



# United States Department of the Interior

FISH AND WILDLIFE SERVICE  
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August 11, 2009

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Colonel Al Pantano  
District Commander  
U.S. Army Corps of Engineers  
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Jacksonville, Florida 32207-8175

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Service Federal Activity Code: 41420-2006-FA-0929  
Service Consultation Code: 41420-2007-F-0941-R001  
Date Received: June 17, 2009  
Project: Site 1 Impoundment  
County: Palm Beach

Dear Colonel Pantano:

This document transmits the U.S. Fish and Wildlife Service's (Service) Biological Opinion to the U.S. Army Corps of Engineers' (Corps) for the construction and operation of the Site 1 (Fran Reich) Impoundment Project and its effects on the federally threatened eastern indigo snake (indigo snake; *Drymarchon corais couperi*) 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.*). A complete administrative record of this consultation is on file in the Service's South Florida Ecological Services Office, Vero Beach, Florida. Table 1 lists the acronyms and abbreviations used in this Biological Opinion.

The Site 1 (Fran Reich) Impoundment was a component in the original Draft Water Preserve Areas (WPA) Feasibility Study (Corps 2001). The Comprehensive Everglades Restoration Project (CERP) broke each component of the WPA Feasibility Study out into separate projects.

This Biological Opinion is based on information provided in the June 2009 Biological Assessment (BA) (prepared by the Corps), the Corps' Intermediate Design Report, and the Corps' June 15, 2009, request for formal consultation letter, field investigations, telephone conversations, email correspondence, and other sources of information.

### **The Use of Best Scientific and Commercial Information by the Service**

The Service uses the most current scientific and commercial information available. The nature of the scientific process dictates information is constantly changing and improving as new studies are completed. The scientific method is an iterative process that builds on previous

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information. As the Service becomes aware of new information, we will ensure it is fully considered in our decisions, evaluations, reviews, and analyses as it relates to the base of scientific knowledge and any publications cited in our documents.

Specifically, there is one such document cited in this Biological Opinion that the Service acknowledges has been affected in its cited form by new scientific information. The Service has taken these new sources of information into account when using this document to help guide our analysis and decisions. This document is the South Florida Multi-Species Recovery Plan (MSRP) of 1999 (Service 1999).

The MSRP was designed to be a living document and to be flexible to accommodate changes identified through ongoing and planned research, and would be compatible with adaptive management strategies. These principals are set forth in both the transmittal letter from the Secretary of the Interior and in the document itself. As predicted, this has occurred in the intervening years since the MSRP was published. The Service uses the MSRP in the context it still presents useful information when taken in conjunction with all the new scientific information developed subsequent to its publication.

### **Consultation History**

Scoping for the WPA Feasibility Study, initiated in June 23, 2000, helped in early identification of issues in the Site 1 Impoundment Project area.

A Notice of Intent to prepare an Environmental Impact Statement (EIS) for the WPA Feasibility Study was published in the Federal Register, Volume 65, No. 133, on July 11, 2000. In addition, workshops and circulation of the draft WPA Feasibility Study were held after the draft EIS release to identify public concerns related to the Feasibility Study's recommended plan for this area.

The Service and Florida Fish and Wildlife Conservation Commission (FWC) biologists first visited the site on June 13, 2003.

A scoping letter, dated August 13, 2003, for the Site 1 Impoundment was mailed to Federal, State, and local agencies; Native American Tribes; private organizations, and interested parties to solicit their views, comments, and information about resources, study objectives, alternatives, and important features within the study area.

On September 15, 2003, the Service provided a Planning Aid Letter (PAL) for the Site 1 Impoundment Project. The PAL provided guidance to the Project Delivery Team (PDT) concerning resource issues of concern to the Service. The purpose of the PAL was to identify conservation opportunities early in the planning process to aid the PDT in its process.

On December 22, 2003, a Feasibility Scoping Meeting was held via video teleconference. Representatives of the South Florida Water Management District's (District) West Palm Beach Office, the Service, the Corps' Jacksonville District Office, the Corps' South Atlantic Division Office, and the Corps' Headquarters Office in Washington, D.C were in attendance.

On January 21, 2004, a Site 1 Impoundment PDT workshop was held. The objectives of the workshop were to identify performance measures and evaluation criteria for plan evaluation, review hydrologic modeling results, and evaluate five alternatives.

On February 13, 2004, a teleconference was held to further refine performance measures and evaluation criteria for the Site 1 Impoundment Project.

On April 7, 2004, there was a joint meeting of the Site 1 Impoundment and Broward WPA PDTs. The purpose of the meeting was to discuss a draft implementation strategy paper developed by the Corps and District to introduce evaluation options for those accelerated projects that were components of the WPA and were to receive no additional modeling.

A teleconference was held on April 15, 2004, among the FWC, Corps, and the Service to discuss the potential effects of the Site 1 Impoundment on Water Conservation Area (WCA)-2A.

On April 16, 2004, a meeting of the natural system subteam of the PDT was held to discuss the status of the evaluation criteria and performance measure documentation sheets.

On April 21, 2004, a meeting of the Vertical Management Team was held in Fort Lauderdale to discuss the white paper implementation strategy proposed for the Site 1 Impoundment and potentially available for use by other WPA Feasibility Study components.

For the purposes of expedited evaluation of this accelerated project, a smaller group of PDT members were divided into an evaluation subteam. The subteam consisted of representatives of the Corps, Service, FWC, Florida Department of Environmental Protection (DEP) and District.

On May 4, 2004, a PDT subteam meeting was held to discuss post-processing modeling needs for the subteam's alternative evaluation.

On May 19, 2004, a teleconference was held between members of the subteam to continue to work toward finalization of performance measures and evaluation criteria for the Site 1 Impoundment Project.

On June 14, 2004, a site visit was made to the Site 1 Impoundment location. A cursory visit was conducted and the need for an additional site visit was identified.

In August 2004, the Interagency Modeling Center, in West Palm Beach, provided post processing of model output for the subteam to review and use in evaluating the project.

On Monday, August 2, 2004, a Restoration Coordination and Verification team meeting was held. The Site 1 Impoundment Project was on the agenda.

On August 26, 2004, an Alternatives Formulation Briefing was held via video teleconference. In attendance were the District's West Palm Beach Office, the Service's South Florida Ecological

Services Office, the Corps' Jacksonville District Office, the Corps' South Atlantic Division Office, and the Corps' Headquarters Office in Washington, D.C.

On September 1, 2004, an evaluation meeting was held by the subteam of the PDT. Final methods for calculating habitat units for demonstrating environmental benefits were discussed and the results were transmitted via email to all team members.

On September 14, 2004, a teleconference was held with the subteam to finalize habitat unit calculations.

A draft Fish and Wildlife Coordination Act (FWCA) report was transmitted from the Service to the Corps on November 9, 2004.

On February 11, 2005, the Corps published the draft Project Implementation Report/Environmental Assessment (dPIR/EA) for the Site 1 Impoundment Project. The dPIR/EA had a 45-day comment period that ended on April 4, 2005. A 15-day extension for the comment period was requested by State agencies and granted by the Corps. A subsequent extension to April 29, 2005, was also granted.

On February 24, 2005, an assemblage of interested agencies, including representatives from the District, Corps, FWC, and the Service re-evaluated the Wetland Rapid Assessment Procedure (WRAP) performed on the site. As a result the wetland polygons and WRAP scores were revised.

On April 8, 2005, a meeting was held to discuss monitoring and operations plans for the Site 1 Impoundment project.

On May 3, 2005, the Service provided its final FWCA report for the Site 1 Impoundment project to the Corps.

During the summer of 2005, many meetings and teleconferences were held to discuss project assurances and water reservations.

On July 26, 2005, the Corps sent a letter to the Service. The letter provided determinations of "may affect, not likely to adversely affect" for the federally endangered wood stork (*Mycteria americana*), endangered Everglade snail kite (*Rostrhamus sociabilis plumbeus*), endangered Florida panther (*Puma [=Felis] concolor coryi*), endangered West Indian manatee (*Trichechus manatus*), threatened bald eagle (*Haliaeetus leucocephalus*), threatened Audubon's crested caracara (*Caracara cheriway*), and threatened eastern indigo snake (*Drymarchon corais couperi*) and requested the Service's concurrence, in accordance with section 7 of the Act. The Federal action under consideration was the construction of the Site 1 Impoundment; operations of the project would be considered in the future as the operations plan is developed.

On August 31, 2005, the Service provided our concurrence with the Corps' determinations. The draft PIR contained project commitments that would reduce risk to federally listed species to a level where the risk was insignificant or discountable.

