-28 Interceptor Canal, and eventually WCA 3A. The North Feeder Canal, West Feeder Canal, and L-28 Interceptor Canal, are located west of the L-28 Levee and provide drainage for the western portion of BCSIR, plus privately owned agricultural land lying north and west of BCSIR. The southeast terminus of the L-28 Interceptor Canal levee eventually joins the southern extreme of the L-28 Levee adjacent to WCA 3A. Two secondary canals also exist in the Feeder Canal Basin located upstream of the West Feeder Canal. BCSIR is primarily natural lands with maximum elevations of 21 ft NGVD in the northwest, to approximately 16-17 ft NGVD in the area around S-190. Land elevations are approximately 15-16 ft NGVD at the southern boundary near the L-28 Interceptor Canal.

The Feeder Canal Basin is divided into three major sub-basins: the North Feeder (Mc Daniel Ranch area) sub-basin, a portion of BCSIR, and the West Feeder sub-basin (comprised of multiple private property owners). The North Feeder Canal is five miles in length and oriented in a north-south direction. Its HWs extend two miles north of BCSIR. Runoff from the North Feeder sub-basin is discharged to the North Feeder Canal through the gated culverts PC-17A. In addition, PC-17A discharges agricultural runoff from private properties directly north of BCSIR. The North Feeder Canal also receives tributary flows from six points along its length. Lands to the east of the North Feeder Canal are considered to be heavily drained in comparison to moderately drained lands to the west (Sobczak, 2002).

G-108 was part of the original C&SF Project and was the northern terminal structure for the North Feeder Canal. The authorized design for G-108 was 580 cfs discharge; a HW elevation of 17.9 feet NGVD and a tailwater elevation of 16.9 feet NGVD. That structure had 6-72 inch stoplog culvert pipes. The riser had a top elevation of 22.0 ft NGVD and an approximate ground elevation of 18 ft NGVD. G-108 was removed by the SFWMD from operation in 2010 and replaced with a

smaller structure with a fixed weir, W-D1AB. That structure was constructed by the landowner in conjunction with the SFWMD as part of a surface water management system that routes basin runoff to PC-17A (SFWMD, 2014).

The West Feeder Canal is five miles in length and oriented in an east-west direction. The West Feeder Canal falls entirely within the bounds of BCSIR. Runoff from the West Feeder sub-basin is discharged to the West Feeder Canal through a fixed crested weir, referred to as the West Weir. The water that flows over the West Weir comes from an upstream network of drainage ditches and canals, the two largest of which are called Lard Can and Windgate Mill Canals. The Lard Can Canal flows north to south and joins the Windgate Mill Canal, which flows west to east at the southern boundary of the basin. Under current conditions, these lands receive low-intensity agricultural usage. The West Feeder Canal also receives tributary flows from 11 points along its length. Lands on BCSIR north of the West Feeder Canal consist of desiccated wetland systems, the Critical Restoration Project (**Section 4.20**) for wetland rehydration and restoration, as well as development for approximately 250 adult Tribal members, with their minor children and elders that reside in BCIR, and lands set aside for agricultural use (STOF 2015). Lands on BCSIR south of the West Feeder remain undeveloped wetland habitat, are predominately forested and include three old-growth cypress stands (Sobczack 2002).

S-190 is the primary discharge structure in the Feeder Canal Basin. S-190 is located in the L-28 Interceptor Canal about one-half mile south of the junction of the North and West Feeder Canals. S-190 is a reinforced concrete, U-shaped, two-bay gated spillway with discharge automatically controlled by two 24.8 ft vertical lift gates. The structure has an operating platform and a service bridge. This structure maintains upstream water control stages in the North and West Feeder Canals. The original gate control operations had three setting that were: "Manual-Off-Automatic", which was due to the remote location of this structure. Due to the need for a quick response during floods, the structure was generally operated under the automatic control setting. The original design HW level of S-190 was 16.6 feet NGVD for 30% of the Standard Project Flood (SPF) for flood control purposes and a design discharge capacity of 2,960 cubic feet per second (cfs). The S-190 was constructed at the request of BIA to prevent over drainage of BCSIR by the L-28 Interceptor Canal. Operations were defined in C&SF Project for Flood Control and Other Purposes, Part I, Supplement 40, Addendum 1 dated February 7, 1964 with a year round optimum canal elevation of 15.5 ft NGVD. As defined within the 1964 Addendum, normal operating criteria for the S-190 HW was such that when the canal level rose to elevation 15.8 ft NGVD, the gates would open and when the canal level receded to elevation 15.2 ft NGVD, the gates would close (**Section 2.1.2**). The 1964 operations were later changed and operations were outlined within the C&SF Project for Flood Control and Other Purposes, Master Water Control Manual for the WCAs, ENP, and ENP-SDCS, Volume 4 dated June 1996, with no documentation outlining the rationale for the change in operations.

The structure is currently operated on either a low (normal condition) or a high setting (dry condition), through automatic controls as described in the current Master Water Control Manual for the WCAs, ENP, and ENP-SDCS, Volume 4 (Corps 1996). Currently, during the normal condition the S-190 optimum HW level is maintained at elevation 14.5 ft NGVD, where the gates are opened and closed respectively at elevations 14.8 ft NGVD and 14.2 feet NGVD. During the dry condition, the S-190 optimum HW level is maintained at elevation 15.5 ft NGVD and the gates

are opened and closed respectively at elevations 15.8 feet NGVD and 15.2 feet NGVD. (**Section 2.1.1**). S-190 affects the surface water and groundwater levels in the area, thus, the change to lower the HW level during the wet season has not prevented over-drainage. The C&SF canal system was designed to ensure flood protection for the area. S-190 was included within the design to ensure the flood protection provided by the canals did not over drain BCSIR. S-190 was designed to work in a connected fashion with the Feeder Canal system by virtue of the original design (when water levels exceeded 15.8 feet NGVD, the gate opens).

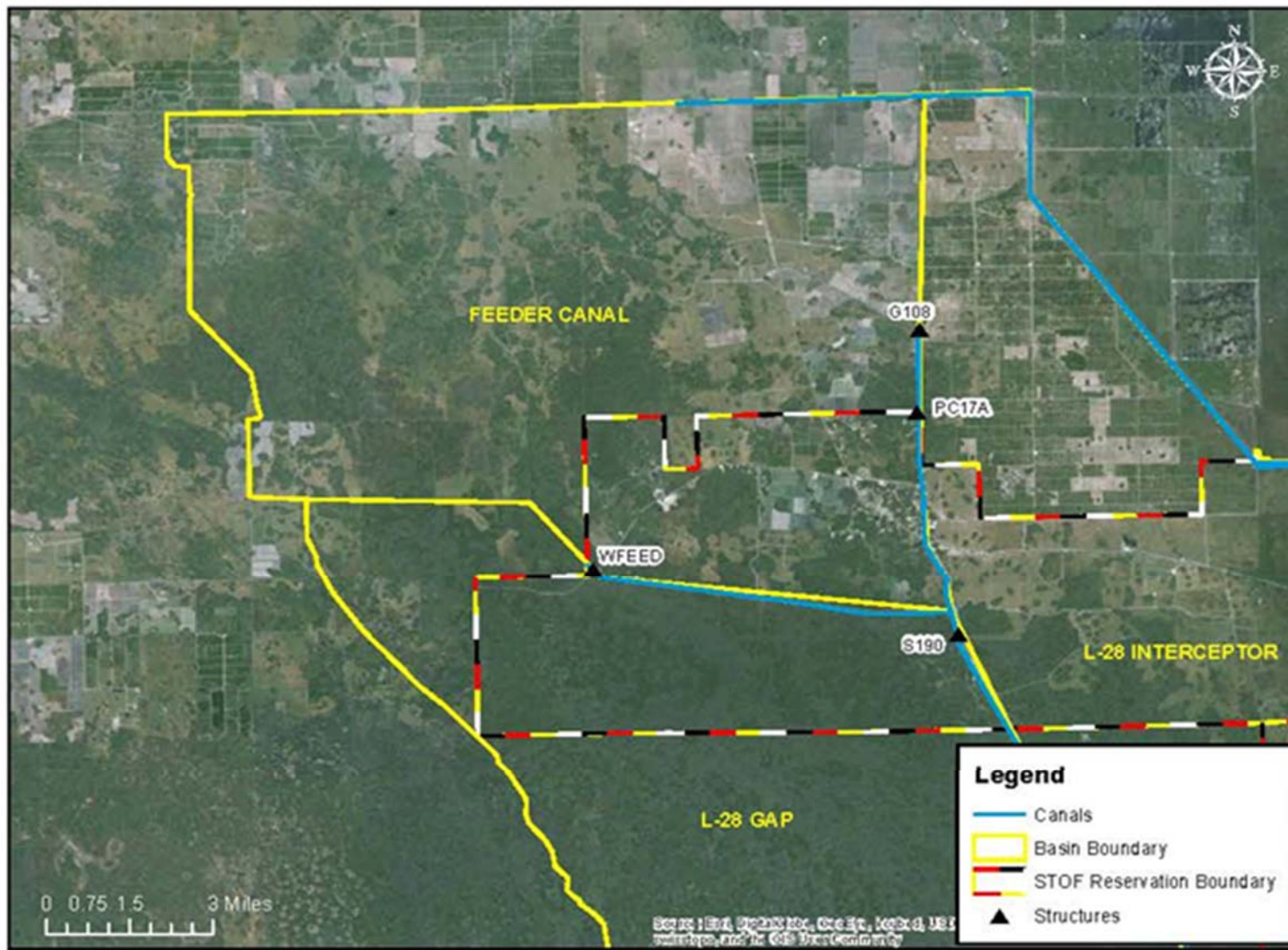


FIGURE 3-10. MAP OF MAJOR WATER CONTROL FEATURES WITHIN AND ADJACENT TO THE PROJECT AREA

The construction of S-190 began on February 19, 1965 and was completed May 27, 1967. The structure was transferred to the SFWMD on July 12, 1967. **Figure 3-11** provides the historical daily HW stage at S-190 from 1978 to 2013 and rainfall recorded at a nearby station. The data presented in Figure 3-11 was obtained via the SFWMD public database, DBHYDRO (http://my.sfwmd.gov/dbhydroplsql/show_dcvp_external.show_site_characters). Review of the data in DBHYDRO indicated that both the “high setting” (i.e. dry condition: water control elevation of 15.5 ft NGVD) and “low setting” (i.e. normal condition: water control elevation of 14.5 ft NGVD dry condition) have been used since at least 1978, with some occurrences of extreme high or low stages due to flooding or drought conditions.

From January 1978 to January 1981, the North Feeder Canal was maintained at an average stage elevation of approximately 15.5 ft NGVD. Within this timeframe, water levels dropped below 14.0 ft NGVD; however, water levels below 15.0 ft NGVD were not maintained for extended periods of time. During a period from July 1985 through January 1988, the North Feeder Canal was maintained at an average stage elevation of approximately 14.3 ft NGVD. This was followed by a period from 1988 to 1991 where canal operations alternated from approximately 14.3 ft NGVD to approximately 15.3 ft NGVD during that period. From June 1991 through October 1995, the North Feeder Canal was consistently maintained at an average stage elevation of approximately 14.5 ft NGVD. Since then operations of S-190 have been established so that the North Feeder Canal is maintained at an approximate stage elevation of 15.5 ft NGVD during the dry season and at approximately 14.3 ft NGVD during the wet season. Daily time series data for stage and rainfall were analyzed to determine trends in S-190 HW levels with respect to rainfall events. The time series spans 16 years and is shown in **Figure 3-12**. It is apparent that rainfall has an effect on S-190 canal stages.

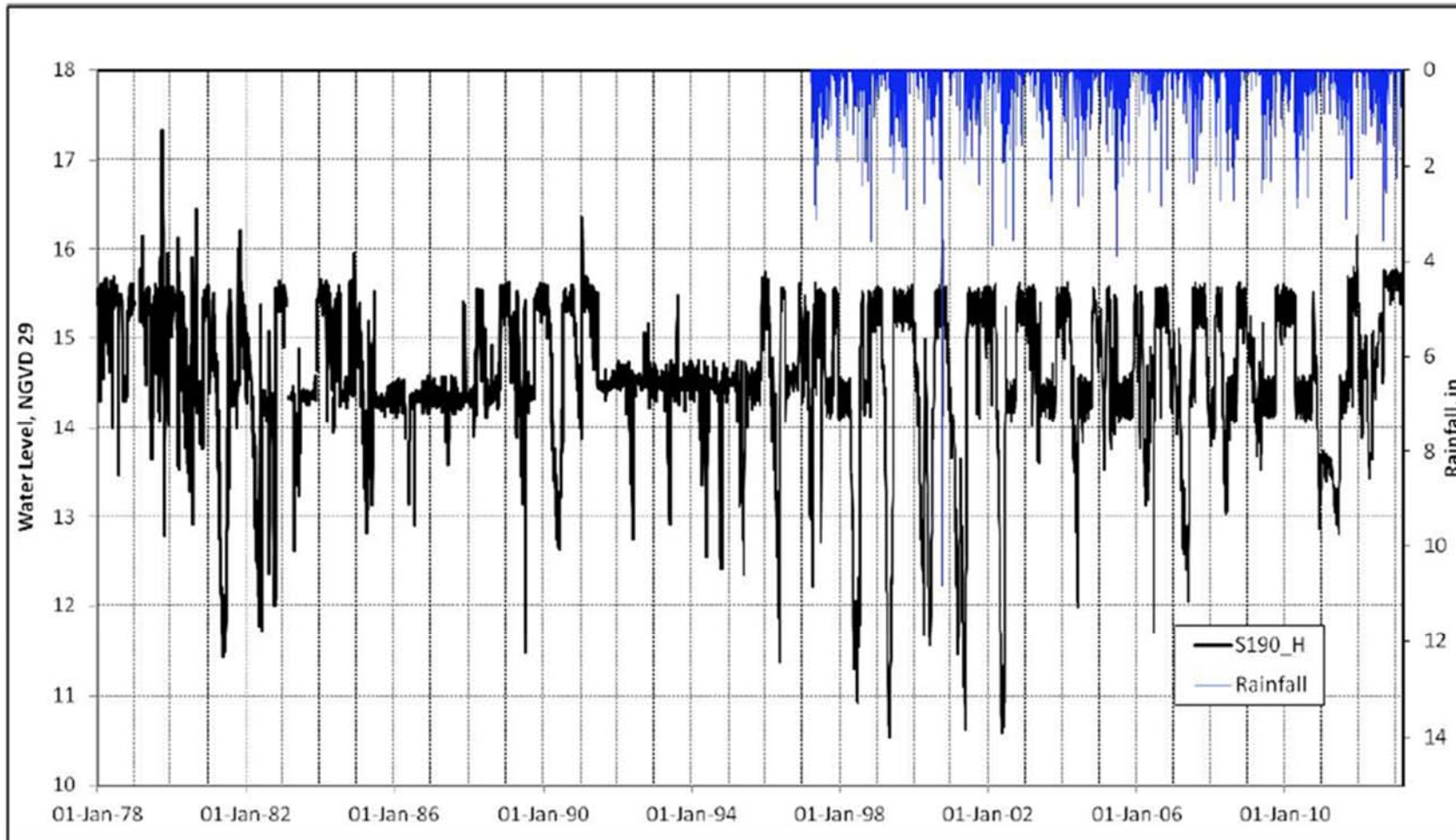


FIGURE 3-11. HISTORICAL S-190 HW LEVELS NGVD AND RAINFALL

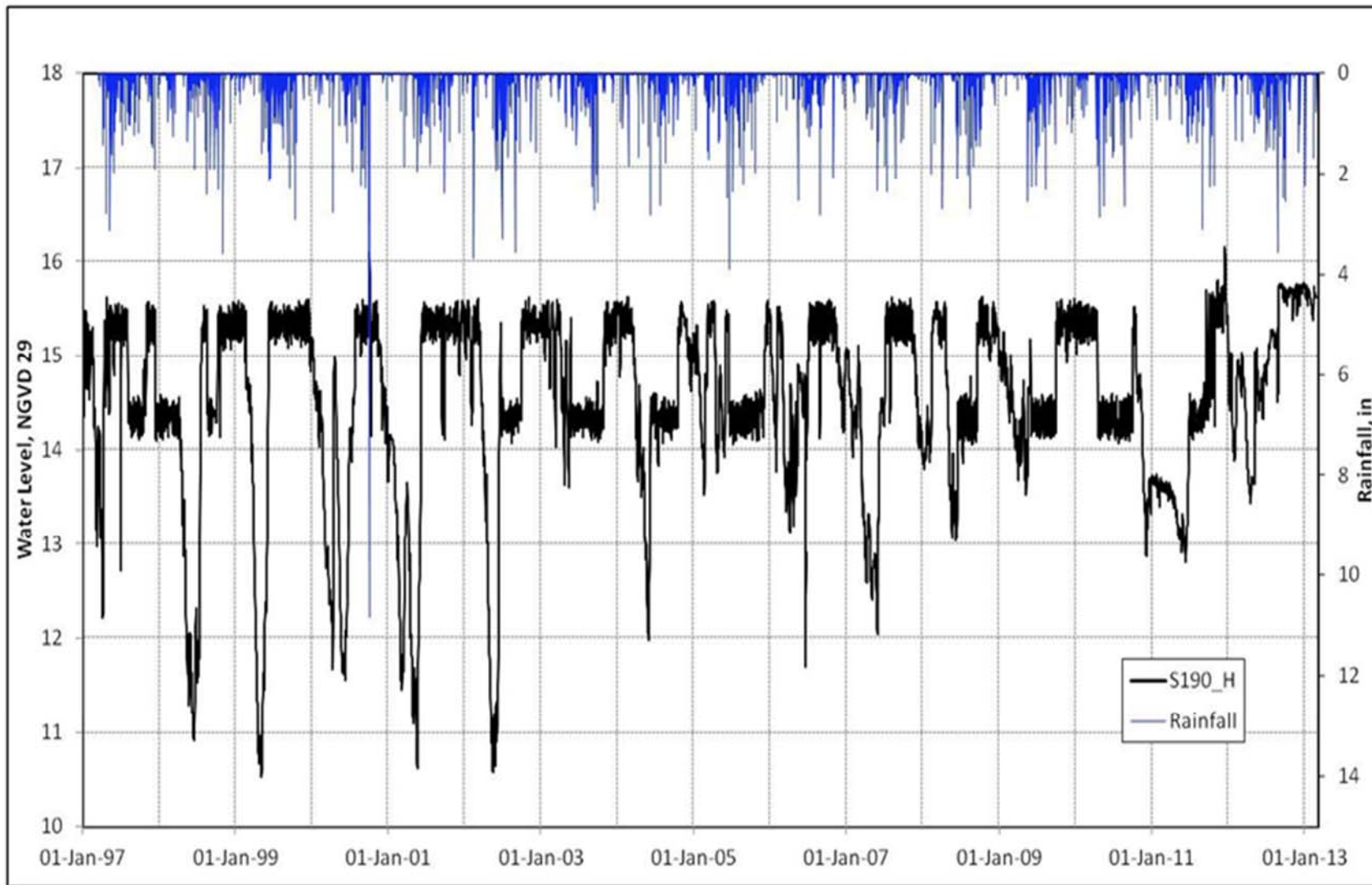


FIGURE 3-12. S-190 HW STAGES AND RAINFALL RECORDED AT A NEARBY STATION (S-190_R).

