APPENDIX E. FISH AND WILDLIFE COORDINATION ACT AND ENDANGERED SPECIES ACT COMPLIANCE

Herbert Hoover Dike

Dam Safety Modification Study

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E FISH AND WILDLIFE COORDINATION ACT AND ENDANGERED SPECIES ACT COMPLIANCE

E.1 Planning Aid Letters

From:	Progulske, Donald
To:	Bush, Eric L SAJ
Cc:	Ralph, Gina P SAJ; Larry_Williams@fws.gov; miles meyer; Summa, Eric P SAJ; Auvenshine, Stacie SAJ; Daryl Thomas
Subject:	Re: [EXTERNAL] Re: Herbert Hoover Dike FWCA PAL Request (UNCLASSIFIED)
Date:	Monday, August 04, 2014 1:56:23 PM

Eric - yes, it means we will not be working on PAL at this time.

Bob

Bob Progulske
U.S. Fish and Wildlife Service

Everglades Program Supervisor
South Florida Ecological Services Field Office
1339 20th Street

Vero Beach, Florida 32960

Office: 772-469-4299
Cell: 772-559-7167
Fax: 772-562-4288
email: donald_progulske@fws.gov
website: www.fws.gov/verobeach

On Mon, Aug 4, 2014 at 4:33 PM, Bush, Eric L SAJ <Eric.L.Bush@usace.army.mil> wrote:

Classification: UNCLASSIFIED
Caveats: NONE

Thanks for the update Bob. Does this mean no PAL?

Eric Bush, Chief
Planning and Policy Division
U.S. Army Corps of Engineers, Jacksonville District
O: 904-232-1517
M: 904-571-3716

-----Original Message-----
From: Progulske, Donald [mailto:donald_progulske@fws.gov]
Sent: Monday, August 04, 2014 4:27 PM
To: Bush, Eric L SAJ
Cc: Ralph, Gina P SAJ; Larry_Williams@fws.gov; miles meyer; Summa, Eric P SAJ; Auvenshine, Stacie SAJ; Daryl Thomas
Subject: [EXTERNAL] Re: Herbert Hoover Dike FWCA PAL Request

Eric - Stacy and Gina provided FWS (Miles, Daryl Thomas, me) and FWC (Don Fox) with an overview of the proposed project to increase the height of HHD - covering approximately 43 miles. Stacy indicated that the preferred alternative would likely be some combination of armoring the dike with interlocking concrete pads and constructing a 5-10 foot flood wall on top of the dike. We had a lot of questions that could not be answered at this time, such as how much it would cost compared to raising the dike with native materials (the estimate now is that it would be $500 million cheaper), when would construction likely begin, etc.

Last Friday I had a opportunity to provide Larry with a summary of some of the projects we are working on, including the HHD wall construction. He also asked me about the construction schedule, cost, etc. Based on other priorities and loss of staff capacity, he gave me clear direction that other projects with imperiled species were a higher priority than the HHD wall, since we have very little information, and it is speculative at this time. He said we should not spend any time or resources on this project at this time. I am sure Larry would be available to discuss it with you or Col. Dodd. Thanks.

Bob

Bob Progulske
U.S. Fish and Wildlife Service

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On Tue, Jul 22, 2014 at 11:11 AM, Bush, Eric L SAJ <Eric.L.Bush@usace.army.mil> wrote:

Larry, Bob: this is a very important project for the Jacksonville District; it's our main budget driver in out years.

We have identified potential design features that we need your assistance with. Fortunately I think we have enough time in our schedule to discuss and address FWS's potential concerns.

Will look forward to meeting w you and Vero Bch staff at your convenience.

Thanks,
Eric L Bush, Chief
Planning and Policy Division
U.S. Army Corps of Engineers,
Jacksonville District
O: 904-232-1517
M: 904-571-3716

----- Original Message -----
From: Ralph, Gina P SAJ
Sent: Tuesday, July 22, 2014 11:05 AM
To: Larry Williams <larry_williams@fws.gov>; Progulske, Donald <donald_progulske@fws.gov>; Daryl Thomas <daryl_thomas@fws.gov>; miles meyer
Cc: Bush, Eric L SAJ; Summa, Eric P SAJ; Dunn, Angela E SAJ; Auvenshine, Stacie SAJ; Wittmann, Kevin M SAJ; Wolz, Michael W SAJ
Subject: Herbert Hoover Dike FWCA PAL Request

Good Morning,

Through further coordination with the USACE Risk Management Center, we have identified the need to develop potential alternative solutions to address the concern regarding potential for overwashing/overtopping at HHD. As a result, we would like to set up a meeting with you and your staff in the next week or two to present an overview of the potential alternatives and receive feedback on these alternatives under the Fish and Wildlife Coordination Act coordination process. Potential alternatives include raising the dike through use of a floodwall or similar concrete structures, fill and armoring. We will follow up our meeting with a formal letter that includes preliminary design and specifications of the alternatives and location along HHD. We will also request a Planning Aid Letter within 30 days of receipt of package documenting fish and wildlife considerations for the overwash/overtop alternatives.

Stacie Auvenshine will contact you directly to schedule a meeting time.

Thank you,
Gina

Gina Paduano Ralph, Ph.D.
Chief, South Florida Section
Environmental Branch, Planning Division
US Army Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019
(904) 232-2336
Gina.P.Ralph@usace.army.mil

Classification: UNCLASSIFIED
Caveats: NONE

E.2 Coordination Act Report

United States Department of the Interior

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

July 14, 2014

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

Service CPA Code: 2014-CPA-0210
Service Consultation Code: 2014-F-0168
Project: Herbert Hoover Dike
Dam Safety Modification Study

Dear Colonel Dodd:

Enclosed for your review is the Draft Interim Fish and Wildlife Coordination Act Report (FWCAR) on the Herbert Hoover Dike (HHD) Dam Safety Modification Study (DSMS). The Draft Interim FWCAR is considered an "interim" document consistent with the conceptual level of detail that has been provided to the U.S. Fish and Wildlife Service (Service) for review. This Draft Interim FWCAR provides the Service's continuing guidance and recommendations for the benefit of fish and wildlife resources in the DSMS area. This report is provided by the Service in accordance with the Fish and Wildlife Coordination Act (FWCA) of 1958, as amended (48 Stat. 401; 16 U.S.C. 661 *et seq.*) and the Endangered Species Act of 1973, as amended (87 Stat. 884; 16 U.S.C. 1531 *et seq.*).

As stated in the enclosed report, the U.S. Fish and Wildlife Service (Service) did not include analyses, conclusions, and recommendations regarding an array of alternatives. A more detailed and comprehensive report will be developed by the Service (Service) when the U.S. Army Corps of Engineers (Corps) submits a Draft Environmental Impact Statement (EIS) detailing the planning process and comparison of alternatives. Upon completion and receipt of the Final EIS, the Service will further assess potential impacts associated with the selected plan and prepare a Final FWCAR.

TAKE PRIDE® IN AMERICA

Thank you for the opportunity to provide this Draft Interim FWCAR for the HHD DSMS. The Service will develop a more detailed and comprehensive report when the Corps submits a Draft EIS describing the planning process and comparison of alternatives. Upon completion and receipt of the Final EIS, the Service will further assess potential impacts associated with the selected plan and prepare a Final FWCAR. We appreciate your long-standing cooperation in minimizing effects to fish and wildlife as you make progress on this important study. For additional assistance, or if you have questions regarding the contents of this Draft Interim FWCAR, please contact Daryl Thomas at 239-535-6850.

Sincerely yours,

Donald R. Progulske

Bob Progulske
Everglades Program Supervisor
South Florida Ecological Services Office

cc: electronic copy only
Corps, Jacksonville, Florida (Eric Summa, Angie Dunn)
Corps, West Palm Beach, Florida (Kim Taplin)
FWC, West Palm Beach, Florida (Chuck Collins)
Service, Atlanta, Georgia (Dave Horning)

Draft Interim Fish and Wildlife Coordination Act Report

Herbert Hoover Dike Dam Safety Modification Study

Submitted to:
Jacksonville District
U.S. Army Corps of Engineers
Jacksonville, Florida

Prepared by: Daryl Thomas, Steven Glass, and Anne Philip
Reviewed by: Miles Meyer and Bob Progulske
Approved by: Bob Progulske

U.S. Fish and Wildlife Service
South Florida Ecological Services Office
Vero Beach, Florida

July 2014

EXECUTIVE SUMMARY

The U.S. Army Corps of Engineers (Corps), Jacksonville District, is preparing a National Environmental Policy Act assessment for the Herbert Hoover Dike (HHD) Dam Safety Modification Study (DSMS). The purpose of the DSMS is to identify an engineering plan to allow the Corps to implement future dam safety projects that will address potential embankment failure modes, reduce risk to lakeside communities, and prioritize future work based on risk to human life. The DSMS includes the entire 143-mile embankment and structures. Multiple risk reduction measures are being developed and analyzed to reduce risk from all potential failure modes and to the population. Alternative plans are being developed, and the projected DSMS approval is in 2015. The environmental consequences of HHD embankment failure include:

- Potential for significant damage to the Everglades and other environmental resources due to flooding and poor water quality.
- Pollution stemming from inundation of adjacent landfills (Moore Haven) and other hazardous/toxic impacts.
- Potential for massive disruption to the Comprehensive Everglades Restoration Program and the Central Everglades Planning Project, both multi-billion dollar, multi-decade Federal investments to ecosystem restoration.
- Possible damage to cultural resources in south Florida (historical churches, Native American archeological sites, cemeteries etc.).

The DSMS has two major Risk Reduction Measures that include a Cutoff Wall Risk Reduction Measure and a Seepage Filter System Risk Reduction Measure.

The fish and wildlife resources of Lake Okeechobee are of remarkable value, including threatened and endangered species, abundant waterfowl, an exceptionally productive recreational fishery, and commercial fisheries. The U.S. Fish and Wildlife Service (Service) has great interest in the protection and enhancement of fish and wildlife resources within the Lake Okeechobee area. Our description of affected resources and fish and wildlife concerns in this Draft Interim Fish and Wildlife Coordination Act Report (FWCAR) concentrates on those resources found within Lake Okeechobee, on HHD itself, and in areas to the landward side of the HHD.

An evaluation of potential impacts of a final proposed action indicates some concerns over federally-listed species. Federally-listed species within the study area include Audubon's crested caracara *(Polyborus plancus audubonii)*, wood stork (*Mycteria americana*), Everglade snail kite (*Rostrhamus sociabilis plumbeus*), eastern indigo snake (*Drymarchon corais couperi*), West Indian manatee (*Trichechus manatus*), Florida panther (panther; *Puma concolor coryi*), Florida bonneted bat (*Eumops floridanus*), and Okeechobee gourd (*Cucurbita okeechobeensis* ssp. *okeechobeensis*). The study area also includes federally designated Everglade snail kite critical habitat.

The Service is recommending the Corps implement applicable federally-listed species Conservation Guidelines and Survey Protocols for the species potentially impacted by the final proposed action. The Service also provided guidance regarding the bald eagle (*Haliaeetus leucocephalus*), migratory birds, and State-listed species. Additionally, we developed construction activity conservation measures to avoid adverse effects to trust resources and minimize potential effects of large construction projects.

The Draft Interim FWCAR for the HHD DSMS is considered an "interim" document consistent with the conceptual level of detail that has been provided for our review. This report does not include analyses, conclusions, and recommendations regarding an Array of alternatives. A more detailed and comprehensive report will be developed by the Service when the Corps submits a Draft Environmental Impact Statement (EIS) detailing the planning process and comparison of alternatives. Upon completion and receipt of the Final EIS, the Service will further assess potential impacts associated with the selected plan and prepare a Final FWCAR.

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LIST OF ACRONYMS AND ABBREVIATIONS USED IN THE TEXT

Act	Endangered Species Act
Corps	U.S. Army Corps of Engineers
DSMS	Dam Safety Modification Study
EA	Environmental Assessment
EIS	Environmental Impact Statement
FWCA	Fish and Wildlife Coordination Act
FWCAR	Fish and Wildlife Coordination Act Report
FWC	Florida Fish and Wildlife Conservation Commission
HHD	Herbert Hoover Dike
MBTA	Migratory Bird Treaty Act
NWR	National Wildlife Refuge
Service	U.S. Fish and Wildlife Service

I. DENTIFICATION OF PURPOSE SCOPE AND AUTHORITY

A. Introduction

This Draft Interim Fish and Wildlife Coordination Act Report (FWCAR) for the Herbert Hoover Dike (HHD) Dam Safety Modification Study (DSMS) is considered an "interim" document consistent with the conceptual level of detail that has been provided for our review. The report does not include analyses, conclusions, and recommendations regarding an array of alternatives. A more detailed and comprehensive report will be developed by the U.S. Fish and Wildlife Service (Service) when the U.S. Army Corps of Engineers (Corps) submits a Draft Environmental Impact Statement (EIS) detailing the planning process and comparison of alternatives. Upon completion and receipt of the Final EIS, the Service will further assess potential impacts associated with the selected plan and prepare a Final FWCAR. This Draft Interim FWCAR provides the Service's continuing guidance and recommendations for the benefit of fish and wildlife resources in the DSMS area. This report is provided by the U.S. Fish and Wildlife Service (Service) in accordance with the Fish and Wildlife Coordination Act (FWCA) of 1958, as amended (48 Stat. 401; 16 U.S.C. 661 *et seq.*) and the Endangered Species Act of 1973, as amended (Act) (87 Stat. 884; 16 U.S.C. 1531 *et seq.*).

B. Purpose and Scope of Project

The Corps, Jacksonville District, is preparing a National Environmental Policy Act assessment for the DSMS. The purpose of the DSMS is to identify an engineering plan to allow the Corps to implement future dam safety projects that will address potential embankment failure modes, reduce risk to lakeside communities, and prioritize future work based on risk to human life. The DSMS includes the entire 143-mile embankment and structures (Figure 1). Multiple risk reduction measures are being developed and analyzed to reduce risk from all potential failure modes and to the population. Alternative plans are being developed, and the projected DSMS approval is in 2015. The environmental consequences of HHD embankment failure include:

- Potential for significant damage to the Everglades and other environmental resources due to flooding and poor water quality.
- Pollution stemming from inundation of adjacent landfills (Moore Haven) and other hazardous/toxic impacts.
- Potential for massive disruption to the Comprehensive Everglades Restoration Program and the Central Everglades Planning Project, both multi-billion dollar, multi-decade Federal investments to ecosystem restoration.
- Possible damage to cultural resources in South Florida (historical churches, Native Indian archeological sites, cemeteries etc.).

The DSMS has two major Risk Reduction Measures that include a Cutoff Wall Risk Reduction Measure and a Seepage Filter System Risk Reduction Measure.

1. Cutoff Wall Risk Reduction Measure

The purpose of a cutoff wall, as proposed at HHD, is to prevent progression of horizontally aligned internal erosion (piping). The proposed wall is a type typically described as a "hanging wall," meaning that it does not tie into a significant confining layer. As such, the wall's primary purpose is not to prevent seepage from passing through the foundation, but rather to act as a barrier to internal erosion, preventing erosion from progressing through the foundation. The cutoff wall depth will vary depending on the geometry and geology of specific areas. The wall is proposed to extend to a depth of five feet below the invert elevation of the adjacent (landside) canal or ditch and through the upper most limestone strata (where present). The wall will be constructed of a cement and or bentonite mixed with in situ soils to create a low permeability barrier about two feet thick within the depths constructed. The location of the wall will be between the approximate centerline of the embankment and approximately 100-feet lakeside of the centerline. The cutoff wall will penetrate some semi confining layers of peat and clayey sand. This will result in a reduction in seepage into the adjacent toe ditches and canals. The proposed cutoff wall will be similar to the Reach 1 cutoff wall discussed in the following Environmental Assessments (EA) but will not be as deep as the cutoff wall in Reach 1.

- Reach 1 Seepage Berm and Reach 1A Test Cutoff Wall, EA / FONSI May 3, 2007.
- Reach 1 Cutoff Wall with Addendum (Quarry), EA / FONSI February 11, 2008.

The cutoff walls will be considered as part of the Tentatively Selected Plan dependent upon local geology.

2. Seepage Filter System Risk Reduction Measure

A toe drain and chimney filter is also being considered as a risk reduction measure for HHD. This filter system addresses the same internal erosion failure mode by stopping particle erosion through filtration and drainage. The chimney filter feature extends from the toe of the embankment to an elevation high enough to capture all of embankment thru seepage created by the standard project flood pool (from elevation 17 feet to elevation 25 feet on the landside embankment slope). The toe drain will extend down from the bottom of the chimney filter to a depth of 5 feet below invert of the adjacent toe ditch or canal. The toe drain will relieve hydrostatic pressure below the toe of the embankment and filter foundation soils from internal erosion. The toe-drain feature of this risk reduction measure will breach shallow confining layers of peat and clayey sand. This will result in an increase in seepage water exiting at the toe of the dam. Two different configurations of the toe drain are being proposed. Those include a trapezoidal configuration with pipes in the drain to release additional seepage into the adjacent toe-ditch/canal system as well as a rectangular toe drain with additional seepage release via a blanket drain into the adjacent drainage system. Where adjacent canals have already breached these semi confining layers, no increase in seepage is anticipated.

The filter system risk reduction feature will be similar to the alternative rehabilitation plan pilot test discussed in the following EA.

Alternative Rehabilitation Plan Pilot Test, EA / FONSI February 7, 2012.

The seepage collection systems described above are expected to have impacts to the landside toe ditch due to required reconstruction of the existing toe ditch. Vegetation in new toe ditches (called toe swales) will be maintained, as is current condition.

C. Authority

The Final Fish and Wildlife Coordination Act (FWCA) Report constitutes the report of the Secretary of the Interior as required by section 2(b) of the FWCA (16 U.S.C. 661 *et seq.*), which establishes fish and wildlife conservation as a co-equal purpose or objective of federally funded or permitted water resource development projects. The FWCA allows for reports and recommendations from the Service and State to be integrated into Corps reports seeking authorization for the Federal action, and it grants the Corps the authority to include fish and wildlife conservation measures within these projects.

II. AREA SETTING

A. Study Area Location

The DSMS area encompasses Lake Okeechobee which is the third largest lake by land area in the United States. The lake has a surface area of approximately 730 square-miles and drains an area to the north and west totaling approximately 5,600 square-miles of lands with major inflows coming from the Kissimmee River and Fisheating Creek.

The HHD is approximately 143 miles long and spans the following five counties around the perimeter of Lake Okeechobee: Glades, Hendry, Martin, Okeechobee, and Palm Beach (Figure 1). The HHD has 32 Federal culverts, 5 spillway inlets, 5 spillway outlets, 9 navigation locks, 9 pump stations, and no emergency spillway. The HHD embankment was built by hydraulic dredge and fill methods that are unacceptable by today's construction standards.

B. Description of Study Area

Lake Okeechobee lies about 30 miles west of the Atlantic Ocean and 60 miles east of the Gulf of Mexico. Extending across parts of Highlands, Charlotte, Glades, Hendry, Okeechobee, Martin, and Palm Beach Counties, this subregion covers the lake and its immediate drainage area to the west, including Fisheating Creek. This subregion does not include the Kissimmee River or Everglades drainages. Lake Okeechobee is the central feature of the South Florida Ecosystem - its liquid heart. The lake is formed by a broad, shallow, relatively circular depression in bedrock and has a surface area of roughly 730 square-miles (Corps 1994). Land levels around the lake vary from 3 to 15 meters (10 to 50 feet) above sea level (McPherson and Halley 1997). The lake is ringed with levees, pumping stations, and control structures to permit fluctuation of lake levels in response to drought, flood conditions, and water supply demands. Major outlets are the St. Lucie Canal (C-44) to the east and the Caloosahatchee

Canal (C-43) and River to the west. In addition, numerous agricultural canals release excess lake water to Water Conservation Areas south of the lake.

Lake Okeechobee formed over 6,000 years ago. Originally, the water flowed south and west from the lake. The lake was the source of the Everglades "River of Grass" sheetflow which sustained the Everglades and nourished Florida Bay and coastal estuaries. During the last 65 years the Okeechobee subregion has been re-engineered; resulting in a much shallower and nutrient laden lake, with a littoral zone filled with exotic species. Today, the major vegetative communities outside the lake proper are predominantly freshwater marsh with some cypress forest wetlands and small fragments of remnant pond-apple (*Annona glabra*) forest (Service 1999).

III. PREVIOUS SERVICE INVOLVEMENT

The Service has been responsive to numerous general and specific design changes proposed for HHD Rehabilitation since our initial FWCA Report on December 11, 2001, which evaluated Reach 1 of the project. We have provided several supplemental FWCA Reports for work on the HHD and several related culvert replacements. On November 7 and 8, 2006, we participated in an interagency team to conduct an assessment of wetland functions and values along Reaches 2 and 3, using the Uniform Mitigation Assessment Method. In 2006, we also provided guidance regarding protection of a previously unknown nest of the threatened Audubon's crested caracara (*Polyborus plancus audubonii*) discovered next to the Corps' construction trailer for Reach 1. In February 2010, our staff collaborated in the fostering of bald eagle (*Haliaeetus leucocephalus*) chicks from the nest designated as PB014 that was close to both the construction of the HHD cutoff wall and the filling of the adjacent borrow pit. In March 2012, we worked with the Corps to minimize disturbance impacts of construction on an osprey (*Pandion haliaetus)* nest in the southern portions of Reach 1. In January 2014, the Service met with the Corps to discuss the DSMS and associated FWCAR. These are just some of the highlights of our continued cooperation with the Corps in assuring protection of fish and wildlife in accordance with the FWCA, Migratory Bird Treaty Act (MBTA), and section 7 of the Endangered Species Act of 1973, as amended (Act) (87 Stat. 884; 16 U.S.C. 1531 *et seq.*).

IV. FISH AND WILDLIFE CONCERNS

A. Introduction

The fish and wildlife resources of Lake Okeechobee are of remarkable value, including threatened and endangered species, abundant waterfowl, an exceptionally productive recreational fishery, and commercial fisheries. The Service has great interest in the protection and enhancement of fish and wildlife resources within Lake Okeechobee. Our description of affected resources and fish and wildlife concerns in this Draft Interim FWCAR concentrates on those resources found within Lake Okeechobee, on HHD itself, and in areas to the landward side of the HHD.

B. Fish and Wildlife Resources

1. Federally-Listed Species

Federally-listed species within the study area include Audubon's crested caracara, wood stork (*Mycteria americana*), Everglade snail kite (*Rostrhamus sociabilis plumbeus*), eastern indigo snake (*Drymarchon corais couperi*), West Indian manatee (*Trichechus manatus*), Florida panther (panther; *Puma concolor coryi*), Florida bonneted bat (*Eumops floridanus*), and Okeechobee gourd (*Cucurbita okeechobeensis* ssp. *okeechobeensis*). The study area also includes federally-designated Everglade snail kite critical habitat.

Audubon's Crested Caracara

The Audubon's crested caracara's decline, as described in historic literature, is attributed primarily to habitat loss (Layne 1996). This decline and the geographic isolation of the Florida population eventually resulted in the caracara's Federal listing as threatened in 1987. In particular, the caracara was listed as threatened because its primary habitat, dry prairie, had been greatly eliminated or modified for agriculture and residential development. It was also listed because existing regulatory mechanisms did not adequately prevent the destruction or modification of the caracara's habitat, which is mainly located on private land. Critical habitat has not been designated for the caracara.

The caracara is a large raptor with a crest, naked face, heavy bill, elongated neck, and unusually long legs. It is about 19.7 to 25.2 inches (50 to 64 centimeters) long and has a maximum wingspan of 47.2 inches (120 centimeters). The adult is dark brownish black on the crown, wings, back, and lower abdomen. The lower part of the head, throat, upper abdomen, and under tail coverts are white. The breast and upper back are whitish, heavily barred with black. The tail is white with narrow, dark crossbars and a broad, dark terminal band. Prominent white patches are visible near the tips of the wings in flight. The large, white patches in the primaries and the white tail, broadly tipped with black, are both very conspicuous in flight and can be recognized at a long distance (Bent 1961).

The Florida caracara population historically inhabited native dry or wet prairie areas containing scattered cabbage palms (*Sabal palmetto*), their preferred nesting tree. Scattered saw palmetto (*Serenoa repens*), and low-growing oaks (*Quercus minima, Q. pumila*), and cypress (*Taxodium spp.*) also occur within these native communities. Over the last century, many of the native prairie vegetation communities in central and south Florida have been converted to agricultural land uses, and frequently replaced by improved and unimproved pasture dominated by short-stature, non-native, sod-forming grasses. Morrison and Humphrey (2001) hypothesized that the vegetation structure of open grasslands (short-stature vegetation, scattered shrub cover, and nest trees) may be preferred by the caracara, due to its tendency to walk on the ground during foraging activities. This may directly facilitate foraging by caracaras and provide less cover for predators. Consequently, caracaras appear to benefit from management actions such as prescribed burning that maintain habitat in a low stature and structurally simple condition. Within agricultural lands, regular mowing, burning, and high-density grazing may maintain low vegetative structure, an important habitat characteristic of the caracara's nest stand area

(Morrison and Humphrey 2001). Regular prescribed burning maintains habitat in a favorable condition in native dry prairies. These field observations are consistent with the territory compositional analyses that indicate non-random selection of improved and semi-improved pastureland.

Caracaras construct new nests each nesting season, often in the same tree as the previous year. Both males and females participate in nest building. Nests are well concealed and most often found in the tops of cabbage palms (Morrison and Humphrey 2001) although nests have been found in live oaks (*Q. virginiana)*, cypress (first record, Morrison et al 1997), Australian pine (*Casuarina spp.*), saw palmetto, and black gum (*Nyssa sylvatica*). Caracaras usually construct their nests 13.1 to 59.1 feet (4 to 18 meters) above the ground; their nests primarily consist of haphazardly woven vines trampled to form a depression (Bent 1938; Sprunt 1954; Humphrey and Morrison 1997). Caracaras vigorously defend their nesting territory during the breeding season (Morrison 2001).

The major threat to this population remains habitat loss. Large areas of native prairie and pasturelands in south-central Florida have been converted to citrus operations, tree farms, other forms of agriculture, and real estate development and this loss has accelerated in the past few decades (Morrison and Humphrey 2001). However, historical conversion of forested habitats to pasture has not been adequately documented as partially offsetting losses to caracara habitat, so a full accounting of historic habitat changes is lacking. The current threat of habitat loss persists as changes in land use continue. Florida's burgeoning human population has also increased the number of motor vehicles and the need for roads. The increase in traffic as well as the caracara's predisposition for feeding on road-killed animals has probably increased the number of caracaras killed or injured as a result of vehicle strikes.

Lack of habitat management is also a potential threat to caracaras in some areas and can result in habitat degradation to the point where it is no longer suitable for occupancy. In particular, encroachment of woody shrubs and trees into open dry prairies, pastures, and similar habitats will result in some reduction in habitat suitability. Complete clearing of large areas that includes removal of cabbage palms and other trees may also reduce the suitability of habitat, but generally only when very large areas are completely cleared.

Wood Stork

The wood stork was federally listed as endangered on February 28, 1984, and reclassified from endangered to threatened on June 30, 2014. Wood storks use a specialized feeding behavior called tactolocation, or grope feeding. This unique feeding method of the wood stork gives it specialized habitat requirements; the habitats on which wood storks depend have been disrupted by changes in the distribution, timing, and quantity of water flows in south Florida. The persistent loss or degradation of wetlands in central and south Florida is one of the principal threats to the wood stork and continue to threaten the recovery of this species in the United States. Critical habitat has not been designated for the wood stork.

The wood stork uses wetlands for foraging throughout the year. Typical foraging sites for the wood stork include freshwater marshes, stock ponds, shallow and seasonally flooded roadside or agricultural ditches, narrow tidal creeks, shallow tidal pools, managed impoundments, and depressions in cypress heads, swamps, and sloughs. Because of their specialized feeding behavior, wood storks forage most effectively in shallow water (*i.e.*, 2 to 16 inches deep) with highly concentrated prey. Almost any shallow wetland depression where fish become concentrated, either through local reproduction or receding water levels, may be used as foraging habitat during some portion of the year.

