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FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
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Vero Beach, Florida 32960

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Memorandum to File

Subject: Biological Opinion and Conference Opinion for the proposed issuance of a Section 10(a)(1)(B) permit to SP Behavioral, LLC, for incidental take of the Florida scrub-jay and eastern indigo snake, and impacts to the gopher tortoise

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This document transmits the U.S. Fish and Wildlife Service's (Service) biological and conference opinions based on our review of the proposed issuance of section 10(a)(1)(B) incidental take permit (Permit) to SP Behavioral, LLC, (Applicant) for the expansion of the Sandy Pines Residential Treatment Center (Sandy Pines) in Martin County, Florida, and its effects on the threatened Florida Scrub-jay (*Aphelocoma coerulescens*) (scrub-jay), the threatened eastern indigo snake (*Drymarchon corais couperi*), and the candidate gopher tortoise (*Gopherus polyphemus*) per section 7 of the Endangered Species Act of 1973, as amended (Act) (16 United States Code [U.S.C.] 1531 *et seq.*).

These biological and conference opinions are based on information provided in the Applicant's Habitat Conservation Plan (HCP), letters, email correspondence, a site visit, and the Service's South Florida Multi-species Recovery Plan (Service 1999). A complete record of this consultation is maintained and available for review at the Service's South Florida Ecological Services Office, Vero Beach, Florida.

Consultation History

On April 30, 2012, the Service received a request for technical assistance from Kimley-Horn and Associates, Incorporated, (Consultant) on behalf of the Applicant regarding the proposed expansion of Sandy Pines.

Between May and June 2012, the Service reviewed documentation provided by the Consultant and Martin County on the site plan approval process, the scrub-jay surveys conducted by the Consultant, and the Preserve Area Management Plan (PAMP) prepared for Martin County to determine if the project was likely to affect the scrub-jay.

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On July 2, 2012, the Service met with the Applicant and the Consultant to discuss the status of the Service's review of the PAMP, the results of scrub-jay surveys conducted at Sandy Pines and the adjacent Jonathan Dickinson State Park (JDSP), and the Service's opinion regarding potential effects.

On July 6, 2012, the Service sent an email to the Applicant and its consultant indicating that the project will require a Habitat Conservation Plan (HCP) and Incidental Take Permit (ITP) to address the proposed Project's potential impacts on scrub-jays.

On July 31, 2012, the Service met with the Applicant and the Consultant to discuss the Permit application process, development of an HCP, and mitigation options.

Between September and November 2012, the Service received draft HCPs and provided comments to the Consultant.

On December 10, 2012, the Consultant submitted the final draft HCP to the Service.

From December 2012 to January 2013, Service staff corresponded by telephone and e-mail with the Consultant and applicant to discuss the progress of the HCP, remaining tasks, and maintenance funding for the preserve area.

On January 23, 2013, the Service attended the Martin County preconstruction meeting on-site and authorized minor vegetation removal for the installation of silt fence, provided the silt fence avoided all gopher tortoise burrows.

On February 13, 2013, the Notice of Availability of the HCP and National Environmental Policy Act (NEPA) documents was published in the Federal Register; the public comment period closed on March 15, 2013.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

The Service proposes to issue a Permit to the Applicant under section 10(a)(1)(B) of the Act in order to authorize take of scrub-jays and eastern indigo snakes incidental to the expansion of Sandy Pines, located at 11301 SE Tequesta Terrace, Tequesta, in Section 24, Township 40 East, Range 42 South, Martin County, Florida (Figure 1). The Permit would cover the addition of 36,167 square feet of educational and residential space, construction of recreational courtyards, expansion of parking areas (paved and unpaved), expansion of the dry retention facility, and construction of a stabilized service road for fire safety, which would permanently alter 2.99 acres of scrub-jay, eastern indigo snake, and gopher tortoise habitat on the Applicant's 18.59-acre property in Martin County, Florida (Project). The Permit would also cover scrub habitat management activities on the 6.0-acre on-site conservation area, provided the Applicant succeeds in finding a grantee such that the on-site conservation easement can be established. Should no appropriate grantees be available, the Applicant will pay into the Florida Scrub-jay Conservation Program Fund (Conservation Fund), as described below.

The Project footprint was planned to locate the expansion and material staging areas as much as practical in currently developed areas, areas impacted by exotic vegetation, and in areas as close to the existing facility as possible, thus minimizing the impacts to native habitat. The Applicant agreed to conduct a scrub-jay nest survey prior to site clearing to confirm that scrub-jays are not nesting on the subject site. If scrub-jays are nesting, land clearing will not commence until after scrub-jay nesting season (March 1 through June 30).

The Applicant proposes to mitigate the potential effects to the scrub-jay by placing 6.0 acres of upland scrub in a conservation easement with third party enforcement rights dedicated to the Service. The Applicant is coordinating with Jonathan Dickinson State Park (JDSP) and the State of Florida, as well as local non-profit conservation organizations, to find an entity to act as grantee on the easement. The process with JDSP and the State may require approval from the Board of Trustees for the Internal Improvement Trust Fund. To provide adequate time to complete that process, within 6 months after permit issuance, the Applicant shall provide proof to the Service that the State of Florida, or other conservation organization, has accepted the easement; shall record the easement over the conservation area; and provide proof of such recording to the Service. The Applicant will coordinate with the Service for approval of an alternate grantee prior to finalizing and recording the easement, if the grantee is an entity other than JDSP.

A Sandy Pines Board of Trustees Resolution earmarked funds in the amount of $32,500.00 to ensure money is available for the maintenance and monitoring activities during the first 5 years, and subsequent monitoring in years 10 and 15; these funds will be kept and managed by Sandy Pines. A separate non-wasting fund in the amount of $14,000.00 will be established by SP Behavioral, LLC, with the Wildlife Foundation of Florida Mitigation Trust Funds, Incorporated, within 6 months after Permit issuance. At an anticipated annual net interest rate of 3 percent, this will yield $2,100.00 every 5 years to ensure the mitigation area is managed in perpetuity.

If no suitable entity is found to act as grantee, the Applicant shall pay into the Florida Scrub-jay Conservation Program Fund (Conservation Fund). The amount of funding to be paid to the Conservation Fund will be equal to the 2013 Conservation Fund amount approved by the Service for the Martin scrub-jay metapopulation ($36,558 per acre) multiplied by 6 acres (for a total of $219,348.00).

Suitable habitat for the threatened eastern indigo snake is present on the Project site. Although eastern indigo snakes have been reported on JDSP, no observations or evidence of this species was encountered on the Project site. The Applicant has agreed to implement the Service's February 12, 2004, *Standard Protection Measures for the Eastern Indigo Snake (Drymarchon corais couperi)* (Service 2004) during construction.

Twenty, apparently active, gopher tortoise burrows were found on the Project site; 7in the construction area, and 13 in the proposed conservation area. The Applicant has received a permit from the Florida Fish and Wildlife Conservation Commission (FWC) to relocate gopher tortoises from the construction area to the proposed on-site conservation area. A silt fence will be erected to separate the construction area from the proposed conservation area, and the Applicant's contractor will be required to conduct walk-throughs of the site to confirm gopher tortoises have not penetrated the silt fence and moved into the construction area. Compromised silt fences will be repaired as soon as possible to reduce further gopher tortoise encroachment.

The Project site is surrounded on the north, east, and west by JDSP, and by a drainage canal and residential development to the south. The Project site consists of approximately 7.02 acres of the existing residential medical facility, 0.51 acre of dry detention, 1.05 acres of exotics, 2.19 acres of pine flatwoods, and 7.82 acres of sand pine-oak scrub. The site is vegetated with sand pine (*Pinus clausa*) and slash pine (*P. elliottii*), with a sub canopy of scrub live oak (*Quercus virginiana*) and chapman oak (*Q. chapmanii*). Ground cover consists of saw palmetto (*Serenoa repens*), rusty lyonia (*Lyonia ferruginea*), wire grass (*Aristida beyrichiana*), rosemary (*Ceratiola ericoides*), gopher apple (*Licania michauxii*), prickly pear (*Opuntia* sp.), hogplum (*Ximenia americana*), fetterbush (*Lyonia lucida*), milk pea (*Galactia* sp.), scrub clover (*Dalea feayi*), joint weed (*Polygonella* sp.), love vine (*Cassytha filiformis*), and lichens (*Cladonia* sp.). Exotic species also occurring onsite include Brazilian pepper (*Schinus terebinthifolius*) and earleaf acacia (*Acacia auriculiformis*).