In addition to PC-17A, upstream water may be made available to BCSIR through a system of tributary canals that receive water from the G-409 pump station. G-409 is operated by the SFWMD to meet requirements of the Water Rights Compact Among the Seminole Tribe, the State of Florida, and the South Florida Water Management District to offset the loss of surface water to BCSIR as a result of regional water diversion from the C-139 Basin and the C-139 Annex which removed a portion of the Tribe's surface water entitlement from the Tribe's use. G-409 is located immediately south of Stormwater Treatment Area 6 at the point commonly referred to as "Confusion Corner." Specifically, the G-409 pump station delivers water from the L-4 Canal into BCSIR, which will be fed from the east by diversion of waters from the Miami Canal via the S-8 pump station. Maintenance of water levels is facilitated by a breach in the levee between the L-3 Levee and L-4 Levee. G-409 pumps are operated by SFWMD to provide a maximum of 47,000 acre-feet of water divided into 12 equal monthly increments per year into the east conveyance canal system on BCSIR. The BCSIR contains an extensive conveyance system to deliver water from G-409 to areas within the BCSIR which is primarily used for irrigation.

3.7 WATER SUPPLY

The Seminole Tribe has six reservations located in Florida. Two reservations of the Seminole Tribe rely on Lake Okeechobee as a secondary supplemental irrigation supply source for their surface water, with specific volumes of water identified for this purpose for the Seminole Tribe's BCSIR and an operational plan addressing drought-water shortage operations for the Brighton Reservation.

The Seminole Tribe has surface water entitlement rights pursuant to the 1987 Water Rights Compact between the Seminole Tribe, the State of Florida, and the SFWMD (Public Law 100-228 and Chapter 87-292 Laws of Florida as codified in section 285.165 Florida Statutes). Additional documents addressing the Water Rights Compact entitlement provisions have since been executed and are available upon request. These documents include Agreements between the Tribe and SFWMD and a SFWMD Final Order. Of particular interest in this regard is the 1996 Agreement which commits SFWMD to mitigate impacts to the Tribe's ability to obtain surface water supplies at both the Brighton and BCSIR, which may be diminished as a result of various activities. For BCSIR, SFWMD has installed forward pumps to deliver water from Lake Okeechobee at lower stages to the Miami Canal at an amount not to exceed 3,197 acre feet per month. This option remains a part of drought management alternatives. Also, real-time operational decisions made during a declared drought event include recognition of the Tribe's water rights. These decisions remain a part of SFWMD drought management operations.

3.8 VEGETATIVE COMMUNITIES

There are four basic wetland communities within BCSIR: (1) sawgrass marshes, (2) wet prairies, (3) cypress domes, and (4) hardwood swamps. These wetland systems are severely over-drained in some areas allowing the establishment of exotic/nuisance vegetation, including Melaleuca (*Melaleuca quinquenervia*) and Brazilian pepper (*Schinus terebinthifolius*) (Corps 1999a). Vegetation types located on BCSIR are depicted in **Figure 3-13**.

Sawgrass marshes are dominated by dense to sparse stands of sawgrass (*Cladium jamaicense*). Sawgrass marshes occurring on deep organic soils (more than one meter) form tall, dense, nearly monospecific stands. Sawgrass marshes occurring on shallow organic soils (less than one meter)

form sparse, short stands that contain additional herbaceous species. Herbaceous marsh plants that commonly occur with sawgrass include maidencane (*Panicum hemitomon*), arrowhead (*Sagittaria latifolia*), and spikerush (*Eleocharis cellulosa* and *E. elongata*). Small trees and brush such as wax myrtle (*Myrica cerifera*), holly, and willow (*Sideroxylon salicifolium*) are also mixed with sawgrass. Sawgrass marshes usually occur on land slightly higher than that of sloughs and wet prairies but lower than that of bay heads and hardwood hammocks. Water inundates the marsh for varying periods during the year to depths ranging from a few inches to several feet; optimum inundation period is in the order of months.

Wet prairies are seasonally inundated lands intermediate in depth and periods of flooding between sawgrass marshes and sloughs. Wet prairies generally have little or no overstory plants and few shrubs. Characteristic plants include the algal components of periphyton, and a variety of vascular plants such as sawgrass, maidencane, spikerush and beakrush (*Rhynchospora tracyi*). Wet prairies occur on mineral soils. Wet prairies occur as flats and as small, isolated areas associated with ponds and marshes. In the flatlands they are characteristically small areas associated with bedrock depressions in the pine forests and dry prairies.

Cypress forests include open areas of cypress trees (*Taxodium spp.*) and a scattered sparse growth of herbaceous plants, such as sawgrass or beakrushes (*Rhynchospora tracyi*), growing on a thin layer of marl soil or sand over limestone. Cypress domes and strands of larger trees grow over much of the forest. Domes are circular or egg-shaped features that are dome shaped in profile on the horizon. Strands are elongate areas of large trees that follow depressions. Shrubs and small swamp trees such as wax myrtle, coco plum (*Chrysobalanus icaco*) and pond-apple (*Annona glabra*) are common understory species within the domes and strands. Cypress domes occur where bedrock surfaces are low. The largest trees are near the center of the dome where bedrock is lowest and organic soils and water are deepest. Trees decrease in size toward the periphery. Cypress requires abundant moisture for germination. Water facilitates germination by allowing the hard seed coats to swell and soften. After germination, the seedlings require dry conditions for a time, and to survive they must grow high enough to stay above the seasonal floods of the next rainy season. Once established, larger trees can grow in the absence of seasonal inundation. Lowered water levels, however, make cypress susceptible to fire.

Hardwood swamps or mixed swamp forests are composed of either pure stands of hardwoods, or occur as a mixture of hardwoods and cypress, where hardwoods achieve dominance. The community is usually a mix of trees and shrubs. Hardwood swamps or mixed swamp forests usually occur as elongated strands that follow low drainage areas. Elevation of land within the swamps or swamp forests is variable, with most of the area being seasonally flooded for months. Cabbage palm (*Sabal palmetto*), red maple (*Acer rubrum*), wax myrtle, coco plum, sweetbay (*Magnolia virginiana*) and redbay (*Persea palustris*), are widely distributed. Cypress, willow, pop ash (*Fraxinus caroliniana*), and pond-apple tend to be more common in deeper water.

The BCSIR also supports four types of uplands: (1) Brazilian Pepper and Melaleuca dominated areas, (2) pine flatwoods, (3) hardwood forests and (4) cabbage palm dominated sites. Brazilian pepper is especially prevalent on sites disturbed by land clearing. Thus, it commonly encircles cypress domes which have been rim ditched in agricultural lands and covers dikes and roadsides that are not mowed regularly. It also invades natural areas at a lower density since the seeds are

widely dispersed by birds. *Melaleuca* as a monoculture typically colonizes short hydroperiod wetland sites intermediate in hydrology between cypress heads and hydric pine flatwoods.

Flatwoods are complex natural vegetative communities visually dominated by slash pine with an understory of saw palmetto (*Serenoa repens*). However since slash pine is actually a wetland species, saw palmetto is a better indicator of upland pine habitat than is slash pine. Hydric pine flatwoods with a sparse understory of saw palmetto are short hydroperiod wetlands. Pine flatwoods occur on rock outcrops and sandy flatlands that are seldom flooded for more than a few weeks each year. Characteristic plants of pine forests are the slash pine and a variety of hardwood trees and shrubs, palms, grasses, and other plants.

Hardwood hammocks consist of a closed canopy forest dominated by a diverse assemblage of hardwood tree species, a relatively open shrub layer, and a sparse herbaceous stratum. Hammocks grow on land slightly higher than that of surrounding marshes, wet prairies, and cypress forests. True tropical hardwood hammocks, occurring on rock pinnacles slightly elevated above the surrounding landscape, are characterized by a mixture of live oak (*Quercus virginiana*), gumbo limbo (*Bursera simaruba*), cabbage palm, strangler fig (*Ficus aurea*), lancewood (*Ocotea coriacea*), pigeon plum (*Coccoloba diversifolia*) and other tropical species. True live oak hammocks are primarily oaks and cabbage palm, with only a few tropical species. These two extreme types blend gradually into one another and such hardwood forests are common on BCSIR.

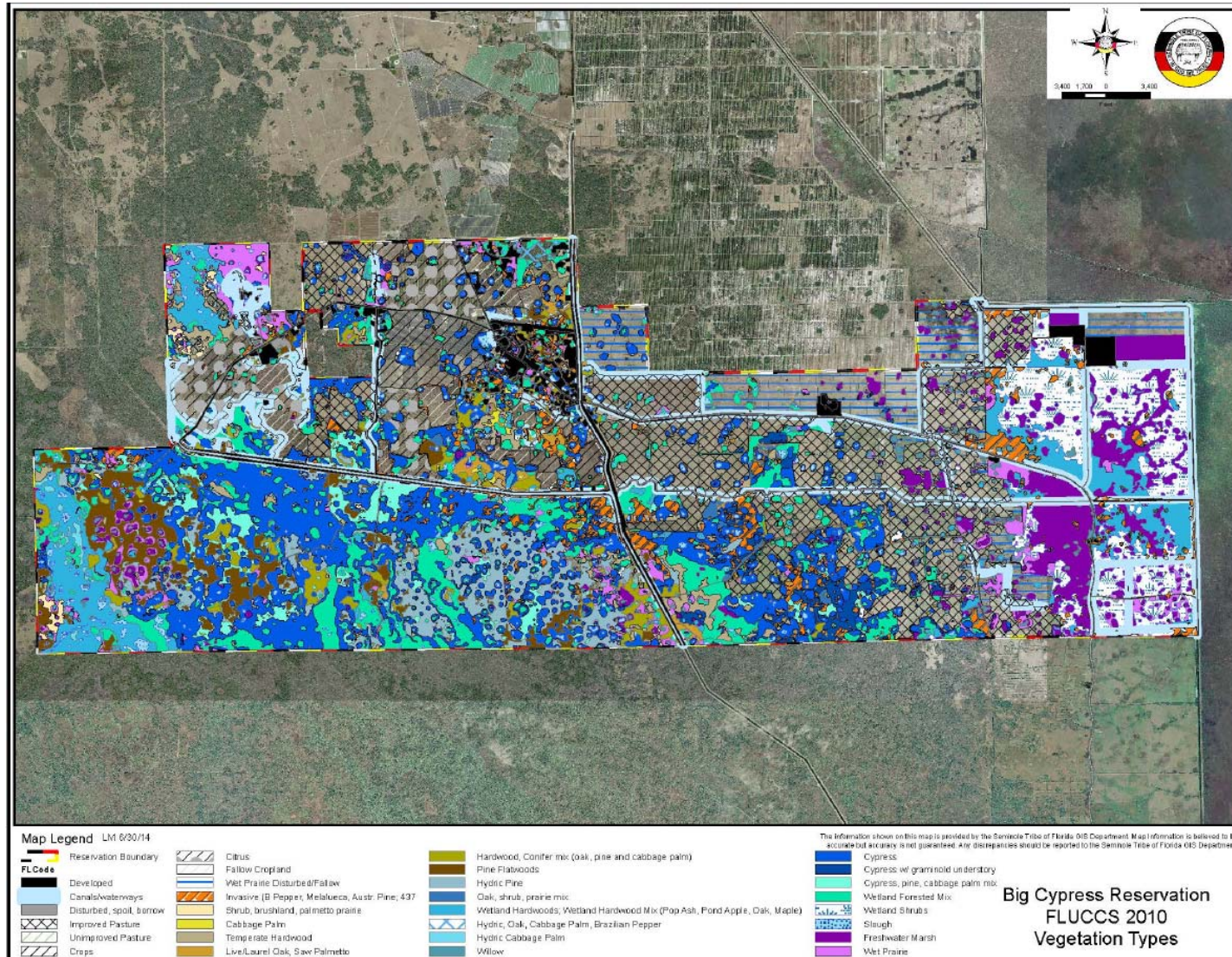


FIGURE 3-13. BIG CYPRESS SEMINOLE INDIAN RESERVATION VEGETATION TYPES (FLORIDA LAND USE AND CLASSIFICATION CODES 2010)

3.9 FISH AND WILDLIFE RESOURCES

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

Small freshwater marsh fishes are also important processors of algae, plankton, macrophytes, and macroinvertebrates. Marsh fishes provide an important food source for wading birds, amphibians, and reptiles. Common small freshwater marsh species include the native and introduced golden topminnow (*Fundulus chrysotus*), least killifish (*Heterandria formosa*), Florida flagfish (*Jordenella floridae*), golden shiner (*Notemigonus crysoleucas*), sailfin molly (*Poecilia latipinna*), bluefin killifish (*Lucania goodei*), oscar (*Astronotus ocellatus*), eastern mosquito fish (*Gambusia holbrookii*) and small sunfishes (*Lepomis* spp.) (Corps 1999b). The density and distribution of marsh fish populations fluctuate with seasonal changes in water levels (Corps 1999b). Numerous sport and larger predatory fishes occur in deeper canals. Common species include largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), redear sunfish (*Lepomis microlophus*), black crappie (*Pomoxis nigromaculatus*), Florida gar (*Lepisosteus platyrhincus*), threadfin shad (*Dorosoma petenense*), gizzard shad (*Dorosoma cepedianum*), yellow bullhead (*Ameiurus natalis*), white catfish (*Ameiurus catus*), bowfin (*Amia calva*), and tilapia (*Tilapia* spp.) (Corps 1999b).

An aquatic species diversity assessment for BCSIR and Brighton Seminole Indian Reservations was performed with sampling events completed during the wet and dry season of September of 2009 and March of 2010, respectively, and during the wet season and dry season of August of 2013 and March of 2014, respectively (Water & Air Research Inc. 2014). Five canals on BCSIR were sampled during the 2014 dry season. During the 2014 dry season, a total of 23 fish species were collected within the canals sampled on BCSIR (Table 3-2).

TABLE 3-2. FISH SPECIES OBSERVED IN THE WEST FEEDER, NORTH FEEDER, L-28 INTERCEPTOR, AND L-28 BORROW CANALS OF THE BIG CYPRESS SEMINOLE INDIAN RESERVATION (SOURCE: WATER & AIR RESEARCH INC. 2014).

Fish Species			
Common Name	Scientific Name	Common Name	Scientific Name
Black Crappie	<i>Pomoxis nigromaculatus</i>	Lake Chubsucker	<i>Erimyzon suetta</i>
Blue Tilapia *	<i>Oreochromis aureus</i>	Largemouth Bass	<i>Micropterus salmoides</i>
Bluefin Killifish	<i>Lucania goodei</i>	Longnose Gar	<i>Lepisosteus osseus</i>
Bluegill	<i>Lepomis macrochirus</i>	Mayan Cichlid *	<i>Cichlasoma urophthalmus</i>
Bowfin	<i>Amia calva</i>	Redear Sunfish	<i>Lepomis microlophus</i>
Brook Silverside	<i>Labidesthes sicculus</i>	Sailfin Catfish *	<i>Pterygoplichthys sp.</i>
Brown Hoplo *	<i>Hoplosternum littorale</i>	Sailfin Molly	<i>Poecilia latipinna</i>
Dollar Sunfish	<i>Lepomis marginatus</i>	Spotted Sunfish	<i>Lepomis punctatus</i>
Eastern Mosquitofish	<i>Gambusia holbrookii</i>	Spotted Tilapia *	<i>Tilapia mariae</i>
Florida Gar	<i>Lepisosteus platyrhincus</i>	Walking Catfish *	<i>Clarias batrachus</i>
Golden Shiner	<i>Notemigonus crysoleucas</i>	Warmouth	<i>Lepomis gulosus</i>

Golden Topminnow	<i>Fundulus chrysotus</i>	Lake Chubsucker	<i>Erimyzon sucetta</i>
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* Exotic species

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

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

Freshwater wetlands are noted for their abundance and diversity of colonial wading birds. Common wading birds include the white ibis (*Eudocimus albus*), glossy ibis (*Plegadus falcenellus*), great egret (*Casmerodius albus*), great blue heron (*Ardea herodias*), little blue heron (*Egretta caerulea*), tricolored heron (*Egretta tricolor*), snowy egret (*Egretta thula*), green-backed heron (*Butorides striatus*), cattle egret (*Bubulcus ibis*), black-crowned night heron (*Nycticorax nycticorax*), yellow-crowned night heron (*Nycticorax violacea*), and wood stork (*Mycteria americana*) (Corps 1999b).

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

Recent wildlife observations on BCSIR have been made as a part of the Seminole Big Cypress Reservation Water Conservation Plan Project (Critical Project). A list of wildlife species observed within each of these basins during the most recent 2014 monitoring event is presented in **Table 3-3**. Wildlife observations took place in Basin 1, located north of the West Feeder Canal and adjacent to West Boundary Road near the Western Weir, and in Basin 4, located west of the North Feeder Canal and south of PC-17A.

TABLE 3-3. WILDLIFE SPECIES OBSERVED IN BASIN 1 AND BASIN 4 DURING 2014 OF THE SEMINOLE BIG CYPRESS RESERVATION WATER CONSERVATION PLAN PROJECT (SOURCE: KEITH & SCHNARS 2014A, 2014B, STANTEC CONSULTING INC. 2014).