The wood stork is ubiquitous in south Florida and they have nested, at one time or another, in every county in the DSMS area. They are primarily associated with freshwater and estuarine habitats for nesting, roosting, and foraging. The study area encompasses the core feeding areas of wood stork colonies.

Everglade Snail Kite

The endangered Everglade snail kite (federally listed in 1967) is nomadic throughout south Florida, seeking suitable wetland habitat for nesting and foraging. Critical habitat was designated for the Everglade snail kite in 1977 (Figure 2). Everglade snail kites are food specialists, preying on apple snails (*Pomacea paludosa*) which live in long hydroperiod, freshwater wetlands with emergent vegetation. The Everglade snail kite has experienced population fluctuations associated with both man-induced and natural hydrologic influences. Water management actions that affect hydrology and water quality are important human-controlled factors in the recovery of the Everglade snail kite. The Everglade snail kite occurs in the Everglades, Lake Okeechobee, Kissimmee River, Caloosahatchee River, and the upper St. Johns River watersheds which have all experienced habitat degradation due to urban development and agricultural activities (Service 1999).

The Everglade snail kite inhabits relatively open freshwater marshes in south Florida that support adequate populations of Florida apple snails, which is the primary forage species for the kite. Favorable areas consist of extensive shallow open water such as sloughs and flats, vegetated by sawgrass (*Cladium jamaicense*) and spikerush (*Eleocharis cellulose*). The areas are often interspersed with tree islands or small groups of scattered shrubs and trees which serve as perching and nesting sites. Suitable snail kite habitat includes water levels that are sufficiently stable to prevent loss of the food supply through dry down or excessive flooding. The Everglades snail kite is threatened primarily by habitat loss and destruction which results in reduced reproductive success and lack of recruitment of new individuals into the breeding population. Water management in south Florida has significantly affected the hydrology of snail kite habitat, which has led to severe population declines. Urban development has also directly impacted Everglade snail kite habitat (Service 1999).

Everglade snail kites are known to nest in the DSMS area (Figure 3). Everglade snail kite critical habitat in Lake Okeechobee is located in the western parts of Glades and Hendry Counties (Figure 2), extending along the western shore to the east of the levee system and the undiked high ground at Fisheating Creek, and from the Hurricane Gate at Clewiston northward to the mouth of the Kissimmee River, including all the spike rush (*Eleocharis* sp.) flats of

Moonshine Bay, Monkey Box, and Observation Shoal, but excluding the open water north and west of the northern tip of Observation Shoal north of Monkey Box and east of Fisheating Bay.

Everglade snail kite nesting is prominent in the DSMS area and could be affected by construction operations associated with HHD. Critical habitat for the snail kite is also found within the DSMS area. Everglade snail kites are known to nest within the western littoral zone of Lake Okeechobee (Figure 3), and snail kites are known to forage within the Lake Okeechobee littoral zone.

Eastern Indigo Snake

The eastern indigo snake was federally listed in 1978 as a threatened species as a result of population declines caused by over-collecting for the pet trade as well as mortalities caused by rattlesnake collectors who gassed gopher tortoise (*Gopherus poluphemus*) burrows to collect snakes. Since listing, habitat loss and fragmentation by residential and commercial expansion have become much more significant threats to the eastern indigo snake (Service 1999).

The eastern indigo snake is a large, black, non-venomous snake found in the eastern United States. Eastern indigo snakes occur throughout south Florida and use a variety of habitats including pine flatwoods, pine rocklands, tropical hardwood hammocks, a variety of wetlands types (including mangrove wetlands), and other developed and undeveloped cover types. An adult eastern indigo snake's diet may include fish, frogs, toads, snakes, lizards, turtles, turtle eggs, juvenile gopher tortoises, small alligators, birds, and small mammals. Juvenile eastern indigo snakes eat mostly invertebrates (Service 1999). Habitat loss and fragmentation by residential and commercial expansion are the most significant threats to the eastern indigo snake (Service 1999). Because of its relatively large home range (185 acres for males and 47 acres for females), the eastern indigo snake is especially vulnerable to habitat loss, degradation, and fragmentation caused by residential and commercial construction and agriculture (Lawler 1977; Moler 1985; Service 1999).

The eastern indigo snake is present but uncommon throughout Florida. In central and coastal Florida, eastern indigo snakes are mainly found within high, sandy ridges. In extreme south Florida, eastern indigo snakes are typically found in pine flatwoods, pine rocklands, tropical hardwood hammocks, and in most other undeveloped areas (Kuntz 1977). Eastern indigo snakes also use some agricultural lands and various types of wetlands (Layne and Steiner 1996). In the milder climates of central and southern Florida, eastern indigo snakes exist in a more stable thermal environment, where availability of thermal refugia may not be as critical to the snake's survival.

Most of the DSMS area can be considered suitable eastern indigo snake habitat except for open water not associated with levees or banks and disturbed areas not associated with vegetative cover. Eastern indigo snakes are also known to use levees which impound water in south Florida, which are common in the DSMS area.

West Indian Manatee

The West Indian manatee is one of the most endangered marine mammals in coastal waters of the United States. This group includes a separate subspecies called the Florida manatee (*Trichechus manatus latirostris*) that appears to be divided into at least two somewhat isolated subpopulations - one along the Atlantic coast and the other on the Florida Gulf of Mexico coast. Manatees were federally listed as endangered in 1967 concurrent with the creation of the Endangered Species Conservation Act, an act that pre-dated the Federal Act of 1973. In addition to Florida, they occur in Georgia, Texas, Mexico, Puerto Rico, and elsewhere in the Caribbean. Accidental collisions with boats are the primary cause of death for these shallow water inhabiting animals, followed by low reproductive rates and a decline in suitable habitat. No manatee critical habitat is adjacent to or near HHD.

The Florida manatee is a large, plant-eating aquatic mammal that can be found in the shallow coastal water, rivers, and springs of Florida in both fresh and salt water habitats. Manatees frequently move into riverine and canal systems and migrate throughout the waterways in south Florida (Service 1999). They depend on areas with access to natural springs or manmade warm water refugia and access to areas with abundant aquatic vascular plants, their primary food source. The relatively deep waters of the canals respond more slowly to temperature fluctuations at the air/water interface than the shallow bay waters. Thus, the canal waters remain warmer than open bay waters during the passage of winter cold fronts.

Manatees have been observed in the C-44 and C-43 Canals that connect Lake Okeechobee to the St. Lucie and Caloosahatchee River Estuaries, respectively. Manatees are found in the seagrass beds of these estuaries. The extensive acreages of seagrass beds in the bays and estuaries provide important feeding areas for Florida manatees. Manatees also occur in Lake Okeechobee. Florida manatees depend upon Lake Okeechobee and canals as a source of freshwater, resting sites, and thermal refugia.

Florida Bonneted Bat

The Florida bonneted bat was federally listed as endangered on November 2, 2013. The Florida bonneted bat is Florida's largest bat, weighing approximately 1.1 to 2.0 ounces, with a 19 to 21 inch wingspan, and a body length of 5.1 to 6.5 inches. The species has dark brown fur and large broad ears that join and slant forward over the eyes. Relatively little is known regarding the ecology and habitat requirements of this species (Service 2013). In general, bats will forage over ponds, streams, and wetlands and require roosting habitat for daytime roosting, protection from predators and rearing of young (Marks and Marks 2008). Florida bonneted bats roost in tree cavities, rocky outcrops, and dead palm fronds. In residential communities, the bats roost in Spanish tile roofs, but have also been found in attics, rock or brick chimneys, and fireplaces of old buildings (NatureServe 2013). Colonies are small, with the largest reported as just a few dozen individuals. The bat is a nocturnal insectivore and relies upon echolocation to navigate and detect prey.

Final survey, conservation, and compensation guidelines for the Florida bonneted bat are currently under development by the Service.

Florida Panther

The Florida panther is the last subspecies of *Puma* (also known as mountain lion, cougar, panther, or catamount) still surviving in the eastern United States. Historically occurring throughout the southeastern United States (Young and Goldman 1946), today the panther is restricted to less than 5 percent of its historic range located in south Florida.

Prior to 1949, panthers could be killed in Florida at any time of the year. In 1950, the Florida Game and Fresh Water Fish Commission (now FWC) declared the panther a regulated game species due to concerns over declining numbers. The FWC removed panthers from the game animal list in 1958 and gave them complete legal protection. On March 11, 1967, the Service listed the panther as endangered (32 FR 4001) throughout its historic range, and these animals received Federal protection under the passage of the Act of 1973. In addition, the Florida Panther Act (Florida Statute 372.671), a 1978 Florida State law, made killing a panther a felony. The Florida panther is listed as endangered by the States of Florida, Georgia, Louisiana, and Mississippi in addition to its Federal listing.

Since the panther was designated as a federally endangered species prior to enactment of the Act, there was no formal listing package identifying threats to the species as currently required by section 4(a)(1) of the Act. However, the Florida Panther Recovery Plan, third revision, addressed the five factor threats analysis (Service 2008). Critical habitat has not been designated for the panther.

The Florida panther, a subspecies of mountain lion, is one of the most endangered large mammals in the world. The most recent population range estimate is 100 to 160 adult panther (FWC 2014). This small population in south Florida represents the only known remaining wild population of an animal that once ranged throughout most of the southeastern United States. The panther presently occupies public conservation lands and private lands in Broward, Collier, Hendry, Lee, Miami-Dade, and Monroe Counties totaling more than 2 million acres. Panthers have an affinity for hardwood forests and mixed swamps but also use fresh and saltwater marshes, prairie and shrub and scrub habitats, agricultural lands (*i.e.*, wooded pasture, rangeland, citrus groves, row crops, etc.), and even urban areas.

Florida panther habitat in the DSMS area includes habitat designated as secondary zone and primary dispersal/expansion area (Figure 4) in the Landscape Conservation Strategy for the Florida Panther in south Florida (Kautz et al. 2006). The primary zone is considered to be the most important area needed to support a self-sustaining panther population. Environmental factors affecting the panther include: habitat loss and fragmentation, contaminants, prey availability, human-related disturbance and mortality, disease, and genetic erosion (Dunbar 1993).

The Florida panther occurs in most central and south Florida counties. Historically, the Florida panther was observed near the Arthur R. Marshall Loxahatchee National Wildlife Refuge and was assumed to forage in the vicinity. Today, Florida panthers are rarely located east of Lake Okeechobee in Palm Beach County and the closest telemetry points to the DSMS area

are located to the west of Lake Okeechobee (Figure 2). There have been no confirmed sightings in recent years, although panthers could potentially range along the HHD.

Okeechobee Gourd

The Okeechobee gourd was federally listed under the Act as endangered on July 12, 1993. The conversion of swamps and marshes for agriculture and water-level regulation in Lake Okeechobee have been the principal causes of the reduction in range and number of Okeechobee gourd plants. The Okeechobee gourd is only found in Florida in two natural populations, one on Lake Okeechobee (Figure 2) and the other along the St. Johns River. Population trends and abundance of this subspecies are difficult to assess because the gourd is ephemeral by nature, often only growing when habitat conditions are favorable, and its growth habit of climbing amongst the tree canopy precludes the ability to count individual plants. This subspecies employs a strategy of growing on open organic soils exposed by low water levels with little to no competition, producing numerous seeds with somewhat long viability, and experiencing vegetative decline when competition increases or water levels rise (Moyroud 2009).

Currently, the survival of the Okeechobee gourd in South Florida is threatened by the water-regulation practices in Lake Okeechobee and the continued expansion of exotic vegetation in the lake. Surveys generally consist of observations of persistence of previously known occurrences, reporting of new sites where gourds are located, evaluating general health of the occurrences, and recording the number of fruits observed if conducting ground surveys. Careful use of herbicides to control exotic woody vegetation (primarily *Melaleuca)* and dense growths of aquatic vegetation can be compatible with recovery of the Okeechobee gourd. Additional conservation recommendations for the Okeechobee gourd can be found in Section V, Recommended Fish and Wildlife Conservation Measures, of this report.

Migratory Birds

Migratory birds are of great ecological and economic value to this country and to other countries. They contribute to biological diversity and bring tremendous enjoyment to millions of Americans who study, watch, feed, or hunt these birds throughout the United States and other countries. The United States has recognized the critical importance of this shared resource by ratifying international, bilateral conventions for the conservation of migratory birds. These migratory bird conventions impose substantive obligations on the United States for the conservation of migratory birds and their habitats. The United States implements these migratory bird conventions through the MBTA.

The south Florida ecosystem is located along one of the primary migratory routes for bird species that breed in temperate North America and winter in the tropics of the Caribbean and South America. Many species of neotropical migrants have been recorded in the south Florida region. A 1995 amendment to the MBTA included a list of migratory nongame birds of management concern in the United States to stimulate a coordinated effort by Federal, State, and private agencies to develop and implement comprehensive and integrated approaches for management of these selected species. Forty-three of these species are found in the south Florida ecosystem. Other migratory species like tanagers (*Pirange spp.*), chimney swifts

(*Chaeturaa pelagica*), tree swallows (*Iridoprocne bicolor*), nighthawks (*Chordeiles minor*), royal terns (*Sterna maxima*), and blue-winged teal (*Anas discors*) also have major migratory pathways through and to (as winter residents) south Florida. More than 129 bird species migrate to the south Florida region to overwinter. Another 132 bird species breed in south Florida. Because south Florida is located near Cuba and the West Indies, it draws tropical species that rarely appear elsewhere in North America. Examples include the smooth-billed ani (*Crotophaga ani*), mangrove cuckoo (*Coccyzus minor*), Antillean nighthawk (*Chordeiles gundlachii*), white-crowned pigeon (*Columba leucocphala*), gray kingbird (*Tyrannus dominicensis*), short-tailed hawk (*Buteo brachyurus*), Everglade snail kite, and black-whiskered vireo (*Vireo altiloquus*). South Florida has an endemic race of the yellow warbler (*Dendroica petechia*) and contains the majority of the nesting locations for the reddish egret (*Egretta rufescens)*, roseate spoonbill (*Platalea ajaja*), and swallow-tailed kite (*Elanoides forficatus*) in the United States.

Shorebirds that migrate along the Atlantic coast of Florida on their way to and from South America use the beach dune community for food and shelter while songbirds use the coastal strand, maritime hammock, and mangrove communities. The FWC identified 26 species of shorebirds and 27 species of songbirds that use coastal barriers during migration as rare or declining species (Enge et al. 1997). Additionally, 15 species of herons, storks, and ibises nest in south Florida and are considered ecological indicators because of their wide foraging ranges, relatively narrow food requirements, and relatively specific habitat requirements. Their breeding success reflects the health of the wetland and coastal habitats of south Florida. Migratory songbirds, raptors, and wading birds utilize a variety of habitats within the DSMS area and represent noted trust resources for the study area.

Many of the species above have also been identified as birds of conservation concern (Service 2008) and the Service is developing a strategy to protect breeding, migration, and wintering habitat for these species. As a public trust resource, migratory birds need to be taken into consideration during project planning and design.

V. RECOMMENDED FISH AND WILDLIFE CONSERVATION MEASURES

A. Federally-Listed Species Conservation Measures

Audubon's Crested Caracara

Audubon's crested caracara nest on and adjacent to the HHD (Figure 2). Surveys should be conducted prior to the initiation of construction and during construction, per the Service's Audubon's Crested Caracara Conservation Guidelines and Audubon's Crested Caracara Nesting Survey Protocol, at HHD construction sites to determine if caracaras are present in the project area. Since the final proposed action may produce noise above ambient levels, mufflers and sound dampening equipment would be required during construction. Human activities should be limited in the 985-foot primary management zone around any active caracara nests. Use of chemicals toxic to wildlife and construction activities lacking visual screening and above-ambient noise levels would be limited in the 985 to 4,920-foot secondary management zone around active caracara nests. Monitoring for caracaras during the nesting season

(November through April) and adaptively managing action activities within 985-foot primary and 4,920-foot secondary management zones of active nests will ensure the action is not likely to increase noise above ambient levels within nest protection areas of active caracara nests.

Figure 5 shows the location of caracara nests in the DSMS area from 1992 to 2013. Although caracaras do show some nest site fidelity, they change nest trees more readily than bald eagles. The Corps has previously committed to conducting nesting surveys in the typical nesting season ahead of anticipated work on HHD in a given year. The reaches of HHD along the western, northern, and northeastern shores of Lake Okeechobee are likely to have nesting and foraging caracaras in or adjacent to construction sites. Nesting would occur often, but not always, in a cabbage palm that would be on adjacent lands outside of the Federal right of way. However, we recommend that any cabbage palms in the right of way or any that may be affected by placement of staging areas be left undisturbed by construction even if these are not known to be active nest trees. Caracaras may select from several potential nest trees within their territories, and signs of previous nests may not be readily prominent in the sometimes dense crown. Figure 6 shows telemetry points for a caracara at the Lakeside Ranch Stormwater Treatment Area. The central cluster of points was around the nest tree, and although this may be far enough from the base of the HHD to avoid disturbance, the nest could have been placed in a given year within the territory closer to the HHD. These data also demonstrate what we have also casually observed; caracaras commonly forage or rest on the crest of the HHD, and the avoidance of harassment should be part of the educational program for workers.

Eastern Indigo Snake

Eastern indigo snakes may be found along the embankment of the HHD. Preconstruction surveys should be completed in the project area per the Service's Standard Protection Measures for the Eastern Indigo Snake (Service 2013). Monitors should be on site during all phases of construction, and construction crews should be educated on identifying the indigo snake and the precautions to be taken to prevent impacts to the indigo snake. Onsite gopher tortoise burrows would be protected to the extent possible to provide potential snake habitat during construction. The habitat (embankment of the HHD) temporarily impacted by the action should be seeded or replaced by sod and is expected to recover within a few months after project completion.

Everglade Snail Kite

Everglade snail kites forage within the Lake Okeechobee littoral zone. Because the final proposed action may produce noise above ambient levels, mufflers and sound dampening equipment would be required during construction. Preconstruction surveys should be completed prior to the initiation of construction activities per the Service's Snail Kite Survey Protocol. Human activities should be limited in the 425-foot primary management zone around active Everglade snail kite nests. Use of chemicals toxic to wildlife and construction activities lacking visual screening and above ambient noise levels should be limited in the 425 to 1,640-foot secondary management zone around active Everglade snail kite nests. Monitoring kites during the nesting season (December through June) and adaptively managing action activities within the 425-foot inner protective no activity zone of active snail kite nests is likely to preclude increases

in noise above ambient levels within nest protection areas of active snail kite nests. A 1,640-foot secondary priority management zone should be established as necessary around active nests. In the event of cofferdam construction, the Corps should minimize effects in Everglade snail kite critical habitat by using driven pile cofferdams which have approximately 50 percent less impacted footprint than earthen cofferdams. Driven pile cofferdams should be constructed as close as possible to the construction area to avoid impacts to snail kite critical habitat.

Wood Stork

The DSMS area overlaps with a wood stork Core Foraging Area. Wood storks are known to forage within the toe ditch adjacent to the HHD, but have not been documented nesting in the DSMS area (Figure 2). The final proposed action may produce noise above ambient levels; therefore, mufflers and sound dampening equipment should be required during construction. Preconstruction surveys should be completed prior to the initiation of construction activities. Should an unexpected wood stork colony become established near the study/project site, human activities should be limited in the 1,500-foot primary management zone around active wood stork colonies (all nest trees plus a 100-foot buffer). Use of chemicals toxic to wildlife and construction activities lacking visual screening and above ambient noise levels should be limited in the 1,300 to 2,500-foot secondary management zone around active wood stork colonies.

Monitoring of wood storks during the nesting season (November through August) and adaptively managing action activities within 1,000 to 1,500 feet of active wood stork nesting colonies will likely not increase noise above ambient levels within nest protection areas of active wood stork colonies. Human activity should not occur within a 300-foot buffer where there is a vegetation screen (dense vegetation), and 750 feet when there is no vegetation present. A 2,500-foot buffer (Secondary Priority Management Zone) should be established as necessary around nesting colonies.

West Indian Manatee

West Indian manatees occur in Lake Okeechobee (Figure 2). The final proposed action may produce noise above ambient levels. Preconstruction surveys should be completed to ensure that no manatees are harmed or harassed during construction. In the event of cofferdam construction, surveys should also be conducted during construction and installation of the cofferdams to determine if manatees are present in the area of construction. The installation of cofferdams would prevent manatees from entering the construction zone and should prevent any disturbance to the manatees. Manatee protection grates with openings no greater than 8 inches by 8 inches should be installed on all replacement culverts to prevent manatees from accessing culvert structures. Additionally, to avoid and minimize adverse effects during construction activities, the Corps should implement the construction conservation measures outlined in *Standard Manatee Conditions for In-Water Work* (FWC 2011).

Florida Bonneted Bat

Through coordination for the HDD Culvert Replacement and Removal project, the Corps has already committed to performing inspections of culverts prior to replacement to determine

presence of Florida bonneted bat. During the construction phase, the Corps will monitor or require contractors to monitor for Florida bonneted bats that could occur on or around the HHD culverts. If bats are encountered, the Corps will coordinate measures with the Service to minimize or avoid potentially adverse effects. The Corps will address potential effects during ongoing communication and adaptive management discussion with the Service throughout the construction phase. Final survey, conservation, and compensation guidelines for the Florida bonneted bat are currently under development by the Service.

Okeechobee Gourd

The Okeechobee gourd is known to be present on or adjacent to the HHD. Preconstruction surveys should be completed to locate any plants within the construction footprint. If plants are found, the Service would be contacted to determine an appropriate course of action for removal and relocation of plants. Flagging should be placed around the gourd for additional protection from pedestrian traffic if plants are sighted outside of, but adjacent to, the construction area.

Federally-Listed Species Conservation Guidelines and Survey Protocols

The Corps should implement before, during and post construction guidelines from the following species Conservation Guidelines and Survey Protocols:

Audubon's Crested Caracara Conservation Guidelines:
http://www.fws.gov/verobeach/images/pdflibrary/Caracara_Conservation_Guidelines.pdf

Audubon's Crested Caracara Nesting survey protocol:
http://www.fws.gov/verobeach/images/pdflibrary/Caracara_Survey_Protocol.pdf

Eastern Indigo Snake Species Conservation Guidelines:
http://www.fws.gov/verobeach/images/pdflibrary/Eastern_Indigo_Snake_Conservation_Guidelines.pdf

Standard Protection Measures For The Eastern Indigo Snake:
http://www.fws.gov/northflorida/IndigoSnakes/20130812_Eastern_indigo_snake_Standard_Protection_Measures.htm

Everglade Snail Kite:
http://www.fws.gov/verobeach/images/pdflibrary/Snail_Kite_Conservation_Measures.pdf

Everglade Snail Kite:
http://www.fws.gov/verobeach/BirdsPDFs/SnailKiteSurveyProtocol.pdf

Okeechobee Gourd:
http://www.fws.gov/verobeach/images/pdflibrary/cuok.pdf

West Indian Manatee:
http://www.fws.gov/verobeach/images/pdflibrary/Manatee%20_Conservation_Guidelines.pdf

Wood Stork Habitat Management Guidelines:
http://www.fws.gov/verobeach/images/pdflibrary/Management_Guidelines_Wood%20Stork.pdf

B. Other Fish and Wildlife Resources Conservation Measures

The Corps or its contractor should conduct a pre-construction survey to determine locations of bald eagle nests (Figure 7) within the immediate vicinity of construction prior to issuance of any construction contracts. Results should be coordinated with the Service's South Florida Ecological Services Office. The Corps should conduct surveys to locate nest trees ahead of construction and should avoid construction close to the nests during the nesting season. If nests are found and construction within the interior of the 660-foot buffer is unavoidable during the nesting season, the National Bald Eagle Management Guidelines should be implemented accordingly. The guidelines can be reviewed at:
http://www.fws.gov/migratorybirds/CurrentBirdIssues/Management/BaldEagle/NationalBaldEagleManagementGuidelines.pdf.

A bald eagle nest (FWC nest number PB-14) is located on the eastern edge of Lake Okeechobee within the Federal right-of-way within Reach 1D. Bald eagle nests are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. §§ 668-668d, June 8, 1940, as amended 1959, 1962, 1972, and 1978). The existing nest tree was retained during cut-off wall construction in the 2009 and 2010 winter-spring bald eagle nesting season. Every effort should be made to retain the nest tree and maintain ground integrity near the foot of the tree. The Corps should monitor the nest site if construction or other project activities are expected to occur within 660 feet of this nest or future nest locations along the HHD during the nest season (October 1 through May 15). The National Bald Eagle Management Guidelines (WebLink provided above) describe the situations under which either a 660-foot or 330-foot buffer is recommended, based on the type of activity and its visibility from the nest. In addition, the Corps could consider coordinating with relevant agencies and organizations to plant native pines to support continued bald eagle nesting near the current nest site when the current nest tree, a scraggly Australian pine, (*Casuarina equisetifolia*), falls over since there are limited large trees nearby that could replace the current nest tree. We would willingly work with the Corps to develop a long term vegetation management site plan to ensure long-term bald eagle productivity at this site.

The Service recommends that the Corps notify the Service and FWC in the event colonial or solitary wading bird nests are observed within the construction footprint.

The Service recommends that the Corps cooperate with research-based efforts to provide for long-term ecological monitoring of indigo snake densities and habitats in the project area.

The Service recommends the Corps consult with the FWC regarding habitat needs and additional conservation recommendations for state-listed species.

The Florida burrowing owl (*Athene cunicularia*) is a State-listed species of special concern and protected under the Federal MBTA. Burrowing owls could potentially be present along canal banks and embankments of HHD. In accordance with MBTA, the Service recommends the Corps perform a burrowing owl nest survey within any HHD construction footprint prior to

construction. The Service further recommends the survey take place immediately prior to construction in order to ensure owls have not nested in the area between the time of the survey and construction. If the project is to be phased, surveys should be performed immediately prior to construction of the various phases.

C. Construction Activities Conservation Measures

The Corps is very familiar with and has a history of responsibly implementing conservation measures to avoid adverse effects to trust resources and minimizing potential effects of large construction projects to the greatest extent possible in both the planning and construction phases. During the construction phase, the Corps should monitor or require contractors to monitor listed species that could occur on or around the HHD. The Corps should address potential effects during ongoing communication and adaptive management discussion with the Service throughout construction phases. HHD construction activities will span over multiple years, and final design plans have not currently been established; therefore consultation with the Service should continue as design plans move forward.

Turbidity screening and diversion should be used to control effects to the drainage ditches and connected canals. Runoff from construction sites should be controlled, retarded, and diverted to protected drainage courses by means of diversion ditches, benches, and any measures required by area wide plans approved under paragraph 208 of the Clean Water Act. Temporary and permanent erosion and sedimentation control features or screening should be installed. Temporary velocity dissipation devices should be placed along drainage courses to provide for non-erosive flows. Temporary erosion and sediment control measures such as berms, dikes, drains, sediment traps, sedimentation basins, grassing, mulching, baled hay or straw, and silt fences should be maintained until permanent drainage and erosion control facilities are completed and operative. For silt fences, the filter fabric is to be of nylon, polyester, propylene, or ethylene yarn of at least 50 pounds per inch strength and able to withstand a flow rate of at least 0.3 gallons/square-foot per minute. It also should contain ultraviolet ray inhibitors and stabilizers and be a minimum of 36 inches in width.

During construction, the contractor should be responsible for keeping construction activities, including refueling and maintenance sites, under surveillance, management, and control to avoid pollution of surface waters, ground waters, and wetlands. The contractor is responsible for conducting all operations in a manner to minimize turbidity and should conform to all water quality standards as prescribed by Chapter 62-302, State of Florida, Florida Department of Environmental Protection.

Project construction should not destroy migratory birds, their active nests, their eggs, or their hatchlings. Monitoring for such would be required by the construction contractor. A buffer zone around active nests or nestling activity would be required during the nesting season.