The action area is defined as all areas to be affected directly or indirectly by the proposed action and not merely the immediate area involved in the Project. It includes the area in which scrub-jays, eastern indigo snakes, and gopher tortoises could reasonably be expected to feed, breed, or shelter and interact with each other. The project site is part of a larger complex of scrub habitat on JDSP and in the central portion of the Martin metapopulation of scrub-jays. The action area for this Biological Opinion is considered the portion of the Martin metapopulation from the city of Hobe Sound south to the Jupiter Inlet, in Martin and Palm Beach Counties, Florida (Figure 2).

STATUS OF THE SPECIES/CRITICAL HABITAT

Florida scrub-jay

Species/Critical Habitat Description

Scrub-jays are about 10 to 12 inches long and weigh about 3 ounces. They are similar in size and shape to blue jays (*Cyanocitta cristata*), but differ significantly in coloration (Woolfenden and Fitzpatrick 1996a). Unlike the blue jay, the scrub-jay lacks a crest. It also lacks the conspicuous white-tipped wing and tail feathers, black barring, and bridle of the blue jay. The scrub-jay's head, nape, wings, and tail are pale blue, and its body is pale gray on its back and belly. Its throat and upper breast are lightly striped and bordered by a pale blue-gray "bib" (Woolfenden and Fitzpatrick 1996a). Scrub-jay sexes are not distinguishable by plumage (Woolfenden and Fitzpatrick 1984), and males, on the average, are only slightly larger than females (Woolfenden 1978). The sexes may be identified by a distinct "hiccup" call made only by females (Woolfenden and Fitzpatrick 1984; Woolfenden and Fitzpatrick 1986). Scrub-jays that are less than about 5 months of age are easily distinguishable from adults; their plumage is smoky gray on the head and back, and they lack the blue crown and nape of adults. Molting occurs between early June and late November and peaks between mid-July and late September (Bancroft and Woolfenden 1982). During late summer and early fall, when the first basic molt is nearly done, fledgling scrub-jays may be indistinguishable from adults in the field (Woolfenden and Fitzpatrick 1984). The wide variety of vocalizations of scrub-jays is described in Woolfenden and Fitzpatrick (1996b).

Scrub-jays are in the order Passeriformes and the family Corvidae. They have been called a "superspecies complex" and described in four groups that differ in geographic distribution within the United States and Mexico: *Aphelocoma californica*, from southwestern Washington through Baja California; *A. insularis*, on Santa Cruz in the Channel Islands, California; *A. woodhousii*, from southeastern Oregon and the Rocky Mountains and Great Plains to Oaxaca, Mexico; and *A. coerulescens* in peninsular Florida (American Ornithologists' Union [AOU] 1983). Other jays of the same genus include the Mexican jay or gray-breasted jay (*A. ultramarina*) and the unicolored jay (*A. unicolor*) of Central America and southwest North America (Woolfenden and Fitzpatrick 1996b).

The Florida scrub-jay, which was originally named *Corvus coerulescens* by Bosc in 1795, was transferred to the genus *Aphelocoma* in 1851 by Cabanis. In 1858, Baird made *coerulescens* the type species for the genus, and it has been considered a subspecies (*A. c. coerulescens*) for the past several decades (AOU 1957). It recently regained recognition as a full species (Florida scrub-jay, *Aphelocoma coerulescens*) from the AOU (AOU 1995) because of genetic, morphological, and behavioral differences from other members of this group: the western scrub-jay (*A. californica)* and the island scrub-jay *(A. insularis)*. The group name is retained for species in this complex; however, it is now hyphenated to "scrub-jay" (AOU 1995). From here on in the document, Florida scrub-jays will be referred to as scrub-jays.

This species account references the full species name, *A. coerulescens*, as listed in the Federal Register (Service 1987a). No critical habitat has been designated for this species; therefore, none will be affected.

Life history/Population dynamics

The scrub-jay has specific habitat needs. It is endemic to peninsular Florida's ancient dune ecosystems or scrubs, which occur on well-drained to excessively well-drained sandy soils (Laessle 1958; Laessle 1968; Myers 1990). This relict oak-dominated scrub, or xeric oak scrub, is essential habitat to the scrub-jay. This community type is adapted to nutrient-poor soils, periodic drought, and frequent fires (Abrahamson 1984). Xeric (dry) oak scrub on the Lake Wales Ridge is predominantly made up of four species of stunted, low-growing oaks: sand live oak (*Quercus geminata*), Chapman oak, myrtle oak (*Q. myrtifolia*), and scrub oak (*Q. inopina*) (Myers 1990). In optimal habitat for scrub-jays on the Lake Wales Ridge, these oaks are 3 to 10 feet high, interspersed with 10 to 50 percent unvegetated, sandy openings, and a sand pine canopy of less than 20 percent (Woolfenden and Fitzpatrick 1991). Trees and dense herbaceous vegetation are rare. Other vegetation noted along with the oaks includes saw palmetto and scrub palmetto *(Sabal etonia)*, as well as woody shrubs such as Florida rosemary and rusty lyonia.

Scrub-jays occupy areas with less scrub oak cover and fewer openings on the Merritt Island-Cape Canaveral Complex and in southwest Florida than is typical of xeric oak scrub habitat on the Lake Wales Ridge (Schmalzer and Hinkle 1992b; Breininger et al. 1995; Thaxton and Hingtgen 1996). The predominant communities here are oak scrub and scrubby flatwoods. Scrubby flatwoods differ from scrub by having a sparse canopy of slash pine; sand pine is rare. The shrub species mentioned above are common, except for scrub oak and scrub palmetto, which are more often found on the Lake Wales Ridge. Runner oak (*Q. minima*), turkey oak (*Q. laevis*),

bluejack oak (*Q. incana*), and longleaf pine (*Pinus palustris*) also have been reported. The Kennedy Space Center located in Brevard County, supports one of the largest contiguous populations of scrub-jays. Studies conducted there give good descriptions of this habitat type (Schmalzer and Hinkle 1992b).

Optimal scrub-jay habitat occurs as patches with the following attributes:

1. Ten to 50 percent of the oak scrub made up of bare sand or sparse herbaceous vegetation;
2. Greater than 50 percent of the shrub layer made up of scrub oaks;
3. A mosaic of oak scrubs that occur in optimal height (4 to 6 feet) and shorter;
4. Less than 15 percent canopy cover; and
5. Greater than 984 feet from a forest (Breininger et al. 1998).

Much potential scrub-jay habitat occurs as patches of oak scrub within a matrix of little-used habitat of saw palmetto and herbaceous swale marshes (Breininger et al. 1991, Breininger et al. 1995). These native matrix habitats supply prey for scrub-jays and habitat for other species of conservation concern. The flammability of native matrix habitats is important for spreading fires into oak scrub (Breininger et al. 1995; Breininger et al. 2002). Degradation or replacement of native matrix habitats with habitat fragments and industrial areas attract predators of scrub-jays, such as fish crows (*Corvus ossifragus*), that are rare in most regularly burned native matrix habitats (Breininger and Schmalzer 1990; Woolfenden and Fitzpatrick 1991). Matrix habitats often develop into woodlands and forests when there is a disruption of fire regimes. These woodlands and forests are not suitable for scrub-jays, decrease the habitat suitability of nearby scrub, attract predators, and further disrupt fire patterns.

Scrub-jays have a social structure that involves cooperative breeding, a trait the other North American species of scrub-jays do not show (Woolfenden and Fitzpatrick 1984; Woolfenden and Fitzpatrick 1990). Scrub-jays live in families ranging from two birds (a single-mated pair) to extended families of eight adults (Woolfenden and Fitzpatrick 1984) and one to four juveniles. Fledgling scrub-jays stay with the breeding pair in their natal (birth) territory as "helpers," forming a closely-knit, cooperative family group. Prebreeding numbers are generally reduced to either a pair with no helpers or families of three or four individuals (a pair plus one or two helpers) (Woolfenden and Fitzpatrick 1996a).
Scrub-jays have a well-developed intrafamilial dominance hierarchy with breeder males most dominant, followed by helper males, breeder females, and, finally, female helpers (Woolfenden and Fitzpatrick 1977; Woolfenden and Fitzpatrick 1984). Helpers take part in sentinel duties (Woolfenden and Fitzpatrick 1984; McGowan and Woolfenden 1989), territorial defense (Woolfenden and Fitzpatrick 1984), predator-mobbing, and the feeding of both nestlings (Stallcup and Woolfenden 1978) and fledglings (Woolfenden and Fitzpatrick 1984; McGowan and Woolfenden 1990). The well-developed sentinel system involves having one individual occupying an exposed perch watching for predators or territory intruders. When a predator is seen, the sentinel scrub-jay gives a distinctive warning call (McGowan and Woolfenden 1989; McGowan and Woolfenden 1990), and all family members seek cover in dense shrub vegetation (Fitzpatrick et al. 1991).