Amphibian and Reptiles		Mammals	
Common Name	Scientific Name	Common Name	Scientific Name
American alligator	<i>Alligator mississippiensis</i>	Bobcat	<i>Lynx rufus</i>
Black Racer	<i>Coluber constrictor</i>	Eastern Gray Squirrel	<i>Sciurus carolinensis</i>
Brown Anole	<i>Anolis sagrei</i>	Eastern Spotted Skunk	<i>Spilogale putorius</i>
Carolina Anole	<i>Anolis carolinensis</i>	Florida Black Bear	<i>Ursus americanus floridanus</i>
Common Snapping Turtle	<i>Chelydra serpentina</i>	Florida Panther	<i>Puma concolor</i>
Cuban tree frog	<i>Osteopilus septentrionalis</i>	Marsh Rabbit	<i>Sylvilagus palustris</i>
Florida Cooter	<i>Pseudemys concinna floridana</i>	Nine Banded Armadillo	<i>Dasyus novemcinctus</i>
Florida Peninsular Cooter	<i>Pseudemys peninsularis</i>	Raccoon	<i>Procyon lotor</i>
Florida Softshell	<i>Apalone sagrei</i>	Virginia Opossum	<i>Didelphis virginiana</i>
Green Banded Water Snake	<i>Nerodia fasciata</i>	White-tailed Deer	<i>Odocoileus virginianus</i>
Green Tree Frog	<i>Hyla cinerea</i>	Wild Hog	<i>Sus scrofa</i>
Oak Toad	<i>Anaxyrus quercicus</i>		
Peninsula Cooter	<i>Pseudemys peninsularis</i>		
Pig Frog	<i>Rana grylio</i>		
Southern Leopard Frog	<i>Lithobates sphenoccephalus</i>		
Squirrel Tree Frog	<i>Hyla squirella</i>		
Three Lined Mud Turtle	<i>Kinosternin baurii</i>		
Water Moccasin	<i>Agkistrodon piscivorus</i>		
Birds			
Common Name	Scientific Name	Common Name	Scientific Name
American Anhinga	<i>Anhinga</i>	Green Heron	<i>Butorides virescens</i>
American Coot	<i>Fulica americana</i>	Hooded Merganser	<i>Lophodytes cucullatus</i>
America Crow	<i>Corvus brachyrhynchos</i>	Killdeer	<i>Charadris vociferus</i>
American Kestrel	<i>Falco sparverius</i>	Little Blue Heron	<i>Egretta caerulea</i>
Barred Owl	<i>Strix varia</i>	Loggerhead Shrike	<i>Lanius ludovicianus</i>
Belted Kingfisher	<i>Megaceryle alcyon</i>	Mourning Dove	<i>Zenaida macroura</i>
Black Vulture	<i>Coragyps atratus</i>	Northern Cardinal	<i>Cardinalis</i>
Blue-winged Tea	<i>Anas discors</i>	Northern Waterthrush	<i>Parkesia noveboracensis</i>
Blue-gray Gnatcatcher	<i>Poliopitla caerulea</i>	Osprey	<i>Pandion haliaetus</i>
Boat-tailed Grackle	<i>Quiscalus major</i>	Pie-billed Grebe	<i>Podilymbus podiceps</i>
Cattle Egret	<i>Bubulcus ibis</i>	Pileated Woodpecker	<i>Dryocopus pileatus</i>
Common Grackle	<i>Quiscalus quiscula</i>	Purple Gallinule	<i>Porphyrio martinicus</i>
Common Ground Dove	<i>Columbina passerine</i>	Red-shouldered Hawk	<i>Buteo lineatus</i>
Common Moorhen	<i>Gallinula chloropus</i>	Red-bellied Woodpecker	<i>Melanerpes carolinus</i>
Common Yellowthroat	<i>Geothlypis trichas</i>	Red-breasted Merganser	<i>Mergus serrator</i>
Cooper's Hawk	<i>Accipiter cooperii</i>	Ruddy Duck	<i>Oxyura jamaicensis</i>
Double Crested Cormorant	<i>Phalacrocorax auritus</i>	Snowy Egret	<i>Egretta thula</i>
Common Grackle	<i>Quiscalus quiscula</i>	Swallow-tailed Kite	<i>Elanoides forficatus</i>
Eastern Kingbird	<i>Tyrannus</i>	Swamp Sparrow	<i>Melospiza georgiana</i>
Eastern Palm Warbler	<i>Setophaga hypochrysea</i>	Tree Swallow	<i>Tachycineta bicolor</i>
Eastern Phoebe	<i>Sayornis phoebe</i>	Tricolored Heron	<i>Egretta tricolor</i>
Fish Crow	<i>Corvus ossifragus</i>	Turkey Vulture	<i>Cathartes aura</i>

Gray Catbird	<i>Dumetella carolinensis</i>	Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>
Great Blue Heron	<i>Ardea herodias</i>	White Ibis	<i>Eudocimus albus</i>
Great-crested Flycatcher	<i>Myiarchus crinitus</i>	Wild Turkey	<i>Meleagris gallopavo</i>
Great Egret	<i>Ardea alba</i>		

3.10 THREATENED AND ENDANGERED SPECIES

3.10.1 Federally Protected Species

The Corps has coordinated with the United States Fish and Wildlife Service (USFWS) and National Marine Fisheries Service, in accordance with Section 7 of the Endangered Species Act, to determine Federally listed threatened and endangered species that are either known to occur or are likely to occur within the project area (See **Appendix B**). Many of these species have been previously affected by habitat impacts resulting from wetland drainage, alteration of hydroperiod, wildfire, and water quality degradation. A number of candidate animal and plant species are also known to exist or potentially exist within the project area. For a complete list of Federally threatened and endangered species within the project area, their critical habitat, and candidate species refer to **Table 3-4**. For a complete description of each species, refer to **Appendix B**.

TABLE 3-4. FEDERALLY THREATENED AND ENDANGERED SPECIES WITHIN THE PROJECT AREA. E= ENDANGERED, T=THREATENED; CH=CRITICAL HABITAT; C= CANDIDATE

Common Name	Scientific Name	Federal Status
Mammals		
Florida panther	<i>Puma concolor coryi</i>	E
Florida manatee	<i>Trichechus manatus latirostris</i>	E, CH
Florida bonneted bat	<i>Eumops floridanus</i>	E
Birds		
Everglade snail kite	<i>Rostrhamus sociabilis plumbeus</i>	E, CH
Audubon's Crested Caracara	<i>Polyborus plancus audubonii</i>	T
Wood stork	<i>Mycteria americana</i>	T
Reptiles		
Eastern indigo snake	<i>Drymarchon corais couperi</i>	T
Gopher tortoise	<i>Gopherus polyphemus</i>	C

3.10.2 State Listed Species

The project area provides habitat for several State listed species. For a complete list of State listed species found in Hendry County please see **TABLE 3-5**.

TABLE 3-5. STATE LISTED SPECIES WITHIN THE PROJECT AREA. E=ENDANGERED, T=THREATENED; SSC=SPECIES OF SPECIAL CONCERN

Common Name	Scientific Name	State Status
Mammals		
Mangrove Fox Squirrel	<i>Sciurus niger avicennia</i>	T
Florida Black Bear	<i>Ursus americanus floridanus</i>	T
Birds		
Limpkin	<i>Aramus guarauna</i>	SSC
Florida Burrowing Owl	<i>Athene cunicularia floridana</i>	SSC
Little Blue Heron	<i>Egretta caerulea</i>	SSC
Snowy Egret	<i>Egretta thula</i>	SSC
Tricolored Heron	<i>Egretta tricolor</i>	SSC
White Ibis	<i>Eudocimus albus</i>	SSC
Southeastern American Kestrel	<i>Falco sparverius paulus</i>	T
Florida Sandhill Crane	<i>Grus canadensis pratensis</i>	T
Amphibians		
Carolina Gopher Frog	<i>Lithobates capito</i>	SSC
Reptiles		
Gopher tortoise	<i>Gopherus polyphemus</i>	T

3.11 ESSENTIAL FISH HABITAT

The Magnuson-Stevens Fishery Conservation and Management Act, 16 USC 1801 et seq., Public Law 104-208 reflects the Secretary of Commerce and Fishery Management Council authority and responsibilities for the protection of essential fish habitat. There is no essential fish habitat within the project area.

3.12 WATER QUALITY

Water quality standards for BCSIR are established and enforced by the Seminole Tribe for surface waters entering BCSIR. Reservation water quality standards are similar to those established by the State of Florida. In 1997, the Seminole Tribe of Indians adopted a narrative nutrient water quality standard (WQS) for its Seminole Reservation (Seminole Water Commission, 1998). It is a narrative WQS that States nutrients shall not cause an imbalance in natural populations of aquatic flora or fauna. The Seminole Tribe applies this WQS to all surface waters on the Reservation and canals managed by the District. No numeric WQS has been adopted by the Seminole Tribe. Surface water quality conditions are generally in compliance at the West Feeder Weir and G-409. Total Phosphorus (TP) is a concern to the Seminole Tribe's Environmental Resource Management Department given that the Tribe has designated the West Feeder, North Feeder and L-28 Interceptor Canals for fresh water recreation and supportive of healthy aquatic communities. The discharge goal from the Critical Restoration Project (**Section 4.20**) is 50 parts per billion (ppb) or 0.050 milligrams per liter (mg/L). The average flow-weighted mean TP concentration at the S-190 structure for the 2011-2015 period was 91 ppb (DBHYDRO: S190 Grab TP, S-190 Flows dbkey K5501). The concentration of TP varies seasonally and annually and is primarily

influenced by flows and loads delivered from upstream of BCSIR through the PC17A structure. At the PC17A structure, the flow-weighted average TP concentration grab samples collected during the 2011 to 2015 period was 0.181 mg/L. In 2015, the flow-weighted TP concentration at the PC17A structure was over 250 ppb which is well in excess of the 50 ppb established by agreement with the McDaniel Ranch and the STOF in 1996 and also referenced in the Environmental Resource Permit (26-00623-P) issued by the SFWMD in 1996.

Downstream of the S-190 structure, the L-28 Interceptor canal discharges into Miccosukee Tribal lands which are also within WCA 3A. In 1999, the Miccosukee Tribe and U.S. Environmental Protection Agency (USEPA) set a 10 ppb TP water quality standard for discharges into Miccosukee Tribal lands as well as the water conservation lands and Everglades National Park. The concentration of TP in water that reaches L-29 Interceptor canal terminus is nearly the same as that discharged at the S-190 structure given that little dilution or treatment occurs between these two locations. In other words, L-28I water quality the canal terminus exceeds the Miccosukee standard by nearly an order of magnitude (70-100 ppb vs a standard of 10 ppb). **FIGURE 3-14** shows SFWMD and Seminole Tribe water quality data for S-190, PC17A, and at upstream Feeder Canal Basin sampling locations.

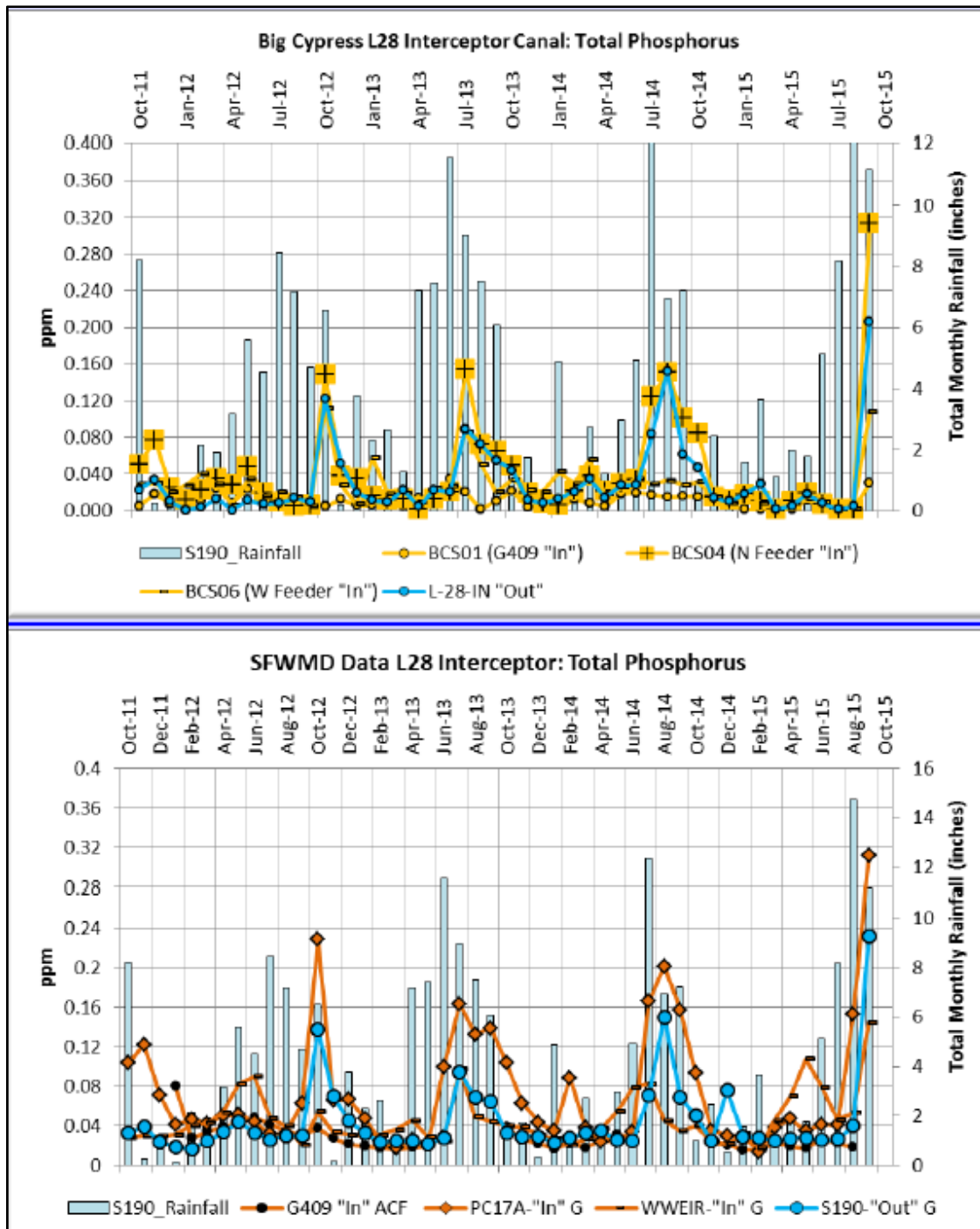


FIGURE 3-14. BIG CYPRESS L-28 INTERCEPTOR TOTAL PHOSPHOROUS

3.13 NATIVE AMERICANS

There are two Federally-recognized Tribes (Miccosukee Tribe of Indians of Florida and the Seminole Tribe of Florida) that are located within and adjacent to the project area. The majority of the S-190 area of potential effects (APE) is located within the boundary of the BCSIR; however,

both Tribes maintain a strong connection to the project area through continued use and regard the indigenous populations of Florida as their ancestors.

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

As early as 1894, the Federal governmental and later the State of Florida started to acquire lands within the Big Cypress area. BCSIR celebrated its 119th anniversary as an Indian reservation in June of 2015 as 1896 congressionally appropriated funds were used to purchase parcels of land within present day BCSIR. However, initial attempts to relocate Tribal members to these areas failed as there were simply no incentives to abandon traditionally occupied areas in favor of the new lands (Weisman 1999). “The Indian New Deal changed that, and for the first time, services, programs, and land were brought together...at Big Cypress (Weisman 1999:125).” In the 1930s, the Federal Government started to bring services to the various Seminole groups. Some of the groups relocated and started to receive Federal aid, while some groups resisted government intrusion into their lives and remained in various traditional areas that now included sites along Tamiami Trail (Weisman 1999). Throughout the next two decades the Federal Government instituted various aid programs to assist the Native American groups living within the reservations until the early 1950s. In the early 1950s, the Federal Government’s policies radically changed, as it was felt that native groups should now join “mainstream society” and that Federal aid should come to an end (Weisman 1999:131). Being faced with a reduction in support and possible termination of recognition as a group by the government, various Native American groups on these reservations began to organize and form their own Tribal governments to assist in the protection of their interests. In 1957, the Seminole Tribe received Federal recognition. However, wishing to remain separate and to maintain their own identity, many of the groups along the Tamiami Trail refused to join and instead held out to form their own government that would be Federally recognized in 1962 as the Miccosukee Tribe of Indians of Florida.

Today most of the Miccosukee Tribe lives within the confines of the reservation located along the forty mile bend of Tamiami Trail while many of the Seminoles Tribal members live on various reservations properties with the largest being those of Big Cypress, Hollywood, and Brighton Reservations which are reserved for the Seminole Tribe as permanent Tribal homelands, and where the Federal government holds title to the land in trust on behalf of review of the Tribe. The

members of both groups maintain a traditional life style that is intricately connected to the Everglades. Traditional practices of hunting, fishing and general living are still maintained, along with modern entrepreneurship through various enterprises such as cattle ranching and with tourism related businesses along Tamiami Trail. Today, both Tribes have vibrant, thriving culture based within the Everglades region. These practices continue to tie the Tribes to the Everglades in such a way that careful consideration of effects is warranted.

Members of both Tribes continue to rely upon the Everglades to support their cultural, medicinal, subsistence, and commercial activities. The specific issues impacting each Tribe have been different over the last few decades, but they are all related to impacts due to man-made changes to the natural Everglades ecosystem. The natural Everglades ecosystem is the foundation and sole-source of their cultural, medicinal and subsistence activities, especially as BCSIR is the Seminole Tribe's permanent Tribal homeland.

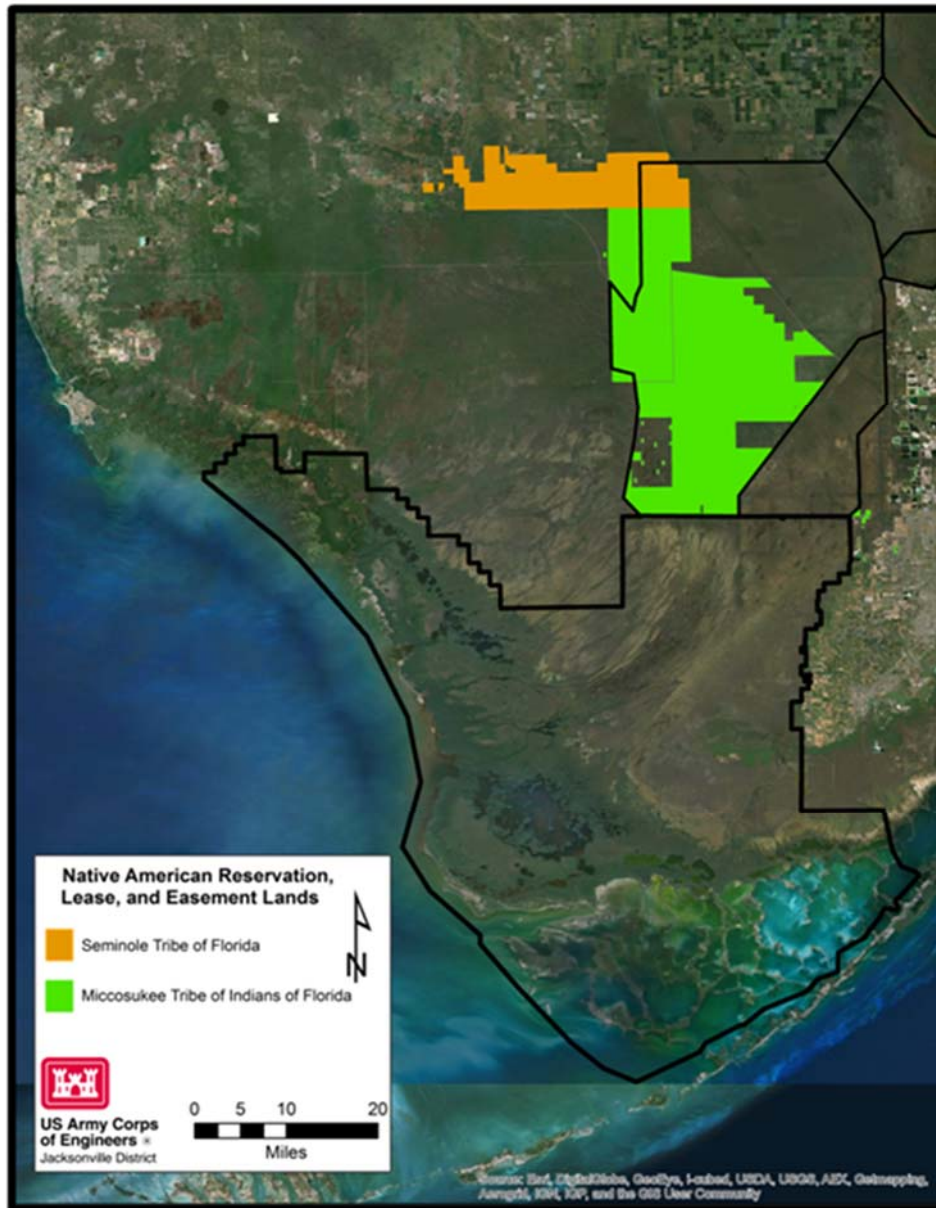


FIGURE 3-15. MAP OUTLINING THE LOCATION OF TRIBAL RESERVATION, LEASED AND EASEMENT LANDS

3.14 CULTURAL RESOURCES

There are numerous recorded archeological sites indicative of Native American habitation in South Florida. Prior to European contact, the Everglades were a heavily populated area. Native Americans traveled via canoe and on foot through the saw grass and inhabited many of the tree islands that dot the landscape. The earliest known habitation sites date to the Early Archaic period (7,500 BC) when the Everglades were much drier. However, within the larger area of south Florida, evidence of Paleo-Indian (12,000 to 7,500 BC) habitation has also been recorded [i.e. Warm Mineral Springs (8SO18) and Little Salt Spring (8SO79) (Griffin 1988)]. Some of the Early Archaic habitation sites have only recently been rediscovered as the result of managed drainage programs in south Florida. As the climate warmed and sea level rose, many Native Americans

abandoned the lowest of the tree islands as they became submerged. This process continued through what is known as the Middle Archaic, until climate conditions stabilized around 300 BC at the start of the Late Archaic. Today many sites from both the Early and Middle Archaic periods are no longer submerged and may have more modern Native American use.