The Corps should implement adaptive management techniques similar to those coordinated with the Service for the HDD Culvert Replacement and Removal Project and should apply relevant lessons learned to the DSMS to avoid or minimize any potential effects to listed species and other wildlife habitat in the DSMS area.

III. SUMMARY OF POSITION

The Service commends the Corps for conducting the most comprehensive study ever conducted on HHD. The Service also applauds the Corps for the early coordination with the Service while conducting the HHD DSMS. We look forward to assisting the Corps in evaluating potential impacts to trust resources as alternatives are developed for consideration in the DSMS.

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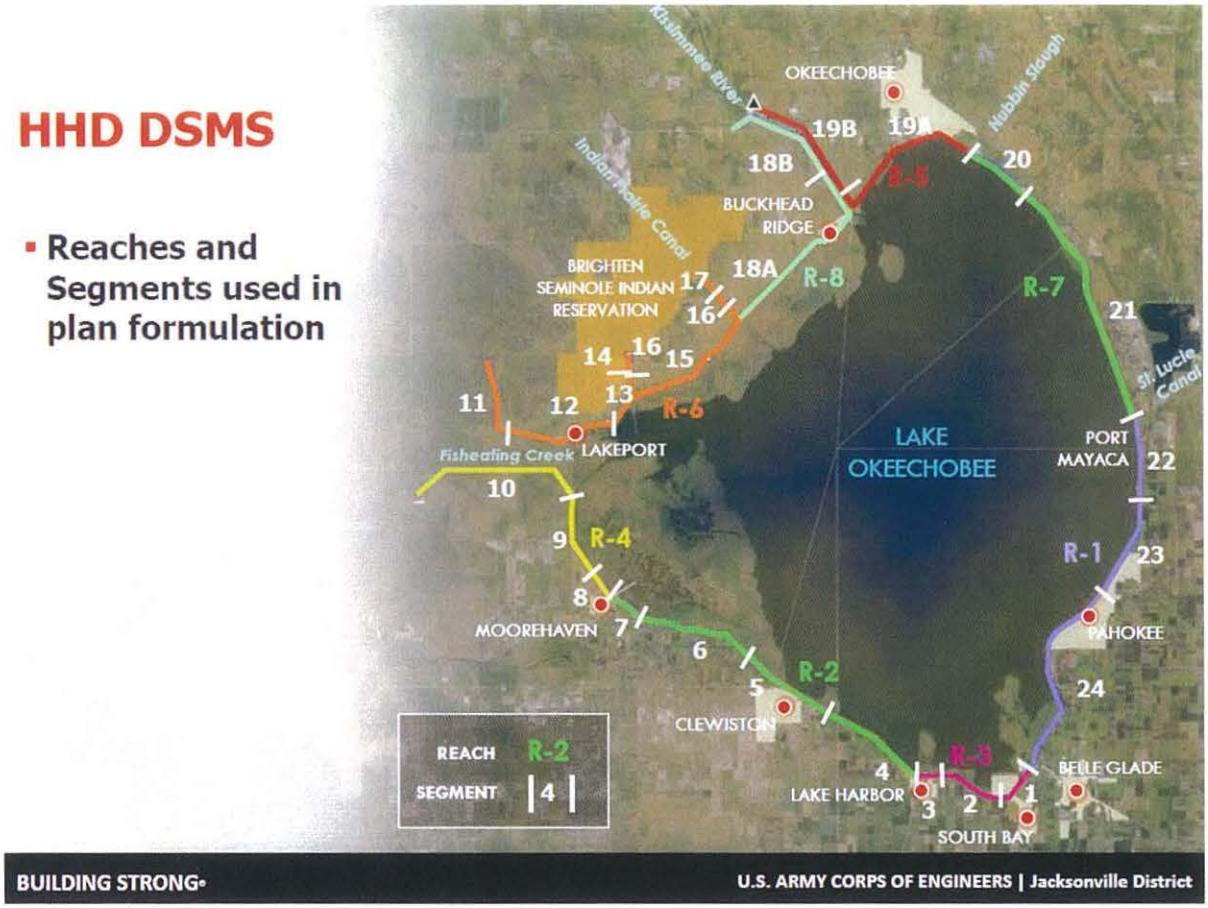


Figure 1. Herbert Hoover Dike Dam Safety Modification Study Area.

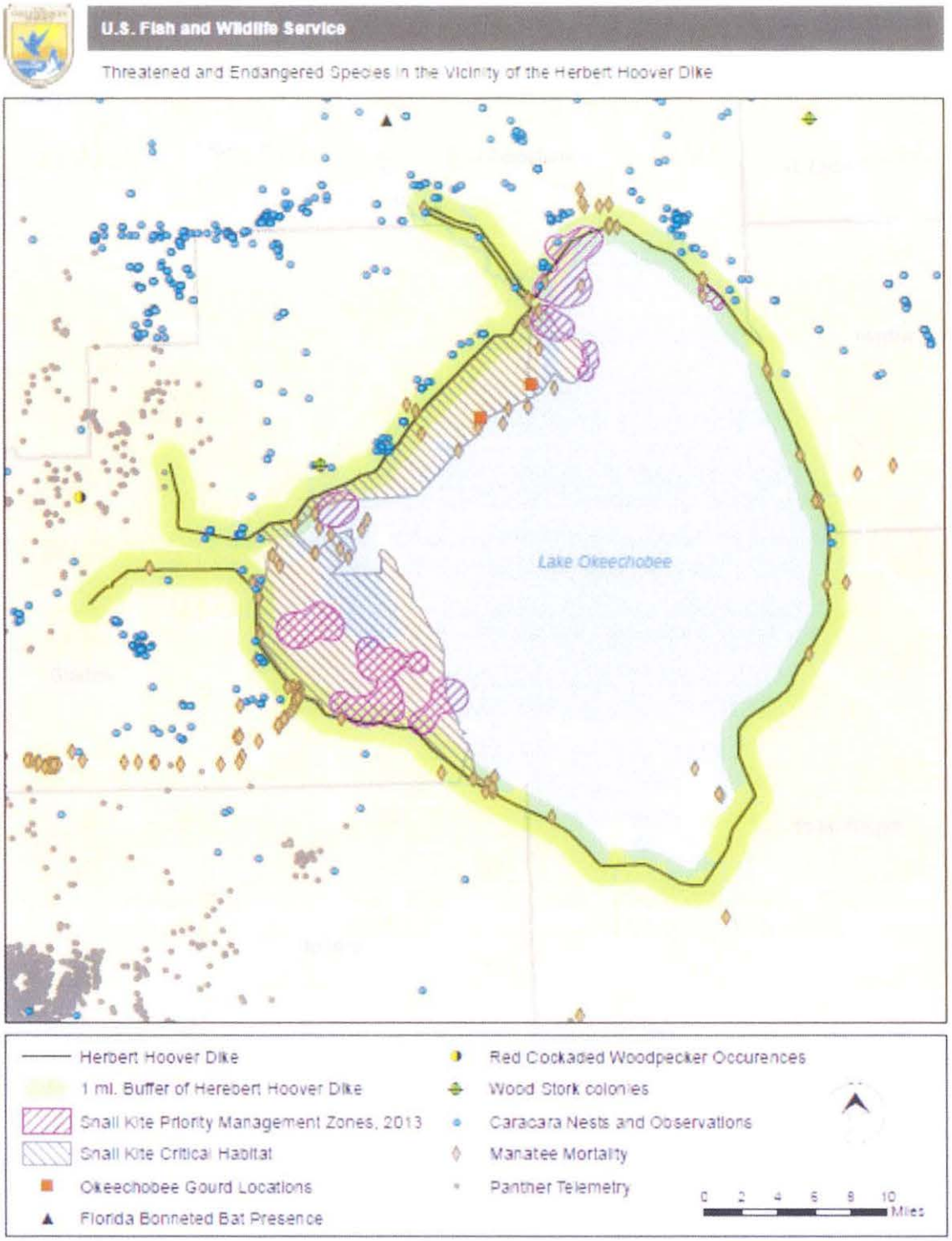


Figure 2. Herbert Hoover Dike Listed Species and Critical Habitat.

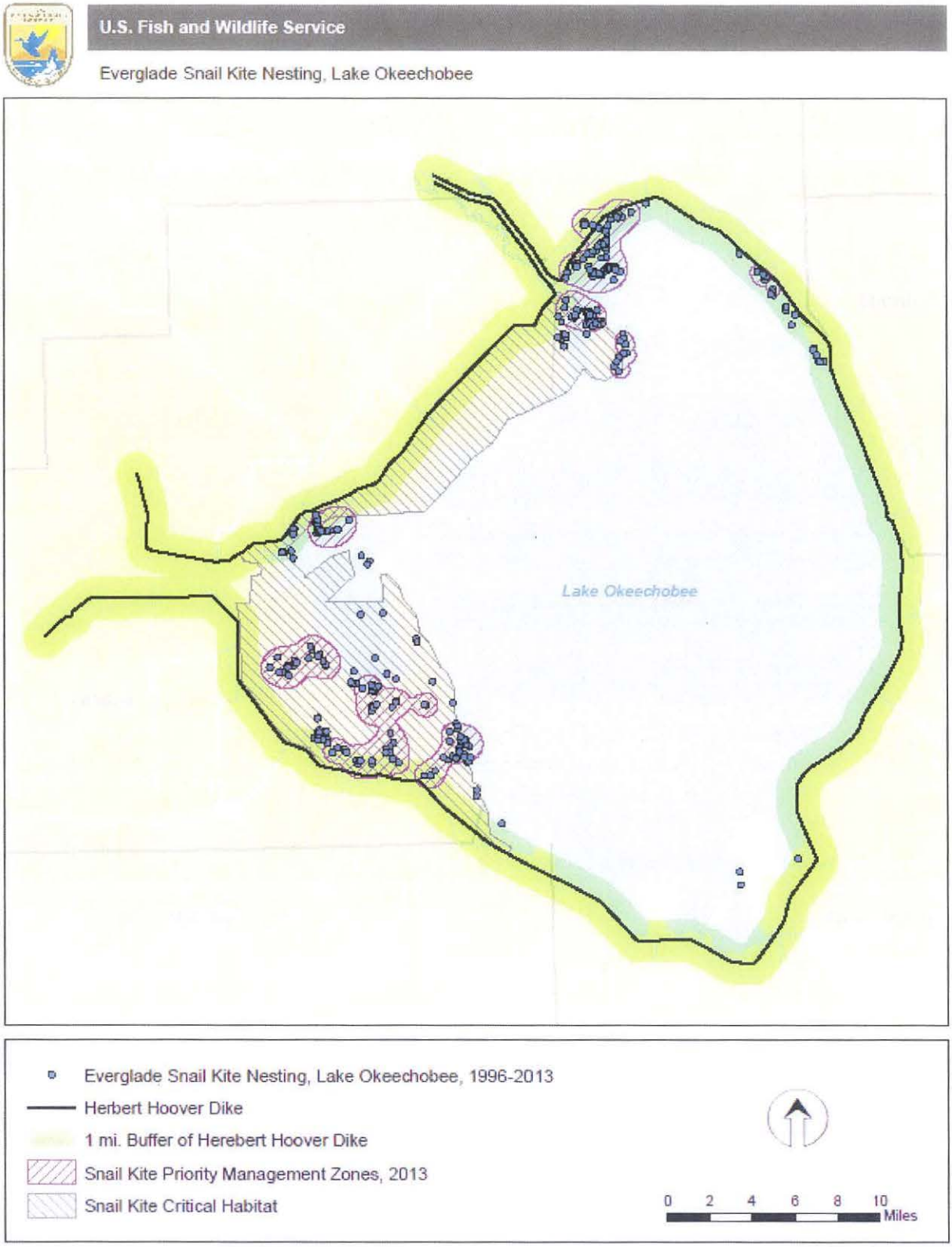


Figure 3. Everglade Snail Kite Nest Locations (1996-2013).

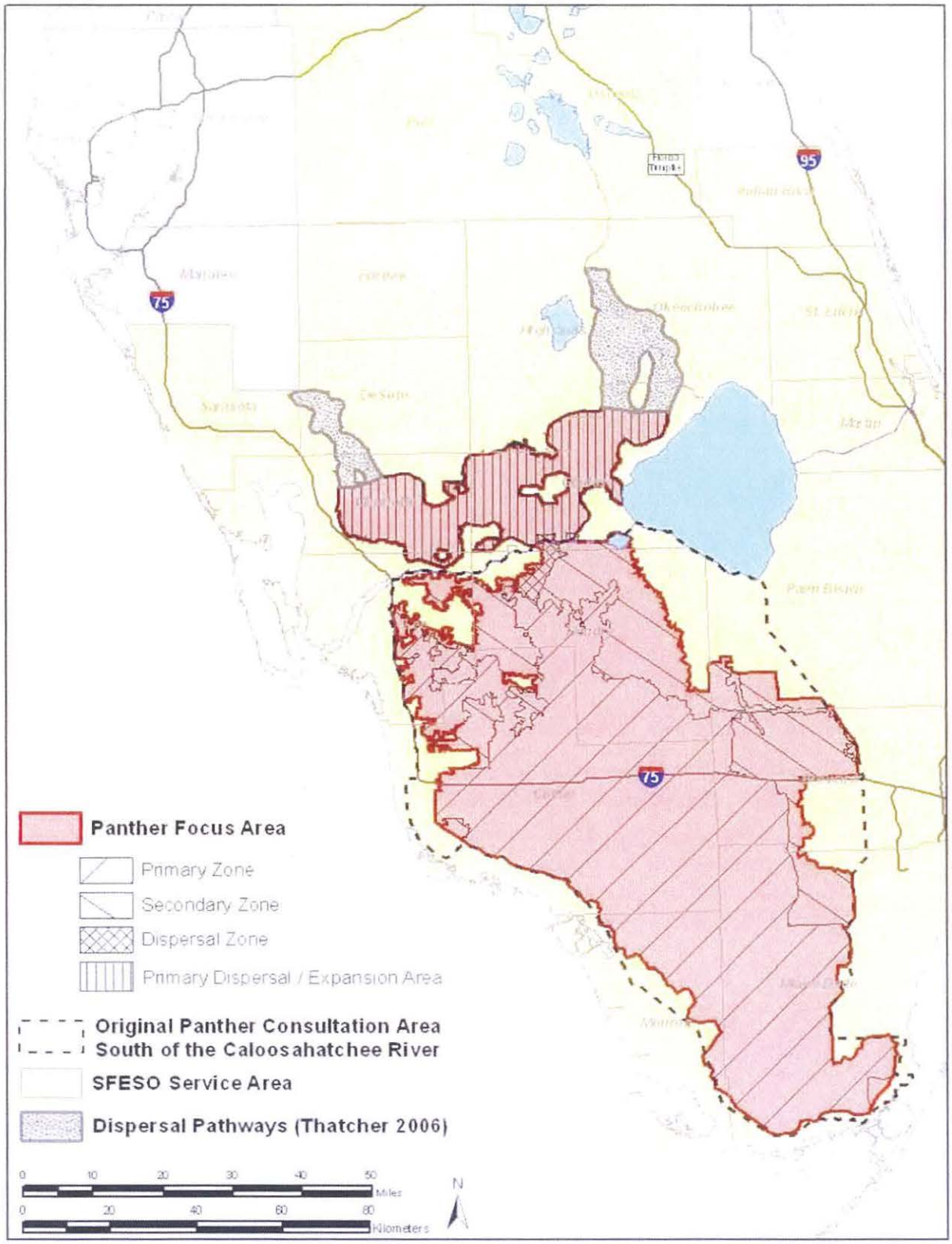


Figure 4. Florida Panther Focus Area.

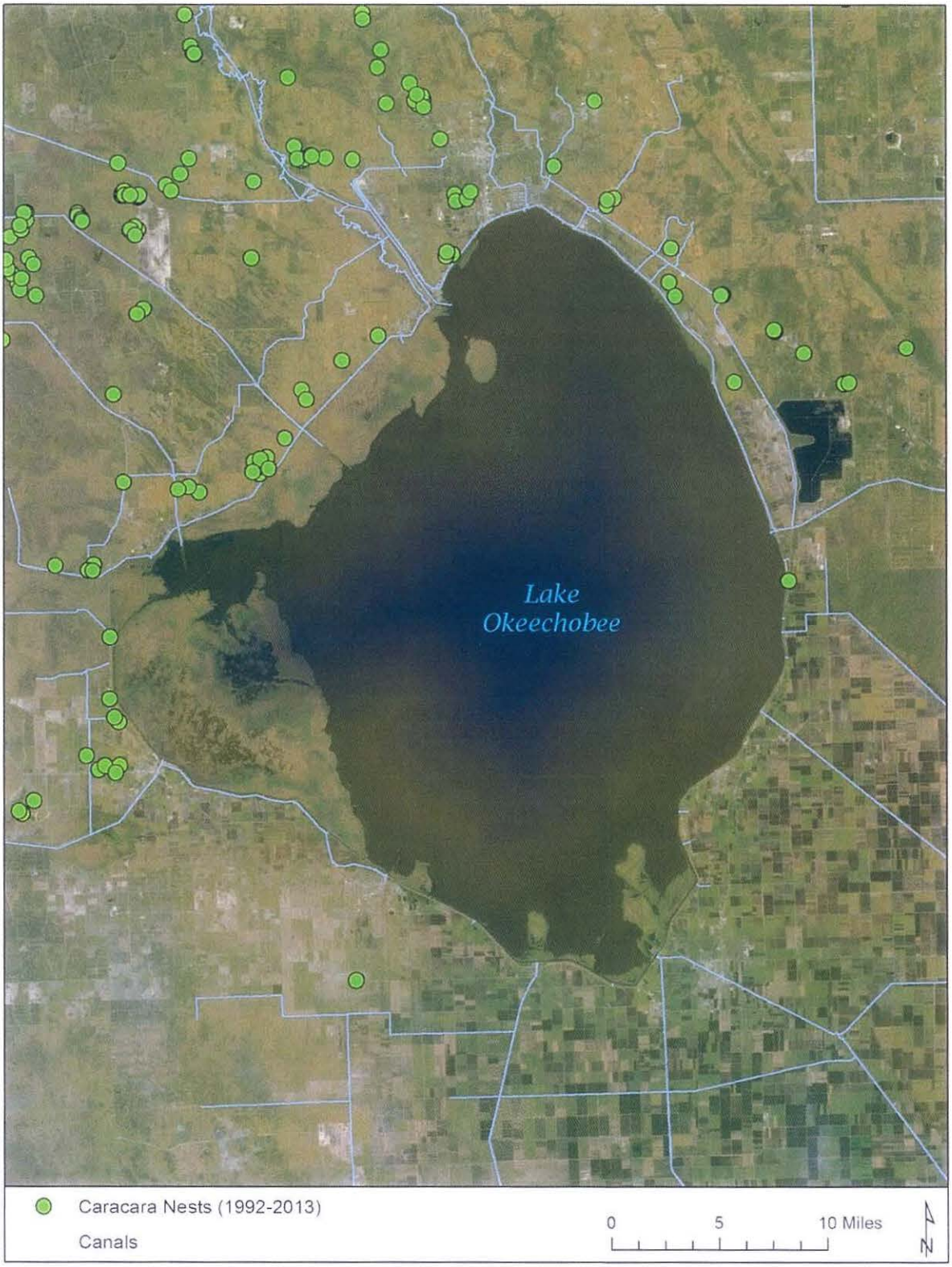


Figure 5. Caracara Nest Locations (1992-2013).

Figure 6. Caracara Telemetry Points (2012-2013).

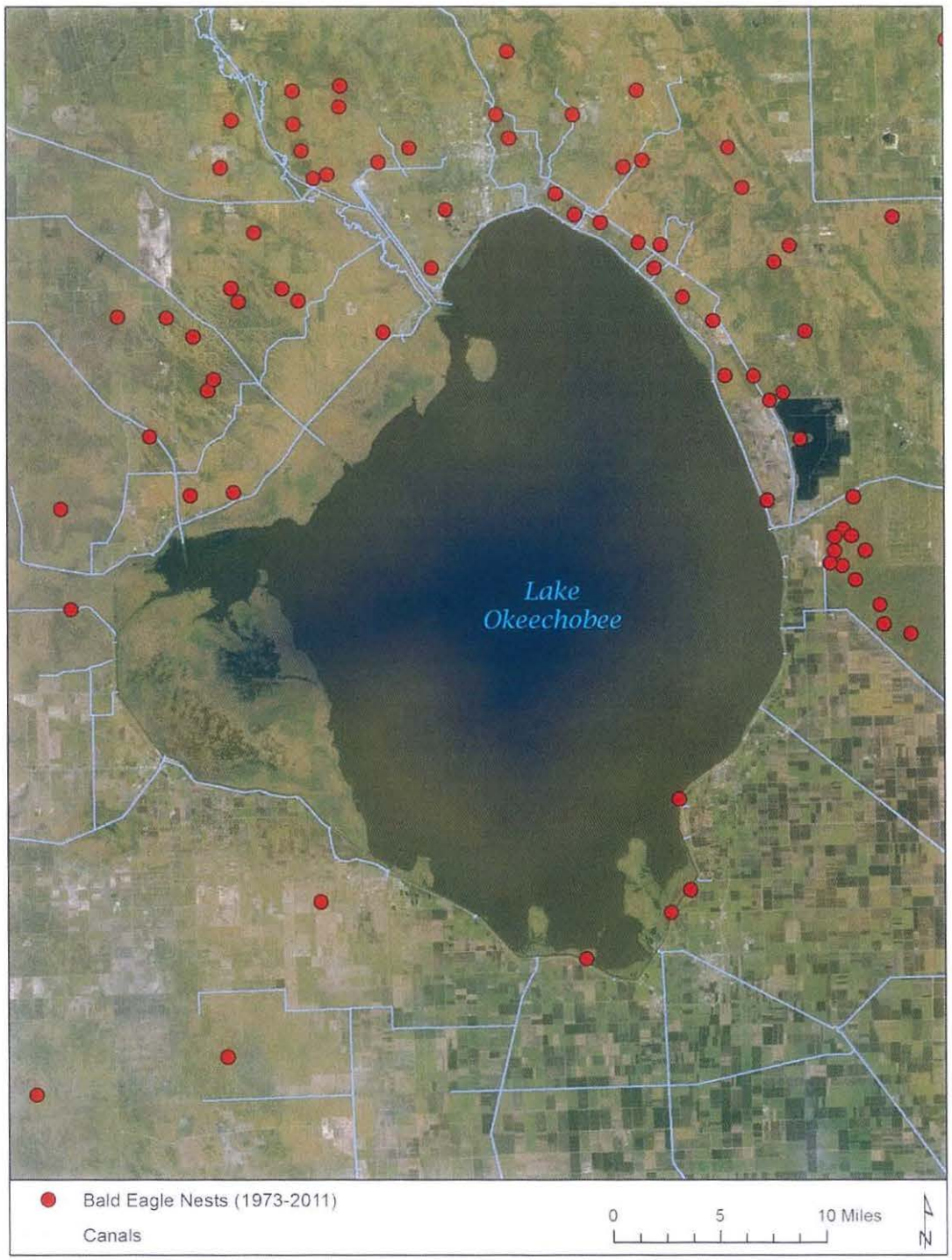


Figure 6. Bald Eagle Nest Locations (1973-2011).

E.3 Listing of Threatened and Endangered Species

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
P.O. BOX 4970
JACKSONVILLE, FLORIDA 32232-0019

REPLY TO
ATTENTION OF

Planning and Policy Division
Environmental Branch

MAY 1 5 2014

Mr. Larry Williams, Field Supervisor
U.S. Fish and Wildlife Service
1339 20th Street
Vero Beach, FL 32960

Dear Mr. Williams,

The U.S. Army Corps of Engineers (Corps), Jacksonville District, is preparing a National Environmental Policy Act assessment for the Herbert Hoover Dike (HHD) Dam Safety Modification Study (DSMS). The purpose of the DSMS is to identify an engineering plan to allow the Corps to implement future dam safety projects that will address potential embankment failure modes, reduce risk to lakeside communities, and prioritize future work based on risk to human life.

The HHD is approximately 143 miles long and spans the following five counties around the perimeter of Lake Okeechobee: Glades, Hendry, Martin, Okeechobee, and Palm Beach (Figure 1 enclosed). Lake Okeechobee is the third largest lake by land area in the United States and a component of the Central and Southern Florida Flood Control Project. The lake has a surface area of approximately 730 square miles and drains an area to the north and west totaling approximately 5,600 square miles of lands with major inflows coming from the Kissimmee River and Fisheating Creek.

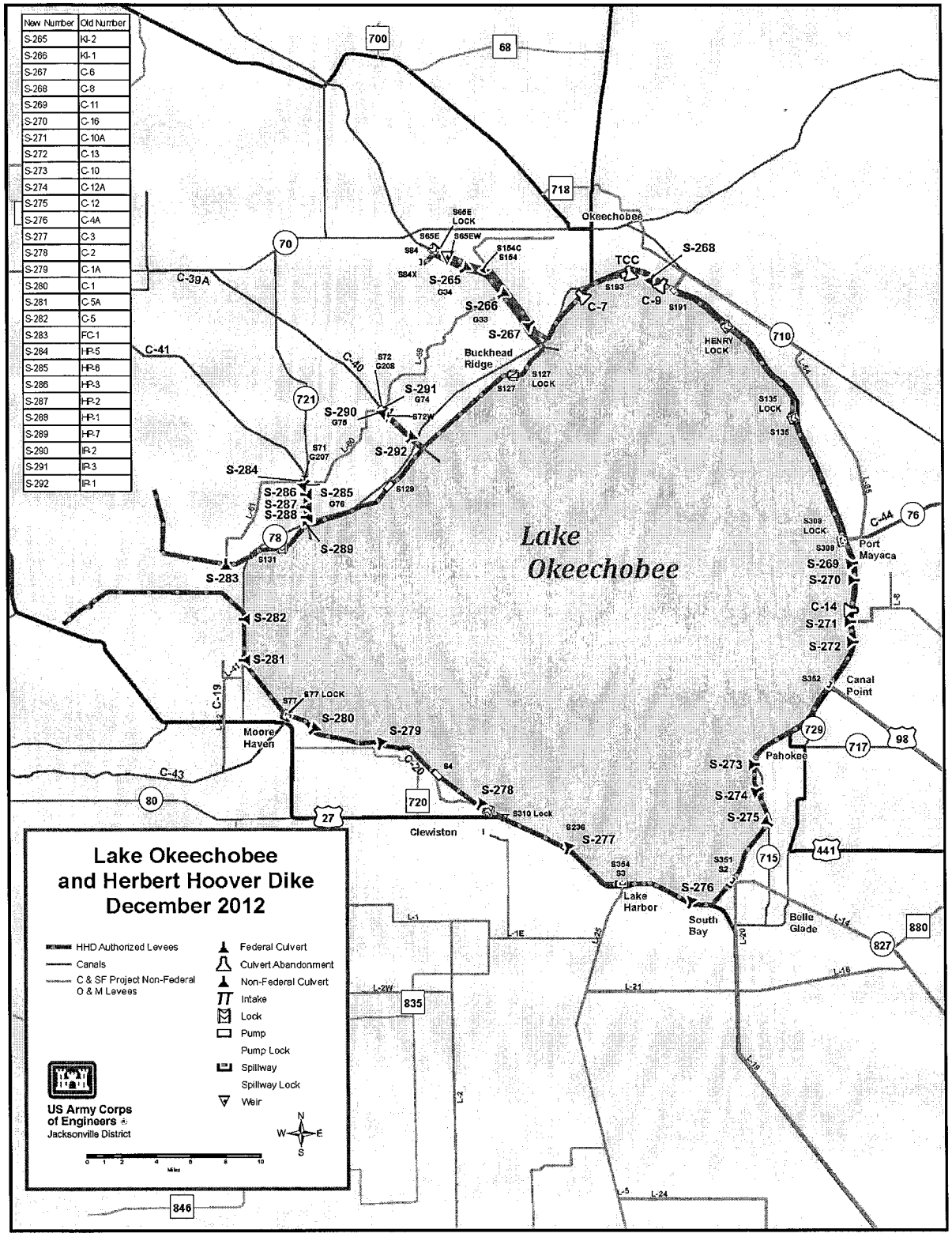
Pursuant to the Endangered Species Act, as amended, the Corps is requesting written confirmation of species or their critical habitat either listed or proposed for listing that may be present within the referenced project area within 30 days upon receipt of this letter. The Corps has tentatively determined that the following list of threatened and endangered species may be present within the project area as illustrated in the enclosed Table 1.