In Fiscal Year's (FY) 2006 and 2007, the PDT became the design team for the Site 1 Impoundment project. Meetings were held to discuss design issues, however, nothing substantive occurred until late 2007 when a proposal to remove the littoral shelves from the outer seepage canal was made. This proposal would result in increases in the extent of storage capacity. As compensation for the loss of wildlife habitat associated with the littoral shelves, the Corps agreed to enhance the impacted, remnant wetland located adjacent to the L-40 and just north of the Aquifer Storage and Recovery (ASR) pilot project. This enhancement will provide a greater spatial extent of wetlands and a larger block of usable habitat adjacent to WCA-1.

Toward the end of 2007, the schedule for construction of the Site 1 Impoundment was moved back, this resulted in a change in the date for pre-construction listed species surveys.

On October 10, 2006, an eastern indigo snake was inadvertently killed during construction of a CERP reservoir project (the Everglades Agricultural Area [EAA] A-1 Reservoir). This information led to concerns that eastern indigo snakes could be located on other CERP reservoir projects and the risk of injury or mortality during construction must be considered on a site-by-site basis.

On June 6, 2007, an eastern indigo snake was sighted on the Site 1 Impoundment project site. This sighting and the risk associated with project construction constituted new information in accordance with 50 CFR §402.16. As a result, discussion began regarding the need for formal consultation on the eastern indigo snake for the Site 1 Impoundment. It was mutually decided by the Corps and the Service that it would be prudent to formally consult on the project.

On June 17, 2009, the Service received a request from the Corps to initiate formal consultation on this species. A biological assessment was received on the same date.

The Service has reviewed all information received pertinent to the indigo snake for the Site 1 Impoundment Project. As of October 1, 2008, the Service received all information necessary for initiation of formal consultation on the indigo snake for this project as required in the regulations governing interagency consultations (50 CFR § 402.14).

## **BIOLOGICAL OPINION**

### **Description of proposed action**

The proposed Site 1 Impoundment Project is a component of the CERP and is one of the initially authorized CERP projects identified in legislation that was approved by Congress in the Water Resources Development Act of 2000 (Public Law 106-541) (WRDA). The project includes construction of a 1,660-acre impoundment on lands located in southern Palm Beach County (Figure 1), currently owned by the District. The proposed Site 1 Impoundment is designed to store up to 8 feet of water in the impoundment. The minimum target depth will be 6 inches; however, it

is likely that the impoundment will regularly draw down completely due to evapotranspiration. In addition, the proposed Site 1 Impoundment design includes between 110 and 140 acres of deep water refugia for fish. The exterior levees on the south and east will be comprised of soilcrete with wave runup steps on the interior and earthen on the exterior. The L-40 levee will be altered with flat plate soilcrete on the interior and reinforced vegetated mat on the exterior (interior side of WCA-1). A total of 1,101 acres of wet pasture will be converted to open water impoundment. The site is located southeast of Arthur R. Marshall Loxahatchee National Wildlife Refuge (LNWR) adjacent to the Hillsboro Canal and L-40 in southeast Florida (Figure 1).

#### Action area

The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate project area involved in the action. The action area for the proposed project for the indigo snake includes the 1,700-acre project area to consider potential effects to indigo snakes that may breed, feed, or shelter within the project area (Figure 1). This includes the slopes of the embankments on the L-40 and Hillsboro Canals. The action area also includes the Hillsboro ASR pilot project site and the future, created wetland area to the north of the ASR pilot project site. The L-40 canal and Hillsboro canal effectively isolate the project site from eastern indigo snakes that may occur south of the Hillsboro Canal and the hydrology of WCA-1 makes it unlikely that eastern indigo snakes would inhabit the interior of WCA-1 and the Site 1 Impoundment site. The action area is, therefore, approximately 1,700 ac.

#### STATUS OF THE SPECIES/CRITICAL HABITAT

##### Species/critical habitat description

The eastern indigo snake is the largest non-venomous snake in North America, obtaining lengths of up to 8.5 ft (2.6 m; Moler 1992). Its color is uniformly lustrous-black, dorsally and ventrally, except for a red or cream-colored suffusion of the chin, throat, and sometimes the cheeks. Its scales are large and smooth (the central 3 to 5 scale rows are lightly keeled in adult males) in 17 scale rows at mid-body. Its anal plate is undivided. In the Florida Keys, adult indigo snakes seem to have less red on their faces or throats compared to most mainland specimens (Lazell 1989). Several researchers have informally suggested that Lower Keys indigo snakes may differ from mainland snakes in ways other than color.

Critical habitat has not been designated for this species.

##### Life history

In south-central Florida, limited information on the reproductive cycle suggests that eastern indigo snake breeding extends from June to January, egg laying occurs from April to July, and hatching occurs from mid-summer to early fall (Layne and Steiner 1996). Young hatch approximately 3 months after egg-laying and there is no evidence of parental care. Eastern indigo snakes in captivity take 3 to 4 years to reach sexual maturity (Speake et al. 1987). Female eastern indigo snakes can store sperm and delay fertilization of eggs. There is a single record of a captive eastern

indigo snake laying five eggs (at least one of which was fertile) after being isolated for more than 4 years (Carson 1945). However, there have been several recent reports of parthogenetic reproduction by virginal snakes. Hence, sperm storage may not have been involved in Carson's (1945) example (Moler 1998). There is no information on the eastern indigo snake lifespan in the wild, although one captive individual lived 25 years, 11 months (Shaw 1959).

Eastern indigo snakes are active and spend a great deal of time foraging and searching for mates. They are one of the few snake species that are active during the day and rest at night. The eastern indigo snake is a generalized predator and will eat any vertebrate small enough to be overpowered. They swallow their prey alive. Food items include fish, frogs, toads, snakes (venomous, as well as non-venomous), lizards, turtles, turtle eggs, small alligators, birds, and small mammals (Keegan 1944; Babis 1949; Kochman 1978; Steiner et al. 1983).

### Population dynamics

Eastern indigo snakes use a mosaic of habitats. A study in southern Georgia found that interspersed tortoise-inhabited sandhills and wetlands improve habitat quality for the eastern indigo snake (Landers and Speake 1980). Eastern indigo snakes shelter in gopher tortoise burrows, hollowed root channels, hollow logs, or the burrows of rodents, armadillos, or land crabs (Lawler 1977; Moler 1985a; 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 snake survival. Over most of its range in Florida, the eastern indigo snake frequents diverse habitats such as pine flatwoods, scrubby flatwoods, floodplain edges, sand ridges, dry glades, tropical hammocks, edges of freshwater marshes, muckland fields, coastal dunes, and xeric sandhill communities (Service 1999). Eastern indigo snakes also use agricultural lands and various types of wetlands, with higher population concentrations occurring in the sandhill and pineland regions of northern and central Florida. Observations over the last 50 years made by maintenance workers in citrus groves in east-central Florida indicate that eastern indigo snakes are occasionally observed on the ground in the tree rows and more frequently near the canals, roads, and wet ditches (Zeigler 2006). In the sugar cane fields at the A-1 Reservoir Project site in the EAA, eastern indigo snakes have been observed (including one mortality) during earthmoving and other construction-related activities. In extreme south Florida (*i.e.*, the Everglades and Florida Keys), eastern indigo snakes are found in tropical hardwood hammocks, pine rocklands, freshwater marshes, abandoned agricultural land, coastal prairie, mangrove swamps, and human-altered habitats (Steiner et al. 1983). It is thought that they prefer hammocks and pine forests since most observations occur there and use of these areas is disproportionate compared to the relatively small total area of these habitats (Steiner et al. 1983).

Eastern indigo snakes range over large areas and use various habitats throughout the year, with most activity occurring in the summer and fall (Smith 1987; Moler 1985a). Adult males have larger home ranges than adult females and juveniles; their ranges average 554 ac, decreasing to 390 ac in the summer (Moler 1985b). In contrast, a gravid female may use from 3.5 to 106 ac (Smith 1987). In Florida, home ranges for females and males range from 5 to 371 ac and 4 to

805 ac, respectively (Smith 2003). At the Archbold Biological Station (ABS), average home range size for females was determined to be 47 ac and overlapping male home ranges to be 185 ac (Layne and Steiner 1996).

### Status and distribution

The eastern indigo snake was listed as threatened on January 31, 1978 (43 FR 4028), due to population declines caused by habitat loss, over-collecting for the domestic and international pet trade, and mortality caused by rattlesnake collectors who gas gopher tortoise burrows to collect snakes. The indigo snake ranges from the southeastern United States to northern Argentina (Conant and Collins 1998). This species has eight recognized subspecies, two of which occur in the United States: the eastern indigo and the Texas indigo (*D. c. erebennus*). In the United States, the eastern indigo snake historically occurred throughout Florida and in the coastal plain of Georgia and has been recorded in Alabama and Mississippi (Diemer and Speake 1983; Moler 1985b). It may have occurred in southern South Carolina, but its occurrence there cannot be confirmed. Georgia and Florida currently support the remaining endemic populations of the eastern indigo snake (Lawler 1977). The eastern indigo snake occurs throughout most of Florida and is absent only from the Dry Tortugas and Marquesas Keys, and regions of north Florida where cold temperatures and deeper clay soils exist (Cox and Kautz 2000).

