APPENDIX C – COORDINATION ACT REPORT

United States Department of the Interior

FISH AND WILDLIFE SERVICE
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IN REPLY REFER TO:
FWS/R4/ES-JAFL

May 22, 2003

Mr. James C. Duck
Chief, Planning Division
U.S. Army Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232

Attn: Ms. Catherine Byrd

Dear Mr. Duck :

Please find enclosed a copy of the Final Fish and Wildlife Coordination Act Report regarding the Proposed Modifications to Project Features North of the Fellsmere Grade, Upper Saint Johns Basin and Related Areas, Brevard County, Florida. Please contact Don. Palmer at 904/232-2580, ext. 115 if you have questions regarding the report.

Sincerely,

Don Palmer

for Peter M. Benjamin
Assistant Field Supervisor

PROPOSED MODIFICATIONS TO PROJECT FEATURES NORTH OF THE FELLSMERE GRADE

CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL PROJECT

UPPER ST. JOHNS RIVER BASIN AND RELATED AREAS, BREVARD COUNTY, FLORIDA

PREPARED BY
U.S. FISH AND WILDLIFE SERVICE
JACKSONVILLE FIELD OFFICE

MAY 22, 2003

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1.0 PROJECT AUTHORITY

The flood control plan for the Upper St. Johns River Basin (USJRB) was authorized by the Flood Control Act of September 1954 (Public Law 780, 83rd Congress, 2nd Session) as part of the Comprehensive Plan for Flood Control and other Purposes for Central and South Florida.

1.1 PROJECT HISTORY

The flood control plan for the USJRB was authorized by the Flood Control Act of September 1954. Project design changes occurred in 1957, 1962 and 1969. Construction of the flood project was started in 1966, but halted in 1972, pending preparation of a more comprehensive Environmental Impact Statement (EIS). In 1974, the State of Florida withdrew its support of the project over environmental concerns, and construction of the project was halted indefinitely. In 1978, the St Johns River Water Management District (SJRWMD) rejected the concepts of the preceding plan and construction efforts due to environmental concerns and initiated development of a new conceptual water management plan for the USJRB. The plan was completed in 1980 and submitted to the Army Corps of Engineers (Corps) for technical review. The Corps was asked to undertake a design review of the final plan in 1983. In June,1985, Part III, Upper St. Johns River Basin and Related Areas; Supplement 2, General Design Memorandum (GDM), Upper St. Johns River Basin Addendum III with Draft Environmental Impact Statement (DEIS) recommended Federal action that should be taken with regard to both the constructed, and unconstructed portions of the authorized plan. The Corps approved the plan in 1986 and construction of the Upper Basin Project resumed in 1988. Currently nearly all project features south of the Fellsmere Grade are complete; including perimeter levee (L-74N) surrounding the Three Forks Marsh Conservation Area (14,000 acres) (TFMCA) (Figure 1)[1].

In the 1985 GDM, the TFMCA was included under the section describing plan components north of the Fellsmere Grade. The proposal called for hydrologically connecting TFMCA with

[1]The figure and table numbers throughout this report refer to the figure and table numbers in the FEIS, and are not included in this report. Please refer to the FEIS to review the figures and tables.

the St. Johns Marsh Conservation Area (SJMCA) immediately to the west. As a result of soil subsidence in TFMCA, the GDM did acknowledge that overdrainage in the SJMCA would result. The GDM proposed to create a series of small gaps in the existing levee separating the two areas, and placing plugs in Canal C-40 to divert water through these gaps in order to ensure appropriate flooding of the SJMCA. However, more detailed hydrologic modeling indicated that even with a series of gaps and plugs, there was still the potential for overdrainage of the SJMCA during low water periods. As a result, the SJRWMD designed another alternative (preferred alternative in the DEIS) that would not lead to overdrainage of the SJMCA.

1.2 PROPOSED ACTION

The objectives of the proposed modifications are to restore, preserve and enhance floodplain and aquatic habitats, improve water quality, provide for improved conveyance of water discharged downstream through structures S-96B and S-96C, and decrease the threat of significant freshwater discharges to the Indian River Lagoon via C-54. A more specific environmental goal for the TFMCA is to maximize the marsh acreage restored while maintaining the recreational fishery that is expected to develop in the deeper flooded areas.

To meet the objectives stated above, the SJRWMD proposes several actions. These actions consist of separating the discharges from S-96B and C so S-96B discharges into TFMCA while S-96C continues to discharges directly into the SJMCA. The TFMCA will operate as a single unit. An existing channel downstream from S-96B will be improved to provide a getaway channel from the structure. This channel will be separated from the rest of TFMCA marsh by a low berm to reduce potential negative water quality impacts to the wetlands at the south end of TFMCA. Unregulated outlfows from TFMCA to the SJMCA will occur over a 600-foot-long weir with a crest elevation at 20 feet (ft). NGVD located near River Mile 273 (Northwest corner of TFMCA). Proposed Structure S-257 will include two gated; 60-inch culverts. When water levels in the TFMCA are below the crest height of the weir, S-257 will remain fully open until water levels fall to 19.0 ft NGVD. When water levels reach 19.0 ft NGVD, discharges through S-257 will be reduced 20 percent per day for five days until the structure is closed.

The TFMCA will be managed separate from SJMCA. The two areas must be kept separate because ground elevations are lower in TFMCA than SJMCA. Ground elevations in the TFMCA vary between 13.0 and 20.0 ft. NGVD. As a result of the soil subsidence, the entire TFMCA cannot be restored to a shallow marsh. Instead, an impounded lake (average depth exceeding five feet) will be created in the northern half of the TFMCA and marsh will be (restored) to the south. Based on the stage-area curve for the TFMCA, the lake will be about 11,900 acres in size and the emergent marsh about 1,500 acres. The elevation break point between lake and marsh is 17.5 ft. NGVD.

Hydrologic criteria established for the TFMCA:

- The inundation frequency of the 18.0 ft NGVD elevation should be at least 60 percent. This will allow for the establishment and maintenance of wetland plant communities in the southern part of the TFMCA and will prevent further soil subsidence.

- The 17.0 ft NGVD elevation should be exposed for at least 60 continuous days every 5 to 10 years. The 17.5 ft. elevation should be exposed for at least 30 continuous days every 2 to 5 years. This allows for germination of some desirable wetland plants and for the other ecological benefits of marsh drawdown (e.g. enhanced wading bird foraging) .

- Timing of fluctuation should be such that minimum water levels occur between April 1 and June 30 in more than 50 percent of the years and maximum water levels occur between September 1 and November 31 in more than 50 percent of the years. This restores the natural seasonal variability of water level fluctuations.