After the Archaic period, the region became incorporated into what is known as the Glades region and remained inhabited until European contact, when Old World diseases and slave raiding heavily reduced the Native populations during the 16th to 18th centuries. Many of the tree islands through this portion of the Everglades have sites associated to the Glades period. This period has been broken down into successive stages starting with Glades I, which dates from 500 BC to 750 AD, Glades Period II dating from 750 to 1200 AD, and Glades Period III dating from 1200 AD to European contact in the 16th century. Typical habitation sites through this region are commonly referred to as middens, which are the accumulation of daily life activities on these tree islands. Material remains can stretch from the surface to well over one meter below the surface on certain islands. Native American burials can also be found among these habitation sites.

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

The proposed S-190 APE includes 9,010 acres, of which approximately 7,160 acres are located within the boundary of the BCSIR. The portion of the APE located on BCSIR lands has been subject to 171 individual cultural resource surveys. As a result of these surveys, a total of 23 previously recorded sites and three archaeological occurrences have been identified by the Seminole Tribe's Tribal Historic Preservation Officer (THPO) within the APE (Mahoney 2016). According to the Florida Master Site File, the portion of the APE located outside of the BCSIR boundary has been assessed twice for cultural resources (DHR Manuscript Nos. 2551 and 2662), resulting in the identification of three archaeological sites (8HN067, 8HN068, and 8HN075). These have not been evaluated regarding eligibility for listing in the National Register of Historic Places.

3.15 AIR QUALITY

Legal limitations on pollutant concentration levels allowed to occur in the ambient air, or air quality standards, have been established by USEPA and the Florida Department of Environmental Protection (FDEP) for six criteria pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO₂), ozone (O₃), particle pollution (10 microns or less in diameter (PM₁₀), and 2.5 microns or less in diameter (PM_{2.5}), and sulfur dioxide (SO₂). Primary sources of air pollution in south Florida are related to transportation, stationary fuel combustion sources, and solid waste disposal. The FDEP air monitoring reports are prepared annually by FDEP to inform the public of the air pollutant levels throughout the State of Florida. The report summarizes the results of monitoring that has been conducted to measure outdoor concentrations of those pollutants for which the USEPA and the State of Florida's Environmental Protection program have established ambient air

quality standards. All areas within the State are designated with respect to each of the six pollutants as attainment (*i.e.*, in compliance with the standards); non-attainment (*i.e.*, not in compliance with the standards); or unclassifiable (*i.e.*, insufficient data to classify). Attainment areas can be further classified as maintenance areas. Maintenance areas are areas previously classified as non-attainment which have successfully reduced air pollutant concentrations to below the standard. Maintenance areas must maintain some of the non-attainment area plans to stay in compliance with the standards. Florida counties are in attainment for all pollutants with the exception of Orange County, Duval County, the Tampa Bay area including Hillsborough and Pinellas Counties, and Southeast Florida including Miami-Dade, Broward, and Palm Beach Counties which continue to be classified by the USEPA as attainment/maintenance areas for the pollutant ozone and a portion of Hillsborough County which is classified as a nonattainment area for lead (FDEP 2012). The Ozone compliance standards have been in flux since 1996 and it is difficult to determine whether attainment/maintenance zones are in force following rule changes by the USEPA. In 2005, the 1-hr Ozone rule was revoked by the EPA. In October of 2015, the 8-hr Ozone rule was revoked by the EPA. Since some of BCSIR is located within Broward County, this portion of the Federal Reservation may be technically classified as an attainment/maintenance area for ozone depending upon how EPA and FDEP are enforcing the Ozone standards. However, any such Ozone attainment/maintenance designation reflects the proximity of the BCSIR to the urban areas of Broward County and is not a reflection of air pollution generated on the Federal Reservation. Although sufficient data have been collected for attainment determinations, USEPA has not considered PM₁₀ for attainment determinations in Florida yet.

3.16 HAZARDOUS, TOXIC OR RADIOACTIVE WASTES

This project is located on BCSIR. A review of FDEP's Contamination Locator Map system shows no hazardous, toxic, or radioactive waste (HTRW) sites within BCSIR. This is likely due to the fact that USEPA has delegated Resource Conservation and Recovery Act and Clean Water Act Authority directly to the Seminole Tribe rather than to FDEP for Reservation lands. While not provided here, a search of the Seminole Tribe data regarding HTRW sites within the BCSIR would likely identify typical release sites associated with gas stations, commercial and light industrial businesses, agricultural, municipal operations, and residential homes.

The FDEP contamination locator map system did identify one HTRW site within 1 mile of BCSIR on the McDaniel's Ranch property. The McDaniel's Ranch contamination site is located at a former Pole Barn located on the southeast corner of the property. The FDEP has approved a natural attenuation remediation plan and the site is being monitored on an annual basis for arsenic in the groundwater.

3.17 NOISE

Noise levels are associated with surrounding land use. Agriculture is the predominant land use to the north of BCSIR. The predominant sources outside of BCSIR contributing to the overall ambient noise level within the project area would include noise associated with agricultural production such as the processing and transportation of agricultural produce. The use of farm equipment such as tractors, plows, and the use of irrigation facilities would be expected to be the dominant background noise. Rural areas have typical noise levels in the range of 35 to 55 decibels (B). Vehicular traffic travelling on roads adjacent to and cutting through the project area would

also contribute to ambient noise levels. Sound levels along transportation arteries are typically in the 70 dB range

Within the natural portions of the project area and within BCSIR, external sources of noise are limited and of low occurrence. Wilderness ambient sound levels are typically in the range of 35 dB. Other sources of noise which may occur within these natural areas include air boats, off road vehicles, swamp buggies, motor boats, and occasional air traffic. Sound levels are typically in the range of 85 to 105 dB for motorboats and air boats, respectively.

3.18 AESTHETICS

The Feeder Canal Basin is more rural in nature, with open and agricultural areas. Beef cattle pastures account for the majority of agricultural land use within the basin. Other agricultural land uses include vegetable or row crops, sugar cane farming and citrus. Urban areas are characterized by low density residential developments (*i.e.* less than 2 units per acre). The landscape has few outstanding features since the topography is flat, with few natural topographic features such as hills or other undulations. Much of the visible topographic features are man-made, including roads, highways, electrical wires, communication towers, buildings, canals and levees and other features which may or may not detract from the regional aesthetic. Less than one-third of the land in BCSIR is characterized in the manner described above.

Aesthetic resources existing within the natural areas include natural areas located on BCSIR and within BCNP. The 729,000 acre BCNP contains a mixture of tropical and temperate plant communities that are home to a diversity of wildlife. WCA 3A is located directly east of BCSIR. Wet prairies, sloughs, sawgrass marshes, and tree islands are typical vegetative communities found with WCA 3A. BCNP and WCA 3A support a large number of fish and wildlife species and provide abundant wildlife viewing opportunities. BCSIR also supports a large number of fish and wildlife species for the Seminole Tribe's sustenance and culture. The majority of land in BCSIR is characterized in a manner described for BCNP and WCA 3A.

3.19 RECREATION RESOURCES

Recreational opportunities are provided within BCSIR. BCSIR is a Federal Indian Reservation and is the permanent homeland for the Seminole Tribe. Therefore, BCSIR is the land where the Seminole Tribal members that live on BCSIR recreate. The Seminole Tribe provides access to camping (RV sites, tent sites, and cabins) at the Big Cypress RV Resort and Campground. Airboat tours and swamp buggy tours are also available on BCSIR. The Billie Swamp Safari is an important land use on approximately 2,200 acres of BCSIR (Seminole Tribe 2012). Billie Swamp Safari offers daily tours of the Reservation's wetlands, hardwood hammocks, and sloughs by airboat and marsh buggy. The 2,200 acre Swamp Safari area is enclosed in a high game fence, and includes native wildlife species common to the area as well as stocked exotic animals. The Tribe operates Big Cypress Wildlife and Hunts as a 3,000 acre hunting operation on BCSIR (Seminole Tribe 2012) that is only available to Tribal members. Big Cypress Wildlife and Hunts operates on an area of approximately 3,000 acres in the eastern corner of BCSIR's Native Area. Hunting opportunities are available for wild hog, white tailed deer (*Odocoileus virginianus*), and "exotic" deer, as well as the Osceola turkey (*Meleagrus gallopavo osceola*). Exotic animals are occasionally relocated from the Billie Swamp Safari for certain clients. Fishing tournaments are

held throughout the year in the canal system, both upstream and downstream of S-190. Public access to the L-28 Interceptor Canal is provided at the I-75 Mile Marker 51 facility.

Recreational opportunities are also present within adjacent areas including WCA 3 and BCNP. Lands within WCA 3 have been used for recreational activities including hunting, fishing, frogging, boating, camping, and off-road vehicle use. A variety of other nature-based recreational opportunities are also provided to the public within WCA 3 including wildlife viewing and nature photography. Hiking and bicycling are also permitted on existing levees where appropriate. Similar recreational opportunities are provided in BCNP.

4 ENVIRONMENTAL EFFECTS

4.1 GENERAL ENVIRONMENTAL EFFECTS

General environmental effects for BCSIR would be a positive enhancement and benefit as it would cease the over drainage of BCSIR caused by the historic operations of S-190. The following includes anticipated changes to the existing environment including direct, indirect, and cumulative effects.

4.2 CLIMATE

Implementation of the No Action Alternative and Alternatives 2, 3, 4 and 5 would not result in significant effects to the climate of south Florida.

The impact of current or projected effects of climate change on S-190 operations is difficult to estimate given the uncertainty in predictions of future weather patterns and water management strategies. However, projections of rainfall show a reduction of up to 20% in rainfall volume in South Florida by 2100 as compared to the historic conditions experienced between 1980 and 1999 (SFWMD 2009). Higher average ambient temperatures are expected to result in increased evapotranspiration. Rainfall events are expected to become less frequent but larger in magnitude. As a peat soil ecosystem, increasing drought would reduce available water to keep the soils wet, resulting in higher peat oxidation and loss of soil elevations in the freshwater wetlands. Regional surface water storage systems (*i.e.* canals) will most likely experience more rapid water loss when compared to current water levels, ultimately impacting availability of water supplies. Sea level change is one of the more certain consequences of climate change, and because it affects the land/ocean interface, it has the potential for environmental impacts on coastal areas. Future rates of sea level change are expected to result in significant impacts on coastal canals and communities, with loss of flood protection and increased saltwater intrusion being the primary effects. Additionally, coastal ecosystems and estuaries are expected to be adversely affected and require additional deliveries of freshwater to maintain desirable salinity patterns and healthy ecosystems. The project area is located upstream of coastal areas within southern Florida. The influence of climate change is not anticipated to alter the severity or nature of impacts resulting from the proposed modification to S-190 operations; whose intent is to reduce water loss out of the natural system and prevent overdrainage. Potential benefits (*i.e.* improved hydroperiods) expected from implementation of the Proposed Action may be reduced as a result of climate change and the potential for increased evapotranspiration.

4.3 GEOLOGY AND SOILS

4.3.1 Alternative 1: No Action Alternative

Geology and soils within the project area would not be expected to change from current conditions. The continued implementation of the current operating criteria for S-190 has the potential for moderate localized effects (*i.e.* increased oxidation, subsidence and peat fires) on soils within BCSIR due to decreased groundwater elevations and decreased storage within BCSIR.

4.3.2 Alternative 2: Maintain Optimum Canal Stages of 15.5 ft NGVD

Alternative 2 consists of a change to the S-190 operational criteria and does not include construction of permanent structures or structural modifications to existing C&SF Project features.

Geologic impacts resulting from removal of surface cover (*i.e.* vegetation and soil) or removal of caprock from blasting and/or removal of limestone would not occur.

Implementation of Alternative 2 has the potential to affect geology and soils within the project area as a result of operational changes. With implementation of Alternative 2, the stage elevations experienced at S-190 and other locations within BCSIR are expected to be similar to the intra-annual range of water stages experienced under recent (2013 to 2015) C&SF Project operations. Under Alternative 2, the duration at which water stages within the West Feeder Canal are maintained at 15.5 ft NGVD is expected to increase. Improved hydroperiods within BCSIR have the potential to reduce soil oxidation, and this would be expected to promote peat accretion. A potential decrease in drying event severity relative to the No Action Alternative, if achieved, should result in reduced fire incidence within BCSIR; however, the frequency of muck fires are primarily controlled by weather patterns within the area. Alternative 2 may have a permanent minor to moderate beneficial effect on geology and soils within BCSIR.

4.3.3 Alternative 3: Maintain Optimum Canal Stages of 15.5 ft NGVD and includes Special Conditions

Implementation of Alternative 3 would result in similar effects as discussed under Alternative 2. Alternative 3 is expected to have beneficial effects on geology and soils within BCSIR due to improvements in hydroperiods. However, with Alternative 3, the low range of 14.8 to 14.2 ft. NGVD may be used in anticipation of a large rainfall event, resulting in a potential loss of groundwater during pre-storm drawdowns. With an overall basin drainage rate of about one inch per day and the considerable storage afforded in the undeveloped areas within the S-190 watershed, pre-storm drawdowns are expected to be required infrequently.

4.3.4 Alternative 4: Maintain Optimum Canal Stages of 15.8 ft NGVD and includes Special Conditions

Implementation of Alternative 4 would result in similar effects as discussed under Alternative 2. Since Alternative 4 maintains canal stages slightly higher than Alternative 2 and Alternative 3, Alternative 4 would likely show a slightly higher beneficial effect on geology and soils as compared with the other alternatives within BCSIR. However, implementation of Alternative 4 includes the potential operating range of 14.8 to 14.2 ft. NGVD to be used in anticipation of a large rainfall event, which may result in a potential loss of groundwater during pre-storm drawdowns. Those pre-storm drawdowns are expected to be required infrequently.

4.3.5 Alternative 5: Maintain Optimal Canal Stages of 16.0 ft NGVD and includes Special Conditions

Implementation of Alternative 5 would result in similar effects as discussed under Alternative 2. Alternative 5 is anticipated to have the greatest beneficial effect on geology and soils, and hydroperiod as compared with the other alternatives evaluated within BCSIR. However, implementation of Alternative 5 includes the potential operating range of 14.8 to 14.2 ft. NGVD to be used in anticipation of a large rainfall event, which may result in a potential loss of groundwater during pre-storm drawdowns. Those pre-storm drawdowns are expected to be required infrequently.

4.4 STUDY AREA LAND USE

Implementation of the No Action Alternative and Alternatives 2, 3, 4 and 5, would not result in significant impacts to study area land use.

4.5 HYDROLOGY – GROUNDWATER HYDROLOGY

4.5.1 Alternative 1: No Action Alternative

Under the No Action Alternative, hydrology within the project area would not be expected to change from current conditions. Please refer to **Section 3.5** for existing hydrology within the project area.

4.5.2 Alternative 2: Maintain Optimum Canal Stages of 15.5 ft NGVD

According to the data as outlined in Appendices A and D, the No Action Alternative in the canals upstream of S-190 are maintained at two different levels throughout the year (*i.e.* the dry condition periods at 15.5 ft NGVD and at 14.5 ft NGVD during normal condition periods) which adversely affected those adjacent areas. Alternative 2 would change the canal optimum level to reflect the dry condition period of 15.5 ft NGVD year round, to improve groundwater hydrology and remediate some of those effects to adjacent areas. It is anticipated that implementation of Alternative 2 would result in minor to moderate permanent improvements in groundwater recharge to the surficial aquifer (*i.e.* increase groundwater storage) and increased duration of discontinuous annual hydroperiods within the native areas within BCSIR.

According to the Corps' subsurface investigations for the Seminole Big Cypress Critical Restoration Project (Basin 1 through Basin 4), soils within the Water Reserve Areas (WRAs) and Irrigations Cells (IC) that were expected to hold standing water for several months per year, are limited by the high permeability of the soil within the area. Data from these investigations reveal that groundwater levels in the adjacent areas are directly related to the HW at S-190. Thus, when canal stages are held at the current "normal" operational stage of 14.5 ft NGVD, a more significant drawdown effect would be experienced within WRAs and Irrigation Storage Areas. The best available data support the assertion that if the water levels were held at an optimum level of 15.5 ft NGVD, as proposed under Alternative 2, groundwater stages within the adjacent areas (*i.e.* WRAs, Irrigation Storage Areas, and native areas, etc.) would improve. Improvements in groundwater stages would sustain longer hydroperiods and improved environmental conditions within the Seminole Big Cypress Critical Project area.

4.5.3 Alternative 3: Maintain Optimum Canal Stages of 15.5 ft NGVD and includes Special Conditions

Implementation of Alternative 3 would result in similar effects on groundwater stages within BCSIR, as discussed under Alternative 2. However, with Alternative 3, the low range of 14.8 to 14.2 ft. NGVD may be used in anticipation of a large rainfall event, resulting in a potential loss of groundwater during pre-storm drawdowns. With an overall basin drainage rate of about one inch per day and the considerable storage afforded in the undeveloped areas within the S-190 watershed, pre-storm drawdowns are expected to be required infrequently.

