



United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
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May 2, 2012

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

Service Federal Activity Code: 41420-2009-FA-0004
Service Consultation Code: 41420-2009-F-0054
Corps Application No.: SAJ-2008-3815 (IP-JSC)
Formal Consultation Initiation Date: November 17, 2011
Applicant: Falcone Group, LLC
County: Osceola

Dear Colonel Pantano:

This document transmits the U.S. Fish and Wildlife Service's (Service) Biological Opinion for the proposed "Rolling Oaks South" project in Osceola County, Florida, and its effects on the threatened bluetail mole skink (*Eumeces egregius lividus*), the threatened sand skink (*Neoseps reynoldsi*), and the threatened Eastern 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.*). This document also represents Service's review of the proposed project referenced above in accordance the provisions of the Fish and Wildlife Coordination Act of 1958, as amended (48 Stat. 401; 16 U.S.C. 661 *et seq.*).

This Biological Opinion is based on information provided by the U.S. Army Corps of Engineers (Corps), the applicant's consultants, email messages, telephone conversations, and other sources of information. A complete administrative record of this consultation is on file at the South Florida Ecological Services Office, Vero Beach, Florida.

Consultation History

By letter to the Service dated October 8, 2008, the Corps determined the proposed work "may affect" the sand skink and bluetail mole skink, and requested initiation of formal consultation for these species.

By letter to the Corps dated November 25, 2008, the Service stated we did not have sufficient information necessary to initiate formal consultation for the proposed project. The Service requested a sand skink survey of suitable habitats in the project's footprint and a description of reasonable and prudent measures employed to minimize anticipated impacts to sand skinks. We also recommend the Department of the Army (DA) permit be held in abeyance until the



applicant has demonstrated adherence to Section 404(b)(1) guidelines regarding avoidance, minimization, and compensation for impacts to wetlands.

On August 24, 2009, the applicant provided a revised sand skink survey and revised estimate of the amount of skink habitat within the proposed project's footprint. The applicant estimated the site contained about 35 acres of skink habitat.

On November 17, 2011, the Service met with the applicant to discuss the revised sand skink survey and the proposed offsite sand skink conservation plan (Plan). The applicant has reserved 70 acres of skink credits from the Morgan Lake Wales Preserve Conservation Bank (Preserve), and has agreed to purchase this mitigation upon DA authorization. The applicant also provided plans for the proposed commercial development on the Rolling Oaks site. The Service advised the applicant this information would be sufficient for the Service to initiate formal consultation for the proposed project.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

Proposed action

Falcone Group, LLC, has applied for a DA permit to permanently impact 0.39 acre of forested wetlands for construction of a 54-acre commercial development known as "Rolling Oaks South." The proposed work includes construction of a commercial retail development with associated parking, maintenance and stormwater management facilities (see Figure 1). The project footprint includes 23.6 acres of xeric oak scrub and 21.1 acres of dry prairie. Based on the applicant's survey of the site's suitable skink habitat (xeric oak scrub above 25 meters [m] NGVD [82 feet NGVD] in Candler and Tavares fine sand), the site contains 35 acres of occupied skink habitat (see Figures 2 and 3). All 35 acres are expected to be impacted by construction of the proposed project. In order to minimize the project's impacts to skinks, the applicant has agreed to purchase 70 acres of xeric scrub credits from the Preserve. The Corps has assigned application number SAJ-2008-3815 (IP-JSC) to the proposal. The project site is located south of U.S. 192 and east of the Western Beltway, in Section 04, Township 25 South, Range 27 East, Osceola County, Florida.

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 area involved in the action.

Sand Skink and Bluetail Mole Skink

The project will result in the construction of a commercial retail facility and associated infrastructure. The proposed project may result in a variety of indirect and cumulative effects in the vicinity of the project. The increase in the local commercial activity will likely stimulate further development in the project area (*e.g.*, road widening and construction of new roadways to

accommodate the increase in local traffic; construction of related facilities such as grocery stores, gas stations, etc.), and increase the loss of skink habitat in the project area. Consequently, existing skink habitat in the vicinity of the project is threatened by development. However, the extent of the project's effects to surrounding lands is difficult to discern. Due to the fragmented configuration and extent of the potentially suitable skink habitat present on the project site, the Service has established a skink action area for this project that includes the 54 acre project site (which includes 35 acres of occupied skink habitat on-site proposed to be impacted) and 70 acres of occupied skink habitat to be purchased and preserved/managed as part of the Preserve in Polk County, Florida. The Service believes an action area of this size is sufficiently large to capture the indirect and cumulative effects resulting from the proposed residential development.

Eastern Indigo Snake

For the eastern indigo snake, the action area is limited to the project site due to the heavy urban development surrounding the project site. Thus, the action area is the 54-acre project site where the Service must consider potential effects to indigo snakes that may breed, feed, or shelter within the project area.

Species/critical habitat description

Sand Skink

The sand skink is a small, fossorial lizard that occurs on the sandy ridges of interior central Florida from Marion County south to Highlands County. The extant range of the sand skink includes Highlands, Lake, Marion, Orange, Osceola, Polk, and Putnam Counties (Christman 1988; Telford 1992; Service 1999). Principal populations occur on the Lake Wales Ridge (LWR) and Winter Haven Ridge (WHR) in Highlands, Lake, and Polk Counties (Christman 1992a; Mushinsky and McCoy 1999; P. Moler, FWC, personal communication 1998). The sand skink is also found on the Mount Dora Ridge (MDR), including sites within the Ocala National Forest (Christman 1970, 1992a). Despite intensive sampling efforts in scrub habitat with similar herpetofauna, the sand skink has not been recorded at Avon Park Air Force Range on the Bombing Range Ridge (Branch and Hokit 2000). According to the Florida Natural Areas Inventory (FNAI) database (updated as of September 2006), there were 132 locality records for the sand skink, including 115 localities on the LWR, 4 on the WHR, and 7 on the MDR. FNAI also reports four localities for this species west of the MDR in Lake County and two localities between the LWR and the Lake Hendry Ridge. The modification and destruction of xeric upland communities in central Florida were primary considerations in listing the sand skink as threatened under the Act in 1987 (52 FR 42662). No critical habitat has been designated for the sand skink.

Recent morphological (Griffith et al. 2000) and molecular studies (Schmitz et al. 2004, Brandley et al. 2005) have demonstrated that the scincid lizard genus *Eumeces*, Weigmann (1834) is paraphyletic and that *Plestiodon*, Dumeril and Bibron (1839) has nomenclatural priority for the American species formally referred to as *Eumeces*, except for those now placed in the genus *Mesoscincus* (Smith 2005). Molecular analysis of ribosomal RNA gene sequences also show "*Eumeces*" *egregius* and *Neoseps reynoldsi* are closely related sister species (Schmitz et al. 2004,

Brandley et al. 2005). Schmitz et al. (2004) suggested the amount of genetic differentiation between the two species (5 percent) is similar to other species of North American skinks and *Neoseps* (Stejneger 1910) should be synonymised. They argue sand skinks are a striking example of morphological adaptation for burrowing, where the rate of morpho-ecological change exceeds phylogenetic change.

The sand skink is believed to have evolved on the central LWR and radiated from there (Branch et al. 2003). Analysis of mitochondrial DNA (mtDNA) indicates populations of the sand skink are highly structured with most of the genetic variation partitioned among four lineages: three subpopulations on the LWR characterized by high haplotype diversity and a single, unique haplotype detected only on the MDR (Branch et al. 2003). Under the conventional molecular clock, the 4.5% divergence in sand skinks between these two ridges would represent about a 2-million-year separation; the absence of haplotype diversity on the MDR would suggest that this population was founded by only a few individuals or severely reduced by genetic drift of a small population (Branch et al. 2003).

The sand skink reaches a maximum length of about 5 inches. The tail makes up about half the total body length. The body is shiny and usually gray to grayish-white in color, although the body color may occasionally be light tan. Hatchlings have a wide black band located along each side from the tip of the tail to the snout. This band is reduced in adults and may only occur from the eye to snout on some individuals (Telford 1959). Sand skinks contain a variety of morphological adaptations for a fossorial lifestyle. The legs are vestigial and practically nonfunctional, the eyes are greatly reduced, the external ear openings are reduced or absent (Greer 2002), the snout is wedge-shaped, and the lower jaw is countersunk.

The sand skink is widespread in native xeric uplands with excessively well-drained soils (Service 2002), principally on the ridges listed above at elevations greater than 25 m above mean sea level. Various authors have attempted to characterize optimal sand skink habitat (Telford 1959, Campbell and Christman 1982, Christman 1978a, 1992a, Service 1993a), but McCoy et al. (1999) have argued these notions are “educated guesswork” (Burgman et al. 1993) with little empirical basis. Commonly occupied native habitats include Florida scrub, variously described as sand pine scrub, xeric oak scrub, rosemary scrub and scrubby flatwoods, as well as high pine communities that include sandhill, longleaf pine/turkey oak, turkey oak barrens and xeric hammock (see habitat descriptions in Myers 1990 and Service 1999). Coverboard transects extended from scrub or high pine (sandhill) through scrubby flatwoods to pine flatwoods revealed sand skinks left more tracks in scrub than the other three habitats and did not penetrate further than 40 m into scrubby flatwoods or 20 m into pine flatwoods (Sutton et al. 1999).