- Stage recession rates should not exceed 1.2 ft. during any 30-day period or exceed 0.5 ft. during any 7-day period when stages are less than 19.0 ft NGVD. This ensures natural water level recession rates are maintained.

- The 16.5 ft. NGVD elevation should be inundated at least 95 percent of the time. Water levels should not fall below 16.0 ft NGVD more frequently than once every 4 years. This criterion is required to protect the integrity of the sport fishery in the TFMCA that will develop as a result of this project. The Fish and Wildlife Conservation Commission (Commission) recommended that minimum average water depth not fall below 3.0 ft. At an elevation of 16.5 ft. NGVD, about 1,650 acres will have depths exceeding 3.0 ft.

2.0 ALTERNATIVES

2.1 OBJECTIVES

The foremost objective of the Upper St. Johns River Basin Project is to provide flood control. The TFMCA will help meet this goal by adding nearly 14,000 additional acres that can be used for stormwater storage to the project. In addition, the TFMCA will help increase the floodwater conveyance capacity of the flood control structures that regulate water levels south of the Fellsmere Grade. When not being used to provide flood control benefits, the primary goal for the TFMCA is to provide high quality wetland and lacustrine habitat.

Because most of the lands that drain into the eastern side of the basin and ultimately into the TFMCA are under agricultural production there are water quality issues, primarily with regards to phosphorous. The natural marshes of the Upper St. Johns were historically oligotrophic and thus extremely sensitive to increased nutrient levels. The water management areas that ultimately drain into the TFMCA are designed and managed to significantly reduce phosphorous loading to the basin from agricultural runoff. While these areas meet nutrient reduction targets, phosphorous concentrations in water discharged into the TFMCA may still be sufficient to cause undesirable impacts to natural wetlands.

The preferred alternative will create a large shallow lake that will be able to assimilate a higher concentration of phosphorous than wetlands without detrimental impacts. This occurs in part because nutrient loads are distributed over the entire lake area rather than concentrated near the

inflow point as occurs when nutrients are discharged into wetlands. The preferred alternative will route S-96B discharges directly to the lake and segregate these discharges from restored wetlands. This will help restore and maintain the low-nutrient status of the marsh and meet habitat quality goals for the TFMCA. An important objective for this project is to restore the marshes of the USJRB, and using the marsh to "clean" runoff, would in effect, defeat this objective.

One other important benefit of the TFMCA is that improved floodwater conveyance capacity through S-96B and S-96C will reduce the need to discharge storm water through Canal C-54 that flows into the Indian River Lagoon (IRL), via Turkey Creek. In the past, pulses of nutrient-rich freshwater into the lagoon as a result of major storm events have been identified as a pollutant that has adversely affected submerged aquatic vegetation as well as caused declines in commercially important shellfish populations.

2.2 THE FOUR CONFIGURATIONS

The FEIS discusses six alternatives, but in reality, four alternatives are being seriously considered. They are, the GDM or No Action, the 18.5 Alternative, the Isolated Wetland and the Preferred Alternative. Each of these alternatives is discussed below.

The GDM or No Action Alternative:

The no action alternative involves construction of the project basically as detailed in the 1985 GDM (Figure 9). For this alternative, structures S-96B and S-96C would continue to discharge into Canal C-40. The internal levee separating the TFMCA from the SJMCA would be gapped in several places to allow equalization of water levels between the two areas during high water conditions. Structure S-257 would remain a single, 72-inch culvert.

The 18.5 Alternative

Under this, and all subsequent alternatives considered, an additional 2,400 acres of land adjacent to the project that has been purchased by the SJRWMD since the GDM was first published has been included in the project area and enclosed by perimeter levee L-74N. The 18.5 ft Alternative will result in S-96B discharging into TFMCA whereas S-96C will continue to discharge directly into the SJMCA (Figure 9). A new levee section will be constructed to keep the discharges from the two structures separate. A canal will be dredged along the inside of perimeter levee L-74N to ensure appropriate tailwater conditions below S-96B are maintained. In addition, the channel will be of sufficient length to ensure that discharge through S96B is routed directly to the deep-water area of the TFMCA. This channel will be separated from the adjacent marshes of the TFMCA by a low berm that will be constructed as the channel is dredged. The 72-inch culvert at S-257 will be replaced with two, 60-inch gated culverts, along with a 600-foot-long weir. Both structures will provide drainage from the TFMCA into the SJMCA approximately 6 miles downstream of the S96 structures. This alternative will not result in over draining the upstream portions of the SJMCA., Under this alternative S-257 will be operated to maintain water levels above 18.5 ft NGVD.

Isolated Wetland Alternative

This alternative is similar to the 18.5 ft Alternative, but with two significant differences (Figure 9). First, a levee would be constructed around the approximately 3,000-acre sawgrass/maidencane marsh at the northwest corner of the TFMCA in order to prevent the loss of this community due to deep flooding. Pumps will be required inside the isolated area to maintain the proper hydrology. Second, the 600-foot-long weir and S-257 outflow structures would be relocated three miles upstream of the location proposed in the 18.5 ft Alternative and the crest height of the weir would be reduced from 21.0 ft NGVD to 19.0 ft NGVD. The resultant lake will be much smaller than under the other alternatives.

The Preferred Alternative

This alternative is very similar to the 18.5 ft Alternative except the TFMCA will be about 320 acres smaller (Figure 9). This 320 acres, located in the northwest corner of the TFMCA, will be leveed off and added to the C-1 Retention Area. This modification will eliminate the need to pump water from the C-1 Detention Area, southeast of TFMCA, into the TFMCA. All other project features of the Preferred Alternative will be identical to those described under the 18.5 ft Alternative except for the operation schedule for S-257. Under the Preferred Alternative S-257 will be operated to maintain water levels above 19.0 ft NGVD.

3.0 AFFECTED ENVIRONMENT

3.1 HISTORIC

The USJRB, located in east, central Florida, includes most of Indian River and Brevard Counties, and portions of Orange, Volusia, Osceola, Seminole, and St. Lucie Counties. The upper basin consists of approximately 2,000 square miles, bounded by the Atlantic coastal ridge to the east and the Kissimmee River basin to the west. The upper basin is about 83 linear miles long (north and south) and about 11 miles wide (east and west). The elevation drop averages one-foot in every five miles. This low gradient and large floodplain allows the USJRB to function as a natural storage area to maintain flow during periods of low rainfall and to serve as a natural regulator of surface water stages during periods of high and low flow (Fernald and Patton 1984). The headwaters of the St. Johns River are located in St. Lucie, Okeechobee, and Indian River Counties, and are separated from the saline Indian River by a sand ridge (Sincock 1958). The average elevation of the marsh varies from 24 feet near Blue Cypress Lake to 12 feet near Lake Poinsett. An important historical feature of the upper basin is the Fellsmere Grade, an abandoned roadbed that crossed the southern Brevard County line and served to impound on the upper reaches of the basin. As part of the Upper Basin Project this old roadbed has been replaced with a flood control levee designated as Levee L-74W.