Scrub-jay pairs occupy year-round, multipurpose territories (Woolfenden and Fitzpatrick 1978; Woolfenden and Fitzpatrick 1984; Fitzpatrick et al. 1991). Territory size averages 22 to 25 acres (Woolfenden and Fitzpatrick 1990; Fitzpatrick et al. 1991), with a minimum size of about 12 acres (Woolfenden and Fitzpatrick 1984; Fitzpatrick et al. 1991). The availability of territories is a limiting factor for scrub-jay populations (Woolfenden and Fitzpatrick 1984). Because of this limitation, nonbreeding adult males may stay at the natal territory as helpers for up to 6 years, waiting for either a mate or territory to become available (Woolfenden and Fitzpatrick 1984). Scrub-jays may become breeders in several ways:

1. By replacing a lost breeder on a non-natal territory (Woolfenden and Fitzpatrick 1984);
2. Through "territorial budding," where a helper male becomes a breeder in a segment of its natal territory (Woolfenden and Fitzpatrick 1978);
3. By inheriting a natal territory following the death of a breeder;
4. By establishing a new territory between existing territories (Woolfenden and Fitzpatrick 1984); or
5. Through "adoption" of an unrelated helper by a neighboring family followed by resident mate replacement (Woolfenden and Fitzpatrick 1984). Territories also can be created by restoring habitat through effective habitat management efforts in areas that are overgrown (Thaxton and Hingtgen 1994).

To become a breeder, a scrub-jay must find a territory and a mate. Evidence presented by Woolfenden and Fitzpatrick (1984) suggests that scrub-jays are monogamous. The pair retains ownership and sole breeding privileges in its particular territory year after year. Courtship to form the pair is lengthy and ritualized and involves posturing and vocalizations made by the male to the female (Woolfenden and Fitzpatrick 1996b). Copulation between the pair is generally out of sight of other scrub-jays (Woolfenden and Fitzpatrick 1984). These authors also reported never observing copulation between unpaired scrub-jays or courtship behavior between a female and a scrub-jay other than her mate. Age at first breeding in the scrub-jay varies from 1 to 7 years, although most individuals become breeders between 2 and 4 years of age (Fitzpatrick and Woolfenden 1988). Persistent breeding populations of scrub-jays exist only where there are scrub oaks in sufficient quantity and form to provide an ample winter acorn supply, cover from predators, and nest sites during the spring (Woolfenden and Fitzpatrick 1996b).

Scrub-jay nests are typically constructed in shrubby oaks, at a height of 1.6 to 8.2 feet (Woolfenden 1974). Sand live oak and scrub oak are the preferred shrubs on the Lake Wales Ridge (Woolfenden and Fitzpatrick 1996b), and myrtle oak is favored on the Atlantic Coastal Ridge (Toland 1991) and southern Gulf coast (Thaxton 1998). In suburban areas, scrub-jays nest in the same evergreen oak species, as well as in introduced or exotic trees; however, they build their nests in a significantly higher position in these oaks than when in natural scrub habitat (Bowman et al. 1996). Scrub-jay nests are an open cup, about 7 to 8 inches outside diameter and 3 to 4 inches inside diameter. The outer basket is bulky and built of course twigs from oaks and other vegetation, and the inside is lined with tightly wound palmetto or cabbage palm (*Sabal palmetto*) fibers. There is no foreign material as may be present in a blue jay nest (Woolfenden and Fitzpatrick 1996b).

Nesting is synchronous, normally occurring from March 1 through June 30 (Woolfenden and Fitzpatrick 1984). On the Atlantic Coastal Ridge and southern Gulf coast, nesting may be protracted through the end of July. In suburban habitats, nesting is consistently started earlier (March) than in natural scrub habitat (Fleischer 1996), although the reason for this is unknown.

Clutch size ranges from one to five eggs, but is typically three or four eggs (Woolfenden and Fitzpatrick 1990). Clutch size is generally larger in suburban habitats, and the birds try to rear more broods per year (Fleischer 1996). Double brooding by as much as 20 percent has been documented on the Atlantic Coastal Ridge and in suburban habitat within the southern Gulf coast, compared to about 2 percent on the Lake Wales Ridge (Thaxton 1998). Scrub-jay eggs measure 1.1 inches in length by 0.8 inch in breadth (Woolfenden and Fitzpatrick 1996b), and coloration "varies from pea green to pale glaucous green… blotched and spotted with irregularly shaped markings of cinnamon rufous and vinaceous cinnamon, these being generally heaviest about the larger end" (Bendire 1895). Eggs are incubated for 17 to 19 days (Woolfenden 1974), and fledging occurs 15 to 21 days after hatching (Woolfenden 1978). Only the breeding female incubates and broods eggs and nestlings (Woolfenden and Fitzpatrick 1984). Average production of young is two fledglings per pair, per year (Woolfenden and Fitzpatrick 1990; Fitzpatrick et al. 1991), and the presence of helpers improves fledging success (Woolfenden and Fitzpatrick 1990; Mumme 1992). Annual productivity must average at least two young fledged per pair for a population of scrub-jays to support long-term stability (Fitzpatrick et al. 1991).

Fledglings depend upon adults for food for about ten weeks, during which time they are fed by both breeders and helpers (Woolfenden 1975; McGowan and Woolfenden 1990). Survival of scrub-jay fledglings to yearling age class averages about 35 percent in optimal scrub; while annual survival of both adult males and females averages around 80 percent (Woolfenden and Fitzpatrick 1996b). Data from Archbold Biological Station, however, suggest that survival and reproductive success of scrub-jays in suboptimal habitat is lower (Woolfenden and Fitzpatrick 1991). These data help explain why local populations inhabiting unburned, late successional habitats become extirpated. Similarly, data from Indian River County show that mean annual productivity declines significantly in suburban areas where Toland (1991) reported that productivity averaged 2.2 young fledged per pair in contiguous optimal scrub, 1.8 young fledged per pair in fragmented moderately-developed scrub, and 1.2 young per pair fledged in very fragmented suboptimal scrub. The longest observed lifespan of a scrub-jay is 15.5 years at Archbold Biological Station in Highlands County (Woolfenden and Fitzpatrick 1996b).

Scrub-jays are nonmigratory and permanently territorial. Juveniles stay in their natal territory for up to 6 years before dispersing to become breeders (Woolfenden and Fitzpatrick 1984; Woolfenden and Fitzpatrick 1986). Once scrub-jays pair and become breeders, generally within two territories of their natal area, they stay on their breeding territory until death. In suitable habitat, fewer than 5 percent of scrub-jays disperse more than 5 miles (Fitzpatrick et al. unpublished data). All documented long-distance dispersals have been in unsuitable habitat such as woodland, pasture, or suburban plantations. Scrub-jay dispersal behavior is affected by the intervening land uses. Protected scrub habitats will most effectively sustain scrub-jay populations if they are located within surrounding habitat types that can be used and traversed by scrub-jays. Brushy pastures, scrubby corridors along railway and road rights-of-way, and open

burned flatwoods offer links for colonization among scrub-jay populations. Stith et al. (1996) believe that a dispersal distance of 5 miles is close to the biological maximum for scrub-jays.

Scrub-jays forage mostly on or near the ground, often along the edges of natural or man-made openings. They visually search for food by hopping or running along the ground beneath the scrub or by jumping from shrub to shrub. Insects, particularly orthopterans (*e.g.*, locusts, crickets, grasshoppers, beetles) and lepidopteran (*e.g.*, butterfly and moth) larvae form most of the animal diet throughout most of the year (Woolfenden and Fitzpatrick 1984). Small vertebrates are eaten when encountered, including frogs and toads (*Hyla femoralis*, *H. squirella*, rarely *Bufo quercicus*, and unidentified tadpoles), lizards (*Anolis carolinensis*, *Cnemidophorus sexlineatus*, *Sceloporus woodi*, *Eumeces inexpectatus*, *Neoseps reynoldsi*, *Ophisaurus compressus*, *O. ventralis*), small snakes (*Thamnophis sauritus*, *Opheodrys aestivus*, *Diadophis punctatus*), small rodents (cotton rat [*Sigmodon hispidus*], *Peromyscus polionotus*, and black rat [*Rattus rattus*] young), downy chicks of the bobwhite (*Colinus virginianus*), and fledgling common yellowthroat (*Geothlypis trichas*). In suburban areas, scrub-jays will accept supplemental foods once the scrub-jays have learned about them (Woolfenden and Fitzpatrick 1984).

Acorns are the principal plant food (Woolfenden and Fitzpatrick 1984; Fitzpatrick et al. 1991). From August to November each year, scrub-jays may harvest and cache 6,500 to 8,000 oak (*Quercus* spp.) acorns throughout their territory. Acorns are typically buried beneath the surface of bare sand patches in the scrub during fall, and retrieved and consumed year round, though most are consumed in fall and winter (DeGange et al. 1989). On the Atlantic Coastal Ridge, acorns are often cached in pine trees, either in forks of branches, in distal pine boughs, under bark, or on epiphytic plants, between 1 to 30 feet in height. Other small nuts, fruits, and seeds also are eaten (Woolfenden and Fitzpatrick 1984).