Effective law enforcement has reduced pressure on the species from the pet trade. However, because of its relatively large home range, the eastern indigo snake is vulnerable to habitat loss, degradation, and fragmentation (Lawler 1977; Moler 1985a). The primary threat to the eastern indigo snake is habitat loss due to development and fragmentation. In the interface areas between urban and native habitats, residential housing is also a threat because it increases the likelihood of snakes being killed by property owners and domestic pets. Extensive tracts of undeveloped land are important for maintaining eastern indigo snakes. In citrus groves, eastern indigo snake mortality occurs from vehicular traffic and management techniques such as pesticide usage, lawn mowers, and heavy equipment usage (Zeigler 2006). Within the 2000 to 2005 timeframe, since the spread of citrus canker, Zeigler (2006) reported seeing at least 12 dead eastern indigo snakes that were killed by heavy equipment operators in the act of clearing infected trees.

Tasks identified in the recovery plan for this species include: habitat management through controlled burning, testing experimental miniature radio transmitters for tracking juveniles, maintenance of a captive breeding colony at Auburn University, recapture of formerly released eastern indigo snakes to confirm survival in the wild, educational lectures and field trips, and efforts to obtain landowner cooperation in conservation efforts (Service 1999).

To protect and manage this species for recovery, Breininger et al. (2004) concluded that the greatest eastern indigo snake conservation benefit would be accrued by conserving snake populations in the largest upland systems that connect to other large reserves while keeping edge to area ratios low. Management of these lands should be directed towards maintaining and enhancing the diversity of plant and animal assemblages within these properties. Where these

goals are achieved, eastern indigo snakes will directly benefit because of improved habitat conditions. Land managers should be encouraged to utilize fire as a tool to maintain biodiversity in fire-dependent ecosystems.

#### Analysis of the species/critical habitat likely to be affected

The proposed action has the potential to adversely affect eastern indigo snake adults, juveniles, nests, and hatchlings within and around the proposed project area. Potential effects include injury, mortality, habitat loss or degradation, and disturbance resulting from construction, operation, maintenance, and management of the proposed Site 1 Impoundment project.

Critical habitat has not been designated for the indigo snake; therefore, none would be affected.

On August 7, 2005, the Service provided concurrence that with the Corps' determination that construction and operation of the Site 1 (Fran Reich) Impoundment was not likely to adversely affect the federally endangered wood stork, endangered Everglade snail kite, endangered Florida panther, endangered West Indian manatee, threatened bald eagle, threatened Audubon's crested caracara, and threatened eastern indigo snake. This Biological Opinion will only address the eastern indigo snake as there have been no changes to the project that would trigger reinitiation of consultation or alter the effect determinations for any other species.

#### ENVIRONMENTAL BASELINE

The environmental baseline is an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat, and ecosystem, within the action area. It includes the impact of state or private actions, which occur simultaneously with the consultation in progress.

#### Climate change

According to the Intergovernmental Panel on Climate Change Report (IPCC)(2007), warming of the earth's climate is "unequivocal," as is now evident from observations of increases in average global air and ocean temperatures, widespread melting of snow and ice, and rising sea level. The 2007 IPCC report describes changes in natural ecosystems with potential wide-spread effects on many organisms, including marine mammals and migratory birds. The potential for rapid climate change poses a significant challenge for fish and wildlife conservation. Species' abundance and distribution are dynamic, relative to a variety of factors, including climate. As climate changes, the abundance and distribution of fish and wildlife will also change. Highly specialized or endemic species are likely to be most susceptible to the stresses of changing climate. Based on these findings and other similar studies, the Department of the Interior requires agencies under its direction to consider potential climate change effects as part of their long-range planning activities (Service 2007).

Climate change at the global level drives changes in weather at the regional level, although weather is also strongly affected by season and local effects (*e.g.*, elevation, topography, latitude,

proximity to the ocean, etc). Temperatures are predicted to rise from 2°C to 5°C for North America by the end of this century (IPCC 2007). Other processes to be affected by this projected warming include rainfall (amount, seasonal timing and distribution), storms (frequency and intensity), and sea level rise. However, the exact magnitude, direction, and distribution of these changes at the regional level are not well understood or easy to predict. Seasonal change and local geography make prediction of the effects of climate change at any location variable. Current models offer a wide range of predicted changes.

Climatic changes in south Florida could amplify current land management challenges involving habitat fragmentation, urbanization, invasive species, disease, parasites, and water management (Pearlstine 2008). Global warming will be a particular challenge for endangered, threatened, and other “at risk” species. It is difficult to estimate, with any degree of precision, which species will be affected by climate change or exactly how they will be affected. The Service will use Strategic Habitat Conservation planning, an adaptive science-driven process that begins with explicit trust resource population objectives, as the framework for adjusting our management strategies in response to climate change (Service 2006).

#### Status of the species within the action area

The size of the action area represents a small portion (approximately 1.5 percent) of the combined acreage of all habitats usable by indigo snakes in south Florida. The Site 1 Impoundment location is fragmented, for the most part, from other areas potentially inhabited by eastern indigo snakes. The most likely route for immigration and emigration would be along the L-40 levee from the northeast corner of the site. The remainder of the site is separated from other potential habitat by the Hillsboro Canal, the L-40 perimeter canal and surrounding wetland habitat, and the Lake Worth Drainage District E-1W-S Canal to the east.

Although we have little information on the distribution and abundance of indigo snakes within the action area, they have been documented using habitats similar to those impacted by the proposed action. No systematic surveys were conducted for the proposed action; however, a single indigo snake was sighted on June 7, 2007, when soil borings were being performed on the site (Figure 2). While no eastern indigo snakes have been sighted within the LNWR, the species could occur there. Eastern indigo snakes are present in similar habitats within 10 miles of the action area.

#### Factors affecting the species environment within the action area

The historic land use in the action area was predominantly freshwater marsh until sometime between 1953 and 1958 ( <http://web.uflib.ufl.edu/digital/collections/FLAP/> ) (Figures 3 and 4). At that time, aerial photography indicated the majority of the Site 1 Impoundment site was converted to agriculture. Pine flatwoods, scrubby flatwoods, and high pine are preferred native habitat types for indigo snakes (Service 1999). Prior to conversion to agricultural uses, the Site 1 Impoundment location was similar in nature to the WCAs with fresh water marsh and tree islands. Since the 1950s, improved pasture has been the dominant land use in the action area. Figure 5 and Table 2 outline the current habitat conditions for eastern indigo snakes in the action

area. Table 2 lists the land cover types based on the Florida Land Use Cover and Forms Classification System (FLUCFCS). Table 2 depicts that information in terms of suitability to eastern indigo snakes (*i.e.*, high, moderate, or low suitability based on the literature and best professional judgement). Although categorized as limited suitability for eastern indigo snakes, the improved pasture, tree nursery, Brazilian pepper, and Melaleuca areas likely provide better habitat for eastern indigo snakes at the Site 1 Impoundment location than in other areas. Site visits to the Site 1 impoundment Project location indicate that these areas are not a monoculture of exotic trees, Brazilian pepper or Melaleuca. Both the Brazilian pepper and Melaleuca areas contain native species like bays and sawgrass, thus improving their quality as shelter for eastern indigo snake prey. Therefore, we are considering the entire site to be usable by eastern indigo snakes, although the habitat present is not of the highest quality.

It is not easy to estimate the density of eastern indigo snakes at the project site due to a general lack of data for the action area. Therefore, we used the data from other studies of eastern indigo snakes in Florida to estimate eastern indigo snake density on the project site. There is uncertainty around these estimates because they were not based on similar types of habitat but the study sites were located on similar latitudes in Florida. Regardless, we believe that the comparisons are valid and represent a conservative approach.

A 26-year study conducted by Layne and Steiner (1996) at Archbold Biological Station (ABS) estimated a population density of 2.6 indigo snakes (1.9 males, 0.7 females) per 100 ha (247 ac). They also estimated a lower density based on 5 snakes (3 males and 2 females) that occupied 314 ha at 1.6 indigo snakes per 100 ha (0.96 males to 0.64 females). ABS is approximately 90 miles northwest of the project area and contains more native snake habitat (*i.e.*, the study area was comprised of 60 percent xeric pine and oak uplands, and 40 percent pine flatwoods, bayheads, swale, and seasonal ponds). Eastern indigo snakes have been observed at ABS in all natural and man-altered habitats with no obvious habitat preferences (Layne and Steiner 1996). Layne and Steiner's (1996) estimated densities and eastern indigo snake territory size for sugar cane habitats, a suboptimal habitat that is used by eastern indigo snakes, The average territory size for an eastern indigo snake in sugar cane was approximately 185 ac.