In pre-Pamlico times, the St. Johns River Valley was a brackish water lagoon lying east of the

Florida coast and bordered on the east by offshore bars. Sands shifting southward gradually filled in between these offshore bars, and the waters in the valley began to freshen and drain northward. The vegetation in the Indian River and its marshes, slowly gave way to the present fresh water marsh vegetation (Sincock 1958).

The USJRB receives the majority of its rainfall during a four-month period, June through September, and under predevelopment conditions, about 289,200 acres of marsh would be inundated. However, the vegetative communities in the basin have been altered as a result of human alterations. Vast sections of the marsh have been diked and drained to create suitable land for agriculture. As more and more diking and drainage occurred, the storage capacity decreased and flood peaks increased, necessitating the construction of conveyance channels within the marsh to move water rapidly away from the areas of agriculture (Fernald and Patton 1984). As a result of agricultural practices in the basin and the reconfiguration of water pathways, vast areas of the marsh have undergone drastic changes. Draining has resulted in soil subsidence and the invasion of plants more adaptable to less wet conditions. A comparison of survey data from 1954 and 1998 indicates that soils in the TFMCA have subsided between two and five feet. The soil loss is due primarily to oxidation of the highly organic peat soils that underlie most of the TFMCA after they were drained. This is particular acute in the northwest corner in the area of the sawgrass/maidencane marsh. The USJRB is an "altered ecosystem".

3.2 CURRENT CONDITIONS

VEGETATION

The vegetative information presented in this report for existing and future with project conditions was prepared by the SJRWMD. Included in this section and section 3.3, Future Conditions, are discussions regarding fish and wildlife issues and anticipated effect of the different alternatives on fish and wildlife resources. Much of this information is also presented in the DEIS. The discussions in this report, however, are limited to only the TFMCA. The current vegetative communities in the TFMCA are shown on Figure 8, and described in Table 3.

In the northern section of TFMCA, the plant communities are more ruderal. This area of TFMCA had been previously used for cattle grazing. The eastern half of the section is dominated by Bahia (*Paspalum notatum*) and non-native pasture grasses. Intermixed with this plant community are other herbaceous plants, including softrush (*Juncus effusus*), pickerlweed (*Pontedaria cordata*) and sand cordgrass (*Spartina bakeri*). This area has also experienced an invasion of wax myrtle (*Myrica cerifera*), saw palmetto (*Serenoa repens*), and saltbush (*Baccharis halimifolia*) since the discontinuation of cattle grazing. Brazilian pepper (*Schinus terebinthifolius*) occurs throughout, primarily in association with remnant farm levees. About one quarter (1,869 acres) of the northern section supports a dense cover of sawgrass (*Cladium jamaicense*) and maidencane (*Panicum hemitomon).* The sawgrass/maidencane wetland is in the northwest corner, and is located at the lowest elevation within TFMCA. There is evidence of soil subsidence in this area.

The middle section of TFMCA , is dominated by shrub swamp, primarily primrose willow

(*Ludwigia peruviana*). This section of TFMCA had been row cropped. Other wetland dependent species intermixed with the willow, include arrowhead, pickerelweed, duckweed (*Lemna minor*), Azolla (*Azolla caroliniana*) and cattail (*Typha* spp.). Deeper water in the southern half has resulted in the establishment of open water and free floating plant communities dominated by water hyacinth (*Eichhornia crassipes*) and water lettuce (*Pistia stratiotes*), surrounded by a grass/sedge marsh. The deeper communities are vegetated be aquatic beds, particularly *Hydrilla* (*Hydrilla verticillata*).

The southern section is covered by a dense, mixed herbaceous marsh intermixed with woody shrubs, primarily willow (*Salix caroliniana*). This section had also been row cropped. Herbaceous species include maidencane, giant smartweed (*Polygonum densiflorum*), and cattail.

FISH AND WILDLIFE RESOURCES

Much of the information presented in this subsection was complied by the SJRWMD and included in the FEIS.

INVERTEBRATES

Two invertebrates found within the USJRB that are important prey items for wading birds, fish, and mammals, are crayfish (*Procambarus alleni*) and fresh water shrimp (*Palaemonetes paludosus*). As reported by Jordan (1995), the average abundance of fresh water shrimp in the Blue Cypress marshes, south of the Fellsmere Grade, was about 550,000 per acre (109 pounds per acre) and for crayfish in the wet prairie communities, the average number was about 640,000 per acre (1,312 pounds per acre). Another very important invertebrate, the apple snail (*Pomacea paludosa*) is found throughout the wetlands. This species is the exclusive prey for the Federally endangered snail kite (*Rostrhamus sociabilis plumerus*)

FISHERIES RESOURCES

Within the USJRB, there is a thriving sport fishery resource, which include the largemouth bass (*Micrpopterus salmoides*), black crappie (*Pomoxi nigromaculatus*) and bluegill (*Lepomis machrochirus*). Numerous forage fish such as the mosquitofish (*Gambusia affinis*), bluefin killifish (*Lucania goodei*), and least killifish (*Heterandria formosa*) are also abundant. Refer to the Table 5 for a complete list of fish that may be found in the basin. Jordan (1995) reported that over a three-year period, average densities of small forage fish in the Blue Cypress wet prairie and slough habitats were 540,000 fish per acre and 1.1 million fish per acre, respectively. This resource provides an important recreational benefit as well as an important food base for wading birds and raptors.

REPTILES AND AMPHIBIANS

Common reptiles found within the project area include the American alligator (*Alligator mississippiensis*), cooter (*Chrysemys floridana*), Florida softshell turtle (*Trionys ferox*), mud turtle (*Kinosternon bauri*), and snapping turtle (*Chelydra serpentina*). Within the drier habitats,

several species of snakes are found such as the southern ringneck snake (*Diadophis punctatus*), southern black racer (*Coluber constrictor*), eastern diamondback rattlesnake (*Crotalus adamanteus*), pygmy rattlesnake (*Sistrurus barbouri*), and the eastern indigo snake (*Drymarchon corais*), a Federally threatened species. The wetter habitats support more aquatic species such as water snake (*Natrix sipedon*), Everglades rat snake (*Elaphe obsoleta*), green water snake (*Natrix sipedon*), and cottonmouth (*Agkistrodon piscivorous*).

The pig frog (*Rana grylio*) is one of the most important amphibians to occur within the project area for its recreational and commercial aspects. Other important frog species include the Florida cricket frog (*Acris gryllus*) and the southern leopard frog (*Rana sphenocephla*).