Many scrub-jays occur in habitat conditions where their long-term persistence is doubtful, although their persistence in these areas can occur for many years (Swain et al. 1995; Stith et al. 1996; Root 1998; Breininger et al. 2001). A primary cause for scrub-jay decline is poor demographic success associated with reductions in fire frequency (Woolfenden and Fitzpatrick 1984; Woolfenden and Fitzpatrick 1991; Schaub et al. 1992; Stith et al. 1996; Breininger et al. 1999). The reduction in fire frequency is associated with increases in shrub height, decreases in open space, increases in tree densities, and the replacement of scrub and marshes by forests (Duncan and Breininger 1998; Schmalzer and Boyle 1998; Duncan et al. 1999). These habitat trajectories result in declines in habitat use and demographic success (Woolfenden and Fitzpatrick 1984; Woolfenden and Fitzpatrick 1991). As a result, mean family size declines, and eventually the number of breeding pairs can decline by 50 percent every 5 to 10 years (Woolfenden and Fitzpatrick 1991; Breininger et al. 1999; Breininger et al. 2001).

Status and distribution

The scrub-jay was federally listed as threatened in 1987 primarily because of habitat fragmentation, degradation, and loss (Service 1987a). Historically, oak scrub occurred as numerous isolated patches in peninsular Florida. These patches were concentrated along both the Atlantic and Gulf coasts and on the central ridges of the peninsula (Davis 1967). Probably until as recently as the 1950s, scrub-jay populations occurred in the scrub habitats of 39 of the 40 counties

south of, and including Levy, Gilchrist, Alachua, Clay, and Duval Counties. Historically, most of these counties would have contained hundreds or even thousands of breeding pairs (Fitzpatrick et al. 1994). Only the southernmost county, Monroe, lacked scrub-jays (Woolfenden and Fitzpatrick 1996a). Although scrub-jay numbers probably began to decline when European settlement began in Florida (Cox 1987), the decline was first noted in the literature by Byrd (1928). After 40 years of personal observation of the Etonia scrub (now known as Ocala National Forest), Webber (1935) observed many changes to the previously-undisturbed scrub habitat found there, noting "The advent of man has created a new environmental complex."

A statewide scrub-jay census was last conducted in 1992 and 1993, at which time there were an estimated 4,000 pairs of scrub-jays left in Florida (Fitzpatrick et al. 1994). At that time, the scrub-jay was considered extirpated in ten counties (Alachua, Broward, Clay, Duval, Gilchrist, Hernando, Hendry, Pinellas, and St. Johns), and were considered functionally extinct in an additional five counties (Flagler, Hardee, Levy, Orange, and Putnam), where 10 or fewer pairs remained. Recent information indicates that there are at least 12 to 14 breeding pairs of scrub-jays located within Levy County, higher than previously thought (Miller 2004), and there is at least one breeding pair of scrub-jays remaining in Clay County (Miller 2004). A scrub-jay has been documented in St. Johns County as recently as 2003 (Miller 2003). Populations are close to becoming extirpated in Gulf coast counties (from Levy south to Collier) (Woolfenden and Fitzpatrick 1996a). In 1992 and 1993, population numbers in 21 of the counties were below 30 or fewer breeding pairs (Fitzpatrick et al. 1994). Based on the amount of destroyed scrub habitat, scrub-jay population loss along the Lake Wales Ridge is 80 percent or more since pre-European settlement (Fitzpatrick et al. 1991). Since the early 1980s, Fitzpatrick et al. (1994) estimated that, in the northern third of the species' range, the scrub-jay has declined somewhere between 25 and 50 percent. The species may have declined by as much as 25 to 50 percent in the last decade alone (Stith et al. 1996).

On protected lands, scrub-jays have continued to decline due to inadequate habitat management (Stith 1999; Boughto and Bowman 2011). However, over the last several years, steps to reverse this decline have occurred, and management of scrub habitat is continuing in many areas of Florida (Hastie and Eckl 1999; Stith 1999; The Nature Conservancy 2001; Turner et al. 2006). If the decline can be reversed, managed lands have the potential to support about twice the number of scrub-jays groups as in 2009-2010 (Boughton and Bowman 2011).

Stith (1999) used a spatially explicit individual-based population model developed specifically for the scrub-jay to complete a metapopulation viability analysis of the species. The species' range was divided into 21 metapopulations demographically isolated from each other. Metapopulations are defined as collections of relatively discrete demographic populations distributed over the landscape; these populations are connected within the metapopulations through dispersal or migration (Hanski and Gilpin 1991). A series of simulations were run for each of the 21 metapopulations based on different scenarios of reserve design ranging from the minimal configuration consisting of only currently protected patches of scrub (no acquisition option) to the maximum configuration, where all remaining significant scrub patches were acquired for protection (complete acquisition option) (Stith 1999). The assumption was made that all areas that were protected were also restored and properly managed.

Results from Stith's (1999) simulation model included estimates of extinction, quasi-extinction (the probability of a scrub-jay metapopulation falling below 10 pairs), and percent population decline. These were then used to rank the different statewide metapopulations by vulnerability. The model predicted that five metapopulations (Northeast Lake, Martin, Merritt Island, Ocala National Forest, and Lake Wales Ridge) have low risk of quasi-extinction. Two of the five (Martin and Northeast Lake), however, experienced significant population declines under the "no acquisition" option; the probability for survival of both of these metapopulations could be improved with more acquisitions.

Eleven of the remaining 21 metapopulations were shown to be highly vulnerable to quasi-extinction if no more habitat was acquired (Central Brevard, North Brevard, Central Charlotte, Northwest Charlotte, Citrus, Lee, Levy, Manatee, Pasco, Saint Lucie, and West Volusia). The model predicted that the risk of quasi-extinction would be greatly reduced for 7 of the 11 metapopulations (Central Brevard, North Brevard, Central Charlotte, Northwest Charlotte, Levy, Saint Lucie, and West Volusia) by acquiring all or most of the remaining scrub habitat. The model predicted that the remaining four metapopulations (Citrus, Lee, Manatee, and Pasco) would moderately benefit if more acquisitions were made.

Stith (1999) classified two metapopulations (South Brevard and Sarasota) as moderately vulnerable with a moderate potential for improvement; they both had one or more fairly stable subpopulations of scrub-jays under protection, but the model predicted population declines. The rest of the metapopulations could collapse without further acquisitions, making the protected subpopulations there vulnerable to epidemics or other catastrophes.

Three of the metapopulations evaluated by Stith (1999) (Flagler, Central Lake, and South Palm Beach) were classified as highly vulnerable to quasi-extinction and had low potential for improvement, since little or no habitat is available to acquire or restore.

Current threats

Research and monitoring of scrub-jays has revealed more information about threats to this species since the time the scrub-jay recovery plan was approved in 1990 (Service 1990a). The following discussion is intended to give an up-to-date analysis:

Present or threatened destruction/modification/curtailment of habitat or range

Scrub habitats have continued to decline throughout peninsular Florida since listing occurred, and habitat destruction continues to be one of the main threats to the scrub-jay. Cox (1987) noted local extirpations and major decreases in numbers of scrub-jays and attributed them to the clearing of scrub for housing and citrus groves. Eighty percent or more of the scrub habitats have been destroyed along the Lake Wales Ridge since pre-European settlement (Fitzpatrick et al. 1991; Turner et al. 2006). Fernald (1989), Fitzpatrick et al. (1991), and Woolfenden and Fitzpatrick (1996a) noted habitat losses due to agriculture, silviculture, and commercial and residential development have continued to play a role in the decline in numbers of scrub-jays throughout the state. Statewide, estimates of scrub habitat loss range from 70 to 90 percent (Woolfenden and Fitzpatrick 1996a). Various populations of scrub-jays within the species' range have been monitored closely, and more precise estimates of habitat loss in these locations are available (Snodgrass et al. 1993; Thaxton and Hingtgen 1996).

Toland (1999) estimated that about 70 to 78 percent of pre-European settlement scrub habitats had been converted to other uses in Brevard County. This is due mainly to development activity and citrus conversion, which were the most important factors that contributed to the scrub-jay decline between 1940 and 1990. A total of only 10,656 acres of scrub and scrubby flatwoods remain in Brevard County (excluding Federal ownership), of which only 1,600 acres (15 percent) is in public ownership for the purposes of conservation. Less than 1,977 acres of an estimated pre-European settlement of 14,826 acres of scrubby flatwoods habitat remain in Sarasota County, mostly occurring in patches averaging less than 2.5 acres in size (Thaxton and Hingtgen 1996). Only 10,673 acres of viable coastal scrub and scrubby flatwoods remained in the Treasure Coast region of Florida (Indian River, Saint Lucie, Martin, and Palm Beach Counties) according to Fernald (1989). He estimated that 95 percent of scrub had already been destroyed for development purposes in Palm Beach County.