The Site 1 Impoundment Project site likely contains or intersects some eastern indigo snake home ranges. The Site 1 Impoundment location is geographically isolated from other contiguous habitat. Although the site is not sugar cane, the site is isolated and does not contain optimal habitat for the eastern indigo snake. We believe the quality of the habitat present on the Site 1 Impoundment Project to be most similar to that of sugar cane. Therefore, we are using Layne and Steiner's (1996) estimates of densities in sugar cane, to yield 7 territories. Assuming that the eastern indigo snakes present at the Site 1 Impoundment are present in a 1:1 sex ratio, the 7 territories would equate to 14 eastern indigo snakes.

There may be additional uncertainty regarding the sex ratio reported by Layne and Steiner (1996) at ABS. From a sample of 181 adult and juvenile eastern indigo snakes, Layne and Steiner (1996) found that 58 percent of the individuals were males and 42 percent were females. The juvenile eastern indigo snakes (< 800 mm; n = 36) were present at a 1:1 sex ratio, therefore, it was the larger snakes that skewed the sex ratio towards males. This led Layne and Steiner

(1996) to postulate that the estimated adult sex ratio may be artificially skewed because males have larger home ranges and move more than females in winter. Therefore, male snakes may have a higher probability of being captured or killed by vehicular traffic (and thus added to their sample). It may be that an adult sex ratio of 1:1 is more appropriate for eastern indigo snakes. This ratio is more typical of colubrid snakes according to Parker and Plummer (2001). A 1:1 sex ratio was also reported by Moulis (1976) for 11 captive hatchling indigo snakes. We have adopted a 1:1 sex ratio for this Biological Opinion.

We do not expect the pasture areas to solely comprise eastern indigo snake territories due to lack of cover; however, there are adequate resources along the drainage canal banks and fencelines to support eastern indigo snakes and their prey. The Melaleuca, tree nursery, and Brazilian pepper communities provide ample cover for both eastern indigo snakes and their prey. Knowing that the males are territorial, we do not expect that existing territories would overlap to a large degree, however, female territories could overlap male territories.

Climate change will affect eastern indigo snake habitat through sea level rise although this is not anticipated to occur within the action area. More likely, altered weather patterns could affect water levels in wetlands and canals and, as a result, decrease prey densities. For example, more intense precipitation events could cause flooding or scouring. Increased periods of drought could reduce wetland prey habitat or refugia. It is also possible that an increase in the intensity or frequency of tropical storms may affect eastern indigo snakes by flood-related drowning (or effects related to moving out of flooded areas), loss of sheltering habitat, or direct impact with debris. These factors are difficult to quantify as the data for climate change impacts are not readily available for this area of Florida.

## EFFECTS OF THE ACTION

### **Eastern Indigo Snake**

This section includes an analysis of the direct and indirect effects of the proposed action on the eastern indigo snake and its interrelated and interdependent activities.

#### Factors to be considered

Factors considered in the analyses for effects of the action include the distribution of the geographic areas where disturbance will occur relative to the potential value of that area to eastern indigo snakes, the type of disturbance, the proximity of the action to natural areas outside of the project site but within the action area that may support indigo snakes, the timing of project activities relative to sensitive periods in the snake's life cycle, the duration of potential effects on indigo snakes and their habitat, and the operation and maintenance of the project.

The Site 1 Impoundment project site is dominated by pasture. Melaleuca, Brazilian pepper, and mature nursery stock that resemble forested system structure is also present. The Corps exerted jurisdiction over the entire site when performing a wetland jurisdictional determination. There is sufficient cover on-site for eastern indigo prey. An eastern indigo snake was sighted on the property, and eastern indigo snakes in South Florida do not require gopher tortoise or other

burrows for shelter. This information indicates that the entire site could be used by eastern indigo snakes although the quality of the habitat is varied.

The action would result in loss of cover, habitat, and associated prey, and disturbance may occur in the form of pedestrian, equipment, and vehicular traffic. Construction noise could disturb eastern indigo snakes where it exceeds ambient noise. Visual disturbance from personnel could also affect eastern indigo snakes. Although personnel will be advised to avoid eastern indigo snakes, the operation of equipment in brushy, grassy, or otherwise vegetated areas where snakes may not be visible may result in direct injury or mortality. The construction of the embankments, pump stations, and other infrastructure involves use of heavy equipment that may also injure or kill eastern indigo snakes.

The county park to the northeast of the site appears to contain some native plant communities but is described as having an approximately 4 acre wetland preserve within it. This site could allow for immigration and emigration from the Site 1 Impoundment along the L-40 corridor, but the corridor area is narrow. The only other connection to potential habitat off-site lies through the L-40 at the S-39 structure. This narrow strip of land provides a connection between the Site 1 Impoundment and the areas to the south of the Hillsboro Canal. These areas are primarily sand mining and agricultural in land use. To the north, west, and south of the site are WCAs 1 and 2A. These areas are primarily long hydroperiod wetlands. Eastern indigo snakes may use long hydroperiod wetlands, but only when they occur in a mosaic of upland and wetland plant communities. WCAs 1 and 2A are mostly long hydroperiod wetlands with tree islands interspersed throughout. Therefore, eastern indigo snakes located on the Site 1 Impoundment project are effectively isolated from other eastern indigo snake populations.

Construction and maintenance activities are most likely to occur during daylight hours—the same time that eastern indigo snakes are active. This would increase risk of injury or mortality of eastern indigo snakes during construction activities.

The timing of construction is not known. It is likely that construction will occur year-round in at least some areas of the site. If construction occurs during the nesting season (April through July), there could be potential for loss of eastern indigo snake nests on the levee because nesting occurs between.

Construction will occur in a single pulse of activity. The projected length of construction is unknown at this time. Therefore, eastern indigo snakes using the Site 1 Impoundment are likely to be disturbed or harassed for the duration of construction.

Effects to the species may continue after construction in the form of operation and maintenance of the project. The initial flooding of the site (as well as potential subsequent rehydrations after droughts) may disturb eastern indigo snakes that are present in the interior of the impoundment. Regular mowing of levees or other equipment and vehicle operation may also disturb snakes that have colonized the site post-construction. Public recreational use of the site may also result in disturbance of eastern indigo snakes on the site. The operation and maintenance of the project is anticipated to last approximately 50 years.

Eastern indigo snakes have been documented within the project's action area, through a sighting of an individual snake in June of 2007. It is reasonable to assume that additional eastern indigo snakes are present on the site as it provides habitat for both eastern indigo snakes and their prey. The lack of immigration and emigration routes would indicate that this may be a small, isolated group of eastern indigo snakes.

#### Analyses for effects of the action

The Site 1 Impoundment Project site currently has raised embankments on all four sides. These embankments provide higher ground for eastern indigo snakes and their prey to inhabit. The nursery area and Melaleuca forested areas also provide cover for eastern indigo snakes and their prey. By visual inspection and projecting a circular 185 acre territory atop the single confirmed sighting, we can estimate that as many as 7 eastern indigo snake territories could be present on the approximately 1,700 acre proposed project site. Since the habitat is not optimal, this is, likely, an overestimate.

Potential effects to eastern indigo snakes may occur during initial construction of the impoundment, future operation and maintenance of the impoundment, and post-construction public use. The action may cause eastern indigo snakes to leave the area, abandon den sites, and possibly miss foraging and mating opportunities. Individual eastern indigo snakes fleeing the area may be more vulnerable to road mortality, predation, and intraspecific aggression. Potential direct negative effects to the eastern indigo snake include injury or mortality from: (1) all construction activities including tree removal and burning; (2) vehicular traffic; and (3) initial hydration and subsequent rehydration of the impoundment. Other potential direct effects include loss of habitat and disruption of normal foraging, breeding, and dispersing behaviors. Potential indirect effects include mortality or injury from future operation and maintenance of the project via: (1) vehicular traffic, mowing; and (2) changes in prey density within the project area and associated infrastructure as water levels fluctuate (including complete dry-out).

The eastern indigo snake is difficult to detect and quantify for the following reasons: (1) it has a wide-ranging distribution; (2) it has a patchy distribution within suitable habitat; (3) it has limited detectability due to use of burrows or holes for shelter; (4) there is likely unoccupied suitable habitat; (5) juveniles have limited detectability due to their affinity for thick vegetation; and (6) it may use cryptic sheltering areas that may be temporarily established during construction (*e.g.*, brush piles, equipment stockpiles, and dirt mounds). The lack of practical methods to survey, in conjunction with wide-ranging activity and use of a variety of habitat types makes it difficult to determine the exact number of eastern indigo snakes that will be affected by the action.