AVIFAUNA

In the FEIS, under Avifauna (Section 2.5.4), Table 6, lists migratory birds that could be found within the project area. We refer the reader to this table. This section will address only wading birds and waterfowl. Hoffman (1996) and Sewell (1999) published reports regarding wading bird use in the project area, and provide the most complete data sets. We refer the reader to Tables 7, 8 and 9 in the FEIS for complete survey results with reference to wading bird nesting and population estimates in the USJRB.

The wading bird surveys reported on nine species of herons and egrets; cattle egret (*Bulbulcus ibis*), great egret (*Casmerodius albus*), great blue heron (*Ardea herodias*), little blue heron (*Egretta caerulea*), snowy egret (*Egretta thula*), tricolored heron (*Egretta tricolor*), glossy ibis (*Plegadis falcinellus*), white ibis (*Eudocimus albus*), and wood stork (*Mycteria americana*).

Wading birds use the USJRB for nesting, foraging, and roosting. In 1998, Sewell (1999) reported 43 colonies, with 22 sites being previously established and 21 newly formed since 1995. Sewell found that the colonies were not evenly distributed throughout the basin, however. Following Hoffman's methodology, the basin was divided into five strata. The project site is located within stratum II. Stratum II had seven colonies, the third highest; strata I and III had more colonies. Stratum II recorded the highest number of wading bird nests, with the most number of nests recorded during the months of June and July. Sewell and Hoffman (1996) identified that nesting substrate consisted of willow, red maple and cypress. Willow was the preferred nesting substrate in the marshes.

Sewell (1999) reported that from 1993, wading bird nesting increased in the upper basin. It also appears that the species composition is changing. Cattle egrets had once comprised a significant proportion (over 50%) of birds nesting in the marsh. However, this proportion has decreased since 1993. The proportion of wood storks nesting has increased since 1993.

WATERFOWL

The Commission conduct annual waterfowl surveys within the USJRB. Table 9 presents the results of three years of surveys (1997 through 1999), between L-74W and State Road 192. Eight waterfowl species were observed using the project area. The American coot was the most

numerous species observed for two of the three years. The most diverse year was 1998 when the ringed-necked duck, American coot and blue-and green-winged teal were the most numerous. Other species of waterfowl that were observed during the surveys were the ruddy duck (*Oxyura jamaicensis*), bufflehead (*Bucephala albeola*), mallard (*Anas platyrhynchos*), and hooded merganser (*Lophodytes cucullatus*).

MAMMALS

Table 10 lists the mammals that most likely will be found within the study area. This table was prepared by the SJRWMD.

3.3. FUTURE CONDITIONS WITH PROJECT

VEGETATIVE ZONES

The future vegetative communities predicated, regardless of which alternative is eventually selected, were developed by the SJRWMD through extensive modeling and literature review. The Fish and Wildlife Service is using the results of the SJRWMD's studies regarding predicted future vegetative communities for the purposes of this report. We refer the reader to the FEIS, section 1.33.1, Methodology for Predicating Plant Communities from Hydrologic Data, for an explanation of the methodology.

There are five vegetative zones (communities) that will most likely develop under each of the four alternatives; Open Water/Aquatic Beds (OW/AB), Sloughs (SL), Emergent Wetlands (EW), Transitional Wetlands (TW), and Uplands (UP). Figure 12 shows the vegetative zones and acreage based on the anticipated water depths for each alternative.

There is no way to predict with any certainty, the array of plant species that may colonize each of the five vegetative communities. However, based on SJRWMD's model, it is anticipated that each of the five vegetative communities will have some, if not all, of the plant associations described in Table 18. There are several reasons for this lack of certainty. First, nutrient content within the soil may drive a plant community to a single species, such as cattail. Second, seed source, both within the soil and adjacent habitats, are important factors in determining what plant species may colonize a site. Third, hydroperiod and water depth will significantly influence the distribution of plant species. The vegetative communities will not remain static, but will change over time depending on the factors identified above, in particular hydroperiod and water depth. As stated in the FEIS, the zonation of marsh plant communities is regulated principally by the annual cyclic period of inundation and water depth. These parameters are fundamental factors determining distribution of major plant communities.

The OW habitat is predicted to be mainly open water with very little vegetative cover. This community may have some free-floating plants such as water hyacinth, duck weed, water lettuce, etc.

The AB habitat is predicted to be mainly submersed aquatic plants such as *Hydrilla* sp., water

milfoil (*Myriophyllum spicatum*), *Egeria* sp., *Naid* sp., or similar plants described under OW.

The SL habitat is predicted to be rooted, floating leafed species such as water lily (*Nymphaea odorata*), spatterdock (*Nuphar luteum*), lotuses (*Nelumbo lutea*), floating hearts (*Nymphoides* spp.), and water shield (*Brasenia schreberi*). Giant bulrush (*Scirpus californicus*) and spikerush (*Eleocharis olivacea*) are categorized as a slough species due to their ability to tolerate deep inundation and its frequent distribution along the deepest portion of the lake littoral zone.

EW habitat is predicted to be emergent species which can occur in nearly monotypic stands or in a diverse mixture of species such as sawgrass, cattail, maidencane, spikerush, arrowhead, pickerelweed, smartweed (*Polygonum* spp.), and beakrush (*Rynchospora* spp.). Some woody species, such as buttonbush (*Cephalanthus occidentalis*) and willow, are expected to occur.

TW habitat is predicted to be a variety of grasses, sedges, and forbs that are dominated by species such as cordgrass, Muhly grass(*Muhlenbergia* spp.), St. Johns wort (*Hypericum* spp.), soft rush (*Juncus* spp.), hatpins (*Eriocaulon spp.*), and broomsedge (*Andropogon* spp.). This community will also likely support large expanses of willow.

UP habitat is predicted to be more upland plant species that can tolerate very little inundation. However, wetland plants that can tolerate frequent and extended periods of drought will also occur on the peat soils that stay moist even when the water table is well below the soil surface.

NO ACTION ALTERNATIVE

This is more or less the 1985 GDM alternative, which will result in an extreme dry-down of the SJMCA annually during the dry season and during periods of low discharge through the S-96 structures. An alteration in the hydrologic regime could negatively impact the SJMCA by shifting from a herbaceous dominated system to a more transitional wetland possibly dominated by willow and shrubs.

Within the TFMCA, the modeling predicts that under this alternative about 75% of the project area will be inundated greater than 95 percent of the time with an average annual water depth of 2.0 ft. or deeper. About 5,383 acres will have water depths of 3.0 ft. or greater. It is predicted that open water/aquatic bed habitat (OW/AB) will cover about 6,157 acres or 53 percent, in the downstream reaches. The sawgrass/maidencane marsh will be inundated and will be converted to OW. The remaining acreage within TFMCA will be dominated by the SL community in the middle reaches and more of a TW in the upper reaches.