If you have any questions, or need further information, please contact Stacie Auvenshine by email stacie.j.auvenshine@usace.army.mil or telephone 904-232-3694. Thank you for your assistance in this matter.

Sincerely,

for Eric P. Summa
Chief, Environmental Branch

Enclosures



Lake Okeechobee and Herbert Hoover Dike December 2012

HHD Authorized Levees
Canals
C & SF Project Non-Federal O & M Levees
Federal Culvert
Culvert Abandonment
Non-Federal Culvert
Intake
Lock
Pump
Pump Lock
Spillway
Spillway Lock
Weir

US Army Corps of Engineers
Jacksonville District

Miles

Figure 1. HHD Project Area

Table 1. Federal and State Listed Land Plant and Animal Species Occurring in Glades, Hendry, Martin, Okeechobee, and Palm Beach Counties, Florida

Scientific Name	Common Name	Federal Status	State Status
Amphibians			
Rana capito	Gopher frog	Not listed	S*
Reptiles			
Caretta caretta	Loggerhead sea turtle	Threatened	Threatened
Chelonia mydas	Green sea turtle	Endangered	Endangered
Crocodylus acutus	American crocodile	Threatened	Endangered
Drymarchon couperi	Eastern indigo snake	Threatened	Threatened
Eumeces egregius lividus	Bluetail mole skink	Threatened	Threatened
Gopherus polyphemus	Gopher tortoise	Not listed	Threatened
Pituophis melanoleucus mugitus	Florida pine snake	Not listed	S
Birds			
Ammodramus savannarum floridanus	Florida grasshopper sparrow	Endangered	Endangered
Aphelocoma coerulescens	Florida scrub jay	Threatened	Threatened
Aramus guarauna	Limpkin	Not listed	S
Athene cunicularia	Burrowing owl	Not listed	S
Calidris canutus rufus	Red knot-migrant	Candidate	Candidate
Campephilus principalis	Ivory-billed woodpecker	Endangered (Historic)	Endangered
Charadrius melodus	Piping plover	Threatened	Threatened
Egretta caerulea	Little blue heron	Not listed	S
Egretta thula	Snowy egret	Not listed	S
Egretta tricolor	Tricolored heron	Not listed	S
Eudocimus albus	White ibis	Not listed	S
Falco sparverius paulus	Southeastern American kestrel	Not listed	Threatened
Grus Americana	Whooping crane	Endangered	S
Grus canadensis pratensis	Florida sandhill crane	Not listed	Threatened
Haematopus palliates	American oystercatcher	Not listed	S
Mycteria americana	Wood stork	Endangered	Endangered
Pandion haliaetus	Osprey	Not listed	S
Pelecanus occidentalis	Brown pelican	Not listed	S
Picoides borealis	Red-cockaded woodpecker	Endangered	S
Platalea ajaja	Roseate spoonbill	Not listed	S
Polyborus plancus audubonii	Audubon's crested caracara	Threatened	Not listed
Rostrhamus sociabilis plumbeus	Snail kite	Endangered	Endangered
Rychops niger	Black skimmer	Not listed	S
Sterna antillarum	Least tern	Threatened	Threatened
Invertebrates			
Anaea troglodyte floridalis	Florida's leafwing butterfly	Candidate (historical)	Not listed
Strymon acis bartrami	Bartram's hairstreak butterfly	Candidate (1974)	Not listed
Mammals			
Eumops floridanus	Florida bonneted bat	Endangered	Threatened
Podomys floridanus	Florida mouse	Not listed	S
Puma concolor coryi	Florida panther	Endangered	Endangered

Scientific Name	Common Name	Federal Status	State Status
Sciurus niger shermani	Sherman's Fox Squirrel	Not Listed	S
Trichechus manatus	Manatee	Endangered	Endangered
Ursus americanus floridanus	Florida black bear	Not Listed	Threatened
Gastropods (Snails and Allies)			
Orthalicus reses reses	Stock Island tree snail	Threatened	Endangered
Plants and Lichens			
Acrostichum aureum	Golden leather fern	Not Listed	Threatened
Argusia gnaphalodes	Sea lavender	Not Listed	Endangered
Asimina tetramera	Four-petal pawpaw	Endangered	Endangered
Calopogon multiflorus	Many-flowered grasspink	Not Listed	Endangered
Chamaesyce cumulicola	Sand-dune spurge	Not Listed	Endangered
Cladonia perforata	Perforate reindeer lichen	Endangered	Endangered
Coccothrinax argentata	Silver palm	Not Listed	Threatened
Cucurbita okeechobeensis	Okeechobee gourd	Endangered	Endangered
Dalea carthagenensis floridana	Florida prairie cover	Candidtate (1918)	Endangered
Dicerandra immaculate	Lakela's mint	Endangered	Endangered
Glandularia maritima	Coastal vervain	Not Listed	Endangered
Halophila johnsonii	Johnson's seagrass	Threatened	Threatened
Hypericum edisonianum	Edison's ascyrum	Not Listed	Endangered
Jacquemontia reclinata	Beach jacquemontia	Endangered	Endangered
Lantana depressa var. *floridana*	Atlantic Coast Florida lantana	Not Listed	Endangered
Lantana depressa var.*sanibelensis*	Gulf Coast Florida lantana	Not Listed	Endangered
Lechea cernua	Nodding pinweed	Not Listed	Threatened
Lechea divaricata	Pine pinweed	Not Listed	Endangered
Liatrus ohlingerae	Scrub blazing star	Endangered	Endangered
Linum carteri var. *smallii*	Carter's large-flowered flax	Not Listed	Endangered
Nemastylis floridana	Celestial lily	Not Listed	Endangered
Okenia hypogaea	Burrowing four-o'clock	Not Listed	Endangered
Ophioglossum palmatum	Hand fern	Not Listed	Endangered
Panicum abscissum	Cutthroat grass	Not Listed	Endangered
Paronchia chartacea	Papery whitlow-wort	Threatened	Endangered
Polygala lewtonii	Lewton's polygala	Endangered	Endangered
Polygala smallii	Tiny polygala	Endangered	Endangered
Pteris bahamensis	Bahama brake	Not Listed	Threatened
Pteroglassaspis ecristata	Giant orchid	Not Listed	Threatened
Sacoila lanceolata var. *paludicola*	Fahkahatchee ladies' tresses	Not Listed	Threatened
Schizaea pennula	Ray fern	Not Listed	Endangered
Tephrosia angustissima var. *cutissii*	Coastal hoary-pea	Not Listed	Endangered
Thelypteris serrata	Toothed maiden fern	Not Listed	Endangered
Tillandsia flexuosa	Banded wild-pine	Not Listed	Threatened
Tolumnia bahamensis	Dancing-lady orchid	Not Listed	Endangered
Warea carteri	Carter's mustard	Endangered	Endangered
Critical Habitat			
Rostrahamus sociabilis plumbeus	Everglade snail kite	Endangered	Endangered
Trichechus manatus	West Indian Manatee	Endangered	Endangered
Chelonia mydas	Green sea turtle	Endangered	Endangered
Halophila johnsonii	Johnson's seagrass	Threatened	Threatened

*S=species of special concern

E.4 Complete Initiation Package

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

REPLY TO
ATTENTION OF

Planning and Policy Division
Environmental Branch

DEC 2 4 2015

Mr. Donald Progulske
U.S. Fish and Wildlife Service
1339 20th Street
Vero Beach, Florida 32960

Dear Mr. Progulske:

In accordance with provisions of Section 7 of the Endangered Species Act, as amended, the U.S. Army Corps of Engineers, Jacksonville District (Corps) is hereby initiating consultation with the U.S. Fish and Wildlife Service (FWS) concerning the Herbert Hoover Dike (HHD). The Corps is preparing an Environmental Impact Statement (EIS) for the Dam Safety Modification Study, to address the rehabilitation of the HHD in a system-wide manner. The HHD is located in south central Florida, in the counties of Okeechobee, Martin, Palm Beach, Hendry, and Glades Counties.

The Corps has previously received a Final Fish and Wildlife Coordination Act (FWCA) Report dated December 20, 2001, and supplemental FWCA Reports dated March 4, 2003, and March 8, 2004 for previous HHD rehabilitation work. In the attached Complete Initiation Package (CIP), the Corps' determination for the Dam Safety Modification Study is "not likely to adversely affect" the following species: Audubon's crested caracara (*Caracara cheriway*), Eastern indigo snake (*Drymarchon corais couperi*), wood stork (*Mycteria americana*), Everglade snail kite (*Rosthrhamus sociabilis plumbeus*) and its designated critical habitat, West Indian manatee (*Trichechus manatus*), and the Okeechobee gourd (*Curbita okeechobeensis*). The Corps will continue to implement the protective measures previously agreed upon to avoid adverse effects to these species. In addition, the proposed action will not affect the Regulation Schedule for Lake Okeechobee.

We request your concurrence with our determinations pursuant to the Endangered Species Act within 60 days after the date stamped on this letter. If you have any questions regarding this initiation package or upcoming EIS or need additional information, please contact Ms. Stacie Auvenshine at 904-232-3694 (Stacie.J.Auvenshine@usace.army.mil). Thank you for your continued attention and support to this matter.

Sincerely,

Eric P. Summa
Chief, Planning and Policy Division

HERBERT HOOVER DIKE DAM SAFETY MODIFICATION STUDY
GLADES, HENDRY, MARTIN, OKEECHOBEE, AND PALM BEACH COUNTIES

COMPLETE INITIATION PACKAGE

HERBERT HOOVER DIKE
DAM SAFETY MODIFICATION STUDY

U.S. Army Corps of Engineers
Jacksonville District

December 2015

1 PROJECT DESCRIPTION

The Herbert Hoover Dike (HHD) is located on Lake Okeechobee located in south central Florida, in the counties of Okeechobee, Martin, Palm Beach, Hendry, and Glades. Lake Okeechobee is a multi-purpose reservoir in the Central and Southern Florida (C&SF) Project. The authorized project purposes for Lake Okeechobee include: flood control, irrigation, enhancement of fish and wildlife, navigation, prevention of saltwater intrusion, recreation, and water supply to Everglades National Park. The U.S. Army Corps of Engineers (Corps), Jacksonville District, has operated and maintained the HHD for over 75 years, its highest priority being the continued safety of the communities surrounding the HHD. Internal erosion (piping) can result when seepage forces through an earthen embankment become strong enough to begin eroding the soil particles used to construct the embankment and/or foundation of the dam. Evidence of this failure mode has been observed in certain areas of HHD during high water events. The likelihood of initiation of a piping failure mode and the rate at which piping occurs is dependent upon lake elevations. The seepage volume and distress indicators in certain reaches of the embankment begin to become more prevalent at lake elevations above 17 feet North American Vertical Datum 1988 (NAVD88) and are cause for increasing concern when operating at or above these levels for any significant period. Major remediation is necessary to prevent a breach in the dike and consequent significant adverse effects on public safety.

The proposed action, to be discussed in an upcoming draft Environmental Impact Statement (EIS), is to implement measures to reduce the risk of failure of the Herbert Hoover Dike (HHD) system (**Figure 1-1**). The EIS will be available for public review on December 24, 2015.

Figure 1-1. Herbert Hoover Dike Location Map, Herbert Hoover Dike Surrounds Lake Okeechobee

In 1993, the Corps established priorities to address structural problems at individual sections of the dike according to the perceived risk of dike failure at that time (USACE, 1993); these sections were classified as Reaches. Reach 1 was previously assigned the highest priority and rehabilitation efforts are nearing completion based on designs from the 2005 Supplemental MRR and EIS and subsequent Environmental Assessments (EA), including the most recent Supplemental MRR in 2015. The implied order of priority (Reaches designated 1 through 8 in descending order of priority) by reach numbering is no longer valid as recent repairs, additional data, and additional analysis have changed the priority. The current construction of the cutoff wall should be considered successful at reducing the probability of failure throughout Reach 1, and a step forward in reducing the Damn Safety Action Classification (DSAC) rating of the dam.

Within the Dam Safety Modification Study, the use of 8 Reaches to delineate HHD has been substituted with seven Common Inundation Zones (CIZ), and then further delineations of segments within CIZs (**Figure 1-2**). These seven CIZs reflect downstream areas where similar inundation or flooding will occur from a breach anywhere within that zone.

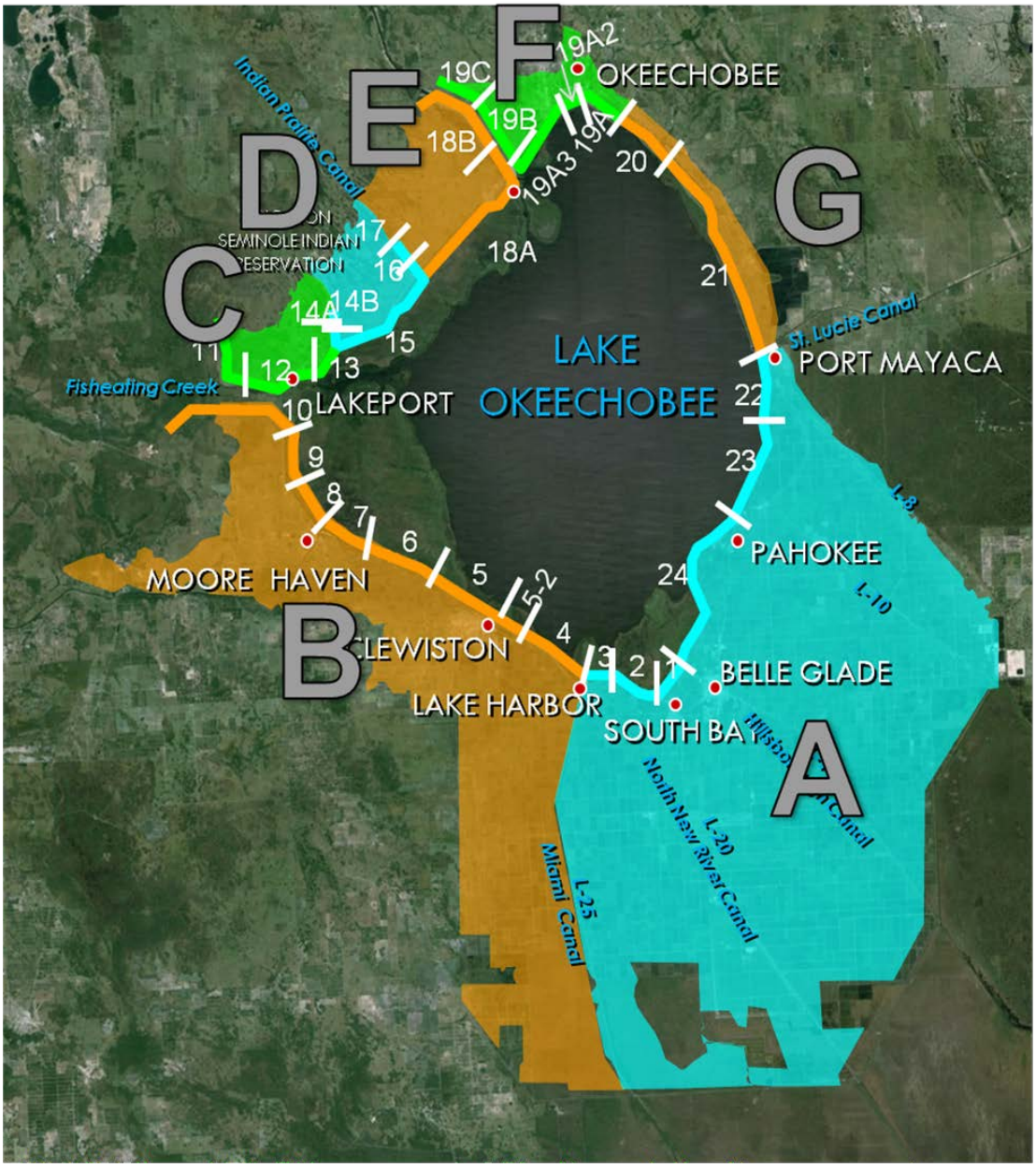


Figure 1-1-2. HHD Common Inundation Zones and Segments

The objective of the Hebert Hoover Dike Dam Safety Modification Study (DSMS) and EIS is to identify and recommend a cost effective risk management plan (RMP) that supports specific actions to expeditiously reduce dam safety risks to tolerable levels for public safety and economic, environmental and social resources. For HHD to be considered tolerable there should be an expectation of less than 0. 001 lives lost on an average annual basis. Additionally, the Annual Probability of Failure (APF) should be less than a 1 in 10,000 chance of occurring when economic, social, or environmental consequences of a breach are significant. Reduction of risk to these threshold values will make HHD no greater risk than other facilities of its type and pose no greater risk to the public than incurred by other normal daily encounters. The primary dam safety issues are:

- Embankment: internal erosion (piping) through both the embankment and foundation (non-storm condition).
- Embankment: wind-driven waves that wash over the crest (overwash) resulting in the erosion of the dam crest and downstream face (storm condition).
- Embankment: wind-driven set-up of the reservoir pool that exceeds the crest elevation (overtopping) resulting in erosion of the dam crest and downstream face (storm condition).
- Structures: internal erosion (piping) along, under, or into the structure or conduit.

The purpose of this project is to improve dam safety along, around, and within the HHD per external review recommendations and current dam safety regulations. During a large storm event, concentrated seepage could begin to move large amounts of material over the top of the embankment at certain locations. Erosion would progress upstream, eventually leading to a breach of the embankment. Action is required as a risk reduction strategy, in conformance with dam safety requirements, to reduce the risk of catastrophic failure of the HHD. Reducing risk where intolerable societal life safety concerns exist is the paramount factor in selecting a plan for implementation.

A cutoff wall was determined to be the least cost, technically acceptable risk reduction solution to remediate areas of HHD that were identified as having intolerable internal erosion risk. The Tentatively Selected Plan (TSP) cutoff wall location would be 2 ft wide Soil Cement Bentonite (SCB) along the approximate centerline of the embankment, with temporary construction platforms needed to widen the crest for the duration of construction. A total of 33.3 miles of cutoff wall would be constructed.

The construction would span from just west of Lake Harbor (areas east of Lake Harbor already approved for remediation) to just east of Moore Haven; Segments 4 through a portion of Segment 9. A cutoff wall through a portion of Segments 12 and 13 would also be proposed under this alternative to reduce the probability of life loss in Lakeport. No remediation is recommended in the section of Segment 12 west of the interceptor levee and in Segment 9 north of the vicinity of the L-41 canal/Culvert 5A due to the low environmental and economic consequences realized from a breach in these area. The cutoff wall would likely be constructed of a mix of soil, cement, and bentonite clay and will have a minimum top elevation of 25-ft NAVD (but will likely be constructed to within a foot or two of the crest) with varying bottom elevations (based on local geologic and topographic characteristics of the Segment) and an approximate width of 2 feet. The range of bottom elevations for the proposed for the cutoff wall are -10-ft to -35-ft NAVD. The range of depths proposed for the cutoff wall and the segments included in the TSP are presented in **Table 1-1** and **Figure 1-3**.

Table 1-1. Alternative 3 Cutoff Wall Termination Elevations.

Segment	Proposed Cutoff Wall Termination Elevation (ft. NAVD 88)[1]
Segment 4	-10 to -30
Segment 5-2	-25 to -30
Segment 5	-20 to -30
Segment 6	-15 to -30
Segment 7	-20 to -30
Segment 8	-15 to -30

Segment 9	-10 to -20
Segment 12/13	-15 to -30

(1) Cutoff wall depths are approximate. Additional subsurface investigation will be completed to support final design of the walls. Minor adjustments to the cutoff wall termination depths may be required to correct for variations in geology (minor variations would include adjustments of the cutoff wall depths by several feet to adjust for elevation variations of the subsurface unit being targeted by the design).

Risk reduction proposed for Segment 5-2 under this alternative includes construction of a filter and drainage blanket around the downstream end of the US Sugar Raw Water Intake pipes. These pipes penetrate the HHD embankment and were constructed with no seepage protection as would be required by modern design standards. The proposed risk reduction for these pipes requires they be retrofitted with a drain at the downstream toe of HHD. The drainage system would wrap around the pipes and intercept seepage (lake water seepage could be concentrating and flowing around the exterior of these pipes) through the embankment and collect, filter, and discharge the seepage through designed sand and gravel filter.

In addition to the cutoff wall, HHD includes three locations where the embankment is low and intolerably susceptible to overwash or overtopping. These locations include the embankment adjacent to S-71 (Segments 14A & 14B) located on the Harney Pond Canal, the embankment adjacent to S-72 (Segments 16 & 17) located on Indian Prairie, and the embankment at the intersection of SR-78 bridge and Harney Pond Canal (Segments 13 and 15).

Armoring the embankment at the intersection of the bridge at the SR-78 and Harney Pond Canal is proposed (a few hundred feet of floodwall may also be included in the design for this area) (**Figure 1-4**). While this configuration would not provide a greater level of service for flood protection, armoring would greatly reduce risks of breach during a short duration overtopping event from storm surge. Additional coordination is needed with the non-Federal sponsor identifying the need to raise the bridges (Harney Pond Canal and Indian Prairie Canal) in the future. The Non-Federal sponsor, through coordination with the State of Florida's Department of Transportation, should ensure that bridges, bridge abutments, and corresponding roads be raised as part of the State's regularly schedule bridge replacement.

S-71 and S-72 are structures located on the Harney Pond Canal and Indian Prairie Canal. They are nearly identical in design and construction and are the terminus of HHD to the north. At these locations, the HHD earthen embankment drops down in elevation to meet the service platform of each structure. A similar situation occurs at the intersection of SR-78 Bridge and Harney Pond canal. The embankment drops down in elevation to meet the bridge abutment. A floodwall ranging in height from 1 to 6 feet or embankment armoring would be constructed adjacent to these structures.

Protection measures, such as sound dampening devices on trucks and other vehicles and species surveys prior to and during construction will be requested as part of contractor proposals and work plans. All monitoring and survey of protected species will be conducted in accordance with survey protocol from the USFWS South Florida Ecological Services Office and website.

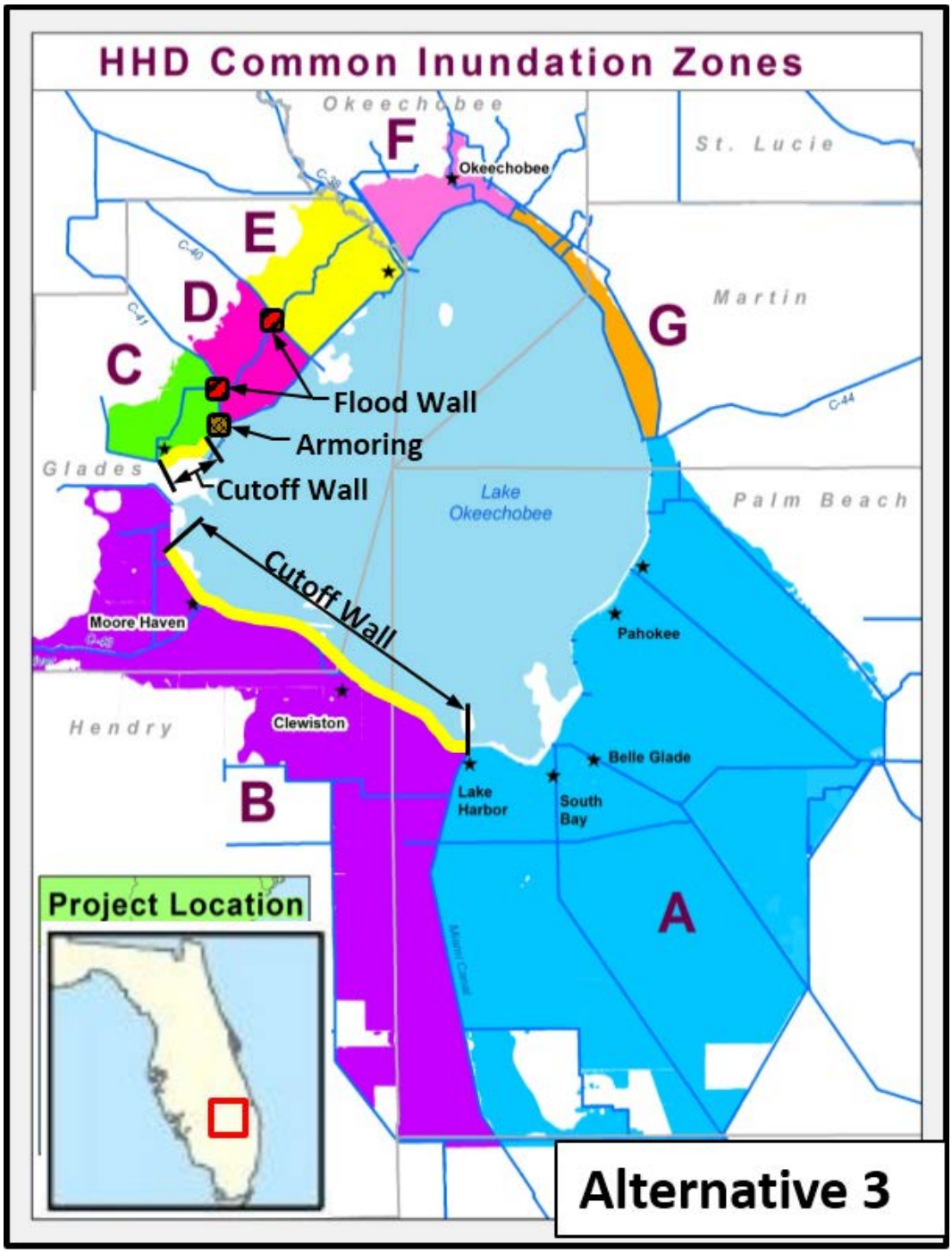


Figure 1-3. HHD Tentatively Selected Plan

Figure 1-4. Limits of ACB armoring.

2 THREATENED AND ENDANGERED SPECIES

A list of federally or state listed species that could be present in Glades, Hendry, Martin, Okeechobee, and Palm Beach counties is presented in **Table 2-2**. The Corps is requesting concurrence for a may affect, not likely to adversely affect determination for the following species: Audubon's crested caracara (*Caracara cheriway*), Eastern indigo snake (*Drymarchon corais couperi*), wood stork (*Mycteria americana*), Everglade snail kite (*Rosthrhamus sociabilis plumbeus*) and its designated critical habitat, West Indian manatee (*Trichechus manatus*), Florida bonneted bat, and the Okeechobee gourd (*Curbita okeechobeensis*).

Table 2-2. List of threatened, endangered, and candidate species know to occur in Glades, Hendry, Okeechobee, and Martin counties. State listed species of special concern (SSC) are also listed.