4.5.4 Alternative 4: Maintain Optimum Canal Stages of 15.8 ft NGVD and includes Special Conditions

Implementation of Alternative 4 would result in similar effects on groundwater stages within BCSIR, as discussed under Alternatives 2 and 3. Alternative 4 will maintain year round canal stages higher than Alternatives 2 and 3, thus the groundwater storage would be greater under Alternative 4 as compared with these alternatives and would likely show a moderate to high beneficial effect on groundwater hydrology within BCSIR. However, Alternative 4 includes the potential operating range of 14.8 to 14.2 ft. NGVD to be used in anticipation of a large rainfall event, which may result in a potential loss of groundwater during pre-storm drawdowns. Pre-storm drawdowns are expected to be required infrequently.

4.5.5 Alternative 5: Maintain Optimal Canal Stages of 16.0 ft NGVD and includes Special Conditions

Implementation of Alternative 5 would result in similar effects on groundwater stages within BCSIR, as discussed under Alternatives 2 through 4. Alternative 5 will maintain year round canal stages at the highest level and is anticipated to have the greatest beneficial effect on groundwater hydrology within BCSIR as compared with the other alternatives evaluated. However, Alternative 5 includes the potential operating range of 14.8 to 14.2 ft. NGVD to be used in anticipation of a large rainfall event, which may result in a potential loss of groundwater during pre-storm drawdowns. Pre-storm drawdowns are expected to be required infrequently.

4.6 REGIONAL WATER MANAGEMENT OPERATIONS – FLOOD CONTROL

4.6.1 Alternative 1: No Action Alternative

The S-190 structure is currently operated on either a low (normal condition) or a high setting (dry condition), through automatic controls as described in the current Master Water Control Manual for the WCAs, ENP, and ENP-SDCS, Volume 4 (Corps 1996). Currently, during normal conditions, the S-190 optimum HW level is maintained at elevation 14.5 ft NGVD, where the gates are opened and closed respectively at elevations 14.8 ft NGVD and 14.2 ft NGVD. During dry conditions, the S-190 optimum HW level is maintained at elevation 15.5 ft NGVD, where the gates are opened and closed respectively at elevations 15.8 ft NGVD and 15.2 ft NGVD. (**Section 2.1.1**). S-190 can affect the surface water and groundwater levels in the area and is operated to prevent over drainage. S-190 was designed to ensure flood protection; when water levels exceed the upper level of the optimum range (*i.e.* 14.8 ft NGVD during the normal condition and 15.8 feet NGVD during the dry condition) the structure is operated for flood control purposes.

The design condition for the S-190 structure is a HW elevation of 16.6 ft NGVD and corresponding tailwater elevation of 16.1 ft NGVD, which would permit a design discharge of 2960 cubic ft per second. The design level of protection is 30% of the Standard Project Flood (SPF), which is commensurate with the 10 year frequency. The North and West Feeder Canals upstream of S-190 were designed and built to maintain flood control under that condition. The Corps' DDM developed the normal operational level (optimum stage) of 15.5 ft NGVD year round (C&SF Project for Flood Control and Other Purposes, Part I Agricultural and Conservation Areas, Supplement 40 (Pt I Supplement 40), DDM L-28 Interceptor and Feeder Canals, including Addendum 1, dated 23 August 1963.) Since the No Action Alternative maintains the upstream Feeder Canals 1 foot lower than the DDM normal operation level during the normal condition (*i.e.*

wet season), an increased level of flood protection under the No Action Alternative is experienced in areas upstream of S-190; however, as previously documented, the lowered canal stages are associated with adverse environmental effects on communities within BCSIR.

4.6.2 Alternative 2: Maintain Optimum Canal Stages of 15.5 ft NGVD

Alternative 2 represents the Corps' DDM normal operational level of 15.5 ft NGVD year round (C&SF Project for Flood Control and Other Purposes, Part I Agricultural and Conservation Areas, Supplement 40 (Pt I Supplement 40) and DDM L-28 Interceptor and Feeder Canals, including Addendum 1, dated 23 August 1963). Thus, as S-190 operations under Alternative 2 would be the same as the original DDM recommended optimal level, implementation of Alternative 2 would result in no significant impact to flood protection within the project area. There is no anticipated effect to the design flood control condition since the original optimum (*i.e.* normal operations condition) canal level upstream of S-190 was recommended to be 15.5 ft NGVD; 1.1 ft lower than the design HW elevation of 16.6 ft NGVD. Under the implementation of Alternative 2, the stage elevations experienced at S-190 and other locations within BCSIR are expected to be similar to the intra-annual range of water stages experienced under recent (2013 to 2015) C&SF Project operations. If the design condition is not exceeded (e.g. 10 year event⁺, HW elevation 16.6 feet⁺, etc.) there would be no adverse effect on flood control. When applying a qualitative analysis approach to all of these alternatives, those that are close to the original operational (optimum) range (15.2 to 15.8 ft NGVD) described in the Corps 1968 O&M manual, adequate flood control would be able to be maintained up to the authorized design level, when the initial condition is at the original optimum level of 15.5 ft NGVD.

4.6.3 Alternative 3: Maintain Optimum Canal Stages of 15.5 ft NGVD and includes Special Conditions

For those alternatives that are close to the original operational range (15.2 to 15.8 ft NGVD) described in the Corps 1968 O&M manual, adequate flood control would be able to be maintained up to the authorized design level. Similar to Alternative 2, Alternative 3 maintains optimal canal stages of 15.5 ft NGVD year round. However, Alternative 3 includes special conditions for a low range of 14.8 to 14.2 ft NGVD that may be used in anticipation of a large rainfall event, resulting in a potential loss of groundwater during pre-storm drawdowns. With an overall basin drainage rate of about one inch per day and the considerable storage added in the undeveloped areas within the S-190 watershed; pre-storm drawdowns are expected to be required infrequently. Adequate flood control should be able to be maintained to the authorized design level, if the initial condition is at the optimum level of 15.5 ft NGVD.

4.6.4 Alternative 4: Maintain Optimum Canal Stages of 15.8 ft NGVD and includes Special Conditions

Alternative 4 maintains optimal canal stages of 15.8 ft NGVD year round. Currently there is not enough data to evaluate flood control under Alternative 4. The capability of S-190 to convey the volume of runoff for the design flood event under this condition is uncertain. However, in order to make that determination, a validated quantitative engineering analysis would need to be performed to ensure this alternative can adequately afford flood protection for the design event. Due to that paucity of data, Alternative 4 cannot be analyzed with a quantitative assessment as part of this EA. Additionally, there is a potential for the special conditions procedure for low range

operations that may not be implemented, and without the validated engineering analysis there is no way to evaluate adequate flood control at the proposed optimum canal level.

4.6.5 Alternative 5: Maintain Optimal Canal Stages of 16.0 ft NGVD and includes Special Conditions

Alternative 5 maintains optimal canal stages of 16.0 feet NGVD year round. Currently, there is not enough data to evaluate flood control under Alternative 5, and the capability of S-190 to convey the volume of runoff for the design flood event under this condition is uncertain.

4.7 WATER SUPPLY

There are no anticipated effects to water supply under any of the alternatives evaluated. Please refer to **Section 3.7** for additional details on water supply.

4.8 VEGETATIVE COMMUNITIES

4.8.1 Alternative 1: No Action Alternative

Vegetation within the project area would not be expected to change from current conditions. The continued implementation of current S-190 water management operations have the potential for negative effects on wetland vegetation and communities due to reduced hydroperiods and increased potential for fire. The Seminole Tribe currently invests significant time, effort and finances to removing exotic and invasive plant species on BCSIR which thrive in desiccated wetland areas. Please refer to **Section 3.8** for additional details regarding existing vegetation conditions.

4.8.2 Alternative 2: Maintain Optimum Canal Stages of 15.5 ft NGVD

The primary factors influencing the distribution of dominant freshwater wetland plant species of the Everglades are soil type, soil depth, and hydrological regime (USFWS 1999). Changes in hydrological regime associated with changes in S-190 operations are expected to affect vegetation within BCSIR. With implementation of Alternative 2, stage elevations experienced at S-190 and other locations within BCSIR are expected to be similar to the intra-annual range of water stages experienced under recent (2013-2015) C&SF Project operations. Holding canal stages higher as compared with the No Action Alternative may act to mitigate some of the existing negative effects associated with previous S-190 operations. Through improvements in groundwater recharge to the surficial aquifer and increased water storage within BCSIR, annual hydroperiods within BCSIR's native lands may be extended. Extended hydroperiods would assist to promote growth of native wetland dependent vegetation and reduce encroachment of woody species into native wetland areas. Shorter hydroperiod sawgrass marshes may transition to wet prairie and slough/open water marsh communities with improved hydroperiods under Alternative 2, a beneficial change as it improves the extent of native vegetative diversity. Extended hydroperiods also have the potential to reduce adverse effects on soils through reduction in soil oxidation and promotion of peat accretion. In addition, a potential decrease in drying event severity relative to the No Action Alternative, if achieved, would aid in restoration of historic wetland vegetation communities including sawgrass marshes, wet prairies and cypress forests within BCSIR. Alternative 2 is anticipated to have a moderate beneficial effect on vegetative communities within BCSIR.

4.8.3 Alternative 3: Maintain Optimum Canal Stages of 15.5 ft NGVD and includes Special Conditions

Implementation of Alternative 3 would result in similar effects on vegetation as discussed under Alternative 2. Alternative 3 is expected to improve hydroperiods within BCSIR due to improvements in groundwater hydrology. Under Alternative 3, the low range of 14.8 to 14.2 ft. NGVD may be used in anticipation of a large rainfall event, resulting in a potential loss of groundwater during pre-storm drawdowns. With an overall basin drainage rate of about one inch per day and the considerable storage afforded in the undeveloped areas within the S-190 watershed, pre-storm drawdowns are expected to be required infrequently.

4.8.4 Alternative 4: Maintain Optimum Canal Stages of 15.8 ft NGVD and includes Special Conditions

Implementation of Alternative 4 would result in similar effects as discussed under Alternatives 2 and 3. Since Alternative 4 maintains canal stages slightly higher than Alternative 2 and Alternative 3; Alternative 4 would likely show a slightly higher beneficial effect on vegetative communities within BCSIR; however, implementation of Alternative 4 includes the potential operating range of 14.8 to 14.2 ft. NGVD to be used in anticipation of a large rainfall event, which may result in a potential loss of groundwater during pre-storm drawdowns.

4.8.5 Alternative 5: Maintain Optimal Canal Stages of 16.0 ft NGVD and includes Special Conditions

Implementation of Alternative 5 would result in similar effects as discussed under Alternatives 2 through 4. Alternative 5 is anticipated to have the greatest permanent minor to moderate beneficial effect on vegetative communities within BCSIR as compared with the other alternatives evaluated; however, implementation of Alternative 5 includes the potential operating range of 14.8 to 14.2 ft. NGVD to be used in anticipation of a large rainfall event, which may result in a potential loss of groundwater during pre-storm drawdowns.

4.9 FISH AND WILDLIFE RESOURCES

4.9.1 Alternative 1: No Action Alternative

Flows through BCSIR under current system compartmentalization and water management practices are greatly reduced when compared with pre-drainage conditions. The result has been lower wet season depths and more frequent and severe dry downs in sloughs and reduction in extent of shallow water edges. Under the No Action Alternative, fish and wildlife resources within the project area would not be expected to change from current conditions. The continued implementation of S-190 operations have the potential for negligible to moderate effects on fish and wildlife resources depending upon location and species. Please refer to **Section 3.9** for additional details on existing fish and wildlife.

4.9.2 Alternative 2: Maintain Optimum Canal Stages of 15.5 ft NGVD

Improved hydroperiods under Alternative 2 would directly benefit aquatic invertebrates within the project area. Shorter hydroperiod sawgrass marshes may transition to wet prairie and slough/open water marsh communities with improved hydroperiods under Alternative 2. Shifts from one vegetation type to another may occur in a relatively short time frame (1 to 4 years) following

hydrological alteration (Armentano et al. 2006, Zweig 2008, Zweig and Kitchens 2008). Emergent aquatic plants are commonly associated with Everglades wetlands and provide structure for growth of periphyton, the main source of primary production within the freshwater Everglades (Gunderson 1994; Powers 2005) and a primary component of invertebrate diets.

Crayfish are important components within the Everglades food web, serving as primary dietary components of higher trophic level species including fish, amphibians, alligators, wading birds and mammals such as raccoons and river otters (Kushlan and Kushlan 1979). Crayfish species composition and abundance within the Greater Everglades are linked to hydroperiod. Increases in hydroperiod associated with implementation of Alternative 2 may provide permanent, minor to moderate beneficial effects to crayfishes within areas of BCSIR.

Increases in forage prey availability (*i.e.* crayfish and other invertebrates, fish) resulting from improved hydroperiods would in turn provide beneficial effects for amphibian, reptile, small mammal and wading bird species. Improved hydroperiods under Alternative 2 may facilitate the movement of small freshwater fishes and amphibians across the landscape within the marsh environment. It is not anticipated, that as a result of the proposed action, that existing aquatic communities would become isolated. Potential effects to existing aquatic communities within the canal system are not expected as no construction (*i.e.* canal backfilling) is anticipated. Potential adverse effects to small mammals resulting from elimination or modification of upland habitat are not anticipated under Alternative 2.

4.9.3 Alternative 3: Maintain Optimum Canal Stages of 15.5 ft NGVD and includes Special Conditions

Implementation of Alternative 3 would result in similar effects as discussed under Alternative 2. Alternative 3 is expected to improve hydroperiods within BCSIR due to improvements in groundwater hydrology. Under Alternative 3, the low range of 14.8 to 14.2 ft. NGVD may be used in anticipation of a large rainfall event, resulting in a potential loss of groundwater during pre-storm drawdowns. With an overall basin drainage rate of about one inch per day and the considerable storage afforded in the undeveloped areas within the S-190 watershed, pre-storm drawdowns are expected to be required infrequently.

4.9.4 Alternative 4: Maintain Optimum Canal Stages of 15.8 ft NGVD and includes Special Conditions

Implementation of Alternative 4 would result in similar effects as discussed under Alternative 2 and Alternative 3. Since groundwater stages would be higher under Alternative 4 than under Alternatives 2 and 3, it is anticipated that implementation of Alternative 4 would have greater permanent minor to moderate beneficial effects on fish and wildlife resources within BCSIR as a result of improved hydroperiods; however, implementation of Alternative 4 includes the potential operating range of 14.8 to 14.2 ft. NGVD to be used in anticipation of a large rainfall event, which may result in a potential loss of groundwater during pre-storm drawdowns.

4.9.5 Alternative 5: Maintain Optimal Canal Stages of 16.0 ft NGVD and includes Special Conditions

Implementation of Alternative 5 would result in similar effects as discussed under Alternatives 2 through 4. Alternative 5 is anticipated to have the greatest permanent minor to moderate beneficial effect on fish and wildlife resources within BCSIR as compared with the other alternatives evaluated as a result of improved hydroperiods; however, implementation of Alternative 5 includes the potential operating range of 14.8 to 14.2 ft. NGVD to be used in anticipation of a large rainfall event, which may result in a potential loss of groundwater during pre-storm drawdowns.

4.10 THREATENED AND ENDANGERED SPECIES

4.10.1 Federally Protected Species

The Corps has determined that the Proposed Action may affect, but is not likely to adversely affect, Florida panther (*Puma concolor coryi*), Florida bonneted bat (*Eumops floridanus*), Everglades snail kite (*Rostrhamus sociabilis plumbeus*) and wood stork (*Mycteria americana*); and will have no effect on the Florida manatee (*Trichechus manatus latirostris*) and its associated critical habitat, critical habitat for the Everglades snail kite, Audubon's crested caracara (*Polyborus plancus audubonii*), and eastern indigo snake (*Drymarchon corais couperi*). Species determinations are listed in **Table 4-1**. Informal consultation was initiated with USFWS on May 9, 2016 with submission of a complete initiation package. USFWS reviewed the information provided and found that the Proposed Action is not likely to adversely affect any federally listed species or designated critical habitat protected by the Endangered Species Act (ESA) by correspondence dated July 18, 2016. Requirements of Section 7 of the ESA have been fulfilled. Reference **Appendix B** for additional information.

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

Common Name	Scientific Name	Federal Status	May Affect, Likely to Adversely Effect	May Affect, Not Likely to Adversely Effect	No Effect
Mammals					
Florida panther	<i>Puma concolor coryi</i>	E		X	
Florida manatee	<i>Trichechus manatus latirostris</i>	E, CH			X
Florida bonneted bat	<i>Eumops floridanus</i>	E		X	
Birds					
Everglade snail kite	<i>Rostrhamus sociabilis plumbeus</i>	E		X	
Everglade snail kite	<i>Rostrhamus sociabilis plumbeus</i>	CH			X
Audubon's Crested Caracara	<i>Polyborus plancus audubonii</i>	T			X
Wood stork	<i>Mycteria americana</i>	T		X	
Reptiles					
Eastern indigo snake	<i>Drymarchon corais couperi</i>	T			X
Gopher tortoise	<i>Gopherus polyphemus</i>	C			X

E=Endangered; T=Threatened; CH=Critical Habitat; Candidate Species

4.10.2 State Listed Species

Implementation of the Proposed Action would not result in significant impacts to State listed species. State listed species determinations are provided in **TABLE 4-2**. Impacts to State listed species would be similar to those outlined for fish and wildlife resources in **Section 4.9**. Potential impacts to wading bird species would be similar to those outlined for the wood stork in **Appendix B**.

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

Common Name	Scientific Name	Status	May Affect, Likely to Adversely Effect	May Affect, Not Likely to Adversely Effect	No Effect
Mammals					
Mangrove fox squirrel	<i>Sciurus niger avicennia</i>	T			X
Florida black bear	<i>Ursus americanus floridanus</i>	T			X
Birds					
Limpkin	<i>Aramus guarauna</i>	SSC			X
Florida burrowing owl	<i>Athene cunicularia floridana</i>	SSC			X
Little blue heron	<i>Egretta caerulea</i>	SSC		X	
Snowy egret	<i>Egretta thula</i>	SSC		X	
Tricolored heron	<i>Egretta tricolor</i>	SSC		X	
White ibis	<i>Eudocimus albus</i>	SSC		X	
Southeastern American kestrel	<i>Falco sparverius paulus</i>	T			X
Florida sandhill crane	<i>Grus canadensis pratensis</i>	T			X
Amphibians					
Carolina gopher frog	<i>Lithobates capito</i>	SSC			X
Reptiles					
Gopher tortoise	<i>Gopherus polyphemus</i>	T			X

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

4.11 ESSENTIAL FISH HABITAT

No Essential Fish Habitat has been designated within the project area. Therefore, continued implementation of the No Action Alternative or implementation of Alternatives 2, 3, 4 or 5, would not result in any effects on Essential Fish Habitat.