18.5 ALTERNATIVE

During high water conditions (storm events), the entire TFMCA impoundment could be flooded, and during severe dry-down, the OW/AB and slough (SL) communities would be significantly reduced, which would expand the emergent wetland (EW) and transitional wetland (TW) communities. Under this alternative the average annual water level in the TFMCA would be 18.8 ft NGVD. At this level, nearly the entire TFMCA would be flooded and greater than 2,700

acres would be flooded to depths exceeding 3 ft. At 16.5 ft NGVD, the depth recommended by the Commission to prevent frequent fish kills in the lake, the average water depth is 1.6 ft. According to the modeling, this level would only be reached about once every four years. At a water level of 16.5 ft NGVD greater than 1,600 acres would still be flooded to depths exceeding 3 ft. The vegetative communities will shift depending on the water depths and length of inundation.

ISOLATED WETLAND ALTERNATIVE

The primary reason for developing this alternative was to investigate the possibility of preserving the sawgrass (1,600 acres) and maidencane marshes (1,600 acres); otherwise, this wetland would be inundated to a depth of about 5.5 feet which would eventually kill these communities. Based on a literature review by the SJRWMD, the maximum water depth that sawgrass may tolerate is less than 4.5 feet, well below what is expected; therefore, it is likely that the sawgrass marsh will die-off. Pumps will be required to remove rainwater and water that seeps through the levee that will separate the isolated cell from the rest of TFMCA. This alternative will result in a reduced OW/AB community, with a corresponding increase in the SL, EW and TW plant communities. There is no assurance that isolating the sawgrass marsh will save it, however if appropriate hydrologic conditions are not maintained.

Under this alternative , hydrologic modeling indicates that 20 percent of remaining area in the TFMCA (2,200 acres) will be inundated greater than 95 percent of the time, with an average annual depth of 2.3 ft or greater. The OW/AB habitat will comprise only about nine percent of the area.. The remainder of the upper and middle reaches will be converted to SL, EW and TW habitats. Overall, 12, 526 acres of wetlands will be created or preserved. Under this alternative, water levels will fall to or below the recommended level to avoid fish kills (16.5 ft NGVD) once every 2.2 years. This alternative has the lowest recreational fisheries benefits of any of the alternatives considered.

PREFERRED ALTERNATIVE

Under this alternative the average annual water level in the TFMCA would be 19.1 ft NGVD. At this water level nearly the entire TMCA would be flooded and greater than 6,700 acres would be flooded to depths at or exceeding 3 ft. Water levels would fall to or below 16.5 ft NGVD only once every 9.3 years. Under this alternative there would be approximately 7,750 acres of OW/AB habitat , 4,123 acres of SL and 1,535 acres of EW/TW. The OW/AB habitat is 700 acres larger than under the 18.5 ft Alternative with a corresponding decline in the EW and TW habitats. Obviously, this alternative has the largest acreage of lake with the greatest fishery benefits.

FISH AND WILDLIFE RESOURCES

The fishery resources within the USJRB are diverse and well represented. There currently exists a sport fisheries in the basin, including Blue Cypress Lake and Stick Marsh. The preferred alternative would result in an approximately 11,000-acre lake ranging in depth from less than 1

foot to 5.5 feet. The USJRB is a managed, flow-through marsh system, and during most of the year, water will move through the TFMCA.

Fish will have no difficulty immigrating into the newly created lake. There are no plans to actively manage water levels for the fishery resources that will develop in the lake, in fact, there no plans to manage lake levels, except during high water conditions. The Commission is developing plans for stocking sport fish into the reservoir as it refloods and will likely implement length limit restrictions to regulate harvest.

Once the lake level drops below the elevation of the weir, Structure S-257 will be opened until water levels in the reservoir fall to 19.0 ft. After this water elevation is reached, S-257 will be closed and; the water level will continue to recede solely through evapotranspiration. To prevent fish kills the Commission has recommended that water levels in the TFMCA only infrequently fall below 16.5 ft NGVD. This is the minimum depth the Commission believes is necessary to prevent a fish die-off in a dry-down event. Under the Preferred Alternative at an elevation of 16.5 feet NGVD, about 1,650 acres within the TFMCA will be flooded to depths exceeding 3 feet. This event, based on modeling, should not occur more often than once every 9.3 years. Frequent drawdowns below 16.5 ft NGVD will significantly reduce the OW component of the lake system and create a much larger EW component. Dry-down may not be the only cause for fish kills, however. As discussed below, fish kills may also result because of cultural eutrophication of the lake.

All else being equal, shallow lakes with large littoral areas tend to be more productive than deeper lakes or those with steep-sided basins and little to no littoral zones (EPA publication 1993, Bennett, 1971). The created lake will be shallow with an expansive littoral zone which will increase productivity as influenced by the insolar radiation (Bennett, 1971).

The nutrient input from the surrounding watershed may affect the water quality of the lake. The open body of water is more efficient in removing phosphorous than the herbaceous marsh. Phosphorous additions, however, from external sources and regeneration of phosphorous from lake sediments are the major forces driving productivity of lakes and reservoirs (American Fisheries Society 1999). Nutrient enrichment, in this instance phosphorous, will more than likely result in eutrophication of the lake. The consequence of eutrophication is manifested by frequent occurrence of algal blooms, decreased water transparency, scums and mats of blue-green algae, and dense littoral zone beds of submergent and emergent aquatic vegetation (American Fisheries Society, 1999).

In moderate abundance, macrophytes are desirable; they provide structure for the epiphyte macroinvertebrate prey for fishes. Excessive growth of macrophytes, however, can affect predator-prey balance by affording too much cover for the prey. In addition, rooted macrophytes may pump nutrients from the sediment into their plant tissue, which puts the nutrients back into circulation when the plants decompose. The survival of the entire fish community may be jeopardized when a dense plant growth decomposes, resulting in oxygen depletion (American Fisheries Society 1999). The biochemical oxygen demand (BOD) for decomposition of organic matter may remove oxygen faster than it can be produced by algae or entrained at the surface.

High BOD levels result in hypolimnetic oxygen depletion and increased incidence of fish kills (American Fisheries Society, 1999). While fish kills will certainly negatively affect the recreational fishing, it will provide an abundant, albeit, short, ready food supply for wading birds.

In addition to the fishery resources, the OW/AB association may create habitat for an important invertebrate, the crayfish (*Procambus alleni*) This invertebrate, while not concentrating during periods of dry-down, will burrow into the soil at the drying edge of the lake. Crayfish may make up a substantial proportion of the diets of great egrets, tricolored herons, and little blue herons, especially during the early part of the nesting cycle (Frederick et.al., 1994).