Scientific Name	Common Name	Federal Status	State Status
Amphibians			
Rana capito	Gopher frog	Not listed	SSC
Reptiles			
Caretta caretta	Loggerhead sea turtle	Threatened	Threatened
Chelonia mydas	Green sea turtle	Endangered	Endangered
Crocodylus acutus	American crocodile	Threatened	Endangered
Drymarchon couperi	Eastern indigo snake	Threatened	Threatened
Eumeces egregius lividus	Bluetail mole skink	Threatened	Threatened
Gopherus polyphemus	Gopher tortoise	Not listed	Threatened
Pituophis melanoleucus mugitus	Florida pine snake	Not listed	SSC
Birds			
Ammodramus savannarum floridanus	Florida grasshopper sparrow	Endangered	Endangered
Aphelocoma coerulescens	Florida scrub jay	Threatened	Threatened
Aramus guarauna	Limpkin	Not listed	SSC
Athene cunicularia	Burrowing owl	Not listed	SSC
Calidris canutus rufus	Red knot-migrant	Candidate	Candidate
Campephilus principalis	Ivory-billed woodpecker	Endangered (Historic)	Endangered
Charadrius melodus	Piping plover	Threatened	Threatened
Egretta caerulea	Little blue heron	Not listed	SSC
Egretta thula	Snowy egret	Not listed	SSC

Scientific Name	Common Name	Federal Status	State Status
Egretta tricolor	Tricolored heron	Not listed	SSC
Eudocimus albus	White ibis	Not listed	SSC
Falco sparverius paulus	Southeastern American kestrel	Not listed	Threatened
Grus Americana	Whooping crane	Endangered	SSC
Grus canadensis pratensis	Florida sandhill crane	Not listed	Threatened
Haematopus palliates	American oystercatcher	Not listed	SSC
Mycteria americana	Wood stork	Endangered	Endangered
Pandion haliaetus	Osprey	Not listed	SSC
Pelecanus occidentalis	Brown pelican	Not listed	SSC
Picoides borealis	Red-cockaded woodpecker	Endangered	SSC
Platalea ajaja	Roseate spoonbill	Not listed	SSC
Polyborus plancus audubonii	Audubon's crested caracara	Threatened	Not listed
Rostrhamus sociabilis plumbeus	Snail kite	Endangered	Endangered
Rychops niger	Black skimmer	Not listed	SSC
Sterna antillarum	Least tern	Threatened	Threatened
Invertebrates			
Anaea troglodyte floridalis	Florida's leafwing butterfly	Candidate (historical)	Not listed
Strymon acis bartrami	Bartram's hairstreak butterfly	Candidate (1974)	Not listed
Mammals			
Eumops floridanus	Florida bonneted bat	Endangered	Threatened
Podomys floridanus	Florida mouse	Not listed	SSC
Puma concolor coryi	Florida panther	Endangered	Endangered
Sciurus niger shermani	Sherman's Fox Squirrel	Not Listed	SSC
Trichechus manatus	Manatee	Endangered	Endangered
Ursus americanus floridanus	Florida black bear	Not Listed	Threatened
Gastropods (Snails and Allies)			
Orthalicus reses reses	Stock Island tree snail	Threatened	Endangered

Scientific Name	Common Name	Federal Status	State Status
Plants and Lichens			
Acrostichum aureum	Golden leather fern	Not Listed	Threatened
Argusia gnaphalodes	Sea lavender	Not Listed	Endangered
Asimina tetramera	Four-petal pawpaw	Endangered	Endangered
Calopogon multiflorus	Many-flowered grasspink	Not Listed	Endangered
Chamaesyce cumulicola	Sand-dune spurge	Not Listed	Endangered
Cladonia perforata	Perforate reindeer lichen	Endangered	Endangered
Coccothrinax argentata	Silver palm	Not Listed	Threatened
Cucurbita okeechobeensis	Okeechobee gourd	Endangered	Endangered
Dalea carthagenensis floridana	Florida prairie cover	Candidate (1918)	Endangered
Dicerandra immaculate	Lakela's mint	Endangered	Endangered
Glandularia maritima	Coastal vervain	Not Listed	Endangered
Halophila johnsonii	Johnson's seagrass	Threatened	Threatened
Hypericum edisonianum	Edison's ascyrum	Not Listed	Endangered
Jacquemontia reclinata	Beach jacquemontia	Endangered	Endangered
Lantana depressa var. *floridana*	Atlantic Coast Florida lantana	Not Listed	Endangered
Lantana depressa var.*sanibelensis*	Gulf Coast Florida lantana	Not Listed	Endangered
Lechea cernua	Nodding pinweed	Not Listed	Threatened
Lechea divaricata	Pine pinweed	Not Listed	Endangered
Liatrus ohlingerae	Scrub blazing star	Endangered	Endangered
Linum carteri var. *smallii*	Carter's large-flowered flax	Not Listed	Endangered
Nemastylis floridana	Celestial lily	Not Listed	Endangered
Okenia hypogaea	Burrowing four-o'clock	Not Listed	Endangered
Ophioglossum palmatum	Hand fern	Not Listed	Endangered
Panicum abscissum	Cutthroat grass	Not Listed	Endangered
Paronchia chartacea	Papery whitlow-wort	Threatened	Endangered
Polygala lewtonii	Lewton's polygala	Endangered	Endangered

Scientific Name	Common Name	Federal Status	State Status
Polygala smallii	Tiny polygala	Endangered	Endangered
Pteris bahamensis	Bahama brake	Not Listed	Threatened
Pteroglassaspis ecristata	Giant orchid	Not Listed	Threatened
Sacoila lanceolata var. *paludicola*	Fahkahatchee ladies' tresses	Not Listed	Threatened
Schizaea pennula	Ray fern	Not Listed	Endangered
Tephrosia angustissima var. *cutissii*	Coastal hoary-pea	Not Listed	Endangered
Thelypteris serrata	Toothed maiden fern	Not Listed	Endangered
Tillandsia flexuosa	Banded wild-pine	Not Listed	Threatened
Tolumnia bahamensis	Dancing-lady orchid	Not Listed	Endangered
Warea carteri	Carter's mustard	Endangered	Endangered
Critical Habitat			
Rostrahamus sociabilis plumbeus	Everglade snail kite	Endangered	Endangered
Trichechus manatus	West Indian Manatee	Endangered	Endangered
Chelonia mydas	Green sea turtle	Endangered	Endangered
Halophila johnsonii	Johnson's seagrass	Threatened	Threatened

2.1 EXISTING CONDITIONS AND EFFECT DETERMINATIONS

The Corps has determined the tentatively selected plan (TSP) is not likely to adversely affect any of the federally listed species known to occur within the project area that are listed below. Informal consultation with the USFWS began on December 10, 2010 and continues with this Complete Initiation Package (CIP). Conservation guidelines for protected species can be found on the FWS website.

Audubon's Crested Caracara: The threatened caracara is a unique raptor scavenger in the family Falconidae that reaches the northern limit of its geographic range in the southern U.S. In Florida, this raptor occurs as an isolated population in the south-central region of the state. Changes in land use patterns throughout central Florida have resulted in this population becoming a subject of concern. This raptor has been documented to occur almost exclusively on privately owned cattle ranches in the south-central part of the state.

Currently, much of the caracara population is found on improved or semi-improved pastures on private cattle ranches. Available evidence suggests that the most serious threat to Florida's caracara population is loss or degradation of nesting and feeding habitat. Such loss is most commonly due to conversion of pasture and other grassland habitats and wetlands to citrus, sugar cane, other agriculture, and urban development.

Adult caracaras exhibit high site- and mate-fidelity; therefore, extensive loss of habitat within the home range, particularly of the nesting site itself, may cause the pair to abandon that home range, or at least the nesting site (Morrison 2001). Egg laying has been documented as early as September and as late as June; peak activity occurs from late December through February (Morrison 2001). Clutch size is 2-3 eggs, with an incubation period of 32-33 days. Double brooding can occur if a nest is lost early in the season. Fledging occurs at 8 weeks. Young are dependent on parents for at least 2 months post-fledging, and may remain in the natal territory for up to 10 months. Most young in Florida leave natal territory after 4-6 months and form groups of up to 30 individuals.

The caracara is an opportunistic feeder, taking prey items such as insects, small reptiles and amphibians, and small mammals. Eggs and carrion are also included in the diet of caracaras. Foraging for food takes place in early morning and late afternoon. Caracaras often walk through pastures searching for prey items, particularly after disturbance such as mowing or plowing. Caracaras have also been observed feeding in recently burned areas. Hunting takes place from conspicuous perches or while in flight. Once prey is sighted, the caracara flies to the ground and walks up to prey item (Morrison 1996, Morrison 2001). The caracara is known to occur in the vicinity of the HHD and Fisheating Creek (USFWS produced map 2015). Audubon's crested caracara have been documented to nest near the project area, specifically nests have been reported south of Port Mayaca outside of the Federal right-of-way. Additionally, it is possible that nests could be found in other areas within the project area. Caracara nests around Lake Okeechobee are shown in **Figure 2-1**.

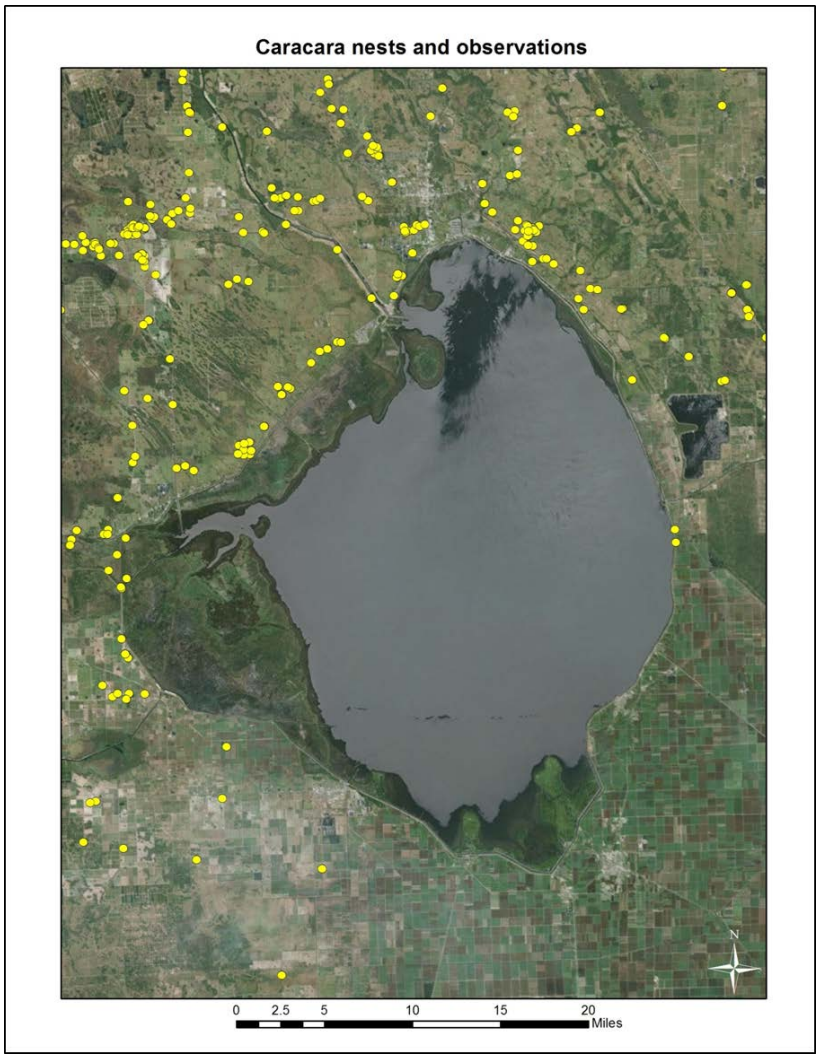


Figure 2-1. Caracara nests and observations (from 1992-2014) around Lake Okeechobee. Source: USFWS 2015

Eastern Indigo Snake: The threatened Eastern indigo snake is the largest native non-venomous snake in North America. It is an isolated subspecies occurring in southeastern Georgia and throughout peninsular Florida. The Eastern indigo snake prefers drier habitats, but may be found in a variety of habitats from xeric sandhills, to cabbage palm hammocks, to hydric hardwood hammocks (Schaefer and Junkin 1990). Eastern indigo snakes need relatively large areas of undeveloped land to maintain their population. In warm months, indigo snakes use a variety of natural areas and have large home ranges (Moler 1992; USFWS 1999). Indigo snakes occupy larger home ranges in the summer than the winter. Information on snakes in Florida indicates adult males have home ranges as high as 224 ha in the summer (Moler 1992). Because it is such a wide-ranging species, the eastern indigo snake is especially vulnerable to habitat fragmentation that makes travel between suitable habitats difficult. The main reason for its decline is habitat loss due to development. Further, as habitats become fragmented by roads, Eastern indigo snakes become increasingly vulnerable to highway mortality as they travel through their large territories (Schaefer and Junkin 1990).

In south Florida, the Eastern indigo snake is thought to be widely distributed. Given their preference for upland habitats, Eastern indigo snakes are not commonly found in great numbers in wetland complexes, though they have been found in pinelands, tropical hardwood hammocks, and mangrove forests in extreme south Florida (Duellman and Schwartz 1958; Steiner *et al*. 1983). Within the range of the gopher tortoise, tortoise burrows are favorite refugia for indigo snakes. They are known to use burrows made by cotton rats and land crabs, hollows at bases of trees and stumps, ground litter, trash piles and rock piles lining banks of canals and pipes or culverts.

Sexual maturity appears to occur around 3-4 years of age. In North Florida, breeding occurs November to April with females laying 4-12 eggs in May-June (Moler 1992). Most hatching of eggs occurs August-September, with yearling activity peaking in April-May (USFWS 1999). Limited data on reproduction in south Florida indicate the breeding season is extended; breeding occurs from June-January, egg deposition is April to July, and hatchlings are born through early fall (USFWS 1999). The Eastern indigo snake is known to occur in the vicinity of the HHD, but has not been observed on the embankment during construction activities in Reach 1 and culvert replacements.

Everglade Snail Kite: The snail kite is listed as an endangered species by both the USFWS and the State of Florida. Although previously located in freshwater marshes over a considerable area of peninsular Florida, the range of the snail kite is now limited to several impoundments on the headwaters of the St. John's River, the southwest side of Lake Okeechobee, the eastern and southern portions of Water Conservation Areas (WCAs) 1, 2A and 3, the southern portion of WCA 2B, the western edge of WCA 3B, and the northern portion of Everglades National Park.

The kite inhabits relatively open freshwater marshes that support adequate populations of apple snail (*Pomacea* sp.), upon which this bird feeds almost exclusively. Favorable areas consist of extensive shallow, open water such as sloughs and flats, vegetated by sawgrass (*Cladium jamaicense*) and spike rush. The areas are often interspersed with tree islands or small groups of scattered shrubs and trees that serve as perching and nesting sites. The water level must be sufficiently stable to prevent loss of the food supply through drying out of the surface.

The snail kite is threatened primarily by habitat loss and destruction. Widespread drainage has permanently lowered the water table in some areas. This drainage permitted development in areas that were once kite habitat. In addition to loss of habitat through drainage, large areas of marsh are heavily infested with water hyacinth that inhibits the kite's ability to see its prey.

Based on the description in the Federal Register (1977), snail kite critical habitat in Lake Okeechobee is located in the western parts of Glades and Hendry Counties, extending along the western shore to the east of the dike system and the undiked high ground at Fisheating Creek, and from the Hurricane Gate at Clewiston northward to the mouth of the Kissimmee River, including all the spike rush (*Eleocharis* sp.*)* flats of Moonshine Bay, Monkey Box, and Observation Shoal, but excluding the open water north and west of the northern tip of Observation Shoal north of Monkey Box and east of Fisheating Bay. Critical habitat for the snail kite includes the southwest and western shore of Lake Okeechobee from Clewiston to the Kissimmee River (excluding deep open water). In the project area, this critical habitat includes the area along the HHD in CIZ B and C (**Figure 2-2**).

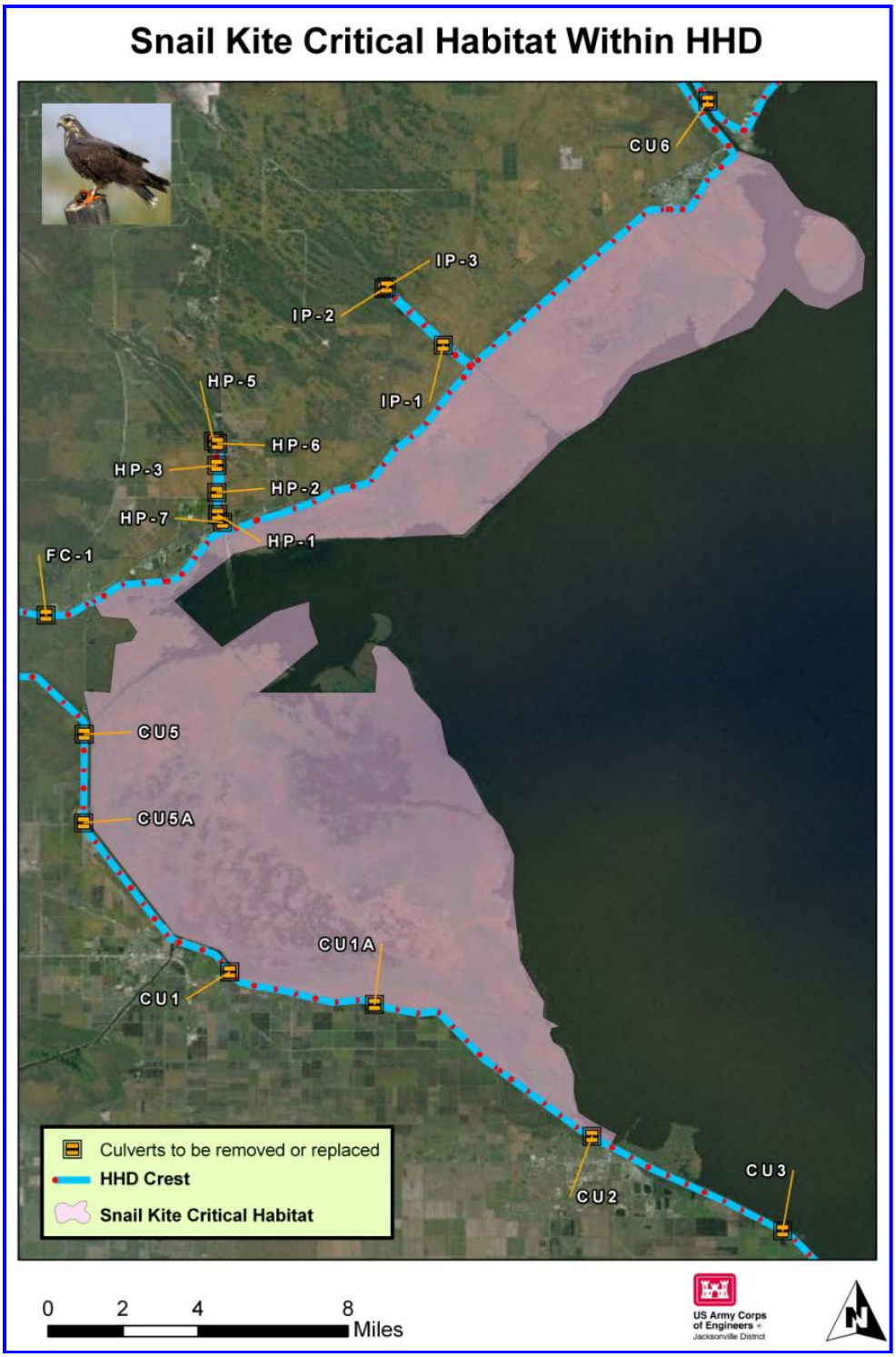


Figure 2-2. Snail Kite Critical Habitat located in Lake Okeechobee

Okeechobee Gourd: The endangered Okeechobee gourd is a climbing annual or perennial vine possessing heart to kidney-shaped leaf blades. The cream-colored flowers are bell-shaped and the light green gourd is globular or slightly oblong.

The Okeechobee gourd was locally common in the extensive pond apple forest that once grew south of Lake Okeechobee. Historically, the Okeechobee gourd was found on the southern shore of Lake Okeechobee in Palm Beach County and in the Everglades. Currently this species is limited to two disjunct populations, one along the St. Johns River in Volusia, Seminole, and Lake Counties in northern Florida and a second around the shoreline of Lake Okeechobee in south Florida (USFWS 1999). The conversion of the pond apple forested swamps and marshes for agricultural purposes as well as water-level regulation within Lake Okeechobee have been the principal causes of the reduction in both range and number of the Okeechobee gourd. The Okeechobee gourd is known to occur in the vicinity of the HHD.

West Indian Manatee: The Florida manatee is a large, plant-eating aquatic mammal that can be found in the shallow coastal waters, rivers, and springs of Florida. The Florida manatee, *Trichechus manatus*, was listed as endangered throughout its range for both the Florida and Antillean subspecies (*T. manatus latirostris* and *T. manatus manatus*) in 1967 (32 FR 4061) and received Federal protection with the passage of the ESA in 1973. Because the Florida manatee was designated as an endangered species prior to enactment of ESA, there was no formal listing package identifying threats to the species, as required by section 4(a)(1) of the Act.

Florida manatees can be found throughout the southeastern United States; however, within this region, they are at the northern limit of their range (Lefebvre *et al*. 2000). Because they are a subtropical species with little tolerance for cold, they remain near warm water sites in peninsular Florida during the winter. During periods of intense cold, Florida manatees will remain at these sites and will tend to congregate in warm springs and outfall canals associated with electric generation facilities (Florida Power and Light 1989). During warm interludes, Florida manatees move throughout the coastal waters, estuaries, bays, and rivers of both coasts of Florida and are usually found in small groups. During warmer months, Florida manatees may disperse great distances. Florida manatees have been sighted as far north as Massachusetts and as far west as Texas and in all states in between (Rathbun *et al*. 1983; Fertl *et al*. 2005). Warm weather sightings are most common in Florida and coastal Georgia. They will once again return to warmer waters when the water temperature is too cold (Hartman 1979; Stith *et al*. 2006). Florida manatees live in freshwater, brackish, and marine habitats, and can move freely between salinity extremes. It can be found in both clear and muddy water. Water depths of at least three to seven feet (one to two meters) are preferred and flats and shallows are avoided unless adjacent to deeper water.

Over the past centuries, the principal sources of Florida manatee mortality have been opportunistic hunting by man and deaths associated with unusually cold winters. As of 2013, the FWC reported 37 Florida manatee deaths. In 2010, over 300 were reported to be found dead, which was related to the prolonged cold water conditions in the winter of 2009-2010. Today, poaching is rare, but high mortality rates from human-related sources threaten the future of the species. The largest single mortality factor is collision with boats and barges. Florida manatees also are killed in flood gates and canal locks, by entanglement or ingestion of fishing gear, and through loss of habitat and pollution. The manatee is known to inhabit Lake Okeechobee.

Wood Stork: The wood stork is a large, white, long-legged wading bird that relies upon shallow, freshwater wetlands for foraging. Black primary and secondary feathers, a black tail and a blackish, featherless neck distinguish the wood stork from other wading birds species. This species was federally

listed as endangered under the ESA on February 28, 1984. No critical habitat has been designated for the wood stork; therefore, none will be affected.

In the United States, wood storks were historically known to nest in all coastal states from Texas to South Carolina (Wayne 1910; Bent 1926; Howell 1932; Oberholser 1938). Dahl (1990) estimates these states lost about 38 million acres, or 45.6 percent, of their historic wetlands between the 1780s and the 1980s. However, it is important to note wetlands and wetland losses are not evenly distributed in the landscape. Hefner *et al*. (1994) estimated 55 percent of the 2.3 million acres of the wetlands lost in the southeastern United States between the mid-1970s and mid-1980s were located in the Gulf-Atlantic coastal flats. These wetlands were strongly preferred by wood storks as nesting habitat. Currently, wood stork nesting is known to occur in Florida, Georgia, South Carolina, and North Carolina from March to late May. However, in south Florida, wood storks lay eggs as early as October and fledge in February or March. Breeding colonies of wood storks are currently documented in all southern Florida counties except for Okeechobee County. Known nesting colonies are shown in **Figure 2-3**.

The wood stork population in the southeastern United States appears to be increasing. Preliminary population totals indicate that the wood stork population has reached its highest level since it was listed as endangered in 1984. In all, approximately 11,200 wood stork pairs nested within their breeding range in the southeastern United States. Wood stork nesting was first documented in North Carolina in 2005 and wood storks have continued to nest in this state through present. This suggests that the northward expansion of wood stork nesting may be continuing.

The primary cause of the wood stork population decline in the United States is loss of wetland habitats or loss of wetland function resulting in reduced prey availability. Almost any shallow wetland depression where fish become concentrated, either through local reproduction or receding water levels, may be used as feeding habitat by the wood stork during some portion of the year; but only a small portion of the available wetlands support foraging conditions (high prey density and favorable vegetation structure) that wood storks need to maintain growing nestlings. Browder *et al*. (1976) and Browder (1978) documented the distribution and the total acreage of wetland types occurring south of Lake Okeechobee, Florida, for the period 1900 through 1973. They combined their data for habitat types known to be important foraging habitat for wood storks (cypress domes and strands, wet prairies, scrub cypress, freshwater marshes and sloughs, and saw grass marshes) and found these habitat types have been reduced by 35 percent since 1900.

Wood storks forage primarily within freshwater marsh and wet prairie vegetation types, but can be found in a wide variety of wetland types, as long as prey are available and the water is shallow and open enough to hunt successfully (Ogden *et al*. 1978; Browder 1984; Coulter 1987; Gawlik *et al*. 2004; Herring and Gawlik 2007). Calm water, about 5 to 25 centimeters in depth, and free of dense aquatic vegetation is ideal, however, wood storks have been observed foraging in ponds up to 40 centimeters in depth (Coulter and Bryan 1993; Gawlik 2002). Typical foraging sites include freshwater marshes, ponds, hardwood and cypress swamps, narrow tidal creeks or shallow tidal pools, and artificial wetlands such as stock ponds, shallow, seasonally flooded roadside or agricultural ditches, and managed impoundments (Coulter *et al*. 1999; Coulter and Bryan 1993; Herring and Gawlik 2007). During nesting, these areas must also be sufficiently close to the colony to allow wood storks to efficiently deliver prey to nestlings.

The wood stork is known to occasionally feed in the toe ditch wetlands of the HHD. However, the principal habitat in the area for the wood stork is within the littoral zone of Lake Okeechobee.

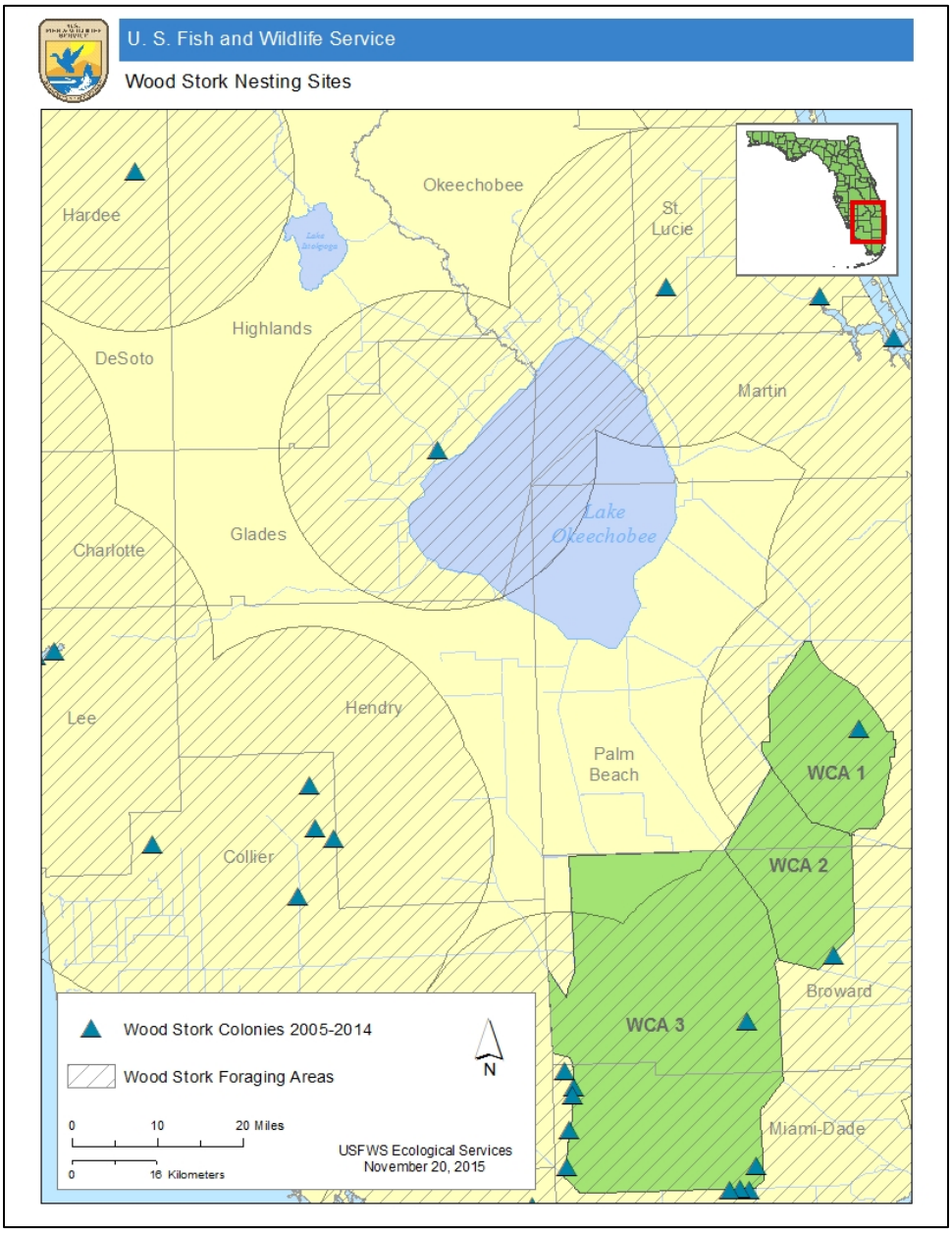


Figure 2-3. Wood stork colonies near HHD and Lake Okeechobee. Source: USFWS 2015

Florida Panther: The endangered Florida panther, also known as cougar, mountain lion, puma and catamount, was once the most widely distributed mammal (other than humans) in North and South America, but it is now virtually exterminated in the eastern United States. Habitat loss has driven the subspecies known as the Florida panther into a small area, where the few remaining animals are highly inbred, causing such genetic flaws as heart defects and sterility. Recently, closely-related panthers from Texas were released in Florida and are successfully breeding with the Florida panthers. Increased genetic variation and protection of habitat may save the subspecies.