4.12 WATER QUALITY

4.12.1 Alternative 1: No Action Alternative

The over drainage of wetlands can result in oxidation of dried wetland soils which typically release nutrients into the water column upon rehydration. The seasonal drawdown of the S-190 structure has over drained some wetland areas in the vicinity of the North Feeder and West Feeder canals and this has resulted in higher TP discharge concentrations and loads at the S-190 structure. Continued implementation of the No Action Alternative will likely continue to contribute to excessive nutrient loads at S-190. Please refer to **Section 3.12** for a detailed summary of existing water quality conditions within the project area.

4.12.2 Alternative 2: Maintain Optimum Canal Stages of 15.5 ft NGVD

Implementation of Alternative 2 is likely to improve the quality of the water discharged at S-190 as a result of enhanced retention and detention of stormwater flows upstream of this structure. This is likely to be evidenced as a reduction in both the flow-weighted mean concentration of TP as measured on an annual basis at S-190 and as a reduction in the annual load of TP discharged at this structure. This is evident from the most recent water quality sampling results which show a downward trend in nutrient loading and concentration at S-190 subsequent to the SFWMD test operations at S-190 which are similar to the Alternative 2 operations. Although Alternative 2 may result in infrequent and short-term changes to the operations of the upstream PC17A structure during high water conditions at this structure, this is not likely to significantly alter the quality of water or nutrient load delivered from PC17A in comparison to the No Action Alternative. The increased frequency of the temporary removal of flash-boards at the PC17A that may occur as a result of increasing the dry season operating stage at S-190 under Alternatives 2 is likely to slightly shift the timing of flood flows and the associated nutrient load. The increased frequency of flash-board removal necessary due to increase operating stages at S-190 considered for Alternative 2 is not likely to cause or contribute to water quality degradation downstream of the PC17A structure. The SFWMD incorporated the 1996 Tribe Landowner Agreement with the upstream land owner into SFWMD Environmental Resource Permit # 26-00623 special conditions, therefore the 50 ppb TP flow weighted mean concentration water quality standard remains in effect regardless of which Alternative is selected within this process. Implementation of Alternative 2 is likely to have a minor beneficial effect on water quality.

Downstream water quality conditions experienced at the Miccosukee Tribal lands within WCA 3A will see an improvement in the loads and concentrations of TP delivered through the S-190 structure to the L-28I canal terminus; however, these nutrient concentrations will still not be low enough to meet the Miccosukee Tribe water quality standard of 10 ppb of TP.

4.12.3 Alternative 3: Maintain Optimum Canal Stages of 15.5 ft NGVD and includes Special Conditions

Implementation of Alternative 3 would result in similar effects as discussed under Alternative 2. As Alternative 3 maintains canal stage elevations higher than Alternative 2, there may be slightly higher improvements to water quality (reduced phosphorus concentrations and loads) with implementation of Alternative 3 due to the anticipated longer enhanced retention and detention of stormwater flows upstream of S-190.

4.12.4 Alternative 4: Maintain Optimum Canal Stages of 15.8 ft NGVD and includes Special Conditions

Implementation of Alternative 4 would result in similar effects as Alternative 2. Alternative 4 is anticipated to perform better than Alternative 3 due to more retention and detention of stormwater flows.

4.12.5 Alternative 5: Maintain Optimal Canal Stages of 16.0 ft NGVD and includes Special Conditions

Implementation of Alternative 5 would result in similar effects as discussed under Alternative 2. Alternative 5 is anticipated to have the greatest permanent minor to moderate beneficial effect on

water quality from S-190 due to the greatest retention and detention of stormwater flows as compared with the other alternatives evaluated.

4.13 AIR QUALITY

Implementation of the No Action Alternative and Alternatives 2, 3, 4 and 5 would not result in significant impacts to air quality. Air quality within the project area would not be expected to change from current conditions. S-190 is a reinforced, concrete, gated spillway with discharge automatically controlled by two cable operated vertical lift gates. Air quality within the project area is not expected to change as a result of modifications to operations of the slide gates. No construction is proposed.

4.14 HAZARDOUS, TOXIC OR RADIOACTIVE WASTES

Implementation of the No Action Alternative, and Alternatives 2, 3, 4 and 5 would not alter the HTRW conditions within BCSIR or HTRW conditions on adjacent lands. Since there is no construction activity associated with the Proposed Action, none of the Action Alternatives are likely to directly or indirectly result in the discovery of HTRW materials.

4.15 NOISE

Implementation of the No Action Alternative, and Alternatives 2, 3, 4 and 5 would not result in significant impacts to the noise environment. S-190 is a reinforced, concrete, gated spillway with discharge automatically controlled by two cable operated vertical lift gates. Noise levels within the project area are not expected to change as a result of modifications to operations of the slide gates. No construction is proposed.

4.16 AESTHETICS

Implementation of the No Action Alternative and Alternatives 2, 3, 4 and 5 would not result in significant impacts to aesthetic resources. Under the No Action Alternative, aesthetic resources within the project area would not be expected to change from current conditions. The continued implementation of S-190 operations have the potential for negligible to moderate effects on wetland vegetation and fish and wildlife resources due to reduced hydroperiods. The Proposed Action consists of a minor modification to the operating criteria for S-190 and does not include construction of permanent structures or structural modifications to existing C&SF Project features. A potential increase in groundwater storage and resultant hydroperiods under the Action Alternatives, if achieved, may contribute positively to maintaining a healthy and aesthetically pleasing ecosystem. A significant impact to aesthetic resources as a result of implementation of the Action Alternatives is not expected.

4.17 RECREATION RESOURCES

Implementation of the No Action Alternative and Alternatives 2, 3, 4 and 5 would not result in significant impacts to recreational resources. Under the No Action Alternative, recreational resources within the project area would not be expected to change from current conditions. Recreational resources for the Seminole Tribe are likely to improve under implementation of the Action Alternatives due to improved hydrologic condition for the natural lands.

4.18 NATIVE AMERICANS

The continued implementation of S-190 operations have the potential for negligible to moderate effects on wetland vegetation and fish and wildlife resources due to reduced hydroperiods, resulting in potential impacts to Native American natural land uses. Positive benefits to natural land uses are expected under implementation of the Action Alternatives due to improved hydrologic condition for the natural lands.

4.18.1 Alternative 1: No Action Alternative

The No Action Alternative would maintain current operations within the project area which continues the over drainage of BCSIR and results in impacts to Native American land use.

4.18.2 Alternative 2: Maintain Optimum Canal Stages of 15.5 ft NGVD

Implementation of Alternative 2 proposes a minor modification to the operating criteria for S-190. Alternative 2 returns S-190 to better serve the original purpose of protecting BCSIR for which it was incorporated into the C&SF Feeder and Interceptor Canal design and construction upon request of BIA. The alternative will benefit Native Americans and it is not expected to have any adverse effects on Tribal lands.

4.18.3 Alternative 3: Maintain Optimum Canal Stages of 15.5 ft NGVD with Special Conditions

Implementation of Alternative 3 would result in similar effects as discussed under Alternative 2. As Alternative 3 maintains canal stage elevations higher as compared with Alternative 2, groundwater levels may be slightly higher during natural restorative rainfall seasons with implementation of Alternative 3. Alternative 3 may provide slightly increased benefits to Native Americans by resulting in improved hydrologic conditions within the natural lands as compared with Alternative 2.

4.18.4 Alternative 4: Maintain Optimum Canal Stages of 15.8 ft NGVD with Special Conditions

Implementation of Alternative 4 would result in similar effects as discussed under Alternative 2. As Alternative 4 maintains canal stage elevations higher as compared with Alternatives 2 and 3, groundwater levels may be slightly higher during natural restorative rainfall seasons with implementation of Alternative 4. Alternative 4 may provide slightly increased benefits to Native Americans by resulting in improved hydrologic conditions within the natural lands as compared with Alternatives 2 and 3. However, Alternative 4 includes special conditions for a low range of 14.8 to 14.2 ft NGVD that may be used in anticipation of a large rainfall event, resulting in a potential loss of groundwater during pre-storm drawdowns. Furthermore, Alternative 4 maintains optimal canal stages of 15.8 ft NGVD year round. Currently there is not enough data to evaluate flood control under Alternative 4. The capability of S-190 to convey the volume of runoff for the design flood event under this condition is uncertain.

4.18.5 Alternative 5: Maintain Optimal Canal Stages of 16.0 ft NGVD and includes Special Conditions

Implementation of Alternative 5 would result in similar effects as discussed under Alternative 2. As Alternative 5 maintains canal stage elevations higher as compared with Alternatives 2, 3, and 4, groundwater levels may be slightly higher during natural restorative rainfall seasons with implementation of Alternative 5. Alternative 5 may provide slightly increased benefits to Native Americans as compared with Alternatives 2, 3, and 4. Benefits to natural lands as a result of improved hydrologic conditions are anticipated to be greatest under Alternative 5. However, Alternative 5 includes special conditions for a low range of 14.8 to 14.2 ft NGVD that may be used in anticipation of a large rainfall event, resulting in a potential loss of groundwater during pre-storm drawdowns. Furthermore, Alternative 5 maintains optimal canal stages of 16.0 feet NGVD year round. Currently there is not enough data to evaluate flood control under Alternative 5. The capability of S-190 to convey the volume of runoff for the design flood event under this condition is uncertain.

4.19 CULTURAL RESOURCES

As part of the consideration of effects, the Corps has consulted with the Florida State Historic Preservation Officer (SHPO) and the appropriate Federally recognized Tribes in accordance with Section 106 of the National Historic Preservation Act and consideration given under the NEPA. Within these consultation events, information has been sought to determine which resources exist within the project area and what, if any, effects the project could have on such resources. Pursuant to Section 101(d)(5) of the National Historic Preservation Act (NHPA), 54 U.S.C. § 302705, the Advisory Council on Historic Preservation (ACHP) has entered into an agreement with the Seminole Tribe to substitute the Tribe's Cultural Resource Ordinance, C01-16, for the ACHP's regulations for the review of undertakings on their tribal lands under Section 106 of the NHPA. Therefore, effects to historic properties within the portion of the APE located on Tribal Reservation lands have been determined by the Seminole Tribe's THPO.

4.19.1 Alternative 1: No Action Alternative

The No Action Alternative would maintain current operations within the project area. No historic properties effected as a result of Alternative 1.

4.19.2 Alternative 2: Maintain Optimum Canal Stages of 15.5 ft NGVD

Based on a hydraulic evaluation of Alternative 2, the APE with regards to cultural resources includes approximately 3,000 feet on either side of the North Feeder Canal and the West Feeder Canal (**Figure 4-1**). Ponding or an increase in surface water as a result of the operational change is not anticipated within the APE. Groundwater levels may increase adjacent to the canals; however, the groundwater elevation will rapidly recede (such that the majority of influence will be within the first 1,500 feet) as it propagates through the surficial aquifer and away from the canals. Therefore, cultural resources closest to the canal may experience higher groundwater table levels during the winter months; however, as the proposed operational change is a return to a previously utilized operational setting, groundwater levels resulting from the change are conditions that the area have been subject to in the past (i.e. 1967-1996 and 2012-2016).

Based on this evaluation, the Corps has determined that Alternative 2 will have no effect to historic properties within the portions of the APE that are located outside of the BCSIR. The Florida SHPO concurred with the determination of effect in a letter dated July 28, 2016, and the Seminole Tribe's THPO concurred with the determination in a letter dated July 22, 2016 (**Appendix B**). Pursuant to Cultural Resource Ordinance C01-16 and the ACHP's regulations for the review of undertakings on their tribal lands under Section 106 of the NHPA, the Seminole Tribe's THPO has determined in a letter to the Corps dated June 9, 2016 (**Appendix B**) that "No Cultural Resources will be Affected" and "No Historic Properties will be Affected" by Alternative 2 for those portions of the APE that are located within the BCSIR.

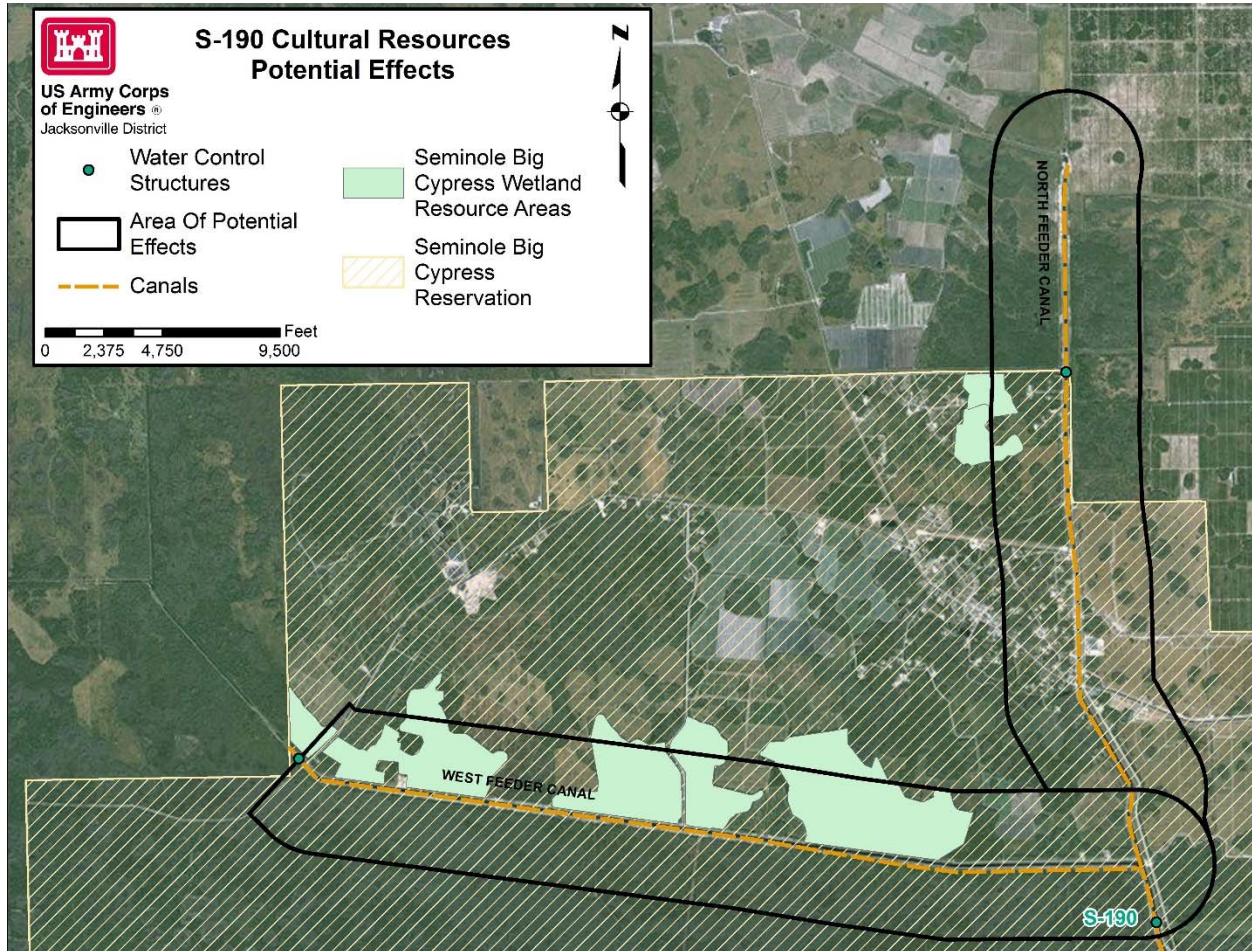


FIGURE 4-1. S-190 OPERATIONAL CHANGE AREA OF POTENTIAL EFFECTS FOR CULTURAL RESOURCES

4.19.3 Alternative 3: Maintain Optimum Canal Stages of 15.5 ft NGVD with Special Conditions

Implementation of Alternative 3 would result in similar effects as discussed under Alternative 2. No effects to historic properties with implementation of Alternative 3.

4.19.4 Alternative 4: Maintain Optimum Canal Stages of 15.8 ft NGVD with Special Conditions

Implementation of Alternative 4 would result in similar effects as discussed under Alternative 2. No effects to historic properties with implementation of Alternative 4.

4.19.5 Alternative 5: Maintain Optimal Canal Stages of 16.0 ft NGVD and includes Special Conditions

Implementation of Alternative 5 would result in similar effects as discussed under Alternative 2. No effects to historic properties with implementation of Alternative 5.

4.20 CUMULATIVE EFFECTS

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

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

Cumulative effects for the Proposed Action were assessed in accordance with guidance provided by the President's Council on Environmental Quality. The primary goal of cumulative effects analysis is to determine the magnitude and significance of the environmental consequences of the Proposed Action in the context of the cumulative effects of other past, present, and future actions. The following summarizes past, present, and projected Corps efforts that cumulatively affect the regional environment of south Florida. **Table 4-3** shows the net cumulative effects of the various resources which are directly or indirectly impacted.

The modifications to S-190 operating criteria are expected to contribute to a net beneficial cumulative effect on BCSIR and the regional ecosystem. The consequences of the Proposed Action would result in increased ground water levels in BCSIR and decreased restorative rainfall losses from BCSIR during the wet season. This would be a significant improvement for lands within BCSIR due to the cumulative effects of the undocumented change to the original S-190 operating criteria shown in the Master Water Control Manual for the WCAs, ENP, and ENP-SDCS, Volume 4 (Corps 1996), which lowered wet season canal stages by one foot for a period of up to 5 months during the wet season. S-190 was added to the C&SF Project for the purpose of protecting BCSIR from over-drainage, with the HW criteria set in the 1960s which was kept constant year-round (**Reference Section 1.2**). At some undetermined point, the operation of S-190 changed resulting in the over drainage of BCSIR for over 30 years. An EA was not performed by the Corps prior to 1996 to assess the environmental impact on BCSIR as a result of operational changes identified in the Master Water Control Manual for the WCAs, ENP, and ENP-SDCS, Volume 4 (Corps 1996). The Proposed Action would restore the original criteria and effectively reduce over-drainage of the western section of BCSIR as well as effects to the BCSIR natural lands and cultural practices.

4.20.1 Past, Present and Reasonably Foreseeable Actions Affecting Resources within the Project Area

4.20.1.1 C&SF Project System Construction

During the 1960s, the Corps constructed the C&SF system through BCSIR. Contiguous wetland systems were separated by canals and levees. The result of the canal system not only provided wide-spread drainage of surface water and ground water to the canals; the canal levees blocked surface water flows which used to flow overland following historic sloughs and natural elevation topography. The blockage of overland flows via the canal levees created and exacerbated flooding conditions as recognized in early design documents between the Corps and BIA.

4.20.1.2 Water Rights Compact among the Seminole Tribe, the State of Florida and the SFWMD

The Seminole Tribe, the State of Florida, and SFWMD entered into a Water Rights Compact which was enacted by Public Law 100-228, and Chapter 87-292, Laws of Florida and codified in Section 285.165, Fla. Stat. (Reference **Section 3.7** and **Section 4.24**). The Water Rights Compact entitles the Seminole Tribe to withdraw up to 3,917 acre-feet of water during any month for the BCSIR. The water rights entitlement is 47,000 acre-feet of water per year, divided into 12 equal monthly increments.