Habitat destruction not only reduces the amount of area scrub-jays can occupy, but may also increase fragmentation of habitat. As more scrub habitat is altered, the habitat is cut into smaller and smaller pieces, and separated from other patches by larger distances; such fragmentation increases the probability of inbreeding and genetic isolation, which is likely to increase extinction probability (Fitzpatrick et al. 1991; Woolfenden and Fitzpatrick 1991; Stith et al. 1996; Thaxton and Hingtgen 1996). Dispersal distances of scrub-jays in fragmented habitat are further than in optimal unfragmented habitats, and demographic success is poor (Thaxton and Hingtgen 1996; Breininger 1999).

Disease and predation

Most scrub-jay mortality probably results from predation (Woolfenden and Fitzpatrick 1996b). The second most frequent cause may be disease, or predation on disease-weakened scrub-jays (Woolfenden and Fitzpatrick 1996b). Known predators of scrub-jays are listed by Woolfenden and Fitzpatrick (1990), Fitzpatrick et al. (1991), Schaub et al. (1992), Woolfenden and Fitzpatrick (1996a, 1996b), Breininger (1999), and Miller (2004); the list includes eastern coachwhip (*Masticophis flagellum*, known to eat adults, nestlings, and fledglings), eastern indigo snake (*Drymarchon corais couperi*, known to eat adults and fledglings), black racer (*Coluber constrictor*, known to eat eggs), pine snake (*Pituophis melanoleucus*), and corn snake (*Elaphe guttata*). Mammalian predators include bobcats (*Lynx rufus*), raccoons (*Procyon lotor*), sometimes cotton rats (known to eat eggs), black rats, and domestic cats (*Felis catus*, known to eat adults). Franzreb and Puschock (2004) also have documented spotted skunks (*Spilogale putorius*) and grey fox (*Urocyon cinereoargenteus*) as mammalian predators of scrub-jay nests. Fitzpatrick et al. (1991) postulated that populations of domestic cats are able to eliminate small populations of scrub-jays. Avian nest predators include the great horned owl (*Bubo virginianus*), eastern screech-owl (*Otus asio*), red-tailed hawk (*Buteo jamaicensis*), northern harrier (*Circus cyaneus*), fish crow, boat-tailed grackle (*Quiscalus major*), common grackle (*Q. quiscula*), American crow (*Corvus brachyrhynchos*), blue jay, and swallow-tailed kites (*Elanoides forficatus*).

Fitzpatrick et al. (1991) reported overgrown scrub habitats are often occupied by the blue jay, which may be one factor limiting scrub-jay populations in such areas. Raptors which seem to be important predators of adult scrub-jays are merlin (*Falco columbarius*), sharp-shinned hawk (*Accipiter striatus*), Cooper's hawk (*A. cooperii*), and northern harrier. During migration and

winter, these four raptor species are present in areas which contain scrub habitat, and scrub-jays may experience frequent confrontations (as many as one pursuit a day) with them (Woolfenden and Fitzpatrick 1990). In coastal scrub, Woolfenden and Fitzpatrick (1996b) report that scrub-jays are vulnerable to predation by raptors in October, March, and April, when high densities of migrating accipiters and falcons are present. Woolfenden and Fitzpatrick (1996b) and Toland (1999) suggest that, in overgrown scrub habitats, hunting efficiency for scrub-jay predators is increased. Bowman and Averill (1993) noted scrub-jays occupying fragments of scrub found in or near housing developments were more prone to predation by free-roaming cats and competition from blue jays and mockingbirds. Woolfenden and Fitzpatrick (1996a, 1996b) stated proximity to housing developments (and increased exposure to free-roaming cats) needs to be taken into consideration when designing scrub preserves. Young scrub-jays are especially vulnerable to ground predators (*e.g.*, snakes and mammals) before they are fully capable of sustained flight.

The scrub-jay hosts two protozoan blood parasites (*Plasmodium cathemerium* and *Haemoproteus danilewskyi*), but incidence is low (Woolfenden and Fitzpatrick 1996b). Several scrub-jays sick from these two agents in March 1992 survived to become breeders. The scrub-jay carries at least three types of mosquito-borne encephalitis (Saint Louis, eastern equine, and "Highlands jay") (Woolfenden and Fitzpatrick 1996b). Of particular concern is the arrival of West Nile virus (the agent of another type of encephalitis) in Florida during 2001 (Stark and Kazanis 2001); since corvids have been particularly susceptible to the disease in states north of Florida, it is expected scrub-jays will be affected (Breininger et al. 2003).

Woolfenden and Fitzpatrick (1996b) noted three episodes of elevated mortality (especially among juveniles) in 26 years at Archbold Biological Station. Each of these incidents occurred in conjunction with elevated water levels following unusually heavy rains in the fall, although high mortality does not occur in all such years. During the most severe of these presumed epidemics (August 1979 through March 1980), all but one of the juvenile cohort and almost half of the breeding adults died (Woolfenden and Fitzpatrick 1984; Woolfenden and Fitzpatrick 1990). The 1979 through 1980 incident coincided with a known outbreak of eastern equine encephalitis among domestic birds in central Florida (Woolfenden and Fitzpatrick, 1996b). From the fall of 1997 through the spring of 1998, the continuing population decline of scrub-jays along the Atlantic coast and in central Florida may have been augmented by an epidemic of unknown origin (Breininger 1999).

At Cape Canaveral Air Force Station, Stevens and Hardesty (1999) noted a decline in juvenile survival from 60 to 70 percent in the preceding years to 22 percent in 1997 and 1998. It stayed low (only 25 percent) in 1998 and 1999 before again climbing into the mid-60 percent range. Also, adult survival dropped from 70 to 80 percent survival in the preceding years to 50 to 60 percent in 1997 and 1998. Overall, their annual surveys documented the largest one-year drop (pairs decreased by 17 percent and birds by 20 percent) in this population at the same time as the presumed statewide epidemic.

In the winter and summer of 1973, 15 species of intestinal parasitic fauna (including 8 nematodes, 5 trematodes, 1 cestode, and 1 acanthocephalan) were found in 45 scrub-jays collected in south-central Florida; the parasite load was attributed to a varied arthropod diet (Kinsella 1974). These naturally-occurring parasites are not believed to have a negative impact on scrub-jay population levels.

Larvae of the burrowing fly, *Philornis porteri*, occur irregularly on scrub-jay nestlings. The species pupates in the base of the nest; larvae locate in nasal openings, mouth flanges, bases of the flight feathers, and toes; apparently no serious effect on the scrub-jay host occurs (Woolfenden and Fitzpatrick 1996b). Additionally, one undescribed chewing louse (*Myrsidea* sp.) (Woolfenden and Fitzpatrick 1996b), one wing-feather mite (*Pterodectes* sp.), two chiggers (*Eutrombicula lipovskyana*), and the sticktight flea (*Echidnophaga gallinacea*; Woolfenden and Fitzpatrick 1996b) occur on some individuals, usually at low densities. Nymphs and larvae of four ticks (*Amblyomma americanum*, *A. tuberculatum*, *Haemaphysalis leporispalustris*, and *Ixodes scapularis*) are known to occur on scrub-jays, as well as the larvae of the tick *A. maculatum* (Woolfenden and Fitzpatrick 1996b). These naturally-occurring parasites were not believed to have a negative impact on scrub-jay population levels; however, a recent study of the impact of the sticktight flea on scrub-jays indicates that low fitness and death can be caused by this parasite (Boughton et al. 2006). The host vector for this flea was a domestic dog (*Canis familiaris*) suggesting that introduction of human pets into scrub-jay areas may increase parasite loads and reduce fitness.

Inadequacy of existing regulatory mechanisms

Woolfenden and Fitzpatrick (1996a) state the importance of enforcing existing Federal laws on the management of Federal lands as natural ecosystems for the long-term survival of the scrub-jay. The Service consults regularly on activities on Federal lands which may affect scrub-jays and also works with private landowners through the section 10(a)(1)(B) incidental take permitting process of the Act when take is likely to occur and no Federal nexus is present. Florida's State Comprehensive Plan and Growth Management Act of 1985 is administered mostly by regional and local governments. Regional Planning Councils administer the law through Development of Regional Impact reviews; at the local level, although comprehensive plans contain policy statements and natural resource protection objectives, they are only effective if counties and municipalities enact and enforce ordinances. As a general rule, counties have not enacted and enforced ordinances that are effective in protecting scrub-jays (Fernald 1989).