One of 30 cougar subspecies, the Florida panther is tawny brown on the back and pale gray underneath, with white flecks on the head, neck and shoulder. Male panthers weigh up to 130 pounds and females reach 70 pounds. Preferred habitat consists of cypress swamps, pine and hardwood hammock forests. The main diet of the Florida panther consists of white-tailed deer, sometimes wild hog, rabbit, raccoon, armadillo and birds. Present population estimations range from 80 to 100 individuals. Florida panthers are solitary, territorial, and often travel at night. Males have a home range of up to 400 square miles and females about 50 to 100 square miles. Florida panther primary, secondary, and dispersal zones are shown in Figure 2-4. Female panthers reach sexual maturity at about three years of age. Mating season is December through February. Gestation lasts about 90 days and females bear two to six kittens. Juvenile panthers stay with their mother for about two years. Females do not mate again until their young have dispersed. The main survival threats to the Florida panther include habitat loss due to human development and population growth, collision with vehicles, parasites, feline distemper, feline alicivirus (an upper respiratory infection), and other diseases (USFWS 1999).

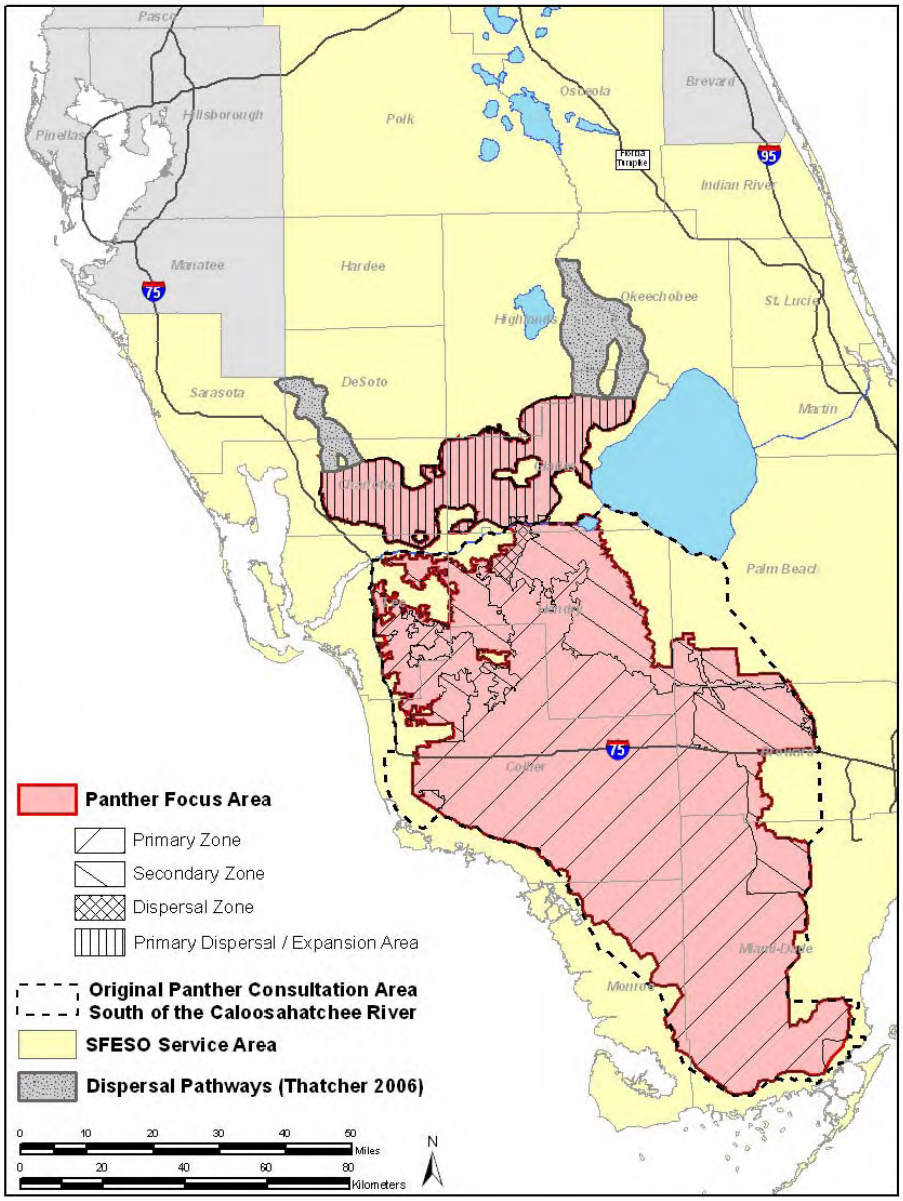


Figure 2-4. Florida panther zones in South Florida.

Florida Bonneted Bat:
The Florida bonneted bat is Florida's largest bat, weighing approximately 1.1 to 2.0 ounces, with a 19 to 21 inch wingspan, and a body length of 5.1 to 6.5 inches. The species has dark brown fur and large broad ears that join together and slant forward over the eyes. Relatively little is known regarding the ecology and habitat requirements of this species. In general, bats will forage over ponds, streams and wetlands and require roosting habitat for daytime roosting, protection from predators and rearing of young (FFWCC 2011). Florida bonneted bats roost in tree cavities, rocky outcrops and dead palm fronds. In residential communities, the bats roost in Spanish tile roofs, but have also been found in attics, rock or brick chimneys and fireplaces of old buildings (FFWCC 2011). Colonies are small, with the largest reported as just a few dozen individuals. The bat is a nocturnal insectivore and relies upon echolocation to navigate and detect prey. Females give birth to a single pup from June through September (FFWCC 2011); however limited data suggests that a female may undergo a second birthing season possibly in January or February.

The Florida bonneted bat is Florida's only endemic bat and is listed by FWC as a state listed endangered species and is a candidate species for Federal listing under the ESA. The range of this species is limited to southern Florida, although this species was encountered in 2008 in two locations within the Kissimmee River Wildlife Management Area north of Lake Okeechobee. Records indicate that it was once common in the 1950s and early 1960s near Coral Gables and Miami (Belwood 1992). The Florida bonneted bat has only been documented in 12 locations within Florida, including areas within Coral Gables, Homestead, Naples, Everglades City and North Fort Myers. Seven of the locations are under public ownership with the Florida bonneted bat found in discrete and specific areas within BCNP, Fakahatchee Strand Preserve State Park, Kissimmee River Wildlife Management Area, Babcock Ranch and Fred C. Babcock and Cecil M. Webb Wildlife Management Area. Loss of suitable habitat is believed to be the primary cause of population declines. Other perceived threats include pesticide and herbicide use, which decrease populations of insects, the bats primary prey.

2.1.1 Effects Determinations

<u>Audubon's Crested Caracara</u>
Audubon's crested caracaras have been documented to nest near the project area. Specifically, nests have been reported south of Port Mayaca outside of the federal right of way. Additionally, it is possible that nests could be found in other areas within the project area. Surveys will be conducted prior to the initiation of construction and during construction at each site to determine if caracara is present in the project area. The action may produce noise above ambient levels, however, mufflers, and sound dampening equipment would be required during construction. Monitoring for caracara during the nesting season (January through April) within 985-4,920 ft of the nests will ensure the action would not increase noise above ambient levels within nest protection areas of active caracara nests.

Conclusion: The TSP may affect, but is not likely to adversely affect, the Audubon's crested caracara.

<u>Eastern Indigo Snake</u>
Eastern indigo snakes may be found along the embankment of the HHD. Preconstruction surveys would be completed in the project area, monitors would be on site during all phases of construction, and construction crews would be educated on identifying the indigo snake and the precautions to take to prevent impacts to the indigo snake. Eastern indigo snake Standard Protection Measures will be included in the environmental protection plan for construction work. Onsite gopher tortoise burrows

would be protected to the extent possible to provide snake habitat during construction. The habitat that would be temporarily impacted would be seeded or replaced by sod and is expected to recover within a few months of project completion.

Conclusion: The TSP may affect, but is not likely to adversely affect eastern indigo snake.

Everglade Snail Kite

Everglade snail kites are known to nest near the project area (see **Figure 2-5** for known nesting locations). In addition to nesting, snail kites forage within the Lake Okeechobee southwestern littoral zone. The proposed action may produce noise above ambient levels, however, mufflers and sound dampening equipment would be required during construction. Preconstruction surveys would be completed prior to the initiation of construction activities. Monitoring kites during the nesting season (January through June) within the 500 ft no activity zone of active snail kite nests will ensure the action will not increase noise above ambient levels within nest protection areas of active snail kite nests. A 1640 ft buffer (Secondary Priority Management Zone) will be established as necessary around active nests.

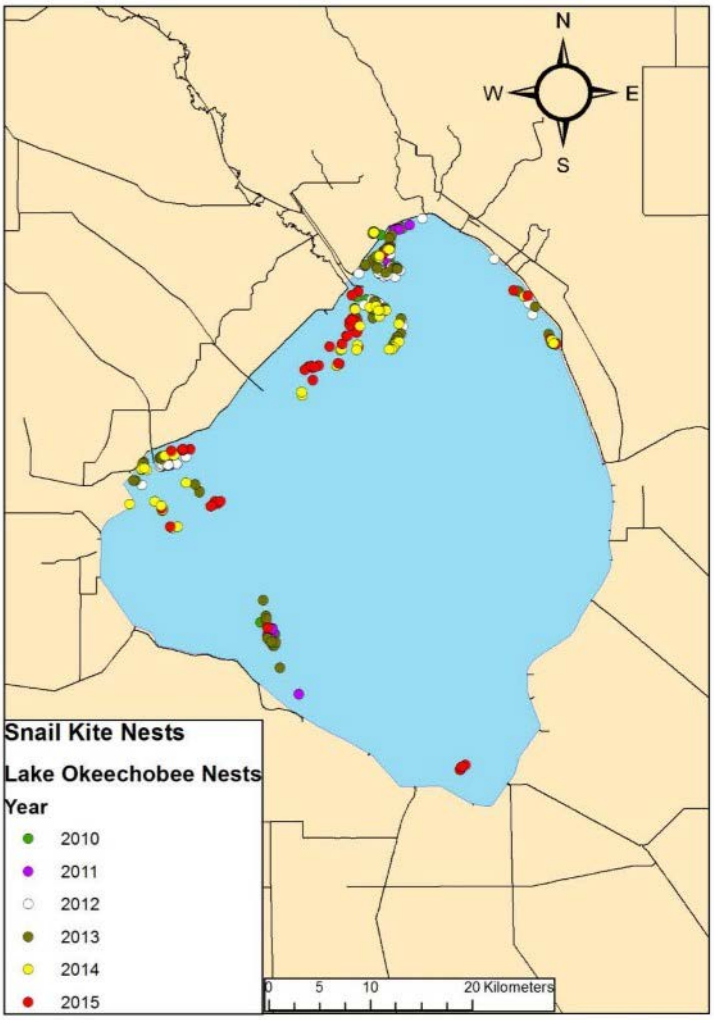


Figure 2-5. Snail kite nest locations from 2010-2015 (*active nests only). Source: USFWS 2015 *Active = only nests where eggs or nestlings were observed.

Snail Kite Critical Habitat

Based on the description in the Federal Register (1977), snail kite critical habitat in Lake Okeechobee is located in the western parts of Glades and Hendry Counties, extending along the western shore to the east of the levee system and the undiked high ground at Fisheating Creek, and from the Hurricane Gate at Clewiston northward to the mouth of the Kissimmee River, including all the spike rush (*Eleocharis sp.)* flats of Moonshine Bay, Monkey Box, and Observation Shoal, but excluding the open water north and west of the northern tip of Observation Shoal north of Monkey Box and east of Fisheating Bay.

The construction footprint includes the grassy vegetation covering the HHD. The critical habitat (shapefile obtained from USFWS in 2010) is shown to extend onto the levee and dike in this grassy vegetation. As discussed with FWS during the HHD Culverts consultation, the upland grassy vegetation is not considered critical snail kite habitat.

If disturbances to snail kite critical habitat occur, it would be temporary in nature and vegetation would be allowed to reestablish through natural recruitment and restored to preconstruction conditions by replanting vegetation along the dike upon completion of construction. There would be no permanent loss of critical habitat.

Conclusion: The TSP may affect, but is not likely to adversely affect, the Everglade snail kite and its designated critical habitat.

Okeechobee Gourd

The Okeechobee gourd is known to occur on the HHD. Preconstruction surveys would be completed to locate any plants within the construction footprint. If plants are found, the USFWS would be contacted to determine an appropriate course of action for removal and relocation of plants. Flagging will be placed around the gourd for additional protection from pedestrian traffic if plants are sighted outside of, but adjacent to, the construction area.

Conclusion: The TSP may affect, but is not likely to adversely affect the Okeechobee Gourd.

West Indian Manatee

Manatees are known to occur in Lake Okeechobee. The proposed action would produce noise above ambient levels. Preconstruction surveys would be completed to ensure that no manatees are harmed or harassed during construction. Surveys would also be conducted during construction to determine if manatees are present in the area of construction. No manatee critical habitat is adjacent to or near the dike.

Conclusion: The TSP may affect, but is not likely to adversely affect the West Indian manatee.

Wood Stork

Wood storks are known to forage within the toe ditch and nest near the proposed project area. Project activities near foraging wood storks could temporarily displace individuals to other foraging areas available within the southwest littoral zone of Lake Okeechobee while construction is occurring. The action may produce noise above ambient levels, however, mufflers and sound dampening equipment would be required during construction. Preconstruction surveys would be completed prior to the initiation of construction activities. Monitoring of wood storks during the nesting season (January through June) within 1,000-1,500 ft of active wood stork nesting colonies will ensure the action will not

increase noise above ambient levels within nest protection areas of active caracara nests. Human activity should not occur within a 300 ft buffer where there is a vegetation screen (dense vegetation), and 750ft when there is no vegetation present. A 2,500 ft buffer (Secondary Priority Management Zone) will be established as necessary around nesting colonies.

Conclusion: The TSP may affect, but is not likely to adversely affect the wood stork.

Florida Panther

Florida panthers are thought to use HHD for traversing from one habitat to the next. Construction of the cutoff wall could temporarily impact panthers to traverse the embankment because the embankment would not be passable during construction. Since this would be temporary in nature, it is not expected to harm or harass the species, resulting in moderate short term effects; the panther would be able to go around the construction zones.

Conclusion: The TSP may affect, but are not likely to adversely affect Florida panther.

Florida Bonneted Bat

The Florida bonneted bat consultation area includes Okeechobee County, which is within the project area. The project area does not include the 2013 bonneted bat focal area as described by FWS (2013). The HHD contains man-made culverts, which could be suitable for roosting, however, roosts are more likely to occur if trees are surrounding the man-made structures in order to avoid predators. HHD also contains open water, which is amenable to bonneted bat foraging. None of the alternatives would disrupt any of the culverts more than the culvert replacement project where the Florida bonneted bat was concluded as may affect, not likely to adversely affect the species. If bats are encountered, the Corps will coordinate measures with FWS to minimize or avoid potentially adverse effects.

Conclusion: Since HHD is within the Florida bonneted bat consultation area and contains man-made structures in which bats could potentially roost, the Corps has determined that the TSP may affect, but are not likely to adversely affect, Florida bonneted bat.

3 CONSERVATION MEASURES

The Corps commits to mitigating effects of the Tentatively Selected Plan to the greatest extent possible in both the planning and construction phases of the project.

4 MONITORING DURING CONSTRUCTION PHASE

Monitoring of listed species identified to occur within the HHD DSMS will be addressed with ongoing communication with the USFWS. Construction will span over multiple years, and design plans have not currently been established for each segment, therefore consultation with the USFWS will continue with construction in each segment.

The USFWS provides conservation measures and guidelines for all threatened and endangered species in Florida. These conservation measures will also be located in the construction specifications.

5 MITIGATION

The Corps and its contractors commit to avoiding, minimizing or mitigating for adverse effects during construction activities by including the following commitments in the contract specifications:

1) Standard protection measures regarding the eastern indigo snake shall be included in the environmental protection plan when the Corps proceeds to the plans and specifications phase of this project.

2) The Corps or its contractor shall conduct a pre-construction survey to determine locations of bald eagle nests within the immediate vicinity of construction prior to issuance of any construction contracts. Results shall be coordinated with the USFWS, Vero Beach office. The Corps will conduct surveys to locate the nest trees ahead of construction and will avoid construction close to the nests during the nesting season. If the hatchlings fledge prior to May 15, activity within the 660-foot buffer would be allowed. In the event that construction within the interior of the buffer is unavoidable within nesting season, the Bald Eagle Monitor Guidelines will be implemented accordingly. The guidelines can be reviewed at the following web address: www.fws.gov/northflorida/BaldEagles/bald-eagles.htm.

3) The Corps shall consult with the USFWS regarding adopting standardized protection measures should any caracara nests be identified within the project construction zone. Results shall be coordinated with the USFWS and FFWCC.

4) Turbidity screening and diversion will be used to control effects to the drainage ditches and connected canals. Runoff from the construction site or storms shall be controlled, retarded, and diverted to protected drainage courses by means of diversion ditches, benches, and any measures required by area wide plans approved under paragraph 208 of the Clean Water Act. Temporary and permanent erosion and sedimentation control features or screening will be installed. Temporary velocity dissipation devices shall be placed along drainage courses to provide for non-erosive flows. Temporary erosion and sediment control measures such as berms, dikes, drains, sediment traps, sedimentation basins, grassing, mulching, baled hay or straw, and silt fences shall be maintained until permanent drainage and erosion control facilities are completed and operative. For silt fences, the filter fabric is to be of nylon, polyester, propylene, or ethylene yarn of at least 50 lb/in strength

and able to withstand a flow rate of at least 0.3 gal/ft sq/minute. It also would contain ultraviolet ray inhibitors and stabilizers and be a minimum of 36 inches in width.

5) In addition, during construction, the Contractor will be responsible for keeping construction activities, including refueling and maintenance sites, under surveillance, management, and control to avoid pollution of surface, ground waters, and wetlands. The Contractor is responsible for conducting all operations in a manner to minimize turbidity and shall conform to all water quality standards as prescribed by Chapter 62-302, State of Florida, FDEP.

6) Project construction shall not destroy migratory birds, their active nests, their eggs, or their hatchlings. Monitoring for such would be required by the construction contractor. A buffer zone around active nests or nestling activity would be required during the nesting season.

6 CONCLUSIONS

The Corps' determination on all threatened and endangered species in this document is may affect, not likely to adversely affect. The purpose of this project is to reduce the risk of failure of the Herbert Hoover Dike system by constructing cutoff walls in segments of the dike and using floodwall or armoring specific areas to prevent overwashing and overtopping. All construction and impacts will be temporary in nature, resulting in preconstruction conditions upon completion of construction. Appropriate conservation measures and survey protocol will be followed throughout the design phase and all stages of construction and will also be coordinated with USFWS. Adaptive management will be applied throughout construction, allowing for unforeseen issues to be addressed if they arise.

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E.5 Endangered Species Act Correspondence

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
P.O. BOX 4970
JACKSONVILLE, FLORIDA 32232-0019

REPLY TO
ATTENTION OF

Planning and Policy Division
Environmental Branch

AUG 2 2 2014

Mr. Larry Williams
Field Supervisor
U.S. Fish and Wildlife Service
1339 20th Street
Vero Beach, Florida 32960

Dear Mr. Williams,

The U.S. Army Corps of Engineers, Jacksonville District (Corps), is preparing a National Environmental Policy Act assessment for the Herbert Hoover Dike (HHD) Dam Safety Modification Study (DSMS). The purpose of the DSMS is to identify a plan to allow the Corps to implement future dam safety projects that will address potential embankment failure modes, reduce risk to lakeside communities, and prioritize future work based on risk to human life. The DSMS is analyzing rehabilitation solutions within the current Lake Okeechobee Regulation Schedule (2008).

The HHD is approximately 143 miles long and spans the following five counties around the perimeter of Lake Okeechobee: Glades, Hendry, Martin, Okeechobee, and Palm Beach (Enclosure 1). Lake Okeechobee is the third largest lake by land area in the United States and a component of the Central and Southern Florida Flood Control Project. The lake has a surface area of approximately 730 square miles and drains an area to the north and west totaling approximately 5,600 square miles of lands with major inflows coming from the Kissimmee River and Fisheating Creek.

The Corps previously received a Final Fish and Wildlife Coordination Act (FWCA; 16 U.S.C. et seq., March 10, 1934 as amended 1946, 1958, 1978, and 1995) Report dated December 20, 2001, and supplemental FWCA Reports dated March 4, 2003, and March 8, 2004 for previous HHD rehabilitation work from the U.S. Fish and Wildlife Service, Vero Beach (USFWS). The Corps will continue to implement the protective measures previously agreed upon in coordination under the Endangered Species Act (ESA; 7 U.S.C. 136, 16 U.S.C. 1531 et seq., December 28, 1973) and FWCA to avoid adverse effects to these species. The Corps also coordinated the HHD Culvert Replacement project with the USFWS under the ESA for the same project area as the DSMS. The USFWS provided concurrence on the Corps' findings for the Culvert Replacement project by letter dated February 10, 2011. Finally, the Corps received a Draft Fish and Wildlife Coordination Act Report (FWCAR) July 14, 2014, for measures proposed to alleviate internal erosion (piping and seepage) of the HHD embankment using a cutoff wall or seepage filter system as risk reduction measures.

Commensurate with the level of detail provided to the USFWS (January 14, 2014) for the measures proposed to resolve internal erosion of the HHD embankment, the Corps presented information related to measures proposed to resolve concerns related to overwash and overtopping (overwash/overtop) failure modes of the HHD embankment via webinar and teleconference July 31, 2014. As part of the July 31 presentation, the Corps presented the definition of overwash/overtop as a failure mode, where the overtop/overwash was predicted to occur, and proposed measures to be considered during the plan formulation process to the USFWS and Florida Fish and Wildlife Conservation Commission (FFWCC). The initial estimate was that 44 of the 143 miles of HHD would need to have the risk of overwash/overtop addressed (slide 5 in the attached powerpoint depicts the locations). A rough estimate of potential open water and wetland impacts due to embankment raising was calculated to be approximately 133 acres, which would be the maximum acreage of wetland impacts for any of the overwash/overtop options. The information provided during the July 31, 2014, meeting and meeting summary is included with this letter as Enclosure 2.

The FWCA requires Federal agencies to consult with the USFWS regarding potential impacts to fish and wildlife resources and the proposed measures to mitigate these impacts. The FWCA affords the USFWS and FFWCC an opportunity to provide input to Federal agencies for fish and wildlife conservation measures during the early stages and throughout the planning process. Additional coordination authorities exist through the National Environmental Policy Act (NEPA; U.S.C. 4321-4347, January 1, 190 as amended 1975 and 1982) review process and the consultations required under the ESA. The HHD DSMS Environmental Impact Statement is expected to undergo coordination and consultation through the NEPA and the ESA processes with impacts to fish and wildlife resources adequately addressed via these two authorities.

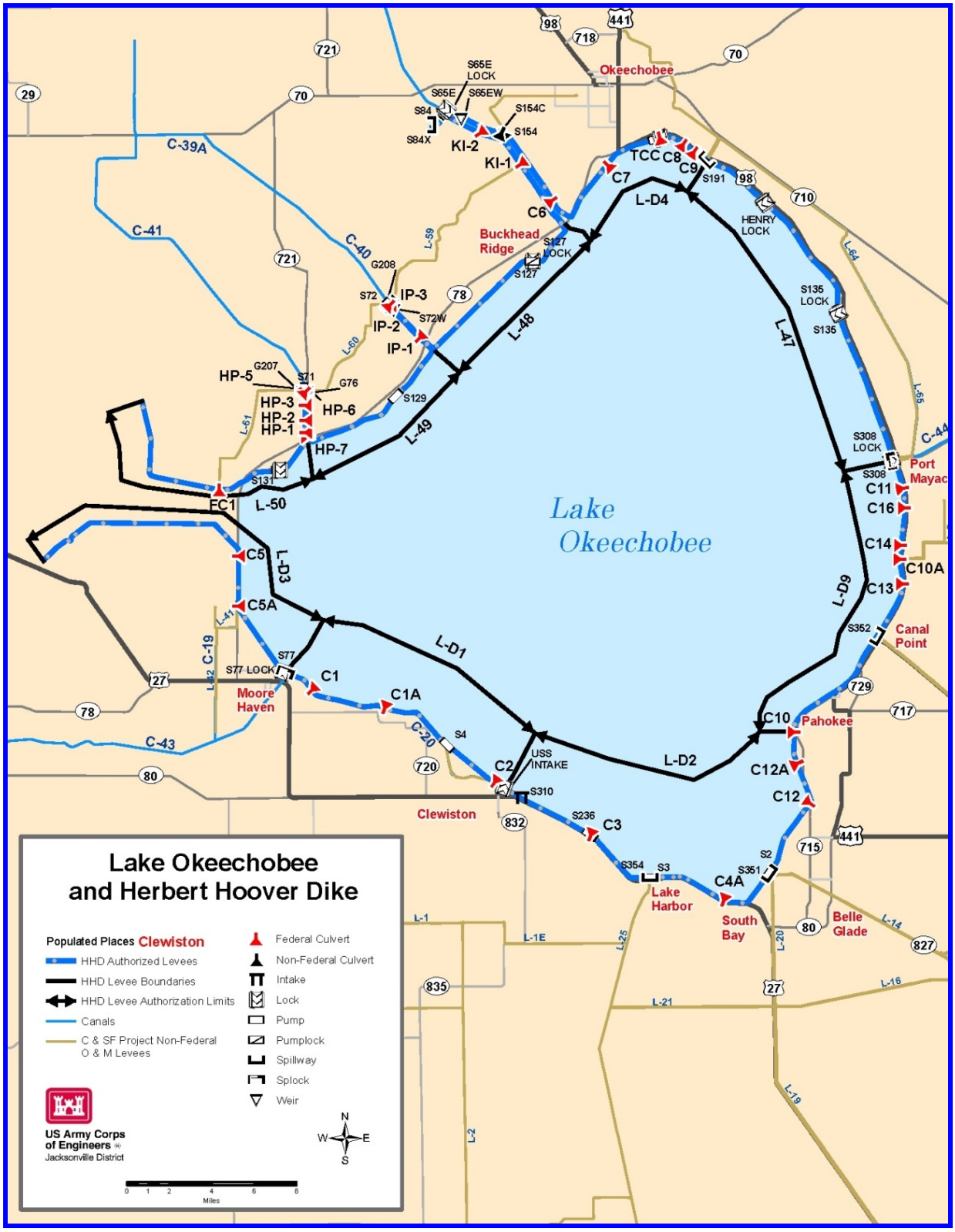
The Corps is requesting concurrence from the USFWS to utilize the NEPA review and ESA consultation processes to complete coordination responsibilities under the FWCA. The Corps requests the USFWS respond via letter or email their concurrence with this methodology for meeting the requirements under the FWCA within 30 days upon receipt of this letter. The USFWS response to this letter will be included in the Corps' administrative record for the HHD DSMS.