McCoy et al. (1999) used trap-out enclosures to measure sand skink densities at seven scrub sites and attempted to rank each area individually based on eight visual characteristics used in the literature (Telford 1959, 1962; Christman 1992a; Service 1993b) to identify good habitat: root-free, grass-free, patchy bare areas, bare areas with lichens, bare areas with litter, scattered scrubs, open canopy, and sunny exposure. None of the individual literature descriptions of optimal habitat (or any combination thereof) accurately predicted the rank order of actual sand skink abundance at these sites, which ranged in density from 125 individuals/ha to 650/ha (Sutton 1996). However, knowledgeable researchers, especially as a group, appear to be able to visually

sort out the environmental variables important to sand skinks, but had difficulty translating their perceptions into a set of rules that others could use to identify optimal sand skink habitat (McCoy et al. 1999). Collazos (1998), Hill (1999), and Mushinsky et al. (2001) used grids of pitfall traps and coverboards to quantify the relationship between sand skink density and a suite of environmental variables. These authors found that sand skink relative density was positively correlated with low canopy cover, percent bare ground, and amount of loose sand, and large sand particle size, but negatively correlated with understory vegetation height, litter cover, small sand particle size, soil moisture, soil temperature, and soil composition. In an unburned sandhill site at Archbold Biological Station (ABS), Meshaka and Layne (2002) captured significantly more sand skinks in pitfall traps set in openings without shrubs than at sites with moderate to heavy shrub density. Telford (1959) suggested scattered debris and litter provided moisture that was important to support an abundant food supply and nesting sites for sand skinks. Cooper (1965) noted the species was most commonly collected under rotting logs and Christman (1992a) suggested they nest in these locations.

The trap-out enclosure surveys of Sutton et al. (1999) and Christman (2005) provide evidence that hot fires may negatively affect sand skink densities and the species continues to occupy scrub with a closed canopy and thick humus layer, although at lower densities. Also, recent coverboard surveys conducted by permit applicants have shown sand skinks may occupy both actively managed lands such as citrus groves and pine plantations and old field communities (Service data), particularly if these sites are adjacent to patches of native habitat that can serve as a source population for recolonization.

Bluetail Mole Skink

The mole skink (*Eumeces egregius*) is a small, fossorial lizard that occupies xeric upland habitats of Florida, Alabama and Georgia (Mount 1963). Five subspecies have been described (Mount 1965), but only the bluetail mole skink (*Eumeces egregius lividus*) is federally listed. It requires open, sandy patches interspersed with sclerophyllous vegetation (Service 1999). The historic and anticipated future modification and destruction of xeric upland communities in central Florida were primary considerations in listing the bluetail mole skink as threatened under the Act in 1987 (52 FR 42662). No critical habitat has been designated for the bluetail mole skink.

Mount (1965) described the bluetail mole skink largely on the basis of a bright blue tail in juveniles and restricted this subspecies to the southern LWR in Polk and Highlands Counties. Christman (1978b) limited the range of bluetail mole skinks to these two counties, but later added Osceola County to the range, based on the collection of a single bluetailed juvenile just north of the Polk County line on the LWR (Christman 1992b, FNAI records). Analysis of mtDNA (Branch et al. 2003) supports Mount's (1965) hypotheses that bluetail mole skinks from the lower LWR represent the ancestral stock with radiation from there. Genetic analysis also indicates high population structure with limited dispersal in mole skinks among sandy habitats (Branch et al. 2003). Based on conventional estimates of molecular evolutionary clocks, these authors suggest a separation of approximately 4 million years between mole skinks occurring on the two oldest ridges (LWR and MDR), which overlaps the proposed Pliocene origin of scrub habitats (Webb 1990).

The bluetail mole skink reaches a maximum length of about 5 inches, and the tail makes up about half the body length. The body is shiny, and brownish to pink in color, with lighter paired dorsolateral stripes diverging posteriorly (Christman 1978b). Males develop a colorful orange pattern on the sides of the body during breeding season. Juveniles usually have a blue tail (Christman 1992b; P. Moler, FWC, personal communication 1998). Regenerated tails and the tails of older individuals are typically pinkish. The legs are somewhat reduced in size and used only for surface locomotion and not for “swimming” through the sand (Christman 1992b).

A variety of xeric upland communities provide habitat for the bluetail mole skink, including rosemary and oak-dominated scrub, turkey oak barrens, high pine, and xeric hammocks. Areas with few plant roots, open canopies, scattered shrub vegetation, and patches of bare, loose sand provide optimal habitats (Christman 1988, 1992b). Within these habitat types, bluetail mole skinks are typically found under leaves, logs, palmetto fronds, and other ground debris. Shaded areas presumably provide suitable microhabitat conditions for thermoregulation, egg incubation, and foraging (Mount 1963). Bluetail mole skinks tend to be clumped in distribution with variable densities that may approach 25 adults per acre (Christman 1992b). The distribution of bluetail mole skinks appears to be closely linked to the distribution of surface litter and, in turn, suitable microhabitat sites.

Eastern Indigo Snake

The eastern indigo snake, which can reach lengths of up to 8.5 feet (2.6 m) (Moler 1992), is one of the largest North American snake species. 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 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

Sand Skink

The sand skink is highly adapted for life in the sand. It spends the majority of its time below the surface where it burrows through loose sand in search of food, shelter, and mates. Sand skinks feed on a variety of hard and soft-bodied arthropods that occur below the ground surface. The diet consists largely of beetle larvae and termites (*Prorethodes* spp.). Spiders, larval ant lions, lepidopteran larvae, roaches and adult beetles are also eaten (Myers and Telford 1965, Smith 1982).

Sand skinks are most active during the morning and evening in spring and at mid-day in winter, the times when body temperatures can easily be maintained between 28°C and 31°C in open sand (Andrews 1994). During the hottest parts of the day, sand skinks move under shrubs to maintain their preferred body temperatures in order to remain active near the surface (Andrews 1994). With respect to season, Telford (1959) reported skinks most active from early March

through early May, whereas Sutton (1996) found skinks most active from mid-February to late April. Based on monthly sampling of pitfall traps, Ashton and Telford (2006) found captures peaked in March at ABS, but in May at Ocala National Forest (ONF). All of these authors suggested the spring activity peak was associated with mating. At ABS, Ashton and Telford (2006) noted a secondary peak in August that corresponded with the emergence of hatchling sand skinks. The literature states sand skinks lay two eggs typically in May or early June (Ashton 2005) under logs or debris, approximately 55 days after mating (Telford 1959). However, there have been observations of three to four eggs per clutch at times (Mushinsky, personal communication, 2007). The eggs hatch from June through July. Sand skinks first reproduce at 2 years of age and females produce a single clutch in a season, although some individuals reproduce biennially or less frequently (Ashton 2005). Sand skinks can live to at least 10 years of age (Meneken et al. 2005). In studies, most sand skinks moved less than 40 m between captures, but some moved over 140 m in 2 weeks (Mushinsky et al. 2001). Limited dispersal ability has been suggested to explain the relatively high degree of genetic structure within and among sand skink populations (Branch et al. 2003, Reid et al. 2004).

Bluetail Mole Skink

Bluetail mole skinks are typically found under leaves, logs, palmetto fronds, and other ground debris in a variety of xeric upland communities, including rosemary and oak-dominated scrub, turkey oak barrens, high pine, and xeric hammocks. Foraging activities of the bluetail mole skink are primarily at the soil surface or at shallow depths to 2 inches (Service 1993b), usually during the morning or evening. Roaches, crickets, and spiders make up the bulk of the diet (Mount 1963). Their diet is more generalized than that of the fossorial sand skink, which probably reflects their tendency to feed at the surface (Smith 1982). Like sand skinks, mole skinks show an activity peak in spring (Mount 1963, Smith 1982). The reproductive biology of the bluetail mole skink is poorly known. Reproduction is presumably very much like that of the peninsula mole skink, *E. e. onocrepis*, where mating occurs in the fall or winter. In the peninsula mole skink, two to nine eggs are laid in a shallow nest cavity less than 12 inches below the surface. The eggs incubate for 31 to 51 days, during which time the female tends the nest. Individuals probably become reproductively active at 1 year of age (Mount 1963, Christman 1978a).

Eastern Indigo Snake

In south-central Florida, limited information on the reproductive cycle suggests that indigo snake breeding extends from June to January, egg laying occurs from April to July, and hatching occurs during 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. Indigo snakes in captivity take 3 to 4 years to reach sexual maturity (Speake et al. 1987). Female indigo snakes can store sperm and delay fertilization of eggs. There is a single record of a captive 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 parthenogenetic 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 indigo snake lifespan in the wild, although one captive individual lived 25 years, 11 months (Shaw 1959).