Pursuant to the 1996 Agreement between the Seminole Tribe and SFWMD (which was precipitated by the Everglades Construction Project), SFWMD agreed to provide replacement water supplies to offset diversion of the Seminole Tribe's entitlement amount. The SFWMD planned, designed and constructed surface water management system improvements (the G-409 Pump Station) for the purpose of delivering the water entitlement to BCSIR. The G-409 Operational Plan provides a G-409 Pump Operation Decision Tree as a means of determining whether or not G-409 should be pumped for the purpose of delivering the Tribe's entitlement water. The G-409 Operation Decision Tree does not take into account discharges at S-190 that could have been part of G-409 flows provided per the entitlement.

4.20.1.3 Seminole Big Cypress Reservation Water Conservation Plan

The Seminole Tribe Big Cypress Reservation Water Conservation Plan (WCP) project is a C&SF Ecosystem Restoration Critical Project. The Critical Projects were authorized by Section 528 of the Water Resources Development Act (WRDA) of 1996. The Critical Project portion referred to as the western project area (*i.e.* Basins 1-4), is authorized under the above referenced WRDA and is cost shared as indicated in that Act. The other portion of the Critical Project, referred to as the eastern portion (*i.e.* Basins 5-7) was to be authorized and funded under a separate authority and funded by the Natural Resources Conservation Service (NRCS); however due to extreme cost and the inability of Basins 1 and 4 to store water, the Seminole Tribe will not construct any basins after Basin 2 completion. The Corps reviewed an application for the entire project (seven basins) under Section 404 of the Clean Water Act. Permit SAJ-1998-00622 was issued July 16, 1999. The project was to provide a comprehensive water management system, improve water quality, retain surface waters for BCSIR irrigation, rehydrate and restore desiccated wetlands within BCSIR, and provide overland flow to lands south of the West Feeder Canal, eventually reaching BCNP.

The WCP integrates the use of field applied Best Management Practices, on-line surface water storage and existing swamp and marsh wetlands as treatment areas to reduce TP concentrations of surface waters leaving BCSIR. Phosphorous levels are expected to drop to 50 ppb or below as a result of filtering through both existing and enhanced wetland systems and through diversion and detention in newly created water management systems (*i.e.* WRA] Irrigation Storage Areas, Stormwater Reservoirs) constructed as part of WCP. The WRAs were designed to achieve 1 foot flow depths and a 9 month hydroperiod. This objective has not been met. During 2014-2015, the hydroperiod in Basin 1 was 3.5 months and was approximately 3 months for Basin 4. Irrigation Storage Areas were designed to achieve 4 foot water storage depths and a 6 month hydroperiod for irrigating pasture, citrus, and vegetable fields. Due to local geology and depressed ground water levels, the Irrigation Storage Areas did not hold any water. Irrigation cells were included in Basin 1 and were not included in Basin 4 and Basin 2 due to lack of performance and cost. Excess treated water was supposed to pass through BCSIR to BCNP Addition and the adjacent canal system; however the design of WRA 1 has the outlet to the Siphon (path to BCNP) higher than 2 outlets to the West Feeder Canal, therefore water levels are controlled in Basin 1 by the release to the West Feeder Canal. The water management systems were designed and located to allow for continued operation of the many separate land uses on BCSIR and to use degraded wetlands for storage and treatment of runoff. The WRAs and Irrigation Storage Areas are located around degraded wetland systems and were designed to rehydrate the impacted systems with the intent to enhance or re-establish better or more wetland systems on the Reservation.

The WCP is multipurpose in scope. The function of WRAs is to reduce phosphorous concentration levels in the runoff from BCSIR land before it is discharged to the receiving waters or used to help rehydrate downstream watersheds. The Irrigation Storage Areas provide an opportunity to store runoff for local use and to store a portion of those waters delivered to BCSIR under the Water Entitlement agreement. Irrigation Storage Areas also serve to provide a residual treatment function as settling basins for nutrient and solid removal. The Stormwater Reservoirs provide the ability to prevent flooding of BCSIR land by receiving and detaining excess runoff generated by large rainfall events and controlling releases to WRAs and receiving canals to reduce flood impacts both on BCSIR and in the offsite canals. The WCP was designed to provide protection against a 24-year, 72-hour flood event. The WCP also serves to restore more natural hydroperiods to wetlands on BCSIR, the native area (14,000 acres) located south of the West Feeder Canal and north of BCNP and ultimately ENP through Mullet Slough. Watershed management system conservatively designed to discharge water at 50 ppb TPA.

Construction of water management features in Basins 1 and 4 occurred in 2008 and 2013, respectively. Construction for Basin 2 is currently ongoing; contract required completion is expected within 2016. Representatives from the Seminole Tribe have requested removal of Basin 3 from the Critical Project by letter dated April 7, 2014. A map of WCP and Basins 1- 4 is shown in **FIGURE 4-2**. An Engineering Documentation Report and supporting National Environmental Policy Act documentation was prepared to remove Basin 3 from the WCP. The Corps will prepare a third Amendment to the Project Cooperation Agreement following approval of the Engineering Documentation Report by the District Commander. Execution of the Project Cooperation Agreement Amendment will remove Basin 3 from the project.

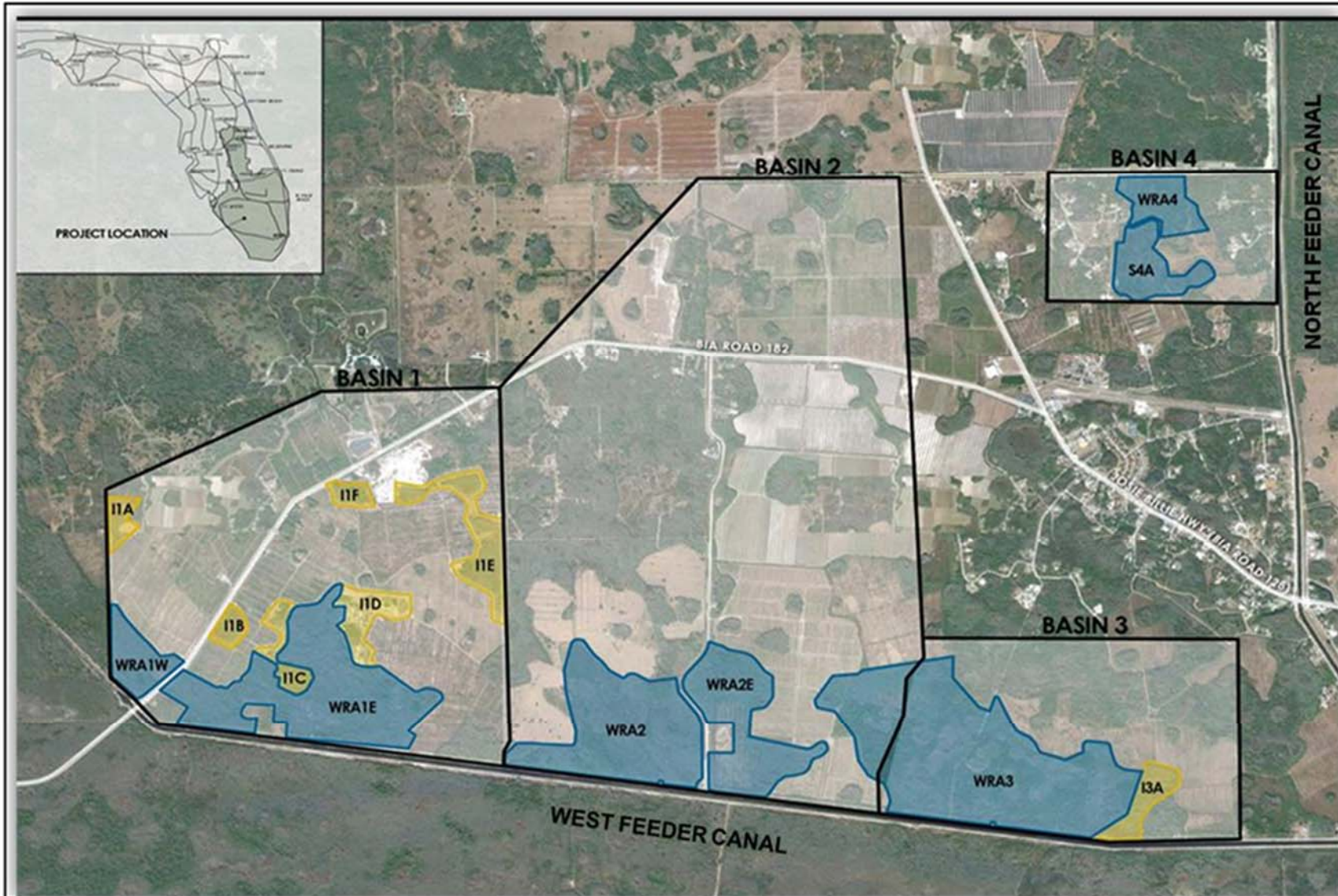


FIGURE 4-2. SEMINOLE BIG CYPRESS RESERVATION WATER CONSERVATION PLAN

4.20.1.4 Big Cypress/L-28 Interceptor Modifications

The L-28 Interceptor Modifications Project is a component of the Comprehensive Everglades Restoration Plan (CERP). The CERP component proposes modification of levees and canals, water control structures, pumps, and construction of stormwater treatment areas located within and adjacent to the Miccosukee and Seminole Indian Reservations in Collier and Hendry Counties (Corps 1999b). The Corps and the SFWMD as non-Federal sponsor anticipates initiating a planning effort which includes this CERP component in the summer of 2016.

4.20.1.5 Seminole Tribe Big Cypress Advanced Mitigation Program

The Big Cypress Advanced Mitigation Program (Corps Permit Number: SAJ-2004-3931) provides an on-site mitigation area authorized within the Native Area of the BCSIR. The Advanced Mitigation Program enhancement includes primarily exotic vegetation removal within six wetland enhancement areas totaling approximately 4,144 acres. Alterations to regional hydrologic patterns and heavy infestation by exotic species have resulted in the disruption of native plant associations and overall community structure, increasing the abundance and distribution of exotic vegetation within the Native Area. Historically, seasonal flows moved through the Native Area (generally from the northwest to the southeast) within the Kissimmee Billie and Little Lard Can slough systems and via overland sheetflow. Depressional areas would remain ponded throughout an average year while intervening strands and wet prairies would experience a “dry season” during which the water table receded below the ground surface. After the completion of the West Feeder and North Feeder Canals under the Central and Southern Flood Control District Administration, surface flow and water table regimes were significantly altered.

The Advanced Mitigation Program does not include construction or operation of a surface water management system. Hydrologic improvements integral to the Advanced Mitigation Program were proposed to result from the development and construction of water management facilities proposed under the Seminole Tribe Big Cypress Reservation WCP.

Corps Permit Number SAJ-2004-03931 provides the Seminole Tribe the general authority to discharge fill material on BCSIR for the following minor activities: single family home sites, utility lines, recreational facilities, boating, agricultural use, commercial use, government facilities, water control activities, ditch maintenance and road construction. Placement of fill material is authorized up to 50 acres of Federally jurisdictional wetlands per year, not to exceed a total of 100 acres of jurisdictional wetlands within BCSIR within a five year period. Mitigation requirements are satisfied by functional capacity credits generated under the Advanced Mitigation Program.

4.20.1.6 Western Basins Initiative and Water Resources Evaluation

In 2012, the Seminole Tribe issued a Minority View for inclusion in the South Florida Ecosystem Restoration Task Force 2012 Strategy and Biennial Report outlining the Seminole Tribe’s long-standing concerns for natural systems in the western basins of the Everglades and the lack of attention to this region by the State and Federal Governments. The Seminole Tribe expressed restoration goals as providing enough water to BCSIR and BCNP to allow rehydration of the natural systems and to restore a healthy, diverse ecosystem sooner than later. They also wanted to ensure that any proposed projects were consistent with the purpose of the Critical Restoration Project. In response, the South Florida Ecosystem Restoration Task Force convened a smaller

subset of agencies to address the issues raised by the Seminole Tribe. Specifically the Seminole Tribe voiced concerns that changes have been visible during the lifetime of current Tribal members and that Seminole Tribe cultural values are threatened by the ecological degradation of these systems. Some elements of the ecosystem have been reported as either having changed significantly or disappeared altogether, including mudpuppies, fireflies, cypress heads and quail. Tribe members also expressed that land that used to be healthy dark soil is now dust under their feet. This initiative has been incorporated into the Corps Integrated Delivery Schedule and is currently scheduled to commence in 2016.

SFWMD is currently conducting a water resources evaluation study in the Western Basins Region (**Figure 1-1**) to identify opportunities for future potential hydrologic and water quality improvements. The Western Basins Region is defined as lands and water bodies within the Feeder Canal Drainage Basin, the C-139 Annex Drainage Basin and the L-28 Interceptor Drainage Basin. The region is located adjacent to the western edge of the EAA, northwest of WCA 3A, south of the C-139 Drainage Basin and north of the BCNP in southeastern Hendry County and northwestern Collier County. Land use in the Western Basins is a mix of citrus farming, cattle ranching and “natural” lands. The water resources in these basins have been moderately developed and include water supply and drainage augmentations. There have been several recent and ongoing efforts in the Western Basins Region to improve water resources such as the completed expansion of the SFWMD Storm Water Treatment Area 5/6 and the current Sam Jones/Abiaki Prairie (C-139 Annex Restoration Project) initiative to restore citrus to natural wet prairie habitat. Additionally, a future State of Florida’s Restoration Strategies project, the C-139 Flow Equalization Basin, will attenuate peak stormwater flows from the C-139 basin prior to treatment in Storm Water Treatment Area 5/6.

The water resources evaluation study will specifically focus on the Feeder Canal Basin and the C-139 Annex. The Feeder Canal Basin, for purposes of this study, is divided into a western portion for flows through the Feeder Weir structure into the West Feeder Canal and an eastern portion for flows through the PC17A structure into the North Feeder Canal. For the C-139 Annex, the study will identify methods to quantify the improvements in water quality leaving the C-139 Annex and flowing through the USSO structure into the L-28 Canal as a result of the ongoing restoration initiative. The primary objectives are: 1. Identify and acquire the additional data needed to facilitate hydrologic modeling of various project alternatives that could be matched with State or Federal funding opportunities; 2. Quantitative estimation of potential water quality benefits as a result of “Best Management Practices” and/or local structural improvements and sub-regional options; 3. Predictive and quantitative estimation of water quality improvements in discharges from the C-139 Annex as a result of restoration efforts; and 4. Identify potential opportunities to link State and Federal funding with identified project alternatives.

(SFWMD;http://www.sfwmd.gov/portal/page/portal/xrepository/sfwmd_repository_pdf/spl_western_basin.pdf).

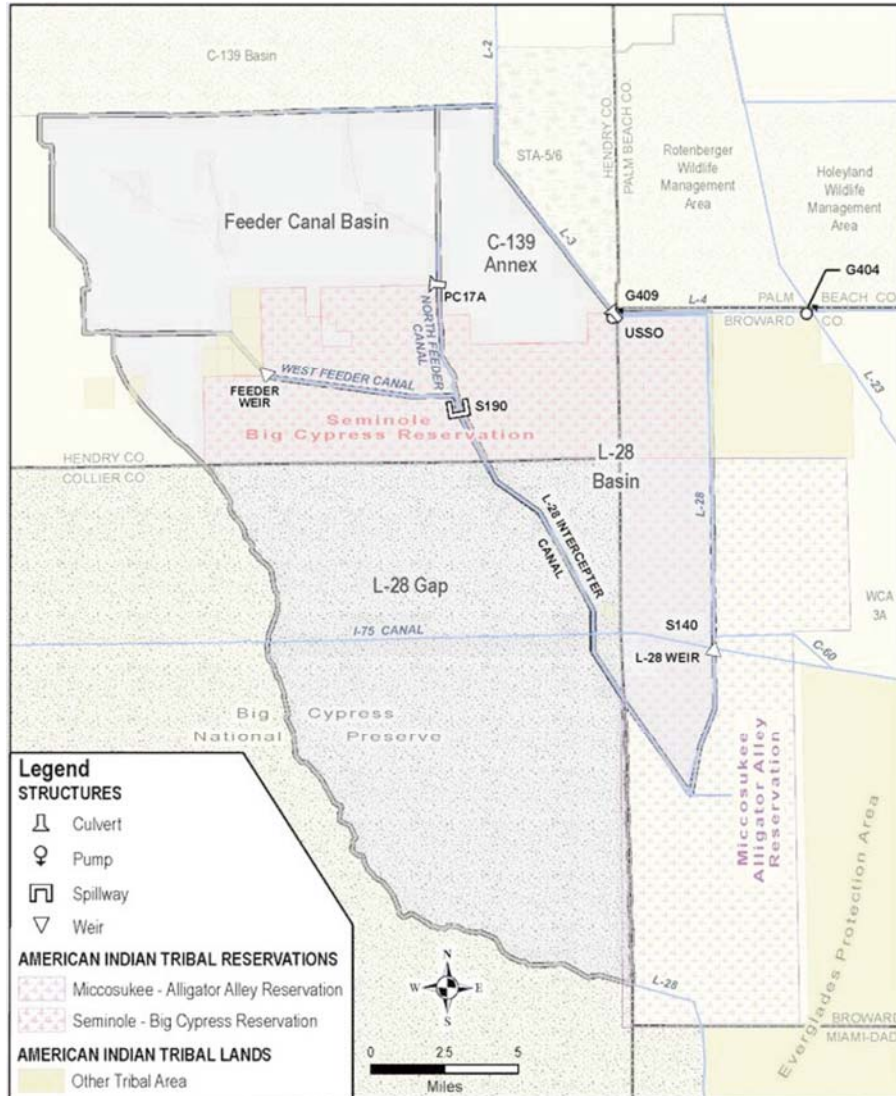


FIGURE 4-3. LOCATION MAP FOR SFWMD WESTERN BASINS WATER RESOURCES EVALUATION (SOURCE: SFWMD).

TABLE 4-3. SUMMARY OF CUMULATIVE EFFECTS

Hydrology	
Past Actions	C& SF flood and water control projects and SFWMD regional water supply/management projects have greatly altered the natural hydrology.
Present Actions	Federal and State agencies and Tribal representatives are coordinating on and implementing projects to improve hydrology
Proposed Action	Hydroperiods with BCSIR are expected to improve under implementation of the Proposed Action.
Future Actions	Additional projects such as Western Basins Water Resources Evaluation, CERP: Big Cypress/L-28 Modifications and Western Basins Initiative if designed to address BCSIR specific needs may also improve ecological conditions within BCSIR.
Cumulative Effect	Although it is unlikely that natural hydrologic conditions would be fully restored to pre-drainage conditions, improved hydrology would occur as a result of decreasing over drainage related to current S-190 operations. In addition, CERP is expected to improve the quantity, quality, timing and distribution of freshwater flow.