If you have any questions, or need further information, please contact Stacie Auvenshine by email stacie.j.auvenshine@usace.army.mil or telephone 904-232-3694. Thank you for your assistance in this matter.

Sincerely,

Eric L. Bush
Chief, Planning and Policy Division

Enclosures


Lake Okeechobee and Herbert Hoover Dike
Populated Places Clewiston
HHD Authorized Levees
HHD Levee Boundaries
HHD Levee Authorization Limits
Canals
C & SF Project Non-Federal O & M Levees
Federal Culvert
Non-Federal Culvert
Intake
Lock
Pump
Pumplock
Spillway
Splock
Weir
US Army Corps of Engineers
Jacksonville District
Miles
Lake Okeechobee
Okeechobee
Buckhead Ridge
Port Mayaca
Canal Point
Pahokee
Belle Glade
South Bay
Lake Harbor
Clewiston
Moore Haven
S65E LOCK
S65E
S65EW
S84
S84X
S154C
S154
KI-2
KI-1
TCC
C8
C9
C7
C6
L-D4
HENRY LOCK
S191
S127 LOCK
S127
G208
S72
IP-3
S72W
IP-2
IP-1
L-48
L-47
S135 LOCK
S135
HP-5
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S71
G76
HP-3
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HP-1
HP-6
HP-7
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L-49
S131
FC1
L-50
S308 LOCK
S308
C11
C16
C14
C10A
C13
L-D9
S352
C5
L-D3
C5A
L-D1
S77
S77 LOCK
C1
C1A
S4
USS INTAKE
C2
S310
L-D2
C10
C12A
C12
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S354
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S2
S351
C4A
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HERBERT HOOVER DIKE REHABILITATION PROJECT

U.S. Army Corps of Engineers
Jacksonville District
Dam Safety Modification Study

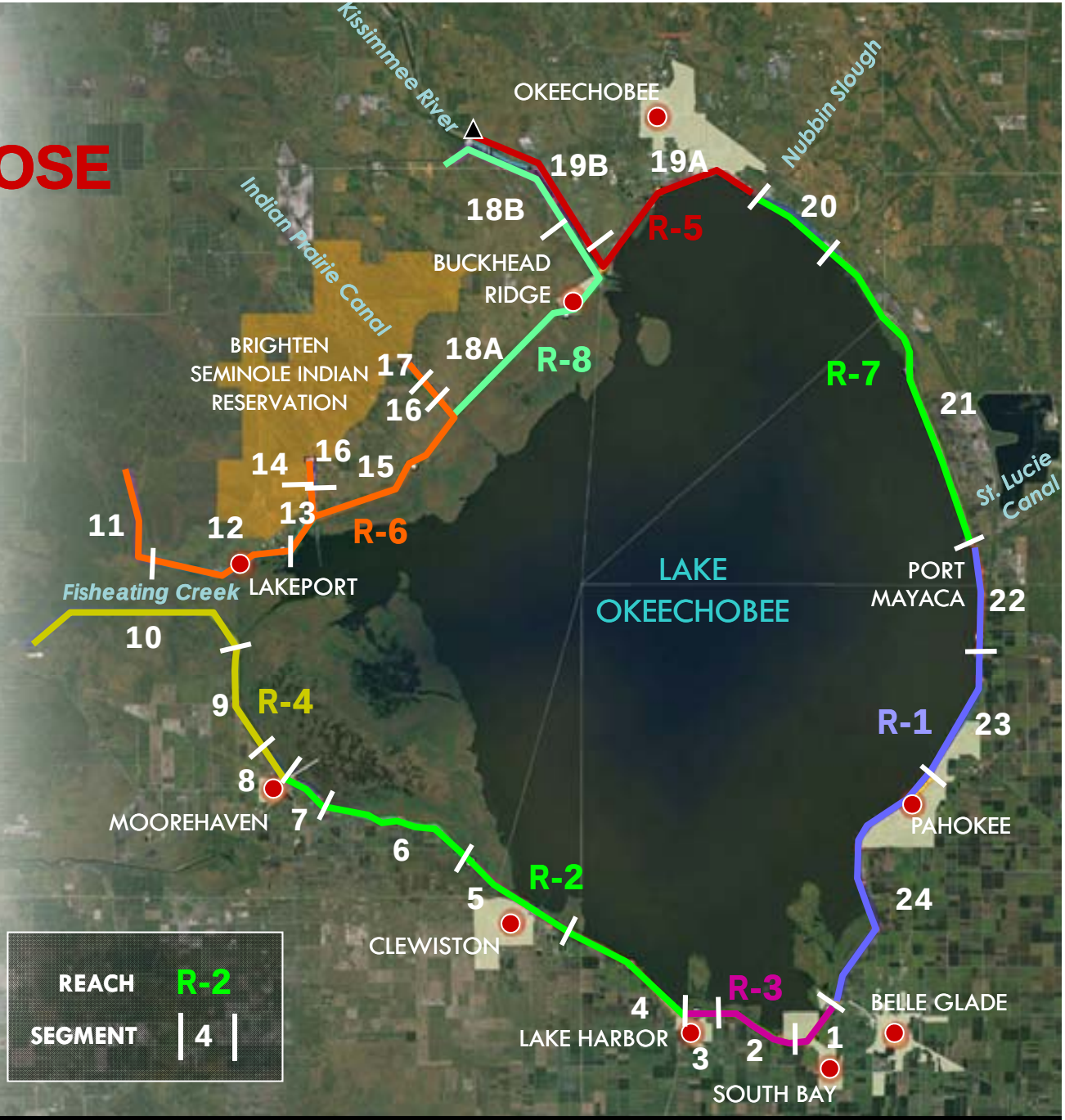
Coordination Act Briefing to USFWS & FWC
31 July 2014

INTRODUCTIONS

Image: Lake Okeechobee and HHD Embankment

MEETING PURPOSE

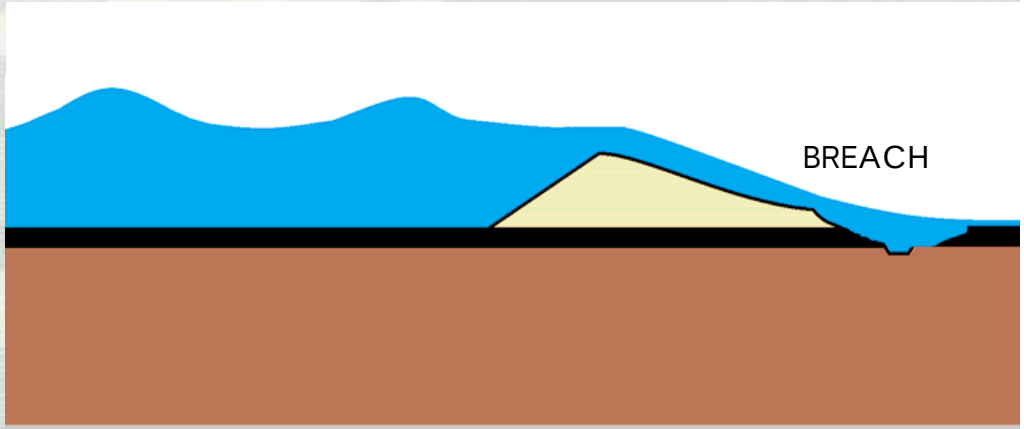
- What is overwash/overtop
- Provide information on measures to address overwash/overtop
- Request Planning Aid Letter for overwash/overtop options

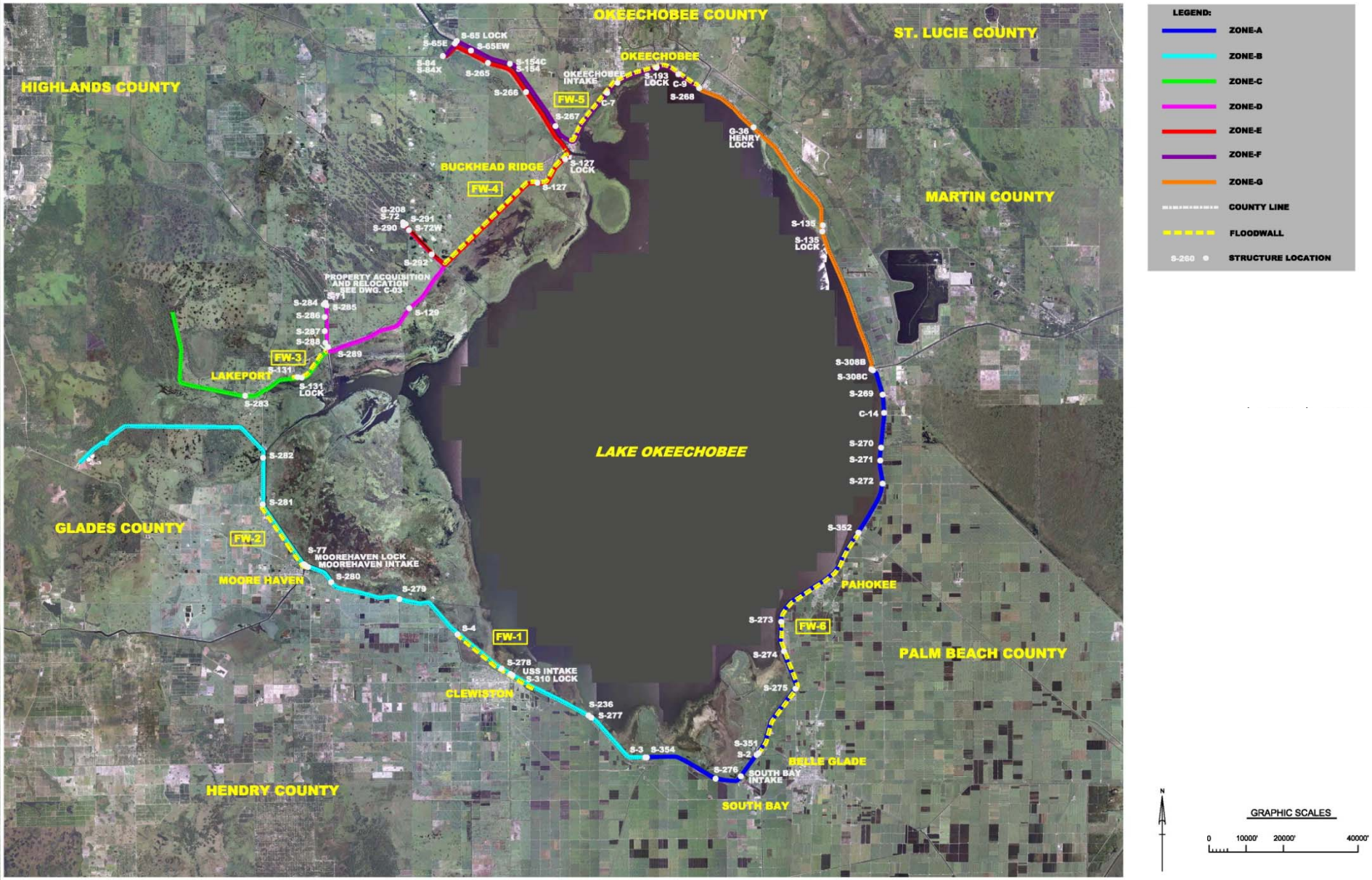


WHAT IS OVERWASH & OVERTOP?

Colorado State Overwash Testing

- **Water from Lake Okeechobee going over the top of the dike due to wind and waves during storm events**
  - Causes erosion of embankment




OKEECHOBEE COUNTY
ST. LUCIE COUNTY
HIGHLANDS COUNTY
MARTIN COUNTY
GLADES COUNTY
HENDRY COUNTY
PALM BEACH COUNTY
LAKE OKEECHOBEE
BUCKHEAD RIDGE
LAKEPORT
MOORE HAVEN
CLEWISTON
OKEECHOBEE
PAHOKEE
BELLE GLADE
SOUTH BAY
FW-1
FW-2
FW-3
FW-4
FW-5
FW-6
S-65 LOCK
S-65E
S-65EW
S-84
S-84X
S-265
S-154C
S-154
S-266
OKEECHOBEE INTAKE
S-193 LOCK
C-9
S-268
C-7
S-267
S-127 LOCK
S-127
G-36 HENRY LOCK
S-135
S-135 LOCK
C-208
S-72
S-291
S-290
S-72W
S-292
PROPERTY ACQUISITION AND RELOCATION SEE DWG. C-03
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S-284
S-285
S-286
S-287
S-288
S-289
S-131
S-131 LOCK
S-283
S-282
S-281
S-77
MOOREHAVEN LOCK
MOOREHAVEN INTAKE
S-280
S-279
S-4
S-278
USS INTAKE
S-310 LOCK
S-236
S-277
S-3
S-354
S-276
SOUTH BAY INTAKE
S-351
S-2
S-275
S-274
S-273
S-352
S-272
S-271
S-270
C-14
S-269
S-308C
S-308B
LEGEND:
ZONE-A
ZONE-B
ZONE-C
ZONE-D
ZONE-E
ZONE-F
ZONE-G
COUNTY LINE
FLOODWALL
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GRAPHIC SCALES
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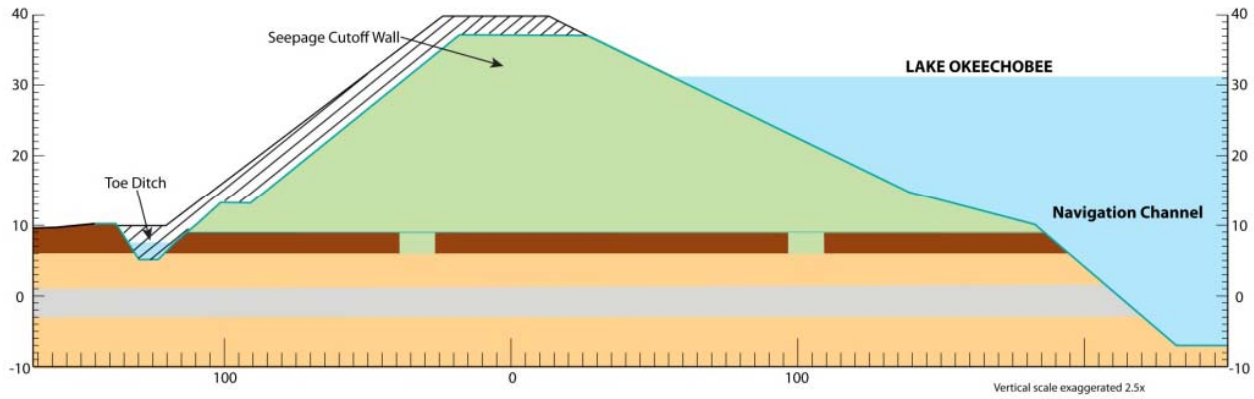
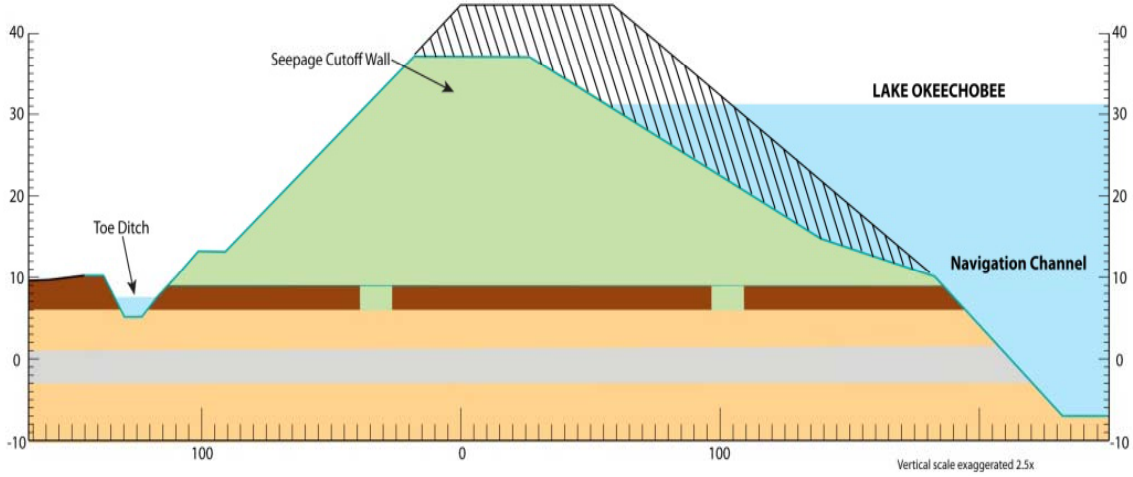
20000'
40000'

OVERWASH/OVERTOP OPTION- RAISE EMBANKMENT



Typical Section
Dam Raising Land Side



Typical Section
Dam Raising Lake Side

LEGEND

- Embankment
- Peat
- Limestone/Marl
- Sand
- New Embankment

NOTES

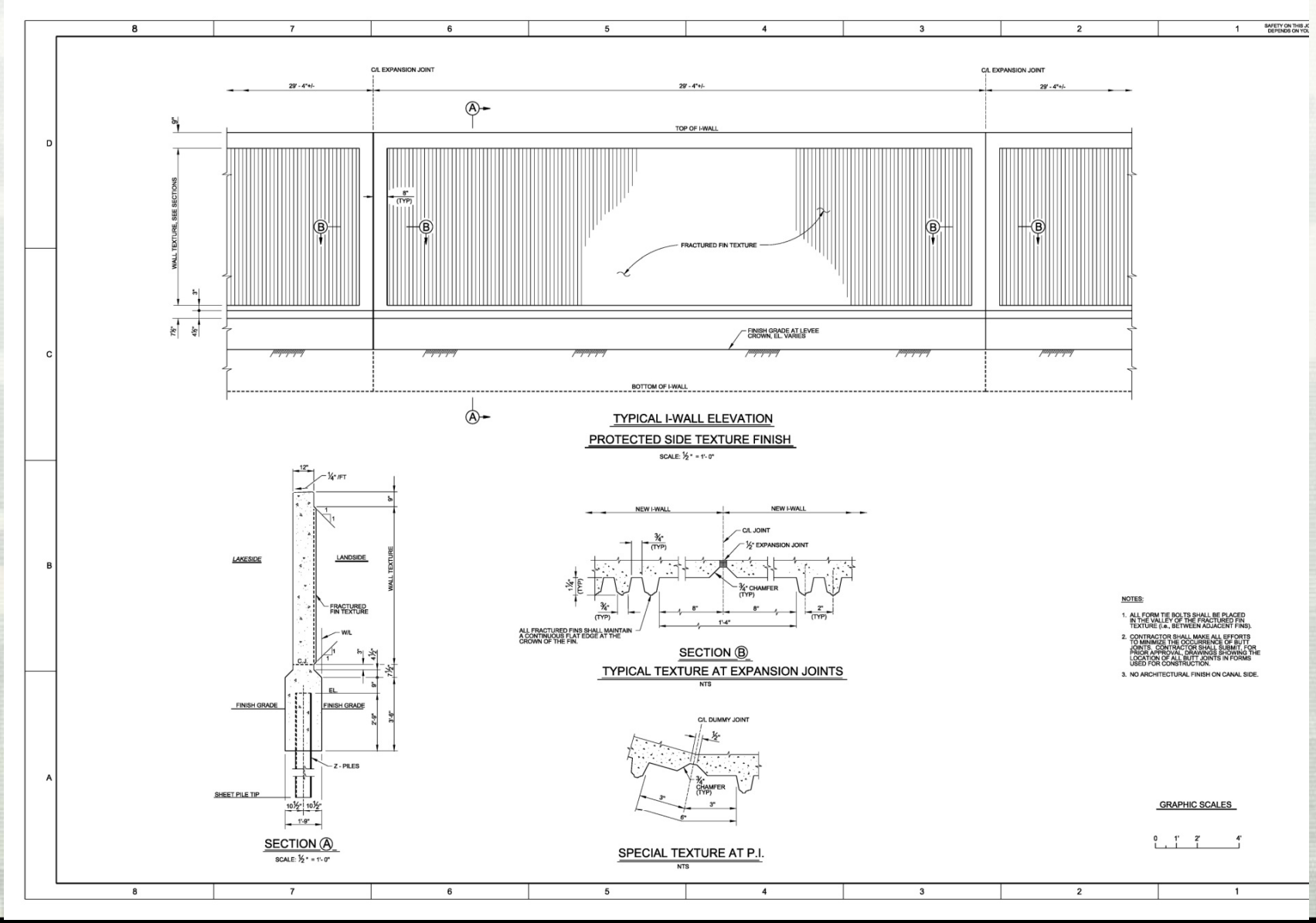
1). Elevations are in NAVD (88)

2). Actual geologic conditions will vary per location.

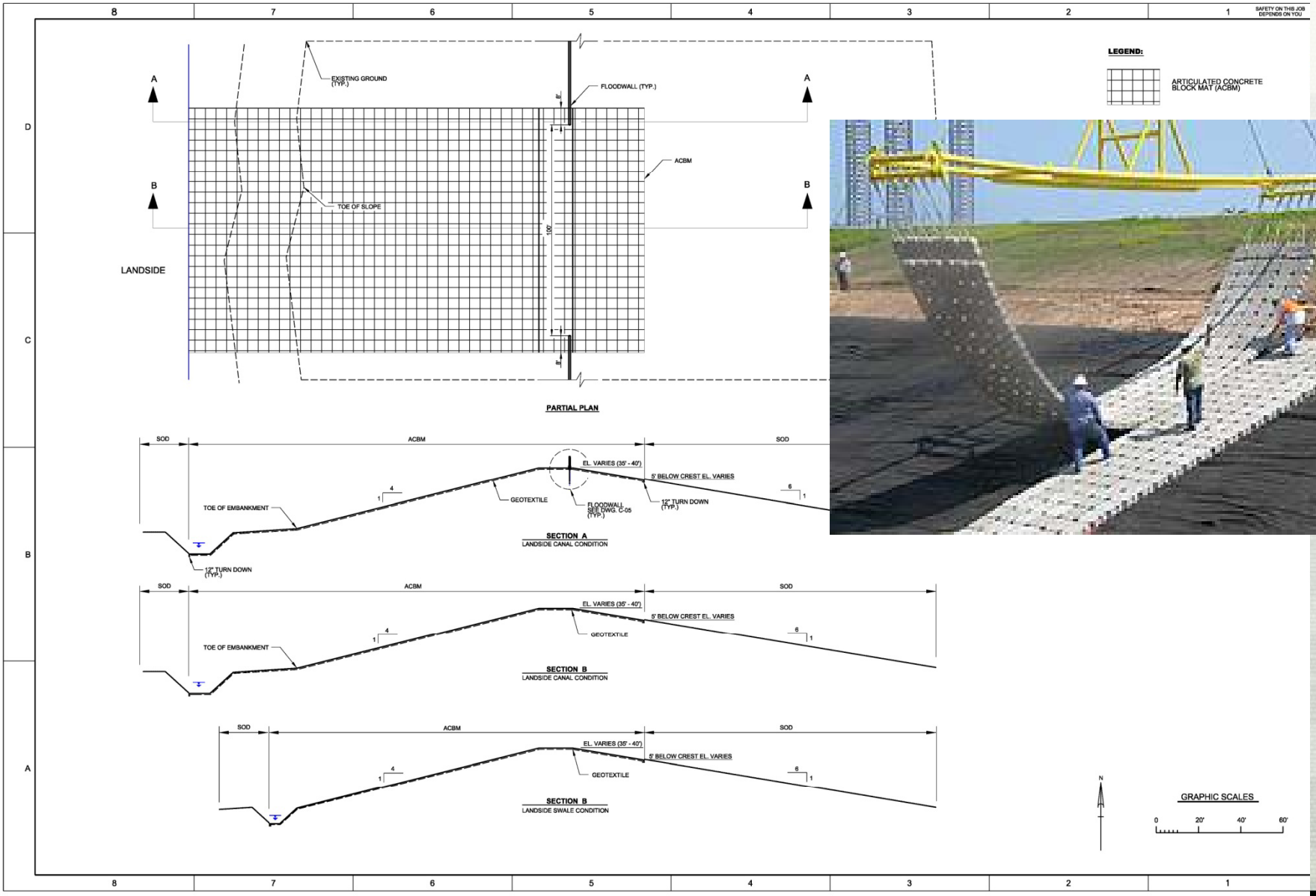
3). Embankment geometry, typography and hydrophy is generalized and will vary by segment.

OVERWASH/OVERTOP OPTION – ARMORING

OVERWASH/OVERTOP OPTION – FLOODWALL & ARMORING



OVERWASH/OVERTOP OPTION – ARMORING & FLOODWALL



SUMMARY

- **Three options to mitigate the risk for overwash/overtop**
  - 1. Raise embankment
  - 2. Floodwall + Armoring
  - 3. Armoring
- **Requesting PAL within 30 days of formal request**

Questions?

HHD Presentation to FWS/FWC on the Overwash/Overtop Options
July 31, 2014

Attendees:
FWC: Don Fox
FWS: Bob Progulske, Daryl Thomas, Miles Meyer
USACE: Tim Willadsen, Mike Christofidis, Brad Foster, Gina Ralph, Stacie Auvenshine

Presented powerpoint to describe what overwash/overtop is, the alternatives we have discussed so far (raise embankment, floodwall with armored gaps, armoring (Articulated Concrete Block Mat). After the presentation we discussed fish and wildlife's first impressions of what their concerns would be regarding the options.

Initial impressions:

- Concerned about recreational activities
- Concerned about ingress/egress of animals to the lake regarding the floodwall. 1000 ft is a long way for them to travel
    - wall would preclude wildlife movement, i.e., turtles, alligators, anything that would perish
- Armoring – covered and sod would be the preferred options for FWS
    - Small animals that are not very mobile could get stuck between blocks if not covered with sod
- Need to check on panther information
    - Panthers use the levee to move north
- Miles asked about sequencing
    - If one method turns out to have negative effects on animals, could one of the other options be constructed at other locations? (we said that sequencing would most likely be based on whichever area has the highest risk, but likely they would not all be constructed at the same time)

Information needed in formal letter to request a Planning Aid Letter:

- Total mileage of areas needing overwash/overtop protection
- Locations of the areas needing overwash/overtop protection
- Option descriptions and figures
    - Identify which option is preferred by the Corps right now
- Corps recommendation on how armoring would be implemented
    - Covered or uncovered with dirt/grass
- Cost estimates
    - We said we may not have detailed information but we could probably get them cost comparisons and/or differences between the options
    - Potentially ROM costs
- Purpose and need
- Include that LORS will not be changed due to any of these options (or project)
- Provide wetland acreage impacts of each option
- Sequencing
    - We said we may be able to get a rough sequencing of what we think at this point would take place

Next steps:
Stacie will provide formal letter by August 15, 2014.

FWS will provide a PAL within 30 days, September 15, 2014. This will ensure that we have FWS input prior to our public risk assessment/formulation meetings.