Indigo snakes are active and spend a great deal of time foraging for food and searching for mates. They are one of the few snake species active during the day and rest at night. The 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

Sand Skink and Bluetail Mole Skink

The Service has little information on the population dynamics of sand and bluetail mole skinks within their extant ranges. The skinks' diminutive size and secretive habits make their study difficult. As noted above, sand skinks can reach densities of up to 650 individuals/ha (263/ac) in high quality habitat, particularly on the LWR. Delayed maturity (2 years), a small clutch size (two eggs) of relatively large eggs, low frequency of reproduction and a long lifespan in sand skinks are life-history traits that also characterize a number of other fossorial lizards that occur in high densities (Ashton 2005). Such character traits may reflect high intra-specific competition and/or predation (Ashton 2005). In contrast, bluetail mole skinks often seem absent or rare on the same LWR study sites where sand skinks are common, and when present, are patchily distributed (Christman 1988, 1992b; Mushinsky and McCoy 1995). Mount (1963) noted peninsula mole skinks also are patchily distributed and mostly occurred on xeric sites greater than 100 acres (40 ha) in size. Early maturity (1 year in laboratory) and a large clutch size (maximum = nine eggs) of relatively small eggs (Mount 1963) suggest the population dynamics of mole skinks are different from sand skinks.

Eastern Indigo Snake

Indigo snakes use a mosaic of habitats. A study in southern Georgia found that interspersions of tortoise-inhabited sandhills and wetlands improve habitat quality for the indigo snake (Landers and Speake 1980). 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, 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 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). 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 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 Everglades Agricultural Area (EAA), 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), indigo snakes are found in tropical hardwood hammocks, pine rocklands, freshwater marshes, abandoned agricultural land, coastal prairie, mangrove swamps, and human-altered habitats. It is thought 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).

Indigo snakes range over large areas and into 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 acres, reducing to 390 acres in the summer (Moler 1985b). In contrast, a gravid female may use from 3.5 to 106 acres (Smith 1987). In Florida, home ranges for females and males range from 5 to 371 acres and 4 to 805 acres, respectively (Smith 2003). At the ABS, the average home range size for females was determined to be 47 acres and overlapping male home ranges to be 185 acres (Layne and Steiner 1996).

Status and distribution

Sand Skink

Reason for listing

The modification and destruction of xeric upland communities in central Florida were primary considerations in listing the sand skink as threatened under the Act in 1987 (52 FR 42662). By some estimates, as much as 90 percent of the scrub ecosystem has already been lost to residential development and conversion to agriculture, primarily citrus groves (Florida Department of Natural Resources 1991, Kautz 1993). Xeric uplands remaining on private lands are especially vulnerable to destruction because of increasing residential and agricultural pressures.

Range-wide trends

Except for a few locations where intensive research has been conducted, limited information about the presence or abundance of sand skinks exists. An extensive 1992 survey in ONF failed to capture any sand skinks, despite placement of traps near historical locations and the capture of a number of other fossorial reptiles. Telford (1992) cited the ephemeral nature of early successional scrub habitats due to dynamic successional changes as an important confounding factor in the evaluation of the sand skink's present status in the ONF. However, 24 sand skinks were collected later from ONF for genetic analysis (Branch et al. 2003) and population studies (Ashton and Telford 2006). Additional studies have provided presence/absence information that has been used to determine the extant range of the species (Mushinsky and McCoy 1991, Stout and Corey 1995). However, few long-term monitoring efforts have been undertaken to evaluate the status or trends of sand skinks at these or other sites.

At the time of Federal listing in 1987, FNAI had recorded 31 known sites for the sand skink. By September 2006, 132 localities were known by FNAI. This increase is largely the result of more intensive sampling of scrub habitats in recent years and does not imply that this species is more widespread than originally thought. Of the known locations, 50 (38 percent) occur on public

lands or private lands placed under conservation easement, and offer habitat protection. It is likely continued residential and agricultural development of xeric upland habitat in central Florida has destroyed or degraded habitat containing sand skinks. Approximately 60 to 90 percent of xeric upland communities historically used by sand skinks on the LWR are estimated to have been lost due to development (Christman 1988, Christman and Judd 1990, Kautz 1993, Center for Plant Conservation 1995). More recently, Turner et al. (2006) calculated 12.9 percent of this habitat remains.

Protection of the sand skink from further habitat loss and degradation provides the most important means of ensuring its continued existence. Existing protection of occupied skink habitat consists primarily of private preserves such as ABS, Hendry Ranch, Tiger Creek Preserve, and Saddle Blanket Lakes Scrub Preserve, coupled with publicly owned lands such as Lake Arbuckle State Park and State Forest, Lake Louisa State Park, and Highlands Hammock State Park (Service 1993a). Current efforts to expand the system of protected xeric upland communities on the LWR, coupled with implementation of effective land management practices, represent the most likely opportunity for assuring the sand skink's survival (Turner et al. 2006). It will also be important to preserve the genetic diversity of sand skinks by protecting sites in each of the four genetically distinct populations, from the MDR, the northern LWR, the central LWR, and the southern LWR.

It is likely a substantial sand skink population is present on existing private and public conservation lands on the LWR. As of 2003, about 21,597 acres (8,740 ha) of Florida scrub and high pine on the LWR have been protected, which represents almost half of the remaining xeric habitat on this ancient ridge, but only 6.3% of its estimated historic extent (Turner et al. 2006). Sand skinks are present on sites that total 87.4% of the currently protected xeric acreage (Turner et al. 2006), but many of the other conserved sites have not been surveyed adequately. Fourteen trap-out enclosures at seven protected sites with a known burn history on the LWR in Polk and Highlands Counties contained a minimum of 84 sand skinks for a mean density of 152 individuals/ha (61/ac) and one enclosure set in dry flatwoods yielded none (Christman 2005). Fourteen of these sites had burned in the last 8 years and the one "rosemary bald" that has not burned for 37 years had 275 sand skinks/ha (110/ac). Five similar enclosures set on unburned xeric sites in Orange and Osceola Counties averaged 385 sand skinks/ha (155/ac) (Sutton 1996). K. Ashton (Personal communication, 2006) sampled skinks with pitfall traps on 12 rosemary scrub sites in Highlands County. Sand skinks were significantly less common in recently burned rosemary scrub, with abundance increasing with time since last fire. Fewer bluetail mole skinks were captured by K. Ashton, but the relationship was similar. Meshaka and Lane (2002) found both species persisted on a sandhill at ABS that remained unburned for 67 years (1927-1994). The relative abundance of sand skinks decreased over time, but bluetail mole skinks did not.

Recovery of the sand skink also may require rehabilitation of suitable but unoccupied habitat or restoration of potentially suitable habitat. Because sand skinks do not readily disperse, introductions into restored or created unoccupied habitat may be necessary. Sand skinks relocated to two former citrus groves in Orange County have persisted for at least 5 years (Hill 1999, Mushinsky et al. 2001).

Bluetail Mole Skink

Reason for listing

The historic and anticipated future modification and destruction of xeric upland communities in central Florida were primary considerations in listing the bluetail mole skink as threatened under the Act in 1987 (52 FR 42662). As stated previously, almost 90 percent of the xeric upland communities on the LWR have already been lost because of habitat destruction and degradation due to residential development and conversion to agriculture, primarily citrus groves (Turner et al. 2006). Remaining xeric habitat on private lands is especially vulnerable because projections of future human population growth suggest additional demands for residential development within the range of the bluetail mole skink. Campbell and Christman (1982) characterized bluetail mole skinks as colonizers of a patchy, early successional, or disturbed habitat type, which occurs throughout the sandhill, sand pine scrub, and xeric hammock vegetative associations as a result of biological or catastrophic factors. Susceptibility of mature sand pine to windthrow may be an important factor in maintaining bare, sandy microhabitats required by bluetail mole skinks and other scrub endemics (Myers 1990).

Range-wide trends

At the time of Federal listing, there were 20 locality records for the bluetail mole skink. Currently, 43 sites are known. The increase in locality records is largely the result of more intensive sampling of scrub habitats in recent years and does not imply that this species is more widespread than originally supposed. Of the known locations, only 13 occur on public land or on private land protected under conservation easement. Turner et al. (2006) suggested bluetail mole skinks may be under-represented in the reserve network of protected public lands, but could not determine if their absence is a result of exclusion or sampling effort. It is likely continued residential and agricultural development of xeric upland habitat in central Florida has destroyed or degraded extensive tracts of habitat containing the bluetail mole skink. Estimates of habitat loss range from 60 to 90 percent, depending on the xeric community type (Christman 1988; Christman and Judd 1990; Kautz 1993; Center for Plant Conservation 1995). Bluetail mole skinks are known to be present on sites which total 52.4 percent of the 21,597 acres (8,740 ha) of Florida scrub and high pine that is currently protected (Turner et al. 2006). However, the extent of potential habitat that is actually occupied is unknown, as is their total population size. As noted above, this species appears to be patchily distributed, even in occupied habitat (Mount 1963; Christman 1992b). Unlike sand skinks, their tracks cannot be easily detected in the sand, and most of the extant scrub sites on the LWR have not been adequately surveyed for bluetail mole skinks, including protected sites.