The Wildlife Code of the State of Florida (Chapter 68A, Florida Administrative Code) prohibits taking of individuals of threatened species, or parts thereof, or their nests or eggs, except as authorized. The statute does not prohibit clearing of habitat occupied by protected species, which limits the ability of the FWC to protect the scrub-jay and its habitat.

Other natural or man-made factors affecting continued existence

Human interference with natural fire regimes has continued to play a major part in the decline of the scrub-jay and today may exceed habitat loss as the single most important limiting factor (Woolfenden and Fitzpatrick 1991; Woolfenden and Fitzpatrick 1996a; Fitzpatrick et al. 1994). Lightning strikes cause all naturally-occurring fires in south Florida scrub habitat (Abrahamson 1984; Hofstetter 1984; Woolfenden and Fitzpatrick 1990). Fire has been noted to be important in maintenance of scrub habitat for decades (Nash 1895; Harper 1927; Webber 1935; Davis 1943; Laessle 1968; Abrahamson et al. 1984). Human efforts to prevent and control natural fires have allowed the scrub to become too dense and tall to support populations of scrub-jays, resulting in the decline of local populations of scrub-jays throughout the state (Fernald 1989;

Fitzpatrick et al. 1994, Percival et al. 1995; Stith et al. 1996; Thaxton and Hingtgen 1996; Woolfenden and Fitzpatrick 1990; Woolfenden and Fitzpatrick 1996a; Toland 1999). Woolfenden and Fitzpatrick (1996a) cautioned, however, that fire applied too often to scrub habitat also can result in local extirpations. Data from Archbold Biological Station show that fire-return intervals varying between 8 and 15 years are optimal for long-term maintenance of productive scrub-jay populations in central Florida (Woolfenden and Fitzpatrick 1996b). These intervals also correspond with those yielding healthy populations of listed scrub plants (Menges and Kohfeldt 1995; Menges and Hawkes 1998). Optimal fire-return intervals may, however, be shorter in coastal habitats (Schmalzer and Hinkle 1992a; Schmalzer and Hinkle 1992b).

Stith et al. (1996) estimated at least 2,100 breeding pairs of scrub-jays were living in overgrown habitat. Toland (1999) reported most of Brevard County's remaining scrub (estimated to be 15 percent of the original acreage) is overgrown due to fire suppression. He further suggests the overgrowth of scrub habitats reduces the number and size of sand openings which are crucial not only to scrub-jays, but also many other scrub plants and animals. Reduction in the number of potential scrub-jay nesting sites, acorn cache sites, and foraging sites presents a problem for scrub-jays. Fernald (1989) reported overgrowth of scrub results not only in the decline of species diversity and abundance but also a reduction in the percentage of open sandy patches (Fernald 1989; Woolfenden and Fitzpatrick 1996b). Fitzpatrick et al. (1994) believed fire suppression was just as responsible as habitat loss in the decline of the scrub-jay, especially in the northern third of its range. Likewise, the continued population decline of scrub-jays within Brevard County between 1991 and 1999 has been attributed mainly to the overgrowth of remaining habitat patches (Breininger et al. 2001). Breininger et al. (1999) concluded optimal habitat management is essential in fragmented ecosystems maintained by periodic fire, especially to lessen risks of decline and extinction resulting from epidemics and hurricanes.

Fitzpatrick et al. (1991), Fitzpatrick et al. (1994), and Woolfenden and Fitzpatrick (1996a) expressed concern for the management practices taking place on Federal lands at Ocala National Forest, Merritt Island National Wildlife Refuge at the Kennedy Space Center, and Cape Canaveral Air Force Station, all supporting large contiguous populations of scrub-jays. They predicted fire suppression or too frequent fires (on the latter two), and silvicultural activities involving the cultivation of sand pine on Ocala National Forest, would be responsible for declines of scrub-jays in these large contiguous areas of scrub. These areas should be those where populations are most secure because of Federal agencies' responsibilities under section 7(a)(1) of the Act. Monitoring of scrub-jay populations, demography, and nesting success is ongoing on all of these properties to assess the effectiveness of management practices in meeting scrub-jay recovery objectives.

Housing and commercial developments within scrub habitats are accompanied by the development of roads. Since scrub-jays often forage along roadsides and other openings in the scrub, they are often killed by passing cars. Research by Mumme et al. (2000) along a two-lane paved road indicated that clusters of scrub-jay territories found next to the roadside represented population sinks (breeder mortality exceeds production of breeding-age recruits), which could be supported only by immigration. Since this species may be attracted to roadsides because of their open habitat characteristics, vehicular mortality presents a significant and growing management problem throughout the remaining range of the scrub-jay (Dreschel et al. 1990; Mumme et al.

2000), and proximity to high-speed, paved roads needs to be considered when designing scrub preserves (Woolfenden and Fitzpatrick 1996a).

Another potential problem in suburban areas supporting scrub-jays is supplemental feeding by humans (Bowman and Averill 1993; Woolfenden and Fitzpatrick 1996a; Bowman 1998). The presence of additional food may allow scrub-jays to persist in fragmented habitats, but recruitment in these populations is lower than in native habitats. However, even though human feeding may postpone local extirpations, long-term survival cannot be ensured in the absence of protecting native oak scrub habitat necessary for nesting.

Scrub-jays in suburban settings often nest high in tall shrubbery. During March winds, these nests tend to be susceptible to destruction (Woolfenden and Fitzpatrick 1996b; Bowman 1998). Hurricanes also pose a potential risk for scrub-jays, although the exact impact of such catastrophic events is unknown. Breininger et al. (1999) modeled the effects of epidemics and hurricanes on scrub-jay populations in varying levels of habitat quality. Small populations of scrub-jays are more vulnerable to extirpation where epidemics and hurricanes are common. Storm surge from a Category Three to Five hurricanes could inundate entire small populations of scrub-jays, and existing habitat fragmentation could prevent repopulation of affected areas. However, this model also predicted that long-term habitat degradation had greater influence on extinction risk than hurricanes or epidemics. Preliminary results of the impact of Hurricane Charley on the Charlotte County scrub-jay populations indicates that at least one member of all 20 family groups surveyed after the storm had survived (Miller 2006).

Fernald (1989) reported many of the relatively few remaining patches of scrub within the Treasure Coast region of Florida had been degraded by trails created by off-road vehicles, illegal dumping of construction debris, abandoned cars and appliances, or household waste. The invasion of these areas by exotic species, including Brazilian pepper, white cypress-pine (*Callitris glaucophylla*), and Australian pine (*Casuarina equisetifolia*) also was a problem. Other human-induced impacts identified by Fernald (1989) include the introduction of domestic dogs and cats, black rats, greenhouse frogs (*Eleutherodactylus planirostris*), giant toads (*Bufo marinus*), Cuban tree frogs (*Osteopilus septentrionalis*), brown anoles (*Anolis sagrei*), and other exotic animal species. These exotic species may compete with scrub-jays for space and food.

Analysis of the species/critical habitat likely to be affected

For the reasons cited in previous sections of this biological opinion, the Florida scrub-jay's status since its listing in 1987 has not improved. The status and trends that we discussed above identify two items essential for recovery of this species: (1) additional purchase of scrub habitat for preservation in key areas, and (2) restoration and management of publicly-owned scrub habitat already under preservation. No critical habitat has been designated for the species; therefore, none will be affected.

Eastern indigo snake

In addition to the assessment below, a 5-year review was completed in 2008 resulting in no change to the species designation (Service 2008). No critical habitat has been designated for this species.

Species/critical habitat description

The eastern indigo snake is one of the largest non-venomous snakes in North America, obtaining lengths of up to 8.5 feet (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 eastern 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 eastern indigo snakes may differ from mainland snakes in ways other than color. Critical habitat has not been designated for this species.

Life history/Population dynamics

In south-central Florida, limited information on the reproductive cycle suggests 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 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 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).

Eastern indigo snakes need a mosaic of habitats to complete their annual life cycle. Over most of its range, the eastern indigo snake frequents several habitat types, including pine flatwoods, scrubby flatwoods, high pine, dry prairie, tropical hardwood hammocks, edges of freshwater marshes, agricultural fields, coastal dunes, and human-altered habitats. Eastern indigo snakes also use some agricultural lands (such as citrus) and various types of wetlands (Service 1999). A study in southern Georgia found that interspersion of 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).