With up to 7 females potentially present, we assume that there could be up to 7 eastern indigo snake nests potentially on the site in any given year. Ms. Rebecca Bolt (2007), an eastern indigo snake researcher (Dynamac Corporation, Cape Canaveral, Florida), recognized that it is difficult to estimate the number of eastern indigo snake nests or eggs during any given year. Snake researchers at Kennedy Space Center, Florida have X-rayed female indigo snakes 2 years in a row and found some to be gravid in both years, and others were gravid in 1 year and not another (Bolt 2007). Assuming every female could find a male and produce a clutch would be a

conservative estimate. We could predict that as the quality of the habitat is reduced compared to native habitat, there may be an additional reduction in reproductive potential due to fewer resources (*e.g.*, prey and cover) and that with fewer snakes, fewer nests would exist. There may also be a reduced likelihood of an eastern indigo snake finding a mate. However, we find it difficult to quantify these potential reductions and therefore, have assumed that there could be up to 7 nests on the site pre-construction. Each nest could have between 4 and 12 eggs or hatchlings (Moler 1992). The majority of construction operations will be confined to the embankment areas although a borrow pit is depicted on the intermediate design plans. Due to the small size of the site, it is likely that all eastern indigo snakes territories present on the site overlap the embankments. Construction would encompass approximately 20 percent of the project site. We, therefore, would anticipate that as many as 20 percent of 7 nests (approximately 2) per year could be present and affected by construction activities. Since timing of construction is not known at this time, there is the potential for up to 2 eastern indigo snake nests to be damaged or destroyed during construction.

#### Direct effects

Direct effects are those effects that result from the proposed action (including the effects of interrelated and interdependent actions) and affect the species or its habitat.

Injury and mortality: It is difficult to determine the number of eastern indigo snakes (adults, juveniles, hatchlings, or eggs) that could be injured or killed by the project. Due to the nature of the proposed construction (*i.e.*, vegetation removal, debris piling and burning, canal filling or dredging, levee construction, scraping, grading, and initial hydration), the Service estimates that some of the eastern indigo snakes present at the time of the action could be adversely affected by the project. The flooding of the impoundment—whether the initial flooding or re-flooding after drought—has the potential to drown eastern indigo snakes nests and eggs, and inundate their burrows and other refugia. If a slow pumping rate resulting in a few inches of water per day should allow eastern indigo snakes to vacate the impoundment.

Eastern indigo snakes could be injured or killed during clearing and grubbing activities that will prepare the site for embankment construction. Should there be a delay between clearing and grubbing and embankment construction, eastern indigo snakes could move back into those areas and be injured or killed as construction resumes.

Although unlikely due to the implementation of the *Standard Protection Measures for the Eastern Indigo Snake* (Service 2004), we acknowledge a potential for additional mortality or injury of indigo snakes that may result from an increase in construction-related traffic. The travel routes in the vicinity of the project site include roads with light to moderate traffic. The main access to the site is from Loxahatchee Road, however, some access may occur from the L-40.

Since the life of the project is 50 years, injury and mortality of eastern indigo snakes could result from vehicular traffic generated during regular operations and maintenance post-construction. In addition, adverse effects could result from post-construction maintenance of the roads, levees, pump stations, and the impoundment itself (including vegetation management methods such as

mowing, herbicide application, and physical removal). The mowing of embankments has the potential to injure or kill eastern indigo snakes, and degrade habitat. In general, the District uses guidelines that specify that wildlife is not to be harmed during mowing; however, mowing does not usually occur until vegetation reaches 8 to 10 inches in height. At this height it may be difficult for equipment operators to observe and avoid snakes or other wildlife, although there have been no documented eastern indigo snake deaths from mowing activities.

Timing of construction will not be determined until a later date, therefore, we must assume that construction operations could also result in destruction of eggs or young.

Habitat conversion and conservation: Improved pasture is not considered good eastern indigo snake habitat if there is lack of cover; however, the associated canal banks may be inhabited by eastern indigo snakes (Layne and Steiner 1996). Because this species is a habitat generalist, we anticipate that eastern indigo snakes will be present in most land cover types as long as prey items and cover are adequate. For this project, we assume the entire 1,700-ac project site is potential habitat for the eastern indigo snake.

The proposed project has a 6-ac wetland component on the west end of the project site. This wetland will be allowed to naturally revegetate and will be kept free of exotic vegetation. While the target plant community is wetland, there will be higher areas interspersed and the area will likely dry down seasonally. This native plant community should improve conditions for eastern indigo snakes on the west site of the project site. The interior of the Site 1 Impoundment will continue to have habitat suitable for use by eastern indigo snakes during dry downs. Since the site will likely fluctuate in depth due to its small size, it is likely that some habitat will be available to eastern indigo snakes during operations. The Site 1 Impoundment is designed to capture releases from the S-39 and stormwater runoff from the surrounding area and store this water until it is needed for metropolitan and industrial uses. Since releases through the S-39 will not occur until LNWR is at or above regulation schedule, the Site 1 Impoundment will, likely, begin to fill in the middle to late portion of the wet season and begin to dry down in the middle to the end of the dry season in average rainfall years. The availability of habitat suitable for use by the eastern indigo snake will be unpredictable and based on localized and regional rainfall events. Therefore, we must assume that the 1,700-acre action area will have a reduced ability to support eastern indigo snakes.

The top of the embankment and any infrastructure such as pump stations, parking areas, and recreational amenities will not provide habitat opportunities for eastern indigo snakes. The embankments and recreational areas on the perimeter of the project site will potentially isolate eastern indigo snakes on this site from those potentially present in the surrounding area.

Disturbance during construction: The increased human presence on the site during construction along with the operation of construction equipment and vehicles may disturb eastern indigo snakes to the point they leave the project area. This may result in missed foraging and mating opportunities and these individuals may be more vulnerable to predation and intraspecific aggression.

## Indirect effects

Indirect effects are those that are caused by or result from the proposed action, are later in time, and are reasonably certain to occur. The indirect effects evaluated by the Service include injury and mortality associated with post-construction traffic by vehicles accessing the area for recreational purposes or monitoring, and reduced foraging opportunities associated with fluctuations in the prey populations due to impoundment drying or flooding. The indirect effects that the proposed action may have on eastern indigo snakes within the action area are discussed below.

Injury and Mortality: Once construction is completed, additional vehicular traffic will access and operate in the area as a result of project monitoring, operations, and maintenance. Some portions of the site will also be accessible to the public for recreational purposes. The Service anticipates that a small number of indigo snakes may occupy the project area during operation and maintenance for the life of the project. Given the elevation of the project site levees and the number of prey items that could become established in and around the impoundment, these snakes (especially snakes that bask on the levee roads during cooler weather) may be injured or killed from the operation of vehicles and equipment, although the precise number of snakes affected is difficult to determine.

Loss of Prey: We expect that a prey base for the eastern indigo snake is available on the Site 1 Impoundment project. This prey base would continue to exist and may prefer the embankment and roads in the post-construction environment. The prey base may be ephemeral due to operations at the Site 1 Impoundment. High precipitation years may result in longer storage times for water collected in the impoundment. This longer storage time may reduce the amount of habitat available to eastern indigo snake prey. In addition, herbicide application to control exotic vegetation may occur as part of project maintenance or accommodation of recreational activities. Prey (*e.g.*, insects, fish, amphibians, and some reptiles) may be vulnerable to herbicide application and may be killed, and therefore, not available to eastern indigo snakes as a result of these activities.

## Interrelated and interdependent actions

An interrelated activity is an activity that is part of the proposed action and depends on the proposed action for its justification. An interdependent activity is an activity that has no independent utility apart from the action under consultation. There are no other interrelated or interdependent actions for this project than those described above (*i.e.*, mowing, etc.).

## Response to the proposed action

Construction, operation, and maintenance of the project can result in actions that may kill or injure individual eastern indigo snakes and destroy nests, and destroy or degrade habitat and foraging areas. Clearing, burning, earthmoving, construction, operation, and maintenance activities may also disturb eastern indigo snakes by causing them to leave the area, and possibly miss foraging and mating opportunities. Individual eastern indigo snakes fleeing the area may be

more vulnerable to predation and intraspecific aggression. The Service anticipates that the number of eastern indigo snakes at the Site 1 Impoundment will be less after construction than that of the baseline condition. This is due primarily to the habitat loss from inundation of the impoundment. We anticipate that up to 14 eastern indigo snakes may inhabit the site.