A density study of bluetail mole and sand skinks was conducted in 2004-2005 by Christman (2005). Only two bluetail mole skinks were observed in the enclosures (mean density = 3.3/hectare, 1.3/acre) relative to at least 84 sand skinks (ratio = 1:41). Christman (1992) suggested only 1 bluetail mole skink is encountered for every 20 sand skinks. Other range-wide pitfall trap data on the LWR revealed a bluetail mole skink to sand skink ratio of 1:1.89 based on 54 total skinks captured in six trap arrays (Christman 1988), 1:4.3 based on 332 total skinks in

58 trap arrays (Mushinsky and McCoy 1991), and 1:2.7 based on 49 total skinks in 31,640 pitfall trap-days (Meshaka and Lane 2002). Mushinsky and McCoy (1991) confirmed that detection rates for bluetail mole skinks increased with sampling effort.

The protection and recovery of bluetail mole skinks will require habitat loss be stopped and unoccupied but potentially suitable habitat be restored. The existing protection of the bluetail mole skink includes a number of private and public preserves within the LWR. Current efforts to expand the system of protected xeric upland habitats on the LWR, in concert with implementation of aggressive land management practices, represent the most likely opportunity for securing the future of this species. Comprehensive land acquisitions that protect areas occupied by the bluetail mole skink include the Service's LWR National Wildlife Refuge, and the State of Florida's Conservation and Recreation Lands (CARL) LWR Ecosystem Project (Service 1993a).

In summary, little information is available to adequately assess the status and population dynamics of the sand and bluetail mole skinks. Both species are endemic to central Florida and are habitat specialists that rely on early successional xeric scrub habitat for their continuing existence. Estimates of habitat loss range from 60 to 90 percent, depending on the xeric community type (Christman 1988, Christman and Judd 1990, Kautz 1993, Center for Plant Conservation 1995). However, the sand skink is relatively widespread in remaining xeric uplands. Furthermore, the implementation of favorable management practices can create and maintain suitable habitat conditions for both sand and bluetail mole skinks, as well as other xeric upland-dependent species. A number of actions over the last 20 years have resulted in conservation benefits to xeric uplands within the extant range of both species. The State of Florida has acquired xeric upland habitat through the CARL, Save Our Rivers, and other P-2000 acquisition programs. Combined, these land acquisition programs have protected 10,000 acres of xeric uplands (Florida Department of Environmental Protection 1998, South Florida Water Management District 1998). The Service has also acquired portions of several small tracts totaling 800 acres as a component of the LWR National Wildlife Refuge. Finally, private organizations, such as The Nature Conservancy and ABS have bought and currently manage xeric uplands within the LWR.

Eastern Indigo Snake

The 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 indigo and the Texas indigo (*D. c. erebennus*). In the United States, the 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 indigo snake (Lawler 1977). The 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 indigo snake is vulnerable to habitat loss, degradation, and fragmentation (Lawler 1977; Moler 1985a). Accordingly, the primary threat to the 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 indigo snakes. In citrus groves, indigo snake mortality occurs from vehicular traffic and management techniques such as pesticide usage, lawn mowers, and heavy equipment usage (Zeigler 2006). Within the last 5 years, since the spread of citrus canker, Zeigler (2006) reported seeing at least 12 dead 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 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 the greatest 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 and area ratios low. Management of these lands would be directed towards maintaining and enhancing the diversity of plant and animal assemblages within these properties. Where these goals are achieved, indigo snakes will directly benefit because of improved habitat conditions. Land managers are encouraged to utilize fire as a tool to maintain biodiversity in fire-dependent ecosystems.

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.

Status of the species within the action area

Sand Skink and Bluetail Mole Skink

The site has been surveyed for sand skinks, as a surrogate for both species, by pedestrian and coverboard survey methods (Figure 2). The findings of this survey effort indicate the site contains about 35 acres of occupied skink habitat (Figure 3). The occupied habitat delineated for this site consists primarily of xeric scrub oak habitat and dry prairie.

Eastern Indigo Snake

The size of the action area represents a small portion of the combined acreage of all habitats usable by indigo snakes in south Florida. Furthermore, the Rolling Oaks South site is fragmented from other areas potentially inhabited by eastern indigo snakes. The most likely

route for immigration and emigration would be via the residential areas to the east and south; however, the natural areas are very sparse within these developments. It is unlikely snakes would survive attempting to cross the New Independence Parkway (SR 429), or West Irlo Bronson Memorial Highway (US 192). Due to these physical barriers in the landscape, it is the Services' opinion indigo snakes are very unlikely to disperse to or from the project site.

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 within 10 miles of the action area. As previously mentioned, the surrounding area is highly developed; therefore, any indigo snakes in the action area are likely to utilize the Rolling Oaks South site and are not likely to have home ranges that include areas outside of the site.

Factors affecting the species' environment within the action area

Sand Skink and Bluetail Mole Skink

Sand skinks and bluetail mole skinks are vulnerable within the action area due to habitat loss resulting from the intense development pressures related to central Florida's burgeoning human population. From 2000 to 2010, Florida's population increased 12.2 percent from 17.5 million to 19.7 million. Between 2005 and 2060, Florida's population is projected to double to approximately 36 million people (Zwick and Carr 2006). Assuming a similar pattern of development at current gross urban densities for each county, this translates into the need to convert an additional 7 million acres of undeveloped land into urban land uses (Zwick and Carr 2006). Accordingly, it is extremely likely remaining unprotected skink habitats in the project area will be targeted for conversion to residential subdivisions, golf courses, and shopping centers.

Remaining skink habitats are also threatened by degradation resulting from fire exclusion and lack of management. Xeric habitats favored by skinks require periodic fire to maintain optimal habitat values, such as patches of bare sand and low shrub architecture. The need to protect agricultural, residential, and commercial development has resulted in the suppression of wildfires. Furthermore, implementing prescribed burns in areas adjacent to residential areas is difficult due to safety concerns and objections of local residents. The Service is unaware of any recent fires within the action area. Xeric habitats lacking periodic fire or management become overgrown and less suitable to skinks. Over time, skinks will diminish in abundance and eventually may be extirpated. All occupied and potentially suitable skink habitat on the proposed project is isolated habitat within a highly urbanized area. The project site is not likely to provide viable habitat for sand skinks in the long term given existing surrounding land use. The occupied skink habitat in the action area associated with the Preserve would benefit greatly from burning, roller chopping, and other suitable types of management practices. The Preserve also has a management plan and endowment to facilitate these management practices. Mechanical treatments, such as roller chopping, are not the preferred method for management of skink habitat because the use of heavy equipment could potentially crush and kill skinks, adversely affect suitable skink habitat by depositing vegetative debris into bare areas, and compact soils over time. However, mechanical management of skink habitat should be considered if the use of fire is not feasible.

Eastern Indigo Snake

Based on available aerial photographs (<http://web.uflib.ufl.edu/digital/collections/FLAP/>), the historic land use in the action area was dry prairie and xeric scrub with pockets of freshwater marsh until sometime after 1959. Based on historic land use, this area contained high-quality habitat for indigo snakes; however, the site is isolated from contiguous indigo snake habitat by the surrounding development. Although the habitat is isolated from other indigo snake habitat, we are considering the entire site to be usable. The Service recognizes it is unlikely snakes and other potential prey can cross New Independence Parkway (SR 429), or West Irlo Bronson Memorial Highway (US 192) successfully, therefore it is likely any potential indigo snakes on-site exist independently of other snakes off-site.

It is difficult 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. As this is the best data available, we believe the comparisons are valid and represent a conservative approach.

A 26-year study conducted by Layne and Steiner (1996) at ABS estimated a population density of 2.6 indigo snakes (1.9 males, 0.7 females) per 100 hectares (247 acres). They also estimated a lower density based on 5 snakes (3 males and 2 females) that occupied 314 hectares at 1.6 indigo snakes per 100 hectares (0.96 males to 0.64 females). ABS is approximately 80 miles south 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 (1996) also 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 acres.

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 millimeters; $n = 36$) 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 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 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.

The habitat on the project site is less than optimal due to the condition of the site and its geographic isolation. As it is the only available study in suboptimal habitat, we have used Layne and Steiner's

(1996) estimates of densities in sugar cane as a surrogate for the project. Therefore, we believe there may one territory on the 54 acre site. Assuming the eastern indigo snakes present at the Rolling Oaks South site are present in a 1:1 sex ratio, the one territory would equate to two eastern indigo snakes.

We do not expect the dry prairie area to solely comprise an eastern indigo snake territory due to lack of vegetative cover; however, the remaining forested portions of the site provide ample cover for both eastern indigo snakes and their prey.

EFFECTS OF THE ACTION

This section includes an analysis of the direct and indirect effects of the proposed action on the sand skink, bluetail mole skink, and eastern indigo snake; and the effects of interrelated and interdependent activities associated with the proposed action.

Sand Skink and Bluetail Mole Skink

Factors to be considered

This project site contains occupied skink habitat and is located within the geographic range of the sand skink and bluetail mole skink. The timing of construction for this project, relative to sensitive periods of the skink's life cycle, is unknown. Skinks are currently found within the proposed construction footprint. The project will be constructed in phases and the time required to complete construction of the project is not known. The disturbance associated with the project will be permanent and will result in a loss of remnant habitat currently available to the skinks. Disturbance may occur in the form of pedestrian, vehicular, or excessive noise over the phases of the proposed project. Construction noise could disturb skinks where it exceeds ambient noise. The land clearing and construction of the infrastructure involves use of heavy equipment that may also injure or kill eastern indigo snakes.