Throughout peninsular Florida, this species may be found in all terrestrial habitats which have not experienced high density urban development. They are especially common in the hydric hammocks throughout this region (Service 1999). In central and coastal Florida, indigo snakes

are mainly found within many of the State's high, sandy ridges. 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; Service 1999). Underground refugia used by this species include natural ground holes; hollows at the base of trees or shrubs; ground litter; trash piles; and in the crevices of rock-lined ditch walls (Layne and Steiner 1996). 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). Observations over the last 50 years made by maintenance workers in citrus groves in east-central Florida indicate 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 Everglades Agriculture Area, eastern indigo snakes have been observed (including one mortality) during earthmoving and other construction-related activities.

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 acres, decreasing 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 Archbold Biological Station, 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

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 (*Drymarchon corais*) 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).

Current threats

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.

Analysis of species/Critical habitat likely to be affected

To protect and manage this species for recovery, Breininger et al. (2004) concluded 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. No critical habitat has been designated; therefore, none will be affected.

Gopher tortoise

The following discussion is summarized from the 12-month finding (Service 2011), as well as from recent research publications and monitoring reports.

Species/Critical habitat description

The gopher tortoise is the only tortoise (family Testudinidae) east of the Mississippi River. It is larger than any of the other terrestrial turtles in this region, with a domed, dark-brown to grayish-black shell (carapace) up to 14.6 inches long, weighing up to 13 pounds. The lower shell (plastron) is yellowish and hingeless. Tortoises cannot completely withdraw their limbs, which remain visible when folded and retracted. The hind feet are elephantine or stumpy, and the forelimbs are shovel-like, with claws used for digging. In comparison to females, males are smaller, usually have a larger gland under the chin, a longer gular projection, and more concave plastron. Hatchlings are up to 2 inches in length, with a somewhat soft, yellow-orange shell. As with other chelonians, gopher tortoises possess a keratinized beak, and lack teeth. No critical habitat has been designated for the gopher tortoise.

Life history/Population dynamics

The gopher tortoise is a long-lived, native, burrowing species of the open, fire-maintained, longleaf pine ecosystem. Historically, typical gopher tortoise habitat consisted of open, frequently burned, longleaf pine or longleaf pine/scrub oak uplands, and flatwoods on moderately well drained to xeric soils. Such habitat provided adequate sunlight reaching the forest floor to stimulate the growth and development of the herbaceous plant stratum for forage, with sufficient warmth for basking and the incubation of eggs.

The burrows of a gopher tortoise are the habitat and center of normal feeding, breeding, and sheltering activity. Gopher tortoises excavate and use more than one burrow for shelter beneath the ground surface. Burrows, which may extend for more than 30 feet, provide shelter from canid predators, fire, winter cold, and summer heat. Dogs and large canids are the most common predator of adult tortoises (Causey and Cude 1978).

In stable populations with fire-maintained, open longleaf pine habitat, females may use an average of 5 burrows each while males occupy an average of 10 burrows (Eubanks et al. 2003). In poor habitat due to encroaching, fire intolerant shrubs and hardwoods, gopher tortoises tend to excavate and use fewer burrows, probably because of limited sites that are sufficiently open. Males tend to use more burrows and move more frequently among their different burrows than females as they seek breeding opportunities with females (McRae et al. 1981; Diemer 1992a, 1992b; Smith 1995; Tuma 1996; Boglioli et al. 2000; Eubanks et al. 2003). The term "active burrow" is applied to burrows exhibiting indications it is likely inhabited by a gopher tortoise. Characteristics of active burrows include fresh soil excavated from the interior of the burrow and deposited on the apron at the burrow entrance, tortoise feces on the apron or near the burrow entrance, eggshells, and tracks. Inactive burrows, which display conditions of recent use and occupancy by a tortoise, are considered to be used as part of the annual home range of one or more tortoises, but are not currently occupied by a tortoise. Indicators of inactive burrows include suitable size and shape of the burrow entrance, a recognizable apron of bare soil without encroachment of grasses or shrubs, and small amounts of leaf litter in the entrance that have not been moved by a tortoise. Abandoned burrows are unlikely to be used by a tortoise and normally exhibit indications of erosion, a loss of shape and structure, vegetative overgrowth, and no apron.

Tortoises spend most of their time within burrows and emerge during the day to bask in sunlight, feed, and reproduce. Tortoises are active above ground during the growing season when daytime temperatures range from 75 to 87°F (McRae et al. 1981; Butler et al. 1995). Daily active periods usually are unimodal in spring, followed by bimodal periods (early to mid-morning, middle to late afternoon) during the hotter temperatures of summer (McRae et al. 1981). Daily activity above ground becomes significantly reduced by the end of the growing season during October with cooler temperatures. Tortoises take shelter within their burrows during the dormant season, become torpid, do not eat, and rarely emerge except during periods of warm days to bask in sunlight at the burrow entrance. Except for those tortoises in southern peninsular Florida that do not have an overwintering period, most tortoises become active again during early spring.

Tortoises mostly forage on foliage, seeds, and fruits of grasses and forbs, generally in an area of about 150 feet surrounding each burrow (McRae et al. 1981; Diemer 1992b). The diet of adults resembles that of a generalist herbivore, with at least some preference for some plants over others, and may also include insects and carrion (MacDonald and Mushinsky 1988; Birkhead 2001). Juvenile tortoises tend to forage on fewer plant species, eat fewer grasses, and select more forbs, including legumes, than adults (Mushinsky et al. 2003).

Burrows are not randomly located in the environment. Tortoises select and prefer burrow sites in open sunny areas (Boglioli et al. 2000; Rostal and Jones 2002). Such sites reflect areas where herbaceous plants for food are more abundant on the forest floor and, for females, sunlight and

soil temperatures for egg incubation are more suitable. Also, males select sites and burrows that increase their proximity to females and breeding opportunities (Boglioli et al. 2000; Eubanks et al. 2003). The repeated use and travel to the same burrows by individual tortoises in stable habitat reveal that tortoises know the geography of their home range, burrows, and the location of neighboring tortoises (Eubanks et al. 2003).

Tortoises breed from May through October (Landers et al. 1980; McRae et al. 1981; Taylor 1982; Wright 1982; Service 1987b; Diemer 1992a; Eubanks et al. 2003). Females ovulate during spring, but likely store sperm so that active breeding during ovulation may not always be required for fertilization. Males travel to female burrows and copulation occurs above ground at the burrow entrance, more frequently during July to September, a period of peak sex and adrenal steroid hormones (Ott et al. 2000; Eubanks et al. 2003). In earlier work by Douglass (1986), he described gopher tortoise "colonial" tendencies with aggregations of burrows in which dominant males competitively and behaviorally exclude other males at female burrows to maintain a loose female harem as a mating system. More recent studies do not indicate the clear existence of an exclusive dominance hierarchy. Also, aggregations of burrows in some habitat and study sites probably is an artifact of fragmentation and the concentration of burrows in the available remaining suitable habitat (Mushinsky and McCoy 1994; Boglioli et al. 2003).

Females do not reproduce every year. In the listed range, about 80 percent of the females at Marion County Wildlife Management Area (WMA) in Mississippi and 85 percent of the females at Ben's Creek WMA in Louisiana were gravid each year (Smith et al. 1997). Females excavate a shallow nest to lay and bury eggs, usually in the apron of soil at the mouth of the burrow, but they may lay elsewhere if the apron is excessively shaded (Landers and Buckner 1981). Range-wide, average clutch size varies from about 4 to 12 eggs per clutch. Average clutch size in the listed range, from 4.8 to 5.6 eggs per clutch, is comparably low (Seigel and Hurley 1993; Seigel and Smith 1995; Tuma 1996; Epperson and Heise 2003). Clutch size generally is positively correlated with adult female size (Diemer and Moore 1994; Smith 1995; Rostal and Jones 2002).

Females usually lay about five to seven eggs from mid-May through mid-July in the soil of the apron at the burrow entrance (Butler and Hull 1996; Smith et al. 1997) and egg incubation lasts 80 to 110 days (Diemer 1986; Smith et al. 1997). Incubation at temperatures from 81°F to 90°C is required for successful development and hatching (Spotila et al. 1994; Burke et al. 1996; DeMuth 2001; Rostal and Jones 2002; Noel and Qualls 2004). Egg hatching success at experimentally protected nests has ranged from 28 to 97 percent in Florida and Georgia (92 percent, Arata 1958; 86 percent, Landers et al. 1980; 28 percent, Linely 1986; 67 to 97 percent, Smith 1995; 80.6 percent, Butler and Hull 1996). In the listed range in Mississippi, mean hatching success from protected nests in the field has ranged from 28.8 to 56 percent (Epperson and Heise 2003; Noel and Qualls 2004). As in other species, sex determination is temperature dependent (Burke et al. 1996; DeMuth 2001).