The Service anticipates that approximately 1,700 ac of potential eastern indigo snake habitat within the construction site would be affected by the proposed action. The number of individuals present at the time of the action is not known. The Service estimates as many as 7 male and 7 female indigo snakes may be present within the construction area of the project. Furthermore, we anticipate that up to 7 nests may be present during any given nesting season (April to July) prior to construction. These population estimates are based partly on population density estimates in native and altered habitats at ABS (Layne and Steiner 1996) and in the sugar cane fields at the EAA A-1 Reservoir Project site. After construction, we anticipate the number of eastern indigo snakes and nests present will decrease due to loss or conversion of habitat and ongoing disturbance.

We believe some eastern indigo snakes may continue to use the Site 1 Impoundment levees and canal banks following construction if vegetative cover and prey items are present.

Eastern indigo snakes may access the impoundment during periods of low water or dry-down. Access to prey items in the impoundment will likely be controlled by the ability of the snake to negotiate water depth and the extent of available foraging habitat in ecotones between dry and wet areas. Individual eastern indigo snakes may also be affected by future maintenance and management activities.

## CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, Tribal, local, or private actions that are reasonably certain to occur in the action area considered in this Biological Opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Conversion of surrounding lands that currently support indigo snakes to residential uses that would support less eastern indigo snakes would be the most likely cumulative effect on the species, but only if no wetlands were impacted (*i.e.*, no Federal permit was required). The primary threat today to the eastern indigo snake is habitat loss and fragmentation due to development (Lawler 1977; Moler 1985a). Besides loss of habitat, residential developments also increase risk of harm to eastern indigo snakes in the interface areas between urban and native habitats because it increases the likelihood of snakes being killed by property owners and domestic pets. Increased traffic associated with development may also lead to increased eastern indigo snake mortality. Given that the north side of the project area is the LNWR, the southwest and west sides of the project border WCA-2, the lands to the east have been already been developed, the remaining lands to the south are the most likely to be developed in the future. However, jurisdictional wetlands are prominent in this area which would require a federal permit for development and subsequent review pursuant to the Act. Therefore, the Service does not anticipate any appreciable cumulative effects to the eastern indigo snake.

## CONCLUSION

After reviewing the current status of the eastern indigo snake, the environmental baseline for the action area, the effects of the proposed action and cumulative effects, it is the Service's biological opinion that the Site 1 Impoundment Project, as proposed, is not likely to jeopardize the continued existence of the eastern indigo snake. We anticipate limited (1 adult and 2 nests) mortality of indigo snakes due to construction activities. We do not anticipate mortality associated with the loss of 1,700 ac of habitat through inundation of the impoundment. We also do not anticipate that eastern indigo snakes will be extirpated from the site. The loss of eastern indigo snakes present at the Site 1 Impoundment will not appreciably reduce the numbers, distribution, and reproduction of indigo snakes in south Florida. Therefore, the Service believes the proposed project is not likely to jeopardize the continued existence of the eastern indigo snake.

No critical habitat has been designated for the eastern indigo snake; therefore, none will be affected.

## INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking, that is incidental to and not intended as part of the agency action, is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are nondiscretionary and must be undertaken by the Corps so that they become binding conditions of any grant or permit issued to the District, as appropriate, for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the terms and conditions or (2) fails to require the District to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the grant, agreement, or permit document, the protection coverage of section 7(o)(2) may lapse. To monitor the impact of incidental take, the Corps or the District, must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR § 402.14(i)(3)].

## AMOUNT OR EXTENT OF TAKE ANTICIPATED

The Service anticipates that the action will cause the permanent loss or degradation of approximately 1,700 ac of indigo snake habitat on the project site. This will occur through the periodic inundation of 364.32 acres of Melaleuca, 210.74 acres of abandoned nursery, 1070.32 acres of improved pasture, 36.16 acres of unimproved pasture, and approximately 31.32 acres of Brazilian pepper. Permanent loss of habitat will occur through improvements to the perimeter embankments and construction of infrastructure.

Based on the reported densities of eastern indigo snakes at ABS and observations of eastern indigo snakes at the EAA A-1 Reservoir Project site, the Service assumes that up to 14 indigo snakes and up to 7 eastern indigo snake nests may be present on the site under pre-construction conditions. Of these snakes and nests, we anticipate the following may be incidentally taken as a result of the action.

Up to one eastern indigo snake may be harmed (injury or mortality) incidental to project construction. The productivity associated with up to two eastern indigo snake nests may also be harmed (lost through mortality) incidental to project construction.

After site clearing and grading, we anticipate that the project site could continue to support eastern indigo snakes (during construction and throughout the life of the project). After construction is completed, we anticipate that these individuals or other eastern indigo snakes (from outside the project site) may enter the impoundment during dry down. In this event, subsequent rehydrations may harass some of these eastern indigo snakes. Maintenance and operations of the Site 1 Impoundment (including mowing or other vehicle and equipment operation) may disturb, or harass an unknown number of eastern indigo snakes on the site. Other human disturbance via recreational activities and loss of prey from water level fluctuations may result from long-term project operation and management. Therefore, we anticipate that any eastern indigo snakes remaining at the Site 1 Impoundment could be incidentally taken through harassment for the life of the project.

## EFFECT OF THE TAKE

In the accompanying Biological Opinion, the Service determined that this level of anticipated take is not likely to jeopardize the continued existence of the eastern indigo snake.

## REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize the effects of incidental take of the eastern indigo snake.

As described in the Corps' June 15, 2009, Biological Assessment, the following measures will be implemented to minimize risk to eastern indigo snakes: (1) pre-construction surveys will be

performed to note any eastern indigo snake locations; (2) the *Draft Standard Protection Measures for the Indigo Snake* (Service 2004) will be included in construction plans and specifications; (3) speed limits of 25 miles per hour will be posted for all vehicular traffic on-site; (4) eastern indigo snake educational information will be made available to contractors; and (5) all personnel will be notified of the possibility that eastern indigo snakes could be present in the project area and the procedure to take if a snake is seen. We have considered these measures in this Biological Opinion and believe they are critical in minimizing take associated with the proposed action. We also believe the following additional reasonable and prudent measures are necessary and appropriate to further minimize the incidental take of indigo snakes:

1. disturbance and injury to indigo snakes shall be minimized during construction activities;
2. disturbance and habitat loss shall be minimized during impoundment hydration and project operation and maintenance;
3. the Corps and District shall coordinate and report to the Service on construction activities, impoundment filling and rehydration, long-term operation and maintenance, management, and recreational activities; and
4. dead or injured indigo snake shall be handled appropriately including the proper notification of the FWC and Service.

## TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the Corps must comply with the following terms and conditions, which implement the reasonable and prudent measures, described above and outline reporting and monitoring requirements. These terms and conditions are non-discretionary.

1. Minimize road and construction-related disturbance, injury, and mortality:

The Corps shall require the District to provide at least one qualified observer during ground clearing activities. The observer's qualifications will be provided to and approved by the Service's Site 1 Impoundment Project biologist (U.S. Fish and Wildlife Service, South Florida Ecological Services Office; 1339 20th Street; Vero Beach, Florida 32960, 772-562-3909), 2 weeks prior to initiation of construction or clearing activities. The observer's primary function would be to visually evaluate the area to be cleared immediately prior to, and following vegetation removal, stockpiling, and burning and to record any eastern indigo snake activity. This would also include any other relevant wildlife observations for eastern indigo snake prey or predators. Only permitted individuals are allowed to come in contact with an eastern indigo snake.

1. Minimize disturbance, habitat loss, and loss of prey during operation and maintenance of the project:
  - a. Initial hydration of the impoundment shall be no more than 6 inches per day until the water depth is 6 inches above the average elevation of the impoundment floor. Once that depth is reached, the impoundment fill rate should not be restricted.

- b. Subsequent rehydration of the impoundment after an extended (*i.e.*, two weeks or more) dry-down (over 50 percent of the impoundment) shall be at a maximum rate of 6 inches per day until the water depth is 6 inches above the average elevation of the impoundment floor. Once that depth is reached, the impoundment fill rate should not be restricted.
- c. The Corps shall require the District to monitor eastern indigo snake response during the initial filling of the impoundment to determine the effect of hydration on eastern indigo snakes. If necessary, individual eastern indigo snakes will be captured by permitted personnel and released outside the impoundment. If necessary, eastern indigo snakes shall be held in captivity only long enough to be moved the minimum distance into suitable habitat out of harm's way; at no time shall more than one snake be kept in the same container.