E.6 Letter of Concurrence from USFWS

United States Department of the Interior

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

February 22, 2016

Eric P. Summa
Chief, Planning and Policy Division
U.S. Army Corps of Engineers
Jacksonville District
701 San Marco Boulevard
Jacksonville, Florida 32207-8175

Service CPA Code:	2015-CPA-0210
Service Consultation Code:	2014-F-0168
Date Received:	December 29, 2015
Project:	Herbert Hoover Dike Dam Safety Modification Study
Applicant:	Army Corps of Engineers
Counties:	Okeechobee, Martin, Palm Beach, Hendry, Glades

Dear Mr. Summa:

The U.S. Fish and Wildlife Service (Service) has reviewed the U.S. Army Corps of Engineers (Corps) request to initiate consultation dated December 24, 2015, for the Herbert Hoover Dike (HHD) Dam Safety Modification Study. A document titled, "Complete Initiation Package (CIP)" for the HHD Dam Safety Modification Study (DSMS) was submitted to the Service to address threatened and endangered species present in the project area. The Corps has also prepared a Draft Environmental Impact Statement (EIS) for the DSMS, to address the rehabilitation of the HHD in a system-wide manner. The HHD is located in south central Florida; in the counties of Okeechobee, Martin, Palm Beach, Hendry, and Glades.

In the HHD CIP submitted by the Corps (Corps 2015a), the Corps has determined that the Tentatively Selected Plan (TSP) "may affect but is not likely to adversely affect" the following species: Audubon's crested caracara (*Caracara cheriway*), Eastern indigo snake (*Drymarchon corais coupen*), Everglade snail kite (*Rosthrhamus sociabilis plumbeus*) and its designated critical habitat, Okeechobee gourd (*Curbita okeechobeensis*), West Indian manatee (*Trichechus manatus*), wood stork (*Mycteria americana*), Florida panther (panther; *Puma concolor coryi*), and the Florida bonneted bat (*Eumops floridanus*). This letter is submitted in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act) (87 Stat. 884; 16 U.S.C. 1531 *et seq.*).

PROJECT DESCRIPTION

The HHD is located on Lake Okeechobee located in south central Florida, in the counties of Okeechobee, Martin, Palm Beach, Hendry, and Glades. Lake Okeechobee is a multi-purpose reservoir in the Central and Southern Florida (C&SF) Project. The authorized project purposes for Lake Okeechobee include: flood control, irrigation, enhancement of fish and wildlife, navigation, prevention of saltwater intrusion, recreation, and water supply to Everglades National Park. The Corps, Jacksonville District, has operated and maintained the HHD for over 75 years, its highest priority being the continued safety of the communities surrounding the HHD. Internal erosion (piping) can result when seepage forces through an earthen embankment become strong enough to begin eroding the soil particles used to construct the embankment and/or foundation of the dam. Evidence of this failure mode has been observed in certain areas of HHD during high water events. The likelihood of initiation of a piping failure mode and the rate at which piping occurs is dependent upon lake elevations. The seepage volume and distress indicators in certain reaches of the embankment begin to become more prevalent at lake elevations above 17 feet North American Vertical Datum 1988 (NAVD88) and are cause for increasing concern when operating at or above these levels for any significant period. Major remediation is necessary to prevent a breach in the dike and consequent significant adverse effects on public safety.

The proposed action, discussed in the DEIS, is to implement measures to reduce the risk of failure of the HHD system. In 1993, the Corps established priorities to address structural problems at individual sections of the dike according to the perceived risk of dike failure at that time; these sections were classified as Reaches. Reach 1 was previously assigned the highest priority and rehabilitation efforts are nearing completion based on designs from the 2005 Supplemental MRR and EIS and subsequent Environmental Assessments, including the most recent Supplemental MRR in 2015. The implied order of priority (Reaches designated 1 through 8 in descending order of priority) by reach numbering is no longer valid as recent repairs, additional data, and additional analysis have changed the priority. The current construction of the cutoff wall should be considered successful at reducing the probability of failure throughout Reach 1, and a step forward in reducing the Damn Safety Action Classification rating of the dam. Within the Dam Safety Modification Study, the use of eight Reaches to delineate HHD has been substituted with seven Common Inundation Zones (CIZ), and then further delineations of segments within CIZ's (Figure 1). These seven CIZ's reflect downstream areas where similar inundation or flooding will occur from a breach anywhere within that zone.

The objective of the Herbert Hoover Dike Dam Safety Modification Study (DSMS) and EIS is to identify and recommend a cost effective risk management plan that supports specific actions to expeditiously reduce dam safety risks to tolerable levels for public safety and economic, environmental and social resources. The TSP consists of installation of a cutoff wall, armoring of the embankment, and floodwall construction.

A cutoff wall was determined to be the least cost, technically acceptable risk reduction solution to remediate areas of HHD that were identified as having intolerable internal erosion risk. The TSP cutoff wall location would be 2 ft. wide of soil cement bentonite along the approximate

centerline of the embankment, with temporary construction platforms needed to widen the crest for the duration of construction. A total of 33.3 miles of cutoff wall would be constructed (Figure 2).

The construction would span from just west of Lake Harbor (areas east of Lake Harbor already approved for remediation) to just east of Moore Haven; Segments 4 through a portion of Segment 9. A cutoff wall through a portion of Segments 12 and 13 would also be proposed under this alternative to reduce the probability of life loss in Lakeport. No remediation is recommended in the section of Segment 12 west of the interceptor levee and in Segment 9 north of the vicinity of the L-41 canal/Culvert 5A due to the low environmental and economic consequences realized from a breach in these areas. The cutoff wall would likely be constructed of a mix of soil, cement, and bentonite clay and will have a minimum top elevation of 25-ft NAVD (but will likely be constructed to within a foot or two of the crest) with varying bottom elevations (based on local geologic and topographic characteristics of the Segment) and an approximate width of 2 feet. The range of bottom elevations for the proposed cutoff wall is 10ft to 35ft NAVD.

Risk reduction proposed for Segment 5-2 under this alternative includes construction of a filter and drainage blanket around the downstream end of the US Sugar Raw Water Intake pipes. These pipes penetrate the HHD embankment and were constructed with no seepage protection as would be required by modern design standards. The proposed risk reduction for these pipes requires they be retrofitted with a drain at the downstream toe of HHD. The drainage system would wrap around the pipes and intercept seepage (lake water seepage could be concentrating and flowing around the exterior of these pipes) through the embankment and collect, filter, and discharge the seepage through designed sand and gravel filter.

In addition to the cutoff wall, HHD includes three locations where the embankment is low and susceptible to overwash or overtopping. These locations include the embankment adjacent to S-71 (Segments 14A & 14B) located on the Harney Pond Canal, the embankment adjacent to S-72 (Segments 16 & 17) located on Indian Prairie, and the embankment at the intersection of SR-78 bridge and Harney Pond Canal (Segments 13 and 15).

Armoring the embankment at the intersection of the bridge at the SR-78 and Harney Pond Canal is proposed (a few hundred feet of floodwall may also be included in the design for this area). While this configuration would not provide a greater level of service for flood protection, armoring would greatly reduce risks of breach during a short duration overtopping event from storm surge. Additional coordination is needed with the non-Federal sponsor identifying the need to raise the bridges (Harney Pond Canal and Indian Prairie Canal) in the future. The non-Federal sponsor, through coordination with the State of Florida's Department of Transportation, should ensure that bridges, bridge abutments, and corresponding roads be raised as part of the State's regularly schedule bridge replacement.

S-71 and S-72 are structures located on the Harney Pond Canal and Indian Prairie Canal. They are nearly identical in design and construction and are the terminus of HHD to the north. At these

locations, the HHD earthen embankment drops down in elevation to meet the service platform of each structure. A similar situation occurs at the intersection of SR-78 Bridge and Harney Pond canal. The embankment drops down in elevation to meet the bridge abutment. A floodwall ranging in height from 1 to 6 feet or embankment armoring would be constructed adjacent to these structures.

Previous Service Involvement and Consultation History

The Service previously provided a Final Fish and Wildlife Coordination Act (FWCA) Report for Reach 1 dated December 20, 2001, for the 2000 HHD MRR and supplemental FWCA Reports for HHD rehabilitation in Reach 1 dated March 4, 2003, and March 8, 2004 (Reach 1A) for previous HHD rehabilitation work. We have provided several supplemental FWCA Reports for work on the HHD and several related culvert replacements. On November 7 and 8, 2006, we participated in an interagency team to conduct an assessment of wetland functions and values along Reaches 2 and 3, using the Uniform Mitigation Assessment Method. In 2006, we also provided guidance regarding protection of a previously unknown nest of the threatened Audubon's crested caracara (*Polyborus plancus audubonii*) discovered next to the Corps' construction trailer for Reach 1. In February 2010, our staff collaborated in the fostering of bald eagle (*Haliaeetus leucocephalus*) chicks from the nest designated as PB014 that was close to both the construction of the HHD cutoff wall and the filling of the adjacent borrow pit. In March 2012, we worked with the Corps to minimize disturbance impacts of construction on an osprey (*Pandion haliaetus)* nest in the southern portions of Reach 1. In January 2014, the Service met with the Corps to discuss the DSMS and associated FWCAR. The Service provided a Draft Interim FWCAR for the HHD DSMS July 14, 2014. These are just some of the highlights of our continued cooperation with the Corps in assuring protection of fish and wildlife in accordance with the FWCA, Migratory Bird Treaty Act (MBTA), and section 7 of the Endangered Species Act of 1973, as amended (Act) (87 Stat. 884; 16 U.S.C. 1531 *et seq.*).

THREATENED AND ENDANGERED SPECIES

Federally-listed species [Audubon's crested caracara (*Caracara cheriway*), Eastern indigo snake (*Drymarchon corais couperi*), wood stork (*Mycteria americana*), Everglade snail kite (*Rostrhamus sociabilis plumbeus*) and its designated critical habitat, Okeechobee gourd (*Cucurbita okeechobeensis* ssp. *okeechobeensis*), West Indian manatee (*Trichechus manatus*), wood stork (*Mycteria americana*), Florida panther (panther; *Puma concolor coryi*), and Florida bonneted bat (*Eumops floridanus*)] within the project area were previously addressed in comprehensive detail in the Service's Draft Interim FWCAR (Service 2014) for the HHD DSMS. Mapped information available (e.g., nest sites and observations) and consultation areas (e.g., critical habitat, Florida panther zones) for each of the above species was included in the Draft Interim FWCAR.

RECOMMENDED FISH AND WILDLIFE CONSERVATION MEASURES

Audubon's Crested Caracara

Audubon's crested caracara has been documented to nest near the project area. Nests have been reported south of Port Mayaca outside of the Federal right-of-way. Additionally, it is possible that nests could be found in other areas within the project area. Caracara nests around Lake Okeechobee are depicted in the Service's Draft Interim FWCAR (Service 2014) for the HHD DSMS.

Audubon's crested caracara nest on and adjacent to the HHD. Surveys should be conducted prior to the initiation of construction and during construction, per the Service's Audubon's Crested Caracara Conservation Guidelines and Audubon's Crested Caracara Nesting Survey Protocol, at HHD construction sites to determine if caracaras are present in the project area. Since the final proposed action may produce noise above ambient levels, mufflers and sound dampening equipment would be required during construction. Human activities should be limited in the 985-foot primary management zone around any active caracara nests. Use of chemicals toxic to wildlife and construction activities lacking visual screening and above-ambient noise levels would be limited in the 985 to 4,920-foot secondary management zone around active caracara nests. Monitoring for caracaras during the nesting season (November through April) and adaptively managing action activities within 985-foot primary and 4,920-foot secondary management zones of active nests will ensure the action is not likely to increase noise above ambient levels within nest protection areas of active caracara nests. Accordingly, the Service concurs with the Corps' determination that the TSP may affect, but is not likely to adversely affect the Audubon crested caracara.

Although caracaras do show some nest site fidelity, they change nest trees more readily than bald eagles. The Corps has previously committed to conducting nesting surveys in the typical nesting season ahead of anticipated work on HHD in a given year. The reaches of HHD along the western, northern, and northeastern shores of Lake Okeechobee are likely to have nesting and foraging caracaras in or adjacent to construction sites. Nesting would occur often, but not always, in a cabbage palm that would be on adjacent lands outside of the Federal right of way. However, we recommend that any cabbage palms in the right of way or any that may be affected by placement of staging areas be left undisturbed by construction even if these are not known to be active nest trees. Caracaras may select from several potential nest trees within their territories, and signs of previous nests may not be readily prominent in the sometimes dense crown.

Eastern indigo snake

The Eastern indigo snake is known to occur in the vicinity of the HHD, but has not been observed on the embankment during construction activities in Reach 1 and culvert replacements. Eastern indigo snakes may be found along the embankment of the HHD. Preconstruction surveys would be completed in the project area, monitors would be on site during all phases of

construction, and construction crews should be educated on identifying the indigo snake and the precautions to take to prevent impacts to the indigo snake. Eastern indigo snake Standard Protection Measures should be included in the environmental protection plan for construction work. Onsite gopher tortoise burrows would be protected to the extent possible to provide snake habitat during construction. The habitat that would be temporarily impacted would be seeded or replaced by sod and is expected to recover within a few months of project completion.

The Corps determined that the TSP may affect, but is not likely to adversely affect eastern indigo snake. Based on implementation of the conservation measures described above, the Service concurs with this determination.

Everglade snail kite

Everglade snail kites forage within the Lake Okeechobee littoral zone. Because the TSP may produce noise above ambient levels, mufflers and sound dampening equipment would be required during construction. Preconstruction surveys should be completed prior to the initiation of construction activities per the Service's Snail Kite Survey Protocol. Human activities should be limited in the 425-foot primary management zone around active Everglade snail kite nests. Use of chemicals toxic to wildlife and construction activities lacking visual screening and above ambient noise levels should be limited in the 425 to 1,640-foot secondary management zone around active Everglade snail kite nests. Monitoring kites during the nesting season (December through June) and adaptively managing action activities within the 425-foot inner protective no activity zone of active snail kite nests is likely to preclude increases in noise above ambient levels within nest protection areas of active snail kite nests. A 1,640-foot secondary priority management zone should be established as necessary around active nests. The Corps determined that the TSP may affect, but is not likely to adversely affect the snail kite and its designated critical habitat. Based on implementation of the conservation measures described above, the Service concurs with this determination.

Everglade snail kites are known to nest in the DSMS area. Everglade snail kite critical habitat in Lake Okeechobee is located in the western parts of Glades and Hendry Counties, extending along the western shore to the east of the levee system and the undiked high ground at Fisheating Creek, and from the Hurricane Gate at Clewiston northward to the mouth of the Kissimmee River, including all the spike rush (*Eleocharis* sp.) flats of Moonshine Bay, Monkey Box, and Observation Shoal, but excluding the open water north and west of the northern tip of Observation Shoal north of Monkey Box and east of Fisheating Bay.

In the event of cofferdam construction, the Corps should minimize effects in Everglade snail kite critical habitat by using driven pile cofferdams which have approximately 50 percent less impacted footprint than earthen cofferdams. Driven pile cofferdams should be constructed as close as possible to the construction area to avoid impacts to snail kite critical habitat.

Okeechobee Gourd

The Okeechobee gourd is known to occur on the HHD. Preconstruction surveys should be completed to locate any plants within the construction footprint. If plants are found, the Service should be contacted to determine an appropriate course of action for removal and relocation of plants. Flagging should be placed around the gourd for additional protection from pedestrian traffic if plants are sighted outside of, but adjacent to, the construction area. The Corps determined that the TSP may affect, but is not likely to adversely affect the Okeechobee gourd. Based on implementation of the conservation measures described above, the Service concurs with this determination.

West Indian Manatee

West Indian manatees occur in Lake Okeechobee. The final proposed action may produce noise above ambient levels. Preconstruction surveys should be completed to ensure that no manatees are harmed or harassed during construction. In the event of cofferdam construction, surveys should also be conducted during construction and installation of the cofferdams to determine if manatees are present in the area of construction. The installation of cofferdams would prevent manatees from entering the construction zone and should prevent any disturbance to the manatees. Manatee protection grates with openings no greater than 8 inches by 8 inches should be installed on all replacement culverts to prevent manatees from accessing culvert structures. Additionally, to avoid and minimize adverse effects during construction activities, the Corps should implement the construction conservation measures outlined in *Standard Manatee Conditions for In-Water Work* (FWC 2011). The Corps determined that the TSP may affect, but is not likely to adversely affect the West Indian manatee. Based on implementation of the conservation measures described above, the Service concurs with this determination.

Wood stork

The DSMS area overlaps with a wood stork Core Foraging Area. Wood storks are known to forage within the toe ditch adjacent to the HHD, but have not been documented nesting in the DSMS area. The final proposed action may produce noise above ambient levels; therefore, mufflers and sound dampening equipment should be required during construction. Preconstruction surveys should be completed prior to the initiation of construction activities. Should an unexpected wood stork colony become established near the study/project site, human activities should be limited in the 1,500-foot primary management zone around active wood stork colonies (all nest trees plus a 100-foot buffer). Use of chemicals toxic to wildlife and construction activities lacking visual screening and above ambient noise levels should be limited in the 1,300 to 2,500-foot secondary management zone around active wood stork colonies.

Monitoring of wood storks during the nesting season (November through August) and adaptively managing action activities within 1,000 to 1,500 feet of active wood stork nesting colonies will likely not increase noise above ambient levels within nest protection areas of active wood stork colonies. Human activity should not occur within a 300-foot buffer where there is a vegetation

screen (dense vegetation), and 750 feet when there is no vegetation present. A 2,500-foot buffer (Secondary Priority Management Zone) should be established as necessary around nesting colonies. The Corps determined that the TSP may affect, but is not likely to adversely affect the wood stork. Based on implementation of the conservation measures described above, the Service concurs with this determination.

Florida Panther

Florida panthers are thought to use HHD for traversing from one habitat to the next. Construction of the cutoff wall could temporarily impact panthers to traverse the embankment because the embankment would not be passable during construction. Since this would be temporary in nature, it is not expected to harm or harass the species, resulting in moderate short term effects; the panther would be able to go around the construction zones. The Corps determined that the TSP may affect, but is not likely to adversely affect the Florida panther. Based on implementation of the conservation measures described above, the Service concurs with this determination.

Florida bonneted bat

The Florida bonneted bat (FBB) consultation area includes Okeechobee County, which is within the project area, but outside the focal areas (Service 2013). Although no FBB's have been documented at the Project site, they have been documented in the focal area to the southeast. The HHD contains man-made culverts, which could be suitable for roosting; however, roosts are more likely to occur if trees are surrounding the man-made structures in order to avoid predators. HHD also contains open water, which is amenable to bonneted bat foraging. None of the alternatives identified in the Draft EIS, including the TSP, would disrupt any of the culverts more than the previous culvert replacement project where the Florida bonneted bat was concluded as may affect, not likely to adversely affect the species. If bats are encountered, the Corps should coordinate measures with the Service to minimize or avoid potentially adverse effects. Based on the lack of documentation of the FBB in the project area, the Service concurs with the Corps' determination that the TSP may affect, but not likely to adversely affect the FBB.

In the 2014 Draft Interim FWCAR provided to the Corps for the HHD DSMS and included in the Appendices of the HHD DSMS Draft EIS (Corps 2015b) dated December 24, 2015, conservation measures, individual species survey protocols, and mitigation measures were outlined which will avoid, minimize, and mitigate any potential adverse effects to threatened and endangered species from the TSP.

In the CIP (pages 25 and 26) submitted to the Service, the Corps (and its contractors) commits to avoiding, minimizing, or mitigating for adverse effects of the TSP to the greatest extent possible in both the planning and construction phases of the project. Monitoring of listed species identified to occur within the HHD DSMS will be addressed with continuing communication

with the Service. Construction will span over multiple years, and design plans have not currently been established for each segment, therefore, consultation with the Service will continue as construction proceeds in each segment of the HHD. Service conservation measures and guidelines for all threatened and endangered species will be included in the construction/contract specifications.

This letter fulfills the requirements of section 7 of the Act and further action is not required. If modifications are made to the Tentatively Selected Plan, if additional information involving potential effects to listed species becomes available, or if a new species is listed, reinitiation of consultation may be necessary.

The Service commends the Corps for conducting the most comprehensive study ever conducted on HHD. The Service also applauds the Corps for early coordination with the Service while conducting the HHD DSMS. We look forward to further coordination with the Corps as the TSP is implemented for the DSMS. For additional assistance, or if you have questions regarding the contents of this letter, please contact Art Roybal at 772-469-4317.

Sincerely yours,

For

Bob Progulske
Everglades Program Supervisor
South Florida Ecological Services Office

cc: electronic copy only
Corps, Jacksonville, Florida (Eric Summa, Stacie Auvenshine)
Corps, West Palm Beach, Florida (Kim Taplin)
FWC, West Palm Beach, Florida (Chuck Collins)

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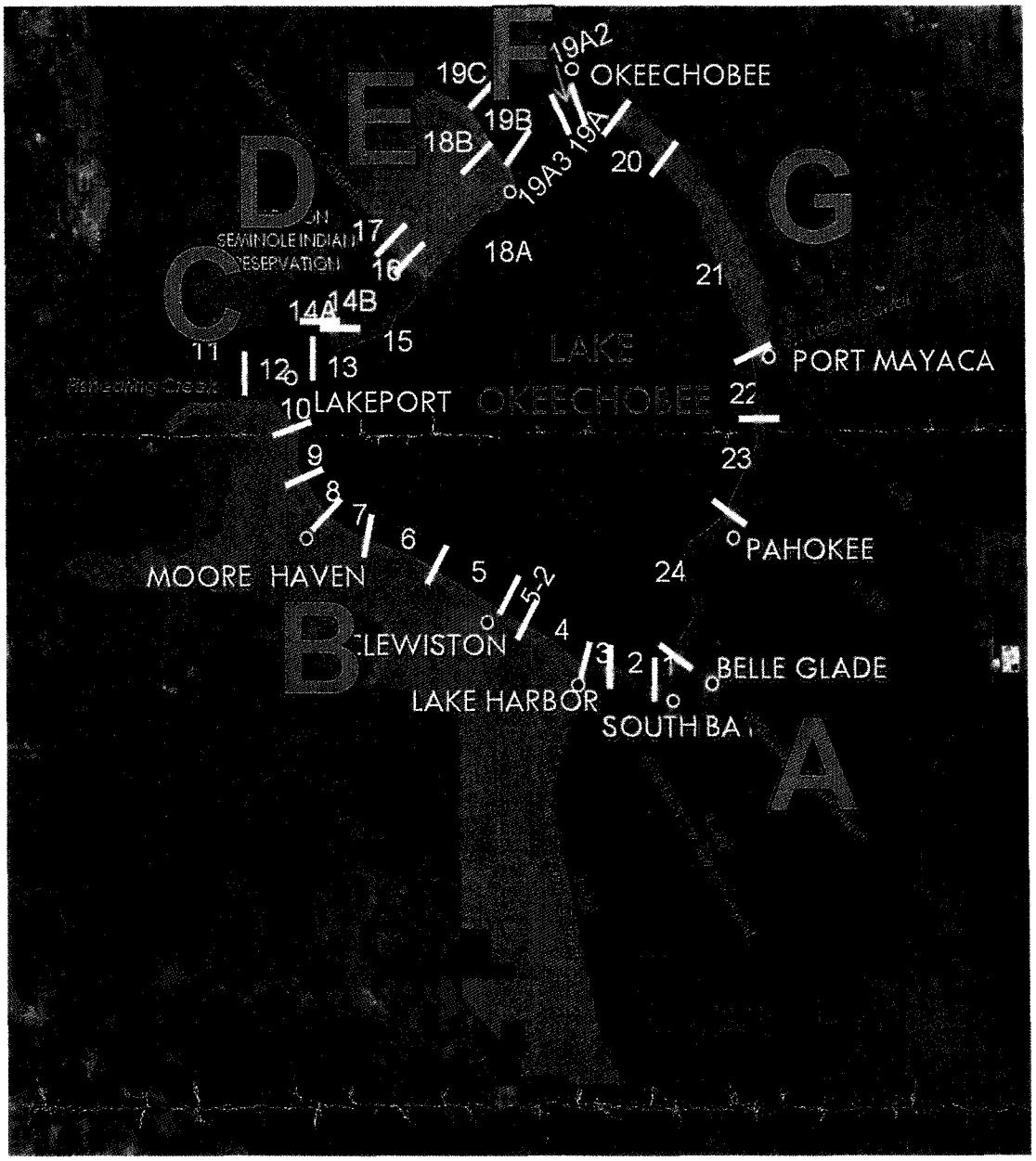

Figure 1. HHD Common Inundation Zones and Segments (Corps Draft EIS)

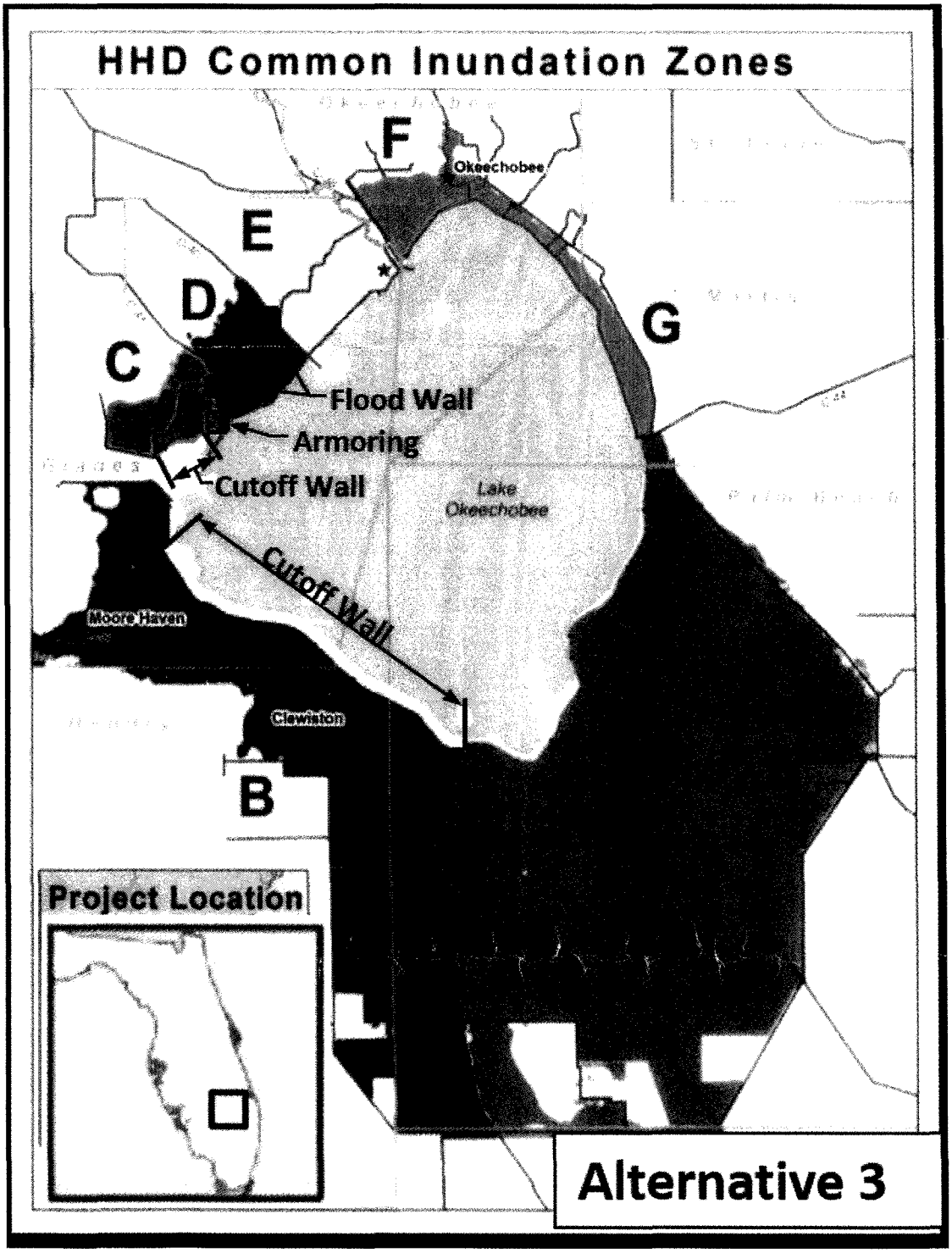

Figure 2. HHD Tentatively Selected Plan

APPENDIX F. SECTION 404(B)(1) EVALUATION SHORT VERSION

Herbert Hoover Dike

Dam Safety Modification Study

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