AVIFAUNA

Under existing conditions, there are a variety of wading birds and waterfowl that currently use the wetlands associated with the USJRB. Depending on the alternative, the anticipated results will benefit these species. The No Action 18.5 Alternative and Preferred Alternatives are similar insofar as vegetative communities are concerned, except the acreages of the different communities shift, as discussed earlier. The Isolated Wetland Alternative reduces significantly the OW/AB community, preserves the sawgrass/maidencane marsh and expands the SL, EW, and TW communities. All of these alternatives will have an effect to varying degrees on the fishery resources, and wading bird and waterfowl use of the wetlands.

Historically, from the Brevard County line to Lake Helen'n Blazes, open water could seldom be seen and the area was covered with dense stands of sawgrass and maidencane (Sinccok 1958). Sawgrass is a rhizomatous, perennial sedge, rather than a grass (Gunderson 1994). This plant has low nutrient requirements, and thrives well in the oligotrophic waters of the basin (Gunderson 1994). Sincock considered sawgrass a deep-water emergent, and one of the most dominant plant species from State Road 68 to Lake Poinsett. Today the sawgrass and maidencane wetland systems have diminished in size and are fragmented as a result of agriculture and other human related development.

Sincock (1958) believed that dense stands of sawgrass were not beneficial for waterfowl. This is not to imply that waterfowl do not use sawgrass if the stands are considered sparse, Yates (1974), in her work on sawgrass, noted several waterfowl species use the seeds as well as the stems from this plant. Most of the waterfowl listed in Table 9 were identified by Yates as using the seeds from this plant. In addition to waterfowl use, she listed alligators and otters as also using sawgrass. With reference to wading birds, dense stands of sawgrass would most probably prevent extensive use except along the margins. However, if the sawgrass stands were sparse, amphibians would be more than likely using the clumps or tussocks as cover, and providing a ready food source for a number of species of wading birds. While the 1,600 plus acres of sawgrass is small in comparison to what occurred historically, it represents an imperiled vegetative community within the USJRB.

The No Action Alternative, the 18.5 Alternative and the Preferred Alternative, while it will eliminate the sawgrass community, will provide fisheries habitat, which in turn will provide a

substantial forage base for herons and egrets, including the Federally endangered wood stork. The size and depth of the lake, regardless of the three alternatives, will not remain static. It is a rain-driven system, and as such, will experience periods of high water and dry-downs. The elevated water levels will create favorable conditions for increasing the fish biomass, and conversely during dry-downs, to concentrate large numbers of fish; thereby creating a tremendous food resource for wading birds (Kushlan 1989).

Below the designed discharged lake level, the lake will continue to shrink due to evapotranspiration. These dry-down events will correspond with wading bird nesting, which may begin with great egrets in mid-January, followed by wood storks in late-January, small herons and egrets mid-February and white ibis in mid-March (Ogden 1994).

Kushlan (1978), indicated that patches of concentrated food items are more important than one central spot as the birds may deplete the site and have no where else to go. While on gross examination, the St. Johns Marsh appears to have little to no relief, the contour map reveals that there are "peaks and valleys", which during low water, will trap fish and other vertebrates and invertebrates. Kushlan (1978) suggested that it is best that fish concentrate in broad, gently sloping marshes and pools along an edge of drying habitat caused by falling water levels. This will provide a continuous supply of available prey along the topographic gradient as the water level falls. Successful breeding requires the continuous availability of foraging sites within the flight range of a wading bird colony site through out the nesting cycle (Hoffman, et al. 1994).

With respect to foraging distances for the different species of wading birds, Bancroft, et al. (1994), stated that great egrets foraged out about 6.3 km and white ibis about 10 km about 65 percent of the time. Hoffman (1996) stated that small herons foraged about 10 km and wood storks about 80 km. The project site is located in stratum II. The addition of another major feeding site for wading birds within this stratum will most likely increase the number of wading birds feeding within the stratum and increase the number of nesting colony sites. We believe there will be a redistribution of wading birds in the basin as a result of the presence of this new lake.

In the FEIS, there are brief discussions related to several Federally threatened and endangered species that have either been observed or there is the potential that they may be observed in the TFMCA. The listed species are bald eagle (*Haliaeetus leuocephalus*), snail kite, Audubon's crested caracara (*Polyborous plancus*), wood stork, and eastern indigo snake. The Whooping Crane (*Grus americanus*), while listed as endangered, is considered an "experimental, non-essential" population in Florida, and not subject to section 7 consultation. A brief discussion of these species and the potential effect of this project on each species is included in the Section 6, Endangered Species Act.

4.0 CONCLUSION

The primary purpose of this project is flood control, with a secondary purpose of restoring and creating quality wetland/lacustrine habitat. There will also be water quality benefits. Four alternatives were evaluated, the No Action Alternative, the 18.5 Alternative and the Isolated

Wetland Alternative, and the Preferred Alternative.

The No Action Alternative, which is basically the preferred alternative in the 1985 GDM, will result in overdraining the SJMCA. Under current conditions rainfall on the northern half of the TFMCA goes to the Indian River Lagoon.

The 18.5 Alternative will prevent overdraining the SJMCA and will create an approximately 11,000-acre lake, depending upon the time of year, over much of the TFMCA. The creation of the lake will result in the loss of approximately 1,900 acres of sawgrass marsh. The lake will provide both OW and AB habitats.

The creation of the lake will provide a sport fishery; however, depending on water levels, the quality of the fishery may vary. There is the possibility that fishery die-offs may occur from time to time as a result of low water conditions, which result in low levels of dissolved oxygen. High nutrient loads in the lake will also result in accelerated growth of aquatic vegetation, most likely hyacinths, which may also affect the fisheries.

However, low water levels and fishery die-offs will have a positive effect, as well. As water levels in the lake recede, fish and other vertebrates and invertebrates will concentrate in isolated pools throughout the marsh, which will provide an abundant food resource for wading birds. Wading birds currently forage and nest in the USJRB. This additional, large feeding area will attract more birds to the TFMCA, and may increase the number of nesting birds.

The lake will result in the loss of the sawgrass marsh in the TFMCA. This marsh system, while once dominant throughout the USJRB, has been significantly reduced in size and fragmented as a result of human intervention, primarily agriculture. Depending upon the density of the sawgrass (sparse or dense), this habitat provides cover for reptiles and feeding sites for wading birds, including waterfowl. If the vegetation is too dense, wading birds are unable to feed except along the edges of the marsh.

The Isolated Wetland Alternative will protect the sawgrass/maidencane marsh by erecting levees around the marsh and installing pumps in the marsh to maintain an appropriate hydrology. However, there is no assurance these measures will preserve this wetland system if the appropriate hydrology cannot be maintained, Structure S-257 will be relocated south of the isolated marsh along with the 600-foot-long weir. The lake, by comparison, will be the smallest in size (734 acres) of any of alternatives.