2. Monitoring and reporting requirements:

- a. Hydration of the impoundment shall be monitored to assure consistency with the Terms and Conditions 2.a., 2.b., and 2.c. Results of observations associated with initial hydration including water levels, observations of eastern indigo snakes or their prey, additional information identified in the monitoring plan, and recommendations to reduce effects to eastern indigo snakes during rehydration shall be provided to the Service's Site 1 Impoundment Project biologist (U.S. Fish and Wildlife Service, South Florida Ecological Services Office; 1339 20th Street; Vero Beach, Florida 32960, 772-562-3909) within 30 days following the activity.
- b. The Corps shall provide the Service's Site 1 Impoundment Project biologist (U.S. Fish and Wildlife Service, South Florida Ecological Services Office; 1339 20th Street; Vero Beach, Florida 32960, 772-562-3909), a 1-week advance notice on the schedule for ground clearing of trees and other construction phases so that they may participate in on-site observational activities, if available.

3. Disposition of dead or injured animals (salvage):

- a. Upon locating a dead, injured, or sick federally listed species, initial notification must be made to referenced project biologist and the nearest Service Law Enforcement Office (U.S. Fish and Wildlife Service, 10426 NW 31st Terrace, Miami, Florida 33172; 305-526-2610). Secondary notification should be made to the FWC, South Region; 8535 Northlake Boulevard, West Palm Beach, Florida; 33412-3303; 561-625-5122; 1-888-404-3922. Injured eastern indigo snakes may be transported to the Busch Wildlife Sanctuary; 2500 Jupiter Park Drive, Jupiter, Florida, 33458; 561-575-3399 for immediate medical care. If not specifically instructed by Service law enforcement to submit dead specimens, all dead specimens and snake sheds shall be offered to the Florida Museum of Natural History; Gainesville, Florida 32601. The museum should be contacted with regard to details for preservation and transport.

- b. Care shall be taken in handling sick or injured specimens to ensure effective treatment and care or in the handling of dead specimens to preserve biological material in the best possible state for later analysis as to the cause of death. Dead eastern indigo snakes should be placed on ice and frozen as soon as possible. In conjunction with the care of sick or injured specimens or preservation of biological materials from a dead animal, the finder has the responsibility to carry out instructions provided by Law Enforcement to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.
- c. Annually, a report of all eastern indigo snakes killed or injured by operation or maintenance of the Site 1 Impoundment Project must be submitted to the Service's Site 1 Impoundment Project biologist (U.S. Fish and Wildlife Service, South Florida Ecological Services Office; 1339 20th Street; Vero Beach, Florida 32960; 772-562-3909). This report shall contain the location (latitude and longitude), dates, times, prevailing environmental conditions, and the circumstances surrounding all sightings of eastern indigo snakes and the disposition of all eastern indigo snakes found. A site map with observation locations shall also be included in this report. If no snakes are encountered, a report shall be submitted indicating that fact.

### **CONSERVATION RECOMMENDATIONS**

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The Service requests notification of the implementation of any conservation recommendations so that we are kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats. We recommend the following:

1. Following construction, maintain an on-site, educational kiosk for the public on the listed species and other wildlife that may be observed in the Site 1 Impoundment and surrounding area.
2. Cooperate with research-based efforts to provide for long-term ecological monitoring on eastern indigo snake prey densities and habitats in the project area.

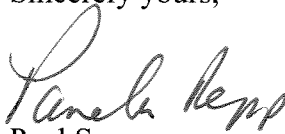
### **REINITIATION NOTICE**

This concludes formal consultation on the Site 1 Impoundment Project. As provided in 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the

amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Thank you for your cooperation and effort in protecting fish and wildlife resources. If you have any questions regarding this project, please contact Jane Tutton at 772-562-3909, extension 235.

Sincerely yours,



*for* Paul Souza

Field Supervisor  
South Florida Ecological Services Office

cc:

Corps, Jacksonville, Florida (Sue Wilcox, Jason Harrah)  
Corps, West Palm Beach, Florida (Tori White, Alisa Zarbo) electronic copy only  
District, West Palm Beach, Florida (Greg Coffelt, Jenny Hiscock, Georgia Vince)  
DEP, West Palm Beach, Florida (Dianne Hughes)  
FWC, Vero Beach, Florida (Joe Walsh)  
Service, Atlanta, Georgia (Dave Flemming, Dave Horning) electronic copy only  
Service, Jackson, Mississippi (Linda LaClaire)  
Service, Vero Beach, Florida (Marilyn Knight) electronic copy only  
Service, Jacksonville, Florida (Miles Meyer)

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**Table 1.** Acronyms and abbreviations used in this document.

<b>Acronym/Abbreviation</b>	<b>Definition</b>
ABS	Archbold Biological Station
ac	acre
ac-ft	acre-feet
Act	Endangered Species Act of 1973, as amended
ASR	Aquifer Storage and Recovery
BA	Biological Assessment
CERP	Comprehensive Everglades Restoration Plan
CFR	Code of Federal Register
Corps	U.S. Army Corps of Engineers
DEP	Florida Department of Environmental Protection
District	South Florida Water Management District
dPIR/EA	Draft Project Implementation Report/Environmental Assessment
EAA	Everglades Agricultural Area
EIS	Environmental Impact Statement
FLUCFCS	Florida Land Use Cover and Forms Classification System
FWC	Florida Fish and Wildlife Conservation Commission
FWCA	Fish and Wildlife Coordination Act
FY	fiscal year
IPCC	Intergovernmental Panel on Climate Change
LNWR	Arthur R. Marshall Loxahatchee National Wildlife Refuge
MSRP	Multi-Species Recovery Plan
PAL	planning aid letter
PDT	Project Delivery Team
Service	U.S. Fish and Wildlife Service
WCA	Water Conservation Area
WPA	Water Preserve Area
WRAP	Wetland Rapid Assessment Procedure

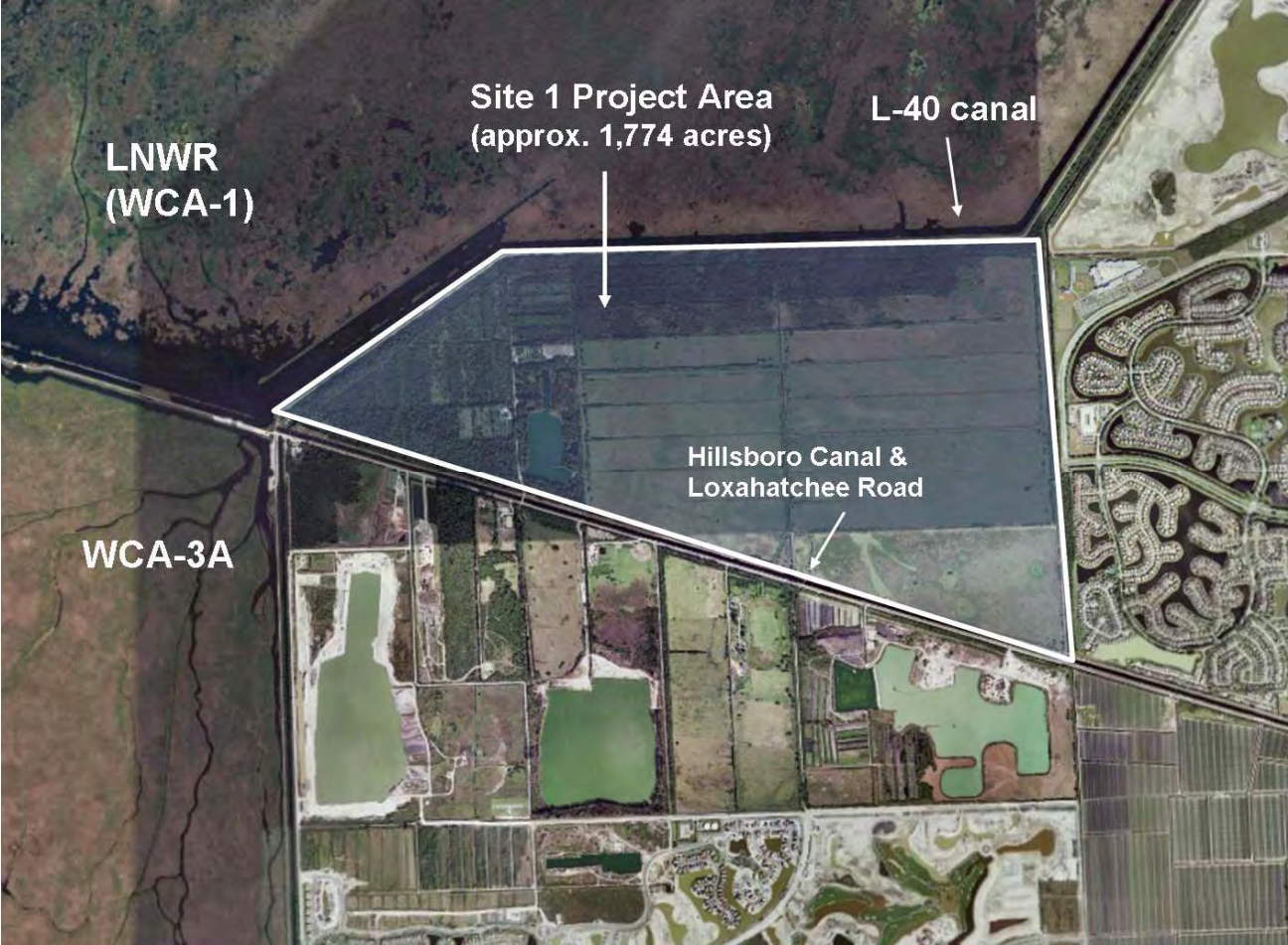
**Table 2.** Land cover types in the Site 1 Impoundment action area based on the Florida Land Use, Cover, and Forms Classification System (2004 data). Figure 4 displays these data.