Threatened and Endangered Species	
Past Actions	Water management practices and urbanization have resulted in the degradation of existing habitat function and direct habitat loss leading to negative population trends of threatened and endangered species.
Present Actions	Many of the threatened and endangered species within the project area have been previously affected by habitat impacts resulting from wetland drainage, alteration of hydroperiod, wildfire, and water quality degradation.
Proposed Action	The Corps has determined that the Proposed Action may affect, but is not likely to adversely affect, Florida panther, Florida bonneted bat, Everglade snail kite and wood stork; and will have no effect on the Florida manatee and its associated critical habitat and designated critical habitat for the Everglades snail kite, Audubon's crested caracara and eastern indigo snake. Species determinations are listed in Table 4-1 .
Future Actions	Ongoing projects would be implemented to maintain threatened and endangered species within the project area.
Cumulative Effect	Habitat improvement, monitoring and management of threatened and endangered species are anticipated to allow populations to be maintained. Improvement of degraded populations is expected to be facilitated by the restoration and enhancement of suitable habitat through efforts to restore more natural hydrologic conditions within the project area.
Fish and Wildlife Resources	
Past Actions	Water management practices have resulted in aquatic vegetation community changes and a resultant disruption of aquatic productivity and function that has had repercussions through the food web, including effects on wading birds, large predatory fishes, reptiles and mammals.
Present Actions	Ongoing efforts have been made by Federal and State agencies and Tribal representatives to implement projects to improve hydrology within the project area to restore habitat conditions for fish and wildlife resources.
Proposed Action	Increases in forage prey availability (<i>i.e.</i> crayfish and other invertebrates, fish) resulting from improved hydroperiods would in turn provide beneficial effects for amphibian, reptile, small mammal, and wading bird species within BCSIR.
Future Actions	Some level of improvement to fish and wildlife resources is expected to occur as a result of implementation of projects with the capability of improving the timing, quantity, quality and distribution of freshwater flow to the study area. Hydrologic restoration planned as part of CERP would further improve fish and wildlife habitat.
Cumulative Effect	Habitat improvement efforts are anticipated to benefit fish and wildlife resources.
Vegetation and Wetlands	
Past Actions	The continued over drainage of BCSIR has reduced the spatial extent and quality of wetland resources.
Present Actions	Efforts are being taken by State and Federal regulatory agencies and Tribal representatives to reduce wetland losses.
Proposed Action	Increased hydroperiods within the native wetland vegetation communities may act to alleviate some of the problems associated with drier conditions. The Proposed Action may have a permanent minor to moderate beneficial effect on vegetative communities within BCSIR.
Future Actions	Some level of improvement to vegetative communities is expected to occur as a result of implementation of projects with the capability of improving the timing, quantity, quality and distribution of freshwater flow to the study area. More natural hydrology as part of the CERP would assist in restoring natural plant communities.
Cumulative Effect	While the spatial extent of natural plant communities would not be restored to historic proportions, the quality of vegetative communities would be improved.
Water Quality	
Past Actions	Water quality has been degraded primarily from agricultural development in lands upstream of BCSIR.

Present Actions	Efforts to improve the quality of water discharged from agricultural areas have been undertaken in the C-139 Basin and Feeder Canal Basin. These efforts target reduction of agriculturally related nutrient loading. The Seminole Tribe has cost shared with the Corps to construct the Critical Restoration Project in an attempt to improve water quality and provide overland flow to BCNP.
Proposed Action	The Proposed Action should result in some improvement of the quality of water discharged through the S-190 structure due to enhanced retention and detention of rainfall runoff upstream of the S-190 structure. Seasonally increasing the operating stage at S-190 is likely to result in some shift in proportions of flow and nutrient load that occur in the wet and dry seasons. This seasonal shift in flow and nutrient loading proportions is not anticipated to adversely affect either upstream or downstream ecosystems since overall loads will be reduced.
Future Actions	Continued improvement in water quality is anticipated due to continued implementation of best management practices on upstream farm land and possible construction of on-farm Stormwater treatment areas.
Cumulative Effect	While anthropogenic effects on water quality are unlikely to be eliminated, water quality is expected to slowly improve. Corps and SFWMD are committed to ensuring that project feature implementation will not result in violations of water quality standards.

4.21 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

An irreversible commitment of resources is one in which the ability to use and/or enjoy the resource is lost forever. One example of an irreversible commitment might be the mining of a mineral resource. An irretrievable commitment of resources is one in which, due to decisions to manage the resource for another purpose, opportunities to use or enjoy the resource as they presently exist are lost for a period of time. An example of an irretrievable loss might be where a type of vegetation is lost due to road construction. The Proposed Action consists of an operational change to the Master Water Control Manual for WCAs, ENP, and ENP-SDCS, Volume 4 (Corps 1996) and does not include construction of permanent structures or structural modifications to existing C&SF Project features. Resources to be committed include the expenditure of funding, energy, and labor. The Proposed Action would not cause the permanent removal or consumption of any natural resources.

4.22 UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

Environmental effects for each resource are discussed in **Section 4.0**. Implementation of the Proposed Action is not expected to result in unavoidable adverse environmental effects and is expected to result in beneficial environmental effects to BCSIR.

4.23 CONFLICTS AND CONTROVERSY

At this time, there is no known conflict or controversy associated with the Proposed Action. The Corps continually strives to include all interested parties in its decision making process and will continue to consider all issues that arise. Comments received during the review period of this EA and proposed FONSI will be addressed and included in the final document.

4.24 ENVIRONMENTAL COMMITMENTS

Mitigation of environmental impacts is appropriately discussed in terms of avoidance, minimization, and compensatory actions that reduce or offset the negative environmental impacts resulting from an action. Implementation of the Proposed Action is not expected to result in environmental impacts that would require mitigation.

Current operations at S-190 are based on the Master Water Control Manual for the WCAs, ENP, and ENP-SDCS, Volume 4 (Corps 1996). Additional monitoring is not necessary to assess the Proposed Action at S-190. Currently water managers from the Corps and SFWMD monitor the weather patterns within the area and the water levels within the watershed (*i.e.* Feeder Canal Basin) 24 hours a day. The SFWMD will operate the major water control structures within the Feeder Canal Basin to ensure there are no impacts to flood control and water supply missions.

The Seminole Tribe will also continue monitoring, currently being conducted as reflected in the commitments summarized below. Information summarized below includes those pertinent to the scope of the Proposed Action and does not include an exhaustive list of monitoring actions currently being conducted by the Seminole Tribe with regard to other projects.

Federally Approved Water Quality Standards

The Seminole Tribe has a Federally approved Water Quality Standards Program, authorized by the Clean Water Act that protects designated uses of classified water bodies within BCSIR. The Water Quality Program requires monitoring, assessment and reporting to the USEPA on an annual basis. The Seminole Tribe has fixed station water quality sampling points within BCSIR and obtains water quality samples at a minimum bi-weekly (*i.e.* twice a month) frequency to ensure compliance with Tribal and State water quality standards. The Seminole Tribe also utilizes surface water flow and ground water level data within the water quality assessment. The Seminole Tribe contracts with the United States Geological Survey (USGS) for the operation and maintenance of surface water gauging sites within BCSIR, uses flow data from the SFWMD's publically available database DBHYDRO, and monitors ground water levels in Tribal, USGS and SFWMD wells. The Seminole Tribe continues ecological assessments and has agreed with USEPA to develop numeric nutrient criteria standards by the year 2017 to protect the biological integrity of the Tribe's natural resources.

Water Rights Compact Among the Seminole Tribe, the State of Florida and the SFWMD

The Seminole Tribe, State of Florida and SFWMD entered into a Water Rights Compact, enacted by Public Law 100-228, and Chapter 87-292, Laws of Florida and codified in Section 285.165, Fla. Stat. (Reference **Section 3.7**). Pursuant to Section D of Part VI of the Compact, the Seminole Tribe is entitled to surface water resources of the South Hendry County/L-28 Gap Water Use Basin, as the lands of BCSIR bear to the total land acreage within the basin. Pursuant to Section C of Part VII of the Compact, the Tribe and the SFWMD entered into an agreement in 1996 ("1996 Agreement") which includes provisions for water quality and water quantity issues within BCSIR. The 1996 Agreement requires periodic monitoring of surface water quality entering, originating on, and leaving BCSIR to ensure compliance with applicable water quality standards and that surface water quality within BCSIR is not adversely impacted.

Pursuant to the 1996 Agreement, a semiannual report is prepared by SFWMD that analyzes and summarizes water quality and flow data. USGS surface water sites are utilized within this reporting to represent water quality and quantities exiting BCSIR. The Seminole Tribe provides water quality data to SFWMD annually for use in the annual Total Phosphorus Load Calculation Report for sites stipulated in the SFWMD/Seminole Tribe Agreement. Section 4.b of the 1996

Agreement identifies the District's responsibility to operate S-190 in a manner which minimizes discharges of water exceeding 50 ppb of phosphorus; when water deliveries to BCSIR exceed 50 ppb.

Seminole Tribe's Water Rights Entitlement

In 1998, the SFWMD produced the Seminole Big Cypress Entitlement Report per the Compact and 1996 Agreement. The water rights entitlement was calculated using surface water flows in the conditions as they existed during 1987-1988 which was during a period when SFWMD held S-190 at 14.25 feet NGVD year round for over 3 years in a row. The water rights entitle the Seminole Tribe to withdraw up to 3,917 acre-feet of water during any month. The water rights entitlement is 47,000 acre-feet of water per year, divided into 12 equal monthly increments. The Seminole Tribe does not utilize entitlement water during wet conditions when additional water is not required. Therefore, the monthly limit condition of the annual entitlement amount prevents the Tribe from accessing the full entitlement on an annual basis. In addition, regional water management operations by SFWMD consistently effect an overall net annual water loss from BCSIR, regardless of entitlement waters accessed. USGS surface water gages and SFWMD structures are monitored by the Tribe to evaluate the provision by the State of the Tribe's entitlement waters.

1996 Landowner Agreement between the Seminole Tribe and the McDaniel Ranch Establishing Water Quality Criteria for Waters Entering BCSIR, Best Management Practices and a Comprehensive Water Quality/Quantity Monitoring Program for the McDaniel Ranch and other Matters and Subsequent Amendments

The objective of the agreement was to outline strategies for the above mentioned parties to reduce the level of phosphorus in stormwater runoff releases from McDaniel's Ranch. The McDaniel's Ranch compliance target phosphorus concentration of 50 ppb was to be achieved by May 12, 1999; after which compliance was based on 12 month rolling average and is part of SFWMD Consent Order SFWMD 98-114. The 2015 SFWMD SFER indicates non-compliance of the 50 ppb target for all years identified except for one (a drought year).

Seminole Big Cypress Water Conservation Plan

A Department of Army Permit (Permit SAJ-1998-00622) was issued to the Seminole Tribe for the Seminole Tribe Big Cypress Reservation WCP (Reference **Section 4.20.1.1** and **FIGURE 4-2**) on July 16th, 1999. The authorized permit requires annual monitoring of vegetation, hydrology, exotic/nuisance species, water quality, and wildlife with each basin (*i.e.* Basins 1-4) as outlined in the Wetland Management Plan. Monitoring with respect to threatened and endangered species is also required and is outlined within USFWS Biological Opinion (BO) for the project dated June 11, 1999 (Service Number 4-1-98-F-398). The Seminole Tribe will continue associated WCP monitoring in accordance with Corps permit reporting requirements (Permit SAJ-1998-00622) and the 1999 USFWS BO.

4.25 COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS

4.25.1 National Environmental Policy Act of 1969

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

4.25.2 Endangered Species Act of 1973

The Corps requested written confirmation of Federally listed threatened and endangered species that are either known to occur or are likely to occur within the project area from USFWS by letter dated February 9, 2015. USFWS provided a revised list of listed species on February 11, 2015. Confirmation of listed species occurred on June 3, 2015 and January 4, 2016. Informal consultation was initiated with USFWS on May 9, 2016 with submission of a complete initiation package (**Appendix B**). USFWS reviewed the information provided and found that the Proposed Action is not likely to adversely affect any federally listed species or designated critical habitat protected by the Endangered Species Act (ESA) by correspondence dated July 18, 2016. Requirements of Section 7 of the ESA have been fulfilled.

4.25.3 Fish and Wildlife Coordination Act of 1958, as amended

The Proposed Action has been fully coordinated with USFWS and Florida Fish and Wildlife Conservation Commission. In response to the requirements of the Act, the Corps has and will continue to maintain continuous coordination with Federal and State wildlife agencies. The Proposed Action is in full compliance with the Act.

4.25.4 National Historic Preservation Act of 1966 (INTER ALIA)

The Proposed Action is in compliance with Section 106 of the National Historic Preservation Act, as amended (Public Law 89-665). As part of the requirements and consultation process contained within the National Historic Preservation Act implementing regulations of 36 CFR 800, this project is also in compliance through ongoing consultation with the Archaeological and Historic Preservation Act, as amended (Public Law 93-29), Archeological Resources Protection Act (Public Law 96-95), American Indian Religious Freedom Act (Public Law 95-341), Native American Graves Protection and Repatriation Act (NAGPRA, Public Law), Executive Order 11593, 13007, and 13175, the Presidential Memo of 1994 on Government to Government Relations, the Seminole Tribe of Florida's Cultural Resource Ordinance C01-16, and appropriate Florida Statutes. Consultation with the Florida State Historic Preservation Office, appropriate Federally recognized Tribes, and other interested parties has been initiated. The Florida SHPO concurred with the determination of no effect on those portions of the APE that are located outside of the BCSIR in a letter dated July 28, 2016, and the Seminole Tribe's THPO concurred with the determination in a letter dated July 22, 2016. Pursuant to Cultural Resource Ordinance C01-16 and the ACHP's regulations for the review of undertakings on their tribal lands under Section 106 of the NHPA, the Seminole Tribe's THPO has determined in a letter to the Corps dated June 9, 2016 that "No Cultural Resources will be Affected" and "No Historic Properties will be Affected" for those portions of the APE that are located within the BCSIR. The Proposed Action is in compliance with the goals of this Act.

4.25.5 Clean Water Act of 1972

The Proposed Action is in compliance with this Act. This test will be coordinated with the State of Florida to determine CZMA consistency. The Corps normally obtains water quality certification from the delegated authority prior to constructing civil works projects. This project does not include any construction activities so the Corps anticipates that water quality certification will not be required for any of the proposed changes to operations.

4.25.6 Clean Air Act of 1972

The Proposed Action is being coordinated with the State of Florida. No air quality permits are required for this project. The Proposed Action is in compliance with this Act.

4.25.7 Coastal Zone Management Act of 1972

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

4.25.8 Farmland Protection Policy Act of 1981

Correspondence with the United States Department of Agriculture and NRCS occurred on March 30, 2016 (**Appendix B**). The USDA-NRCS is responsible for monitoring the conversion of Prime, Unique, or Locally Important Farmland to urban areas. The NRCS has determined that there are delineations of Important Farmland soils within the scope of this project. However, based on correspondence from the Corps, there will be no anticipated conversion of Important Farmland within the scope of the project.

4.25.9 Wild and Scenic River Act of 1968

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

4.25.10 Marine Mammal Protection Act of 1972

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

4.25.11 Estuary Protection Act of 1968

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

4.25.12 Federal Water Project Recreation Act of 1965, as amended

The principles of the Federal Water Project Recreation Act, (Public Law 89-72) as amended, are not applicable to the Proposed Action.

4.25.13 Fishery Conservation and Management Act of 1976

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

4.25.14 Submerged Lands Act of 1953

The Proposed Action would not occur on submerged lands of the State of Florida. The Proposed Action is in compliance with the Act.

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

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

4.25.16 Resource Conservation and Recovery Act, As Amended by the Hazardous and Solid Waste Amendments of 1984, Comprehensive Environmental Response Compensation and Liability Act, Toxic Substances Control Act of 1976

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

4.25.17 Rivers and Harbors Act of 1899

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

4.25.18 Safe Drinking Water Act of 1974, As Amended

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

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

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

4.25.20 Anadromous Fish Conservation Act

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

4.25.21 Migratory Bird Treaty Act and Migratory Bird Conservation Act

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

4.25.22 Marine Protection, Research and Sanctuaries Act

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

4.25.23 Magnuson-Stevens Fishery Conservation and Management Act

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

4.25.24 E.O. 11990, Protection of Wetlands

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

4.25.25 E.O. 11988, Floodplain Management

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

4.25.26 E.O. 12898, Environmental Justice

E.O. 12989 provides that each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority or low income populations. The Proposed Action would not result in disproportionately high and adverse human health or environmental effects on minority populations and low-income populations. The Proposed Action is in compliance with this E.O.

4.25.27 E.O. 13089, Coral Reef Protection

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

4.25.28 E.O. 13112, Invasive Species

The Proposed Action would have no significant impact on invasive species. The Proposed Action is in compliance with the goals of this E.O. It is anticipated that with implementation of the Proposed Action, that hydroperiods would improve, thereby, assisting to reduce spread of exotic vegetation with BCSIR.

4.25.29 E.O. 13045, Protection of Children

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

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

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

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

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

4.25.31.1 E.O. 13175. Presidential Memorandum on Tribal Consultation

E.O. 13175 reaffirms the Federal government's commitment to Tribal sovereignty, self-determination, and self-government. Its purpose is to strengthen the United States government-to-government relationships with Indian Tribes and ensure that all executive departments and agencies establish regular and meaningful consultation with Indian Tribes and respect Tribal sovereignty as they develop policy on issues that impact Indian communities. E.O. 13175 directs that agencies respect treaty rights and grants wide discretion to Tribes in self-governance and the development of Tribal policy. Further, this E.O. directs each agency to develop a consultation process. The Corps has consulted with the Miccosukee Indian Tribe of Florida and the Seminole Tribe during the National Environmental Policy Act process for the Proposed Action. The Proposed Action is in compliance with the goals of this memorandum.

5 LIST OF PREPARERS

TABLE 5-1. TABLE OF PREPARERS

Name	Organization	Role in Document Preparation
Melissa Nasuti	Corps	Report Preparation
Tiphanie Jinks	Corps	Project Management
Dave Weston	Corps	Report Preparation Operations
Jaime Graulau-Santiago	Corps	Report Preparation Hydrology and Modeling
Ravindranath Ramnath	Corps	Report Preparation Hydrology and Modeling
Mark Shafer	Corps	Report Preparation Water Quality
Brittany Berger	Corps	Office of Counsel
Meredith Moreno	Corps	Report Preparation Native Americans and Cultural Resources

6 PUBLIC INVOLVEMENT

6.1 SCOPING AND EA

This EA and Proposed FONSI will be circulated for a 60-day review period to agencies, organizations, and other interested stakeholders. Comments received during this review period will be used in determining whether a FONSI is appropriate or an Environmental Impact Statement is warranted. Comments received during this review period will be addressed and included in the final document.

6.2 AGENCY COORDINATION

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

6.3 LIST OF RECIPIENTS

Copies of notice of availability and the EA and proposed FONSI were mailed to a list of interested parties. Recipients included Federal and State agencies, Tribal representatives, environmental groups, adjacent land owners and members of the general public. A complete mailing list is available upon request. The EA and proposed FONSI will be posted to the internet at the following address under:

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

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