A major difference between this alternative and the others is that most of the water quality treatment will occur in the marsh rather then in the lake. Using the marsh as a filter could profoundly change the vegetative composition of the marsh, from a mosaic of hydrophytic wetland vegetation that currently exists to a monotypic stand of vegetation, for example, cattails.

The size of the lake will most likely preclude the development of a substantial fishery resource. Regardless, it is likely that wading birds will find this open body of water suitable for foraging, in particular when there is a dry-down, and fish become concentrated. Fish kills will occur more

frequently as the size of the lake during dry-down will not meet the Commission's hydrology criterion discussed earlier. The benefits to wading birds, a concentrated food source, should be similar to the other alternatives, but to a lesser degree due to the small size of the lake.

The Preferred Alternative is very similar to the 18.5 Alternative, except that about 320 acres of sawgrass marsh will be protected through the expansion of the levee and water will not be pumped into TFMCA from the C-1 Detention Area during high water events. Because S-257 will be closed when the lake level reaches 19.0 ft NGVD instead of 18.5 the acreage of OW/AB habitat will be approximately 700 acres larger than under the 18.5 Alternative. As a result, there will be approximately 700 acres less of EW habitat. Fish kills will be less likely under this alternative. The results of this alternative, both positive and negative are similar. The 320 acres of sawgrass are not being removed to save sawgrass, but rather to increase the water holding capacity of the C-1 Retention Basin.

5.0 RECOMMENDATIONS

While the lake will more than likely increase potential wading bird nesting, there may be a limited number of new nesting sites. Hoffman (1996), recommended that in areas designated as reservoirs, construction of artificial islands would provide new colony sites. We believe this management recommendation requires further investigation, and if deemed appropriate, should be considered in this instance.

A separate, but related issue that we believe should be evaluated, is the potential threat of contaminants that may be in the soil in TFMCA. Historically, these lands had been used as either pasture or for row crops, or both. The possibility exists reflooding these lands will release contaminants into the water column hence into the food chain, thereby, creating the potential for wading bird and waterfowl die-offs. We understand that some contaminant work is currently be conducted on lands east of the project site in, Broadmoore Marsh Restoration Area. We recommend this work be expanded to include the TFMCA.

To reduce the potential negative affects of increasing the nutrient concentration in the lake, thereby possibly increasing the density of macrophytes and affecting the fisheries, control of aquatic vegetation will be imperative, especially the control of water hyacinths and water lettuce. The District has indicated that they will be aggressively controlling these plant species by chemical means. The District has an aquatic plant management plan in place that should minimize potential negative impacts. Thus by frequent treatment, the District is attempting to minimize the acreage treated at any given time.

6.0 ENDANGERED SPECIES ACT: SECTION 7 CONSULTATION

Our comments are submitted in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act)(16 U.S.C. 1531 *et seq.*) Within the USJRB, in particular the area in and around TFMCA, the following federally listed threatened and endangered species have been observed or may be present: bald eagle, wood stork, snail kite, Audubon crested caracara caracara, and eastern indigo snake. Much of the following information is from the Service's

South Florida Multi-Species Recovery Plan of South Florida (May1999).

BALD EAGLE:

The bald eagle was down listed to threatened status in July 1995. No critical habitat has been designated for this species. In Florida, there area approximately 1,000 active bald eagle nesting territories. There are no known bald eagle nests in or adjacent to the project area.

Bald eagles generally nest near large rivers, lakes or estuaries where they feed primarily on fish and water-dependent birds. Bald eagles are considered a water-dependent species (Herrick 1924, Stevenson and Anderson 1994). Nesting habitat includes the nest tree, usually a live pine (*Pinus* spp.), bald cypress (*Taxodium* spp.), and perch and roost sites. Eagles will, however, nest in dead trees, and recently have been observed nesting on towers. In Florida, most nests are found within three kilometers of water (McEwan and Hirth 1979, Wood et al. 1989). In areas with a high human population, the distance between the nest site and water may be greater.

Eagles are monogamous. Eagles usually initiate nesting in the beginning of October. Incubation is about 30 days and the young fledge in about 90 days, usually by mid-May.

Eagles are opportunistic feeders. They will select live prey as well as feed on carrion. The primary diet is fish, but eagles will also take small to medium size mammals (Johnsgard 1990). The restoration of TFMCA will provide additional feeding habitat for eagles, in particular when water levels recede, thereby concentrating fish. A limiting factor, however, is suitable nesting substrate. During our field reviews, we did observe potential nest trees in or around TFMCA.

We believe the restoration project, regardless of which alternative is selected, is not likely to adversely affect the bald eagle.

AUDUBON CRESTED CARACARA CARACARA

The Audubon's crested caracara caracara was listed as threatened in July 1987. No critical habitat has been designated for this species. This species is a large, boldly patterned raptor, with a crest and unusually long legs. It is a Florida resident, diurnal, long-lived, and non-migratory.

Currently, the greatest concentration is within a five-county area north and west of Lake Okeechobee, including Glades, DeSoto, Highlands, Okeechobee, and Osceola. Birds are observed elsewhere, however. There is only one known active nest in Brevard County, at Viera.

This species occurs in dry or wet prairie areas with scattered cabbage palm (*Sabal palmetto*). It may also be found in lightly wooded areas. This species also uses improved or semi-improved pastures, again with scattered cabbage palm (Layne 1996). The nest at Viera is in improved pasture, in a cluster of cabbage palms.

Little is known regarding breeding behavior. Egg laying begins in early December and the height of the nesting season is January and February (Nicholson 1929). Nests are well

concealed, and are found in tops of cabbage palms (J.Morrison, University of Florida, pers.com). Nests have also been found in live oaks (*Quercus virginiana*), Australian pine (*Casuarina spp.*), and black gum (*Nyssa biflora*). Clutch size is two or three eggs. Incubation lasts for about 28 days and is shared by both sexes. The young fledge in about eight weeks (Bent 1961).

This species is highly opportunistic in their feeding habits, eating carrion and capturing live prey. Their diets include insects and other invertebrates, fish, snakes, turtles, birds and mammals. They hunt on the wing, from perches and on the ground (Layne 1978). They have been observed feeding on road kills in the company of vultures (Palmer 1988).

There has been no nesting reported in the TFMCA. Regardless of which alternative is selected, the project area will become significantly wetter, which will further reduce the likelihood that this species will be found in the restored marsh habitat. We believe, therefore, the restoration of the TFMCA is not likely to adversely affect this species.