<b>Land Cover Code</b>	<b>DESCRIPTION</b>	<b>Indigo Snake Suitability*</b>	<b>Acres</b>
1710	Educational Facilities	R	0.45
2110	Improved Pasture	R	1070.32
2120	Unimproved Pasture	Y	36.16
2410	Tree Nurseries	R	210.74
4220	Brazilian Pepper	Y	31.32
4240	Melaleuca	Y	364.32
5120	Channelized Waterways and Canals	R	12.46
5300	Reservoirs	R	27.2
6410	Freshwater Marshes	R	1.71

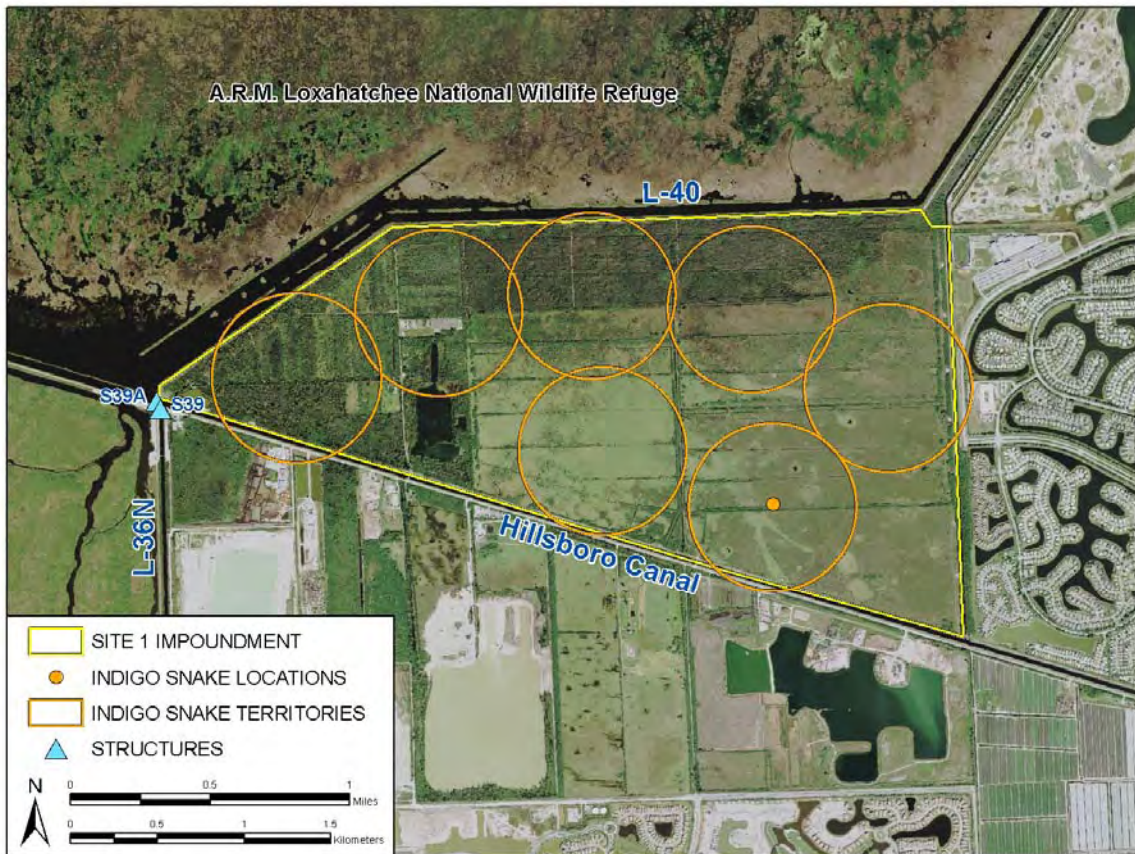
\*R = Red (little or no suitability for indigo snakes)

Y = Yellow (moderate suitability for indigo snakes)

G = Green (high suitability for indigo snakes)



**Figure 1.** The Site 1 Impoundment Project location (from the U.S. Army Corps of Engineers).



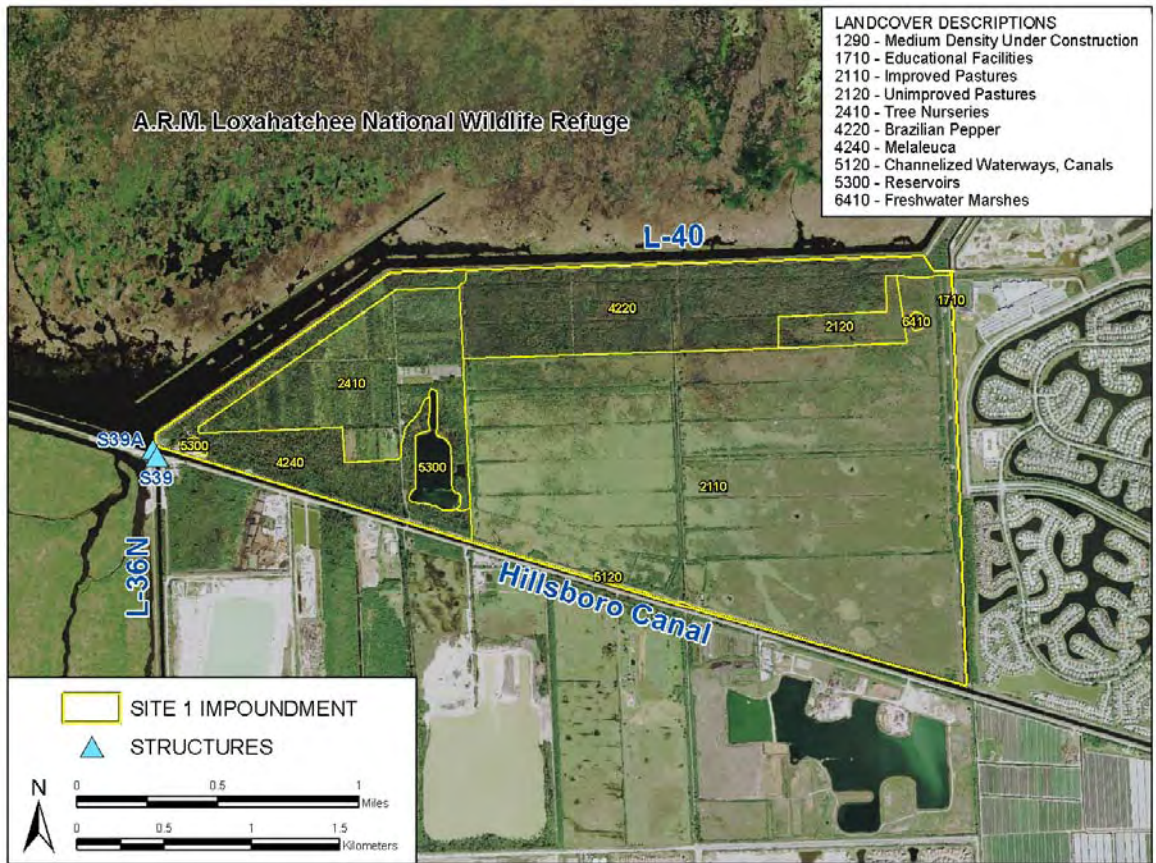
**Figure 2.** Eastern indigo snake location and potential territories for the Site 1 Impoundment Project.



**Figure 3.** Aerial photography from 1953 depicting the future Site 1 Impoundment location prior to conversion to agricultural uses (photo from <http://web.uflib.ufl.edu/digital/collections/FLAP/> )



**Figure 4.** Aerial photography from 1958 depicting the future Site 1 Impoundment location with agricultural land uses (photo from <http://web.uflib.ufl.edu/digital/collections/FLAP/>).



**Figure 5.** The Site 1 Impoundment Project with Florida Land Use Cover and Forms Classification System codes depicted.