There is very little undeveloped land in the vicinity of the proposed project; therefore, the potential for emigration from the site is limited. Several residential developments surround the site, and narrow corridors or patch landscape are all that exist to sustain prey and provide cover for the indigo snakes in these areas. It is unlikely skinks would survive attempting to cross the New Independence Parkway (SR 429), or West Irlo Bronson Memorial Highway (US 192). Due to these physical barriers in the landscape, it is the Service's opinion skinks are very unlikely to disperse to or from the project site.

Beneficial effects

About 70 acres of occupied skink habitat located on the Preserve will be preserved and managed in perpetuity as part of the Management Plan developed for this regionally significant scrub conservation bank. The Preserve consists of approximately 487 acres located on the LWR (Figure 4). The purpose for establishing the Preserve is to conserve these on-site communities and habitats and to manage them in perpetuity for sand skinks, bluetail mole skinks, and other indigenous wildlife species.

A Management Plan has been prepared for the Preserve and approved by the FWC and Service. A Conservation Easement has been recorded and assigned to the FWC, and perpetual management of the Preserve will be funded by the Endowment Fund established with the Wildlife Foundation of Florida Mitigation Trust Funds, Incorporated, to assure financial support for dedication and management of the Preserve in perpetuity. The Service provided written approval and concurrence with the Agreement and establishment of the Preserve on January 19, 2011.

Direct effects

Direct effects are those effects caused by the proposed action, at the time of construction, and are reasonably certain to occur. The direct effects this project will have on sand skinks and bluetail mole skinks within the action area are discussed below.

The construction of the project will result in the direct loss of about 35 acres of occupied skink habitat. Incidental mortality of skinks due to land clearing and construction activities may also occur. Mechanical preparation of the proposed project site can crush or injure individual skinks and skink eggs, and destroy or degrade occupied and potential habitat and foraging areas. In addition, any clearing activities may adversely affect skinks by causing them to leave the area and possibly miss foraging and mating opportunities. Individual skinks fleeing the area may be more vulnerable to predation. The Service considers this project, as proposed, to represent a threat of disturbance to skinks. In addition, the project will add to the continued fragmentation of skink habitat in the region and result in a small reduction of the geographic distribution of these species. Therefore, the proposed work is expected to directly affect 35 acres of occupied sand and bluetail mole skink habitat and result in the incidental mortality of sand and bluetail mole skinks in the project area.

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. Interrelated actions include the purchase 70 acres of skink mitigation from the Preserve. Interdependent actions are not expected to result from the project.

Indirect effects

Indirect effects are those effects that result from the proposed action, will occur later in time, and are reasonably certain to occur. The indirect effects this project will have on skinks within the action area are discussed below.

The construction of the proposed commercial development will increase vehicle traffic in the action area. The increase in the commercial activity from the project may stimulate further development in the project area such as road widening and construction of new roadways to accommodate the increase in local traffic and construction of service related facilities (*e.g.*, grocery stores, gas stations, etc.) on privately owned lands in the project vicinity. Such

development may result in the conversion of skink habitat to buildings, parking lots, roadways, and other land uses unsuitable as skink habitat. The habitat loss resulting from these projects may continue to fragment habitat in the action area and further reduce the geographic range of the species.

Eastern Indigo Snake

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 Rolling Oaks South project site is primarily xeric scrub and dry prairie. With the absence of other large tracts of undeveloped parcels in this part of Osceola County, it is likely the site could act as a sink for all wildlife needing larger natural areas, including the indigo snake. The Service believes the presence of other snakes, gopher tortoise burrows, and suitable habitat provides a good indication of the potential for eastern indigo snakes to occur on site.

The proposed action will result in loss of cover, habitat, and associated prey, and disturbance may occur in the form of pedestrian, vehicular, or excessive noise over the phases of the proposed project. Construction noise could disturb eastern indigo snakes where it exceeds ambient noise. Visual disturbance from personnel and equipment could also affect eastern indigo snakes by causing the snakes to avoid, or flee from, active construction areas. Although personnel will be advised to avoid eastern indigo snakes, the operation of equipment in heavily vegetated areas where snakes may not be visible may result in direct injury or mortality. The land clearing and construction of the infrastructure involves use of heavy equipment that may also injure or kill eastern indigo snakes.

There is very little undeveloped land in the vicinity of the proposed project; therefore, the potential for emigration from the site is limited. Several residential developments surround the site, and narrow corridors or patch landscape are all that exist to sustain prey and provide cover for the indigo snakes in these areas. It is unlikely snakes would survive attempting to cross the New Independence Parkway (SR 429), or West Irlo Bronson Memorial Highway (US 192). Due to these physical barriers in the landscape, it is the Service's opinion indigo snakes are very unlikely to disperse to or from the project site.

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 and it is likely construction will occur year-round in at least some areas of the site. The project will be constructed in phases and the time required to complete construction of the project is not known. Therefore, eastern indigo snakes using the site are likely to be disturbed or harassed for the duration of construction.

Analyses for effects of the action

The 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). This makes the quantifiable determination of effects of a project difficult.

The direct effects that this project may have on indigo snakes within the action area are discussed below. The total area directly affected is estimated to be 54 acres, the entire project area.

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, 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 initial clearing of vegetation could crush or injure individual snakes and their nests and destroy or degrade occupied and potential den sites. However, the applicant has agreed to implement the *Standard Protection Measures for the Eastern Indigo Snake* (Service 2004) as part of the proposed action; therefore, it is possible that not all indigo snakes encountered during preparation activities will be injured or killed. 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.

Harassment: Noise associated with the proposed activities could disturb snakes where it exceeds ambient noise. Additionally, visual disturbance from personnel during site preparation and clearing activities could also affect snakes.

The *Standard Protection Measures for the Eastern Indigo Snake* require the applicant to develop a protection/education plan for all construction personnel to follow. Onsite personnel should be familiar with the physical description of the snake and what to do if a snake is observed during any phase of construction activities. An eastern indigo snake must be allowed to leave the site on its own accord and must not be harassed in any way.

Disturbance during construction: The increased human presence on the site during clearing and construction along with the operation of 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, intraspecific aggression, and mortality from vehicle strikes.

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 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 the site. The Service recognizes the possibility that a small number of indigo snakes may temporarily continue to occupy the project area post-construction. These snakes will be at risk for vehicular injuries or death. In addition, these snakes may experience harassment from living in close proximity to development as this increases the likelihood of snakes being killed or injured by property owners and domestic pets.

Loss of Prey: We expect that a prey base for the eastern indigo snake is available on the project site. This prey base would likely be diminished in the post-construction environment due to the land use conversion.

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. Interrelated actions include the purchase 70 acres of skink mitigation from the Preserve. Interdependent actions are not expected to result from the project.

Species' response to the proposed action

Construction, operation, and maintenance of the project may result in actions that could kill or injure individual eastern indigo snakes, 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 try to leave the area, and possibly miss foraging and mating opportunities. Individual eastern indigo snakes attempting to flee the area are likely to be unsuccessful due to surrounding major roadways, and any who manage to successfully disperse may be more vulnerable to predation and intraspecific aggression. The Service anticipates the number of eastern indigo snakes at the site will be less after construction than that of the baseline condition. This is due primarily to the habitat loss. We anticipate up to two eastern indigo snakes may currently inhabit the site.

The Service anticipates approximately 54 acres of potential eastern indigo snake habitat within the construction site will be affected by the proposed action. The number of individuals present at the time of the action is not known; however, the Service estimates as many as one male and one female indigo snakes may be present within the construction area of the project. Furthermore, we anticipate up to one nest 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.

Although unlikely, the possibility exists a small number of eastern indigo snakes may continue to use the site following construction if vegetative cover and prey items are present. However, these snakes will be subject to effects due to ongoing activities on site as discussed above in the indirect effects section.

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 unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Sand Skink and Bluetail Mole Skink

Anticipated future county actions in the action area that will adversely affect skink habitat include the issuance of county building permits. Permits to construct single-family homes and commercial buildings within the action area are required by Osceola County. Many of the construction projects impacting skink habitat in the action area will require both a county building permit and a Corps permit, and will require consultation under section 7 of the Act.

Some construction projects requiring county building permits will not impact wetlands and will not require a permit from the Corps. In general, these projects will not have a Federal nexus requiring consultation with the Service under the Act. However, applicants obtaining county building permits are not absolved from the prohibition of take of listed species under the Act. Section 10 of the Act provides a means for permitting the incidental take of listed species associated with non-Federal actions such as county building permits. Issuance of an incidental take permit under Section 10 of the Act requires the applicant to prepare a Habitat Conservation Plan (HCP), acceptable to the Service, describing how impacts to the species will be minimized and mitigated for to the maximum extent practicable. An acceptable HCP for a non-Federal action affecting federally listed skinks would generally require conservation measures that include the enhancement, restoration, or preservation of skink habitat. The Service has considered cumulative effects within the action area for the sand skink and bluetail mole skink, and based on the above discussion, we have not identified any additional cumulative effects beyond those already discussed in the Environmental Baseline.