WOOD STORK

The wood stork was listed as endangered in February 1984. No critical habitat has been designated for this species. The wood stork is a large, long-legged wading bird. Currently, wood storks breed in north and south Florida , parts of Georgia and coastal South Carolina. Wood storks have been documented nesting in the USJRB, in close proximity to the TFMCA. Aerial surveys conducted between 1993 and 1995 documented up to 1,300 wood storks and 296 nests in the USJRB (Hoffman 1996). Wood storks were observed foraging in three borrow-pits in or near the project area. This species is primarily associated with freshwater habitats for nesting, roosting, forging, and rearing young.

They typically construct their nests in medium to tall trees that occur in stands located either in swamps or on islands surrounded by relatively broad expanses of open water (Palmer 1962), Rogers et al. 1987, Ogden 1991). They tend to use the same colony sites over many years, as long as the sites remain undisturbed and sufficient feeding habitat remains in the surrounding wetlands.

Wood storks are seasonally monogamous, probably forming a new pair bond every season. Females lay a single clutch per breeding season, but will renest if the nests fails early in the breeding season. They lay about three to five eggs, incubation takes about 30 days

During the non-breeding season, wood storks are found throughout Florida, with interchange between north and south Florida and between states. This information suggests the notion of a single population in the southeast, which responds to changing environmental conditions through temporal relocation.

Foraging behavior requires that a large concentration of fish be present. Their feeding behavior is referred to tactolocation or grope feeding. To forage, a wood stork wades through the water with its beak immersed and partially open. When it touches a prey item, the mandibles shut, raises its head, and swallows what it has caught (Kahl 1964). In order to increase feeding

efficiency, it is critical that large numbers of fish, their primary prey item, are concentrated in shallow ponds or wetlands. This becomes even more critical during the breeding season when young must be fed. It is important to have sufficient feeding sites in close proximity to the rookeries to provide enough food items to the young in a timely manner to reduce the probability of nestling mortality due to starvation.

The alternatives that would provide the greatest lift for wood storks are the 18.5 Alternative or the Preferred Alternative, followed by the No Action Alternative. The two former alternatives would result in a large OW/AB system with an extensive shallow EW system. During periods of low water, the fish would be concentrated throughout the isolated ponds and wetlands created as a result of receding water. The Isolated Wetland Alternative will also result in a OW/AB system, but to a much smaller degree. The No Action Alternative would create an OW/AB system, larger than the Isolated Wetlands Alternative, but smaller than the 18.5 Alternative. Depending on the alternative selected, the benefit to wood storks will vary. It is the Service's opinion that the restoration of the TFMCA will benefit the wood stork.

SNAIL KITE

The snail kite was listed as endangered in March 1967, followed by critical habitat designation in August 1977. However, the project area is not within critical habitat. The snail kite is a medium-sized raptor. The slender, decurved bill is an adaptation for extracting the kite's primary prey, the apple snail. The snail kite occurs in Florida, Cuba and Honduras. Within Florida, the current distribution is south and central Florida. Within the USJRB, snail kites are found primarily in the Blue Cypress Water Management Area, south of the Fellsmere Grade. Up to 100 birds and 60 nests have been documented (Miller et al. 1996). Snail kites have been observed in the SJMCA.

Snail kite habitat consists of freshwater marshes and shallow vegetated edges of lakes where apple snails can be found. Suitable foraging habitat is typically a combination of a low profile marsh with a mosaic distribution of shallow open water (about 1-foot to 4 feet deep), which is relatively clear and calm in order to visually search for apple snails. The marsh vegetation is dominated by spike rush, maidencane, sawgrass, and/or cattails. Dense growth of herbaceous or woody vegetation is not conducive for efficient foraging.

The snail kite usually nests in loose colonies The clutch size ranges from one to four eggs. Incubation is between 23 to 30 days, and is shared by both sexes (Sykes 1987, Beissinger 1988). Hatching success is about 2.3 chicks per nest. The most successful hatching period is from February through April (Sykes 1987). Breeding season varies depending on rainfall and water levels. The snail kite, when not breeding, uses communal roosts throughout the year in association with other birds, such as herons.

Wetland vegetation communities that develop in the TFMCA are expected to be similar to those found in the SJMCA and the BCMCA. Kites use the sloughs of the BCMCA but not the emergent marshes. There may be kite habitat created in the TFMCA but use may only be periodic. Snail kites have not been documented using the TFMCA in the past; therefore, the

snail kite distribution in the USJRB may remain unchanged. Therefore, it is the Service's opinion that the project, regardless of which alternative is eventually selected, is not likely to adversely affect the snail kite.

EASTERN INDIGO SNAKE

The eastern indigo snake was listed as a threatened species in January 1978. No critical habitat has been designated for this species. The eastern indigo snake is a large, black, non-venomous snake. Throughout most of its range, this species is found in a variety of habitats from pine and scrubby flatwoods, high pine, dry prairie, edges of freshwater marshes, agricultural fields, coastal dunes and human altered habitats. This species requires a mosaic of habitats (Landers and Speake 1980, Auffenberg and Franz 1982). This species requires sheltered "retreats" from winter cold and desiccating conditions, for example, gopher tortoise burrows. Throughout peninsular Florida, the eastern indigo snake may be found in all terrestrial habitats which have not been subjected to increased human development. Eastern indigo snakes have been observed in drier habitats in the project area or along the levees in TFMCA and SJMCA.

This species is an active terrestrial and fossorial predator that will eat any vertebrate that it can consume. Adults prey on fish, frogs, toads, snakes, lizards, turtles, turtle eggs, birds and small mammals (Keegan 1944, Babis 1949, Kochman 1978, Steiner et al. 1983). Juvenile indigo snakes eat mostly invertebrates.

Eastern indigo snakes travel over a wide range into various habitats (Smith 1987, Moler 1985, Speake 1993). Adult male snakes have larger home ranges than adult females and juveniles; their ranges may encompass as much as 533 acres and 390, respectively, in the summer months (Moler 1985, Speake 1993).

This species has been observed in the project area, and while two of the three alternatives will create OW/AB, which will reduce the amount of available habitat in the immediate area, there remains many thousands of acres in the USJRB suitable for this species. In addition, as the lake recedes on an annual basis, EW and TW will increase which will provide a variety of habitats for the snake and also a food source. The isolated wetland alternative will provide very little in OW/AB habitat, but will retain the sawgrass marsh, which may be used by this species if the density of the sawgrass is not too high. The Service believes, therefore, the implementation of the project, regardless of which alternative is selected, is not likely to adversely affect the eastern indigo snake.

Although this does not represent a biological opinion as described in section 7 of the Act, it does fulfill the requirements of the Act and no further action is required. If additional alternatives are developed or new information becomes available on listed species, reinitiation of consultation may be required.

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