Eastern Indigo Snake

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 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 the surrounding

area is already heavily developed; there is little potential for future development. 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 beyond those already discussed in the Environmental Baseline.

CONCLUSION

Sand Skink and Bluetail Mole Skink

After reviewing the current status of the sand skink and the bluetail mole skink, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's Biological Opinion the project as proposed, is not likely to jeopardize the continued existence of the sand skink or bluetail mole skink. Critical habitat for the sand skink and bluetail mole skink has not been designated. Therefore, critical habitat will not be affected.

Construction of the project will result in the permanent loss of 35 acres of occupied sand skink and bluetail mole skink habitat. However, the loss of this habitat is expected to be offset by the purchase of appropriate off-site mitigation from the Preserve, and is not expected to appreciably affect the overall survival and recovery of the sand skink or bluetail mole skink.

Eastern Indigo Snake

The project will remove 54 acres of moderately suitable habitat which is already fragmented from other potential snake habitat by major roads and development. This is less than 0.5 percent of the potential habitat for eastern indigo snakes available on public and agricultural lands in Osceola County alone. After reviewing the current status of the eastern indigo snake, the environmental baseline for the action area, the effects of the proposed action and anticipated cumulative effects, it is the Service's biological opinion that the project, as proposed, is not likely to jeopardize the continued existence of the eastern indigo snake. No critical habitat has been designated for this species; therefore, none will be affected.

We anticipate all eastern indigo snakes (one male, one female, one nest) will over time be extirpated from the site as there will be limited cover available to hide and support sufficient forage. The habitat that will remain on site is neither contiguous nor large enough to support snakes indefinitely. The potential loss of eastern indigo snakes present at the site will not significantly reduce the numbers, distribution, and reproduction of indigo snakes in south Florida.

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 to 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 such taking is in compliance with the terms and conditions of this incidental take statement.

The terms and conditions described below are nondiscretionary and must be undertaken by the Corps so they become binding conditions of any grant or permit issued to Rolling Oaks South, 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 Rolling Oaks South, to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protection coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Corps or Rolling Oaks South, 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

Sand Skink and Bluetail Mole Skink

The Service has reviewed the biological information for these species, information presented by the applicant's consultant, and other available information relevant to this action; and, based on our review; incidental take is anticipated for 35 acres of occupied skink habitat due to the construction of a new commercial development. The Service anticipates incidental take of sand skinks and bluetail mole skinks will be difficult to detect and quantify for the following reasons: skink density varies considerably within and between apparently suitable habitat patches; density dependent mechanisms are currently unknown and may be due to territorial requirements, micro habitats, and other unknown environmental influences; individuals have a small body size and spend the majority of their time underground; and finding a dead or impaired specimen is unlikely. Bluetail mole skinks have not been located onsite; however, this species is usually found in habitats occupied by sand skinks in Polk, Highlands, and Osceola Counties, and a reliable survey technique to detect bluetail mole skinks is not currently available. Therefore, incidental take of both sand skinks and bluetail mole skinks can be anticipated within the 35 acres of suitable skink habitat located in the project footprint due to land clearing and construction activities associated with the project. Therefore, the Service believes all individuals occurring within this 35-acre portion of the project footprint will be incidentally taken. The incidental take is expected to be in the form of harm, injury, or death due to construction activities, and/or habitat loss, or disturbance.

Eastern Indigo Snake

The Service anticipates the action will cause the permanent loss or degradation of 54 acres of indigo snake habitat on the project site. Permanent loss of habitat will occur through clearing

and development of the site. 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 up to two indigo snakes and up to 1 eastern indigo snake nest may be present on the site under pre-construction conditions. Of these, we anticipate up to two eastern indigo snakes may be harmed (injury or mortality) incidental to project construction and the productivity associated with up to one eastern indigo snake nest may also be lost through direct mortality incidental to project construction.

After site clearing and development, we anticipate the project site will not continue to support eastern indigo snakes. The green spaces of the proposed development are not contiguous with other undeveloped land and are too small to support a snake indefinitely. If a snake were to return to the site post development, the increase in traffic could lead to future mortality or injury. Human involvement and maintenance of the facility would likely deter snakes from returning. Therefore, we anticipate all eastern indigo snakes at the project site could be incidentally taken through harassment for the life of the project.

EFFECT OF THE TAKE

The Service has determined this level of anticipated take is not likely to jeopardize the continued existence of the sand skink, bluetail mole skink, or eastern indigo snake. If, during the course of this action, this level of take is exceeded; such take would represent new information requiring review of the reasonable and prudent measures provided. The Federal agency must immediately provide modification of the reasonable and prudent measures.

REASONABLE AND PRUDENT MEASURES

When providing an incidental take statement, the Service is required to give reasonable and prudent measures it considers necessary or appropriate to minimize the take along with terms and conditions that must be complied with, to implement the reasonable and prudent measures. Furthermore, the Service must also specify procedures to be used to handle or dispose of any individuals taken.

Sand Skink and Bluetail Mole Skink

The Service believes the following reasonable and prudent measures are necessary and appropriate to reduce take and to minimize the direct and indirect effects of the proposed project on the sand skink and bluetail mole skink:

1. Notify the Service of any unauthorized take of sand skinks or bluetail mole skinks; and
2. Minimize adverse effects of habitat loss and fragmentation to sand skinks and bluetail mole skinks by implementing an appropriate compensation plan.

Eastern Indigo Snake

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.

The Corps has stated it will require the applicant to follow the *Standard Protection Measures for the Indigo Snake* (Service 2004). These measures require the applicant to develop an indigo snake protection/education plan. Within this protection/education plan the applicant will develop an eastern indigo snake educational brochure to be available to contractors. Additionally, the plan will identify what to do and who to contact in the event an indigo snake is encountered. This plan must be submitted and approved by the Service 30 days prior to land clearing activities.

We have considered these measures in this Biological Opinion and believe they are critical in minimizing take associated with the proposed action. No additional reasonable and prudent measures are necessary or appropriate to further minimize the incidental take of indigo snakes.

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.

Sand Skink and Bluetail Mole Skink

1. As a condition of the DA permit, the applicant will purchase credits for 70 acres of sand skink and bluetail mole skink habitat located within the Preserve. The applicant will finalize the transfer of funds for this purchase prior to commencement of activities authorized under DA permit application number SAJ-2006-7408 (IP-JSC), if issued. The applicant will provide a copy of the Receipt of purchase for 70 acres of Conservation Credits from the Preserve, and the Preserve Owner shall issue a Credit Receipt to the purchaser and provide the Service with a Copy of the Credit Receipt within 30 days of the issuance. Signed copies of these documents shall be provided to the Service prior to commencement of activities authorized under DA permit application number SAJ-2008-3815 (IP-JSC), if issued.
2. Upon locating a dead sand skink or bluetail mole skink specimen, initial notification must be made to the nearest Service Law Enforcement Office (Mr. Edward Lewis; U.S. Fish and Wildlife Service; 1-239-561-8148). Secondary notification should be made to the FWC; South Region, 3900 Drane Field Road; Lakeland, Florida, 33811-1299; 1-800-282-8002. Care must be taken in handling any dead specimens of proposed or listed species found in the project area to preserve the specimen or its remains in the best possible state. In conjunction with the preservation of any dead specimens, the finder has the responsibility to ensure evidence intrinsic to determining the cause of death of the specimen is not unnecessarily disturbed. The finding of dead specimens does not imply enforcement proceedings pursuant to the Act. The reporting of dead specimens is required to enable the Service to determine if take is reached or exceeded and to ensure the terms and conditions are appropriate and effective. If not specifically instructed by Service law enforcement to submit dead specimens, all dead specimens should be provided to the Florida Museum of Natural History, SW 34th Street and Hull Road, PO Box 112710, Gainesville, Florida 32611 (352-846-2000). Contact the museum for details on how best to preserve and provide the specimen.

Eastern Indigo Snake

1. 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 (Mr. Edward Lewis; U.S. Fish and Wildlife Service; 1-239-561-8148). Secondary notification should be made to the FWC, South Region; 3900 Drane Field Road; Lakeland, Florida, 33811-1229; 1-800-282-8022. Injured indigo snakes may be transported to the Florida Wildlife Hospital; 4560 North U.S. 1, Melbourne, Florida, 32935; 321-254-8843 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.
2. 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 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 evidence intrinsic to the specimen is not unnecessarily disturbed.

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 Act listed species or critical habitat, to help implement recovery plans, or to develop information. The Service recommends the following:

Sand Skink and Bluetail Mole Skink

- Place any additional sand skink habitat on the project site, not needed for construction of the project, under conservation easement.
- The Service recommends funding skink genetic and demographic research projects. Such findings are needed to better assess impacts of habitat loss on the population dynamics of skinks, identify vulnerable populations, identify priority conservation areas, and refine mitigation strategies under section 10 of the Act. This information will also improve the Service's knowledge about the biology of the skink, particularly as it relates to the effects of residential and commercial development.

Eastern Indigo Snake

- We recommend following construction, the Applicant maintain an on-site, educational kiosk for the public on the listed species and other wildlife that may be observed in on project site, including indigo snakes.

- We recommend the Applicant participate with research-based efforts to provide for long-term ecological monitoring on indigo snake prey densities and habitats in the project area.

REINITIATION NOTICE

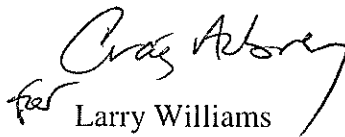
This concludes formal consultation on the Rolling Oaks South project. As provided in 50 CFR Section 402.16, reinitiation of formal consultation is required when discretionary Federal agency involvement or control over the action has been retained and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect Act listed species or critical habitat in a manner or to an extent not considered in this biological opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the Act listed species or critical habitat not considered in this Biological Opinion; or (4) a new species is listed or critical habitat is 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.

FISH AND WILDLIFE RESOURCES

The Service recommends following the Clean Water Act section 404(b)(1) guidelines in the sequence of avoidance, minimization, and the provision of compensatory mitigation for wetland impacts.

Thank you for your cooperation in the effort to protect fish and wildlife resources. If you have any questions regarding this project, please contact Chuck Kelso by email at Charles_Kelso@fws.gov , or by phone at 772-469-4241.

Sincerely yours,

A handwritten signature in black ink, appearing to read "Larry Williams", with a stylized flourish extending from the bottom left.

Larry Williams
Field Supervisor
South Florida Ecological Services Office

cc: electronic only
Corps, Cocoa, Florida (Jeffrey Collins)
FWC, Vero Beach, Florida (Tim Tolles)
Service, Atlanta, Georgia (Ken Graham)

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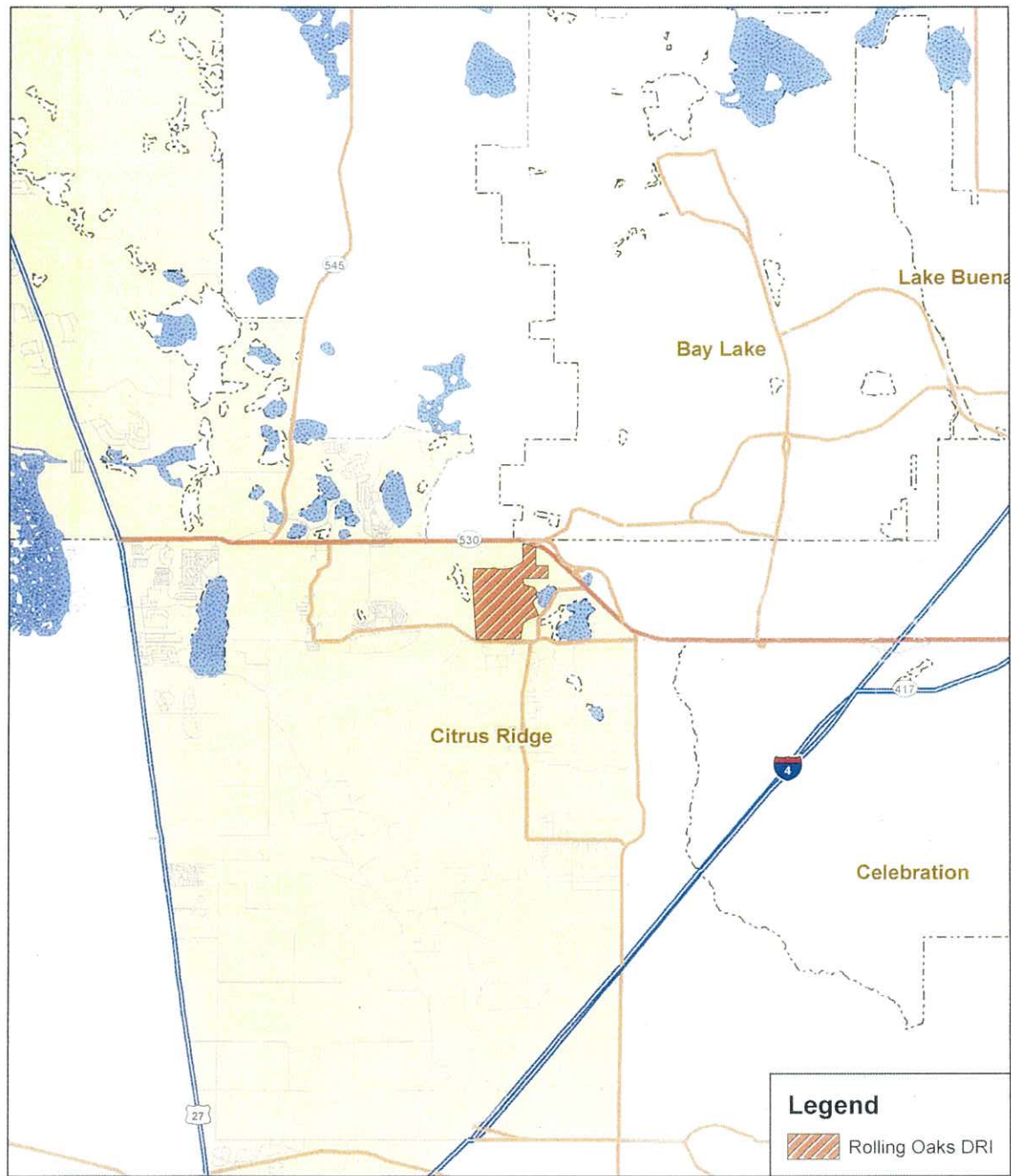
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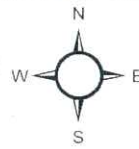
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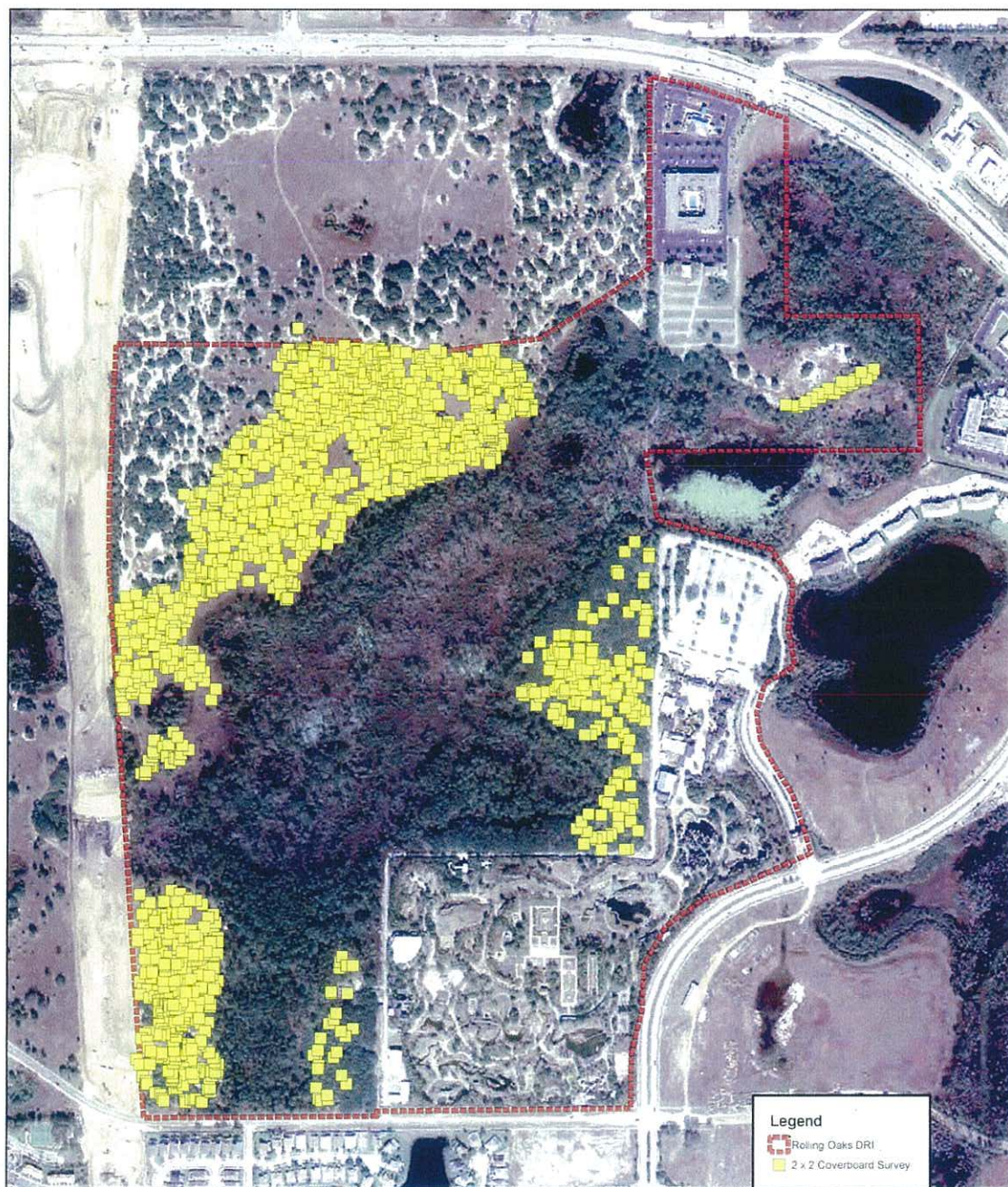
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 Environmental and Permitting Services
 2002 E. Robinson St. Orlando, FL 32803
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 www.bio-techconsulting.com

Rolling Oaks DRI
 Osceola County, Florida
 Figure 1
 Location Map



Project #: 107-11
 Produced By: BMM
 Date: 8/20/2009

Figure 1. Map showing the location of the Rolling Oaks South project site.



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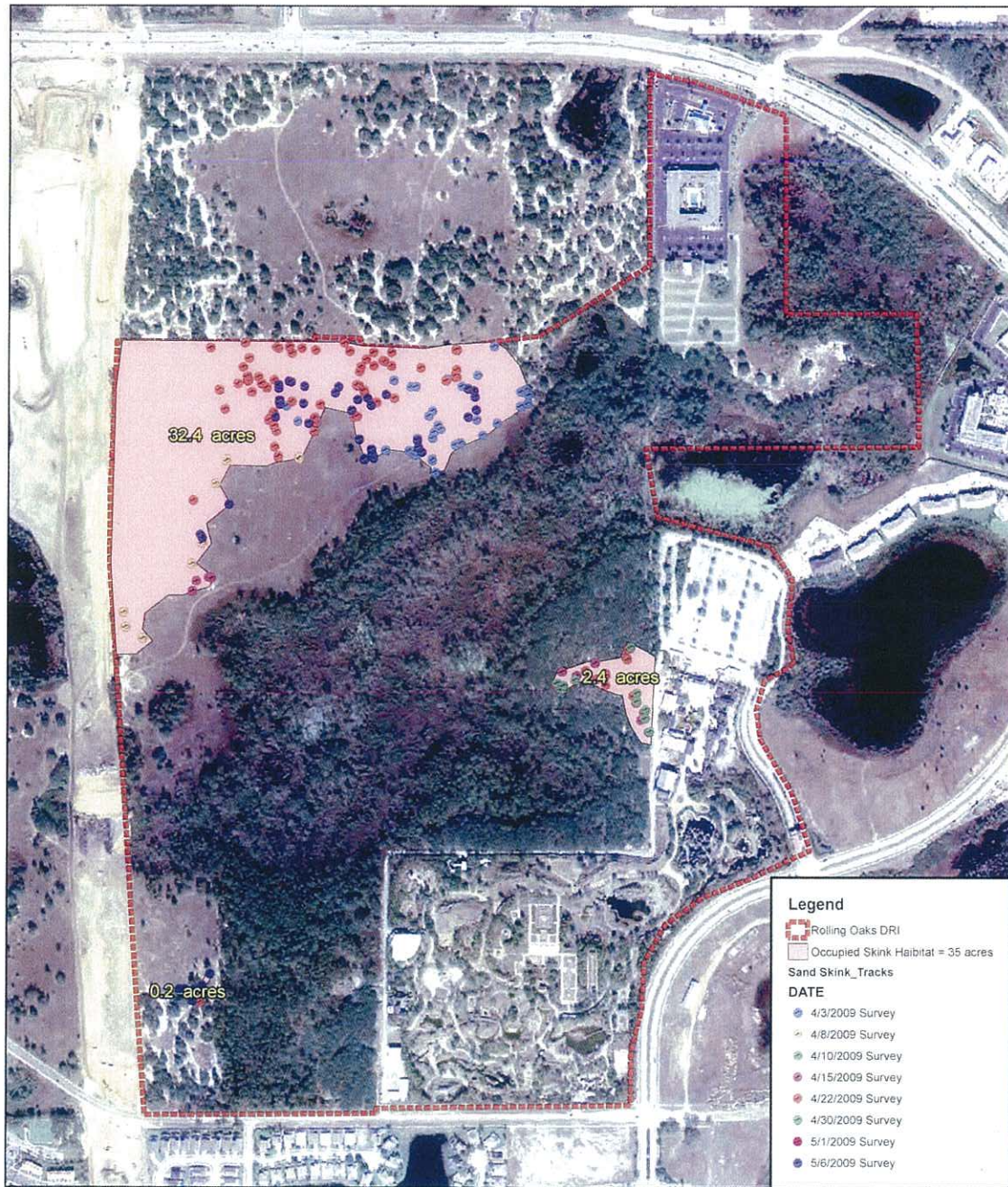
Rolling Oaks DRI
Osceola County, Florida

Coverboard Survey Map



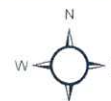
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Project #: 533-01
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Figure 2. Map showing the skink coverboard survey locations on the Rolling Oaks South site.



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Rolling Oaks DRI
 Osceola County, Florida



710
 Feet

Project #: 533-01
 Produced By: BMM
 Date: 8-13-09

Territory & Observed Sand Skink Trails

Figure 3. Map showing the occupied habitat sand skink habitat on the Rolling Oaks South site delineated from the coverboard survey (see Figure 2).

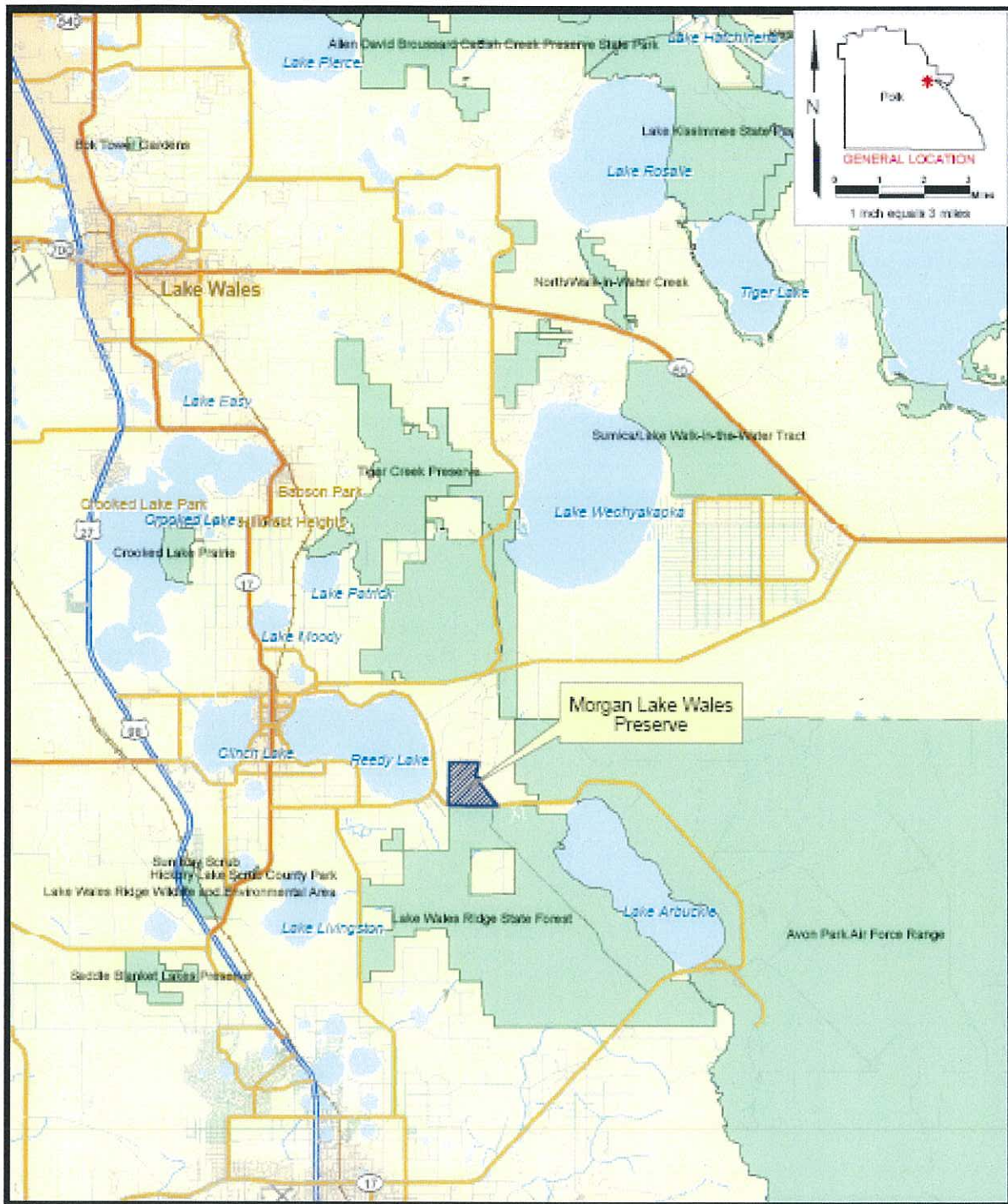


Figure 4. Map showing the location of the Morgan Lake Wales Preserve in Polk County.