Hatchlings excavate themselves from the nest and emerge from the middle of August through October (Ashton and Ashton 2008). Hatchlings and yearlings (0 to 1 year old) may temporarily use the adult burrow, bury under sand or leaf litter, or excavate a small burrow nearby (Douglass 1978; Wilson et al. 1994; Butler et al. 1995; Pike 2006). Growth is most rapid during the

juvenile stage, becoming slower at the onset of adulthood and reproductive maturity, followed by little or no adult growth (Mushinsky et al. 1994; Aresco and Guyer 1998, 1999). Generally, tortoises become adults at about 20 years of age, although the minimal stage to reach reproductive maturity is determined by size rather than age. Growth rates and sizes at sexual maturity can vary among populations and habitat types (Landers et al. 1982; Mushinsky et al. 1994; Aresco and Guyer 1998, 1999).

Hatchlings and yearlings initially move up to about 50 feet from their nest to establish their first burrow, from which they will subsequently excavate and use about five burrows in a home range from 0.5 to 11.8 acres (Mushinsky et al. 1994; Butler et al. 1995; Epperson and Heise 2003; Pike 2006). Yearlings move, on average, relatively short distances to establish new burrows, although they are known to have traveled up to 1,485 feet to new burrows (Butler et al. 1995; Epperson and Heise 2003). Hatchlings and yearlings may take shelter beneath litter and woody debris during longer distances or times encountered to move to a new burrow (Diemer 1992b; Butler et al. 1995). Yearlings and juveniles usually forage within about 23 feet of their burrow (McRae et al. 1981; Wilson et al. 1994; Butler et al. 1995; Epperson and Heise 2003).

Home range size and movements increase with age and body size. The burrows of a gopher tortoise represent the general boundaries of a home range, which is the area used for feeding, breeding, and sheltering. Home range area tends to vary with habitat quality, becoming larger in areas of poor habitat (Auffenberg and Iverson 1979). Males typically have larger home ranges than females. Mean home ranges of individual tortoises in Alabama, Florida, and Georgia outside the federally listed area have varied from 1.3 to 5.2 acres for males and 0.2 to 2.5 acres for females (McRae et al. 1981; Auffenberg and Franz 1982; Diemer 1992b; Tuma 1996; Ott 1999; Eubanks et al. 2003; Guyer 2003). In comparison to females, male tortoises use more burrows, and during breeding season, move among burrows more frequently over longer distances (McRae et al. 1981; Auffenberg and Franz 1982; Diemer 1992b; Smith 1995; Tuma 1996; Ott 1999; Eubanks et al. 2003; Guyer 2003).

A burrow may or may not be exclusively used by just one gopher tortoise. Two or more tortoises may share the same burrow, although the burrow is used at different times of the year by different individuals. Home ranges overlap when a burrow is used by more than one tortoise. About 50 percent of the area occupied by 123 tortoises was shared by two or more tortoises in relatively pristine, stable habitat in southwestern Georgia (Eubanks et al. 2002). At Camp Shelby, Mississippi, average home range varied from 7.3 to 10.4 acres for males and from 12.1 to 32.9 acres for females (Tuma 1996; Guyer 2003). At another population on timber industry land in Alabama, average home range was 10.4 acres for males and 32.9 acres for females. These home ranges are larger than those typically determined for tortoises at populations in Alabama, Georgia, and Florida outside the listed range. Since gopher tortoise movements and distance increase as herbaceous biomass and habitat quality decrease (Auffenberg and Iverson 1979; Auffenberg and Franz 1982), larger home ranges at these two study sites in the listed range probably reflect differences in habitat quality. Habitat conditions on the timber industry study site were highly heterogeneous, with patches and stands of suitable habitat mixed among patches of unsuitable habitat. These tortoises moved relatively long distances to different burrows located in suitable habitat patches within a matrix of poor and unsuitable habitat.

As distances increase between gopher tortoise burrows, isolation among tortoises also increases due to the decreasing rate of visitation and breeding (Boglioli et al. 2003; Guyer 2003). Using extensive data from individual tortoise interburrow movements and home range size, Eubanks et al. (2003) found that most colonies or breeding population segments would consist of burrows no greater than about 558 feet apart. Guyer (2003) found that males only rarely will move from their burrows up to 1,640 feet to a female burrow for mating opportunities, and females typically experience a visitation rate of near zero when their burrows are 460 to 623 feet from nearest neighbors. Demographically, tortoises located at distances of about 600 feet from other tortoises are functionally isolated and subdivided as separate breeding populations. Thus, breeding populations or colonies likely consist of tortoises and burrows in suitable, unfragmented habitat within 600 feet or less from each other.

Gopher tortoises require well-drained, sandy soils for burrowing and nest construction, an abundance of herbaceous ground cover for food, and a generally open canopy that allows sunlight to reach the forest floor (Landers 1980; Auffenberg and Franz 1982). Longleaf pine and oak uplands, xeric hammock, sand pine and oak ridges (beach scrub), and ruderal (disturbed) habitat most often provide the conditions necessary to support gopher tortoises (Auffenberg and Franz 1982). Ruderal (*i.e.*, disturbed or atypical) habitats include roadsides and utility rights-of-way, grove/forest edges, fencerows, and clearing edges. In the western range, soils contain more silt, and xeric (dry) conditions are less common west of the Florida panhandle (Craul et al. 2005). Ground cover in this Coastal Plains area can be separated into two general regions, with the division in the central part of southern Alabama and northwest Florida. To the west, bluestem (*Andropogon* spp.) and panicum (*Panicum* spp.) grasses predominate; to the east, wiregrass (*Aristida stricta*) is most common (Boyer 1990). However, gopher tortoises do not necessarily respond to specific plants but rather the physical characteristics of habitat (Diemer 1986). Historic gopher tortoise habitats were open pine forests, savannahs, and xeric grasslands that covered the coastal plain from Mexico and Texas to Florida. Historic habitats might have had wetter soils at times and been somewhat cooler, but were generally xeric, open, and diverse (Ashton and Ashton 2008).

Gopher tortoises have a well-defined activity range where all feeding and reproduction take place and that is limited by the amount of herbaceous ground cover (Auffenberg and Iverson 1979). Tortoises are primarily herbivores eating mainly grasses, plants, fallen flowers, fruits, and leaves. Gopher tortoises prefer grassy, open-canopy microhabitats (Boglioli et al. 2000), and their population density directly relates to the density of herbaceous biomass (Auffenberg and Iverson 1979; Landers and Speake 1980; Wright 1982; Stewart et al. 1993) and a lack of canopy (Breininger et al. 1994; Boglioli et al. 2000). Grasses and grass-like plants are important in gopher tortoise diets (Auffenberg and Iverson 1979; Landers 1980; Wright 1982; MacDonald and Mushinsky 1988; Mushinsky et al. 2006). A lack of vegetative diversity may negatively impact the long-term sustainability of gopher tortoise populations (Ashton and Ashton 2008).

Gopher tortoises require a sparse canopy and litter-free ground not only for feeding, but also for nesting (Landers and Speake 1980). In Florida, McCoy and Mushinsky (1995) found the number of active burrows per tortoise was lower where canopy cover was high. Females require almost full sunlight for nesting (Landers and Buckner 1981) because eggs are often laid in the burrow

apron or other sunny spot and require the warmth of the sun for appropriate incubation (Landers and Speake 1980). At one site in southwest Georgia, Boglioli (et al. 2000) found most tortoises in areas with 30 percent or less canopy cover. Diemer (1992a) found ecotones created by clearing were also favored by tortoises in north Florida. When canopies become too dense, usually due to fire suppression, tortoises tend to move into ruderal habitats such as roadsides with more herbaceous ground cover, lower tree cover, and significant sun exposure (Garner and Landers 1981; McCoy et al. 1993; Baskaran et al. 2006). In Georgia, Hermann et al. (2002) found open pine areas (*e.g.*, pine forests with canopies that allow light to penetrate to the forest floor) were more likely to have burrows, support higher burrow densities, and have more burrows used by large, adult tortoises than closed-canopy forests. Historically, open-canopied pine forests were maintained by frequent, lightning-generated fires.

As long-lived animals, gopher tortoises naturally experience delayed sexual maturity, low reproductive rates, high mortality at young ages and small size-classes, and relatively low adult mortality. The growth and dynamics of populations are stochastically affected by natural variation due to demographic rates, the environment, catastrophes, and genetic drift (Shaffer 1981). Factors affecting population growth, decline, and dynamics include: the number or proportion of annually breeding and egg-laying females (breeding population size), clutch size, nest depredation rates, egg hatching success, mortality, the age or size at first reproduction, age- or stage-class population structure, maximum age of reproduction, immigration rates, and emigration rates.

These factors and data have been evaluated in several investigations of population viability to estimate the probabilities of gopher tortoise population extinction over time and the important factors affecting persistence. In the absence of field surveys and long-term monitoring, models may be used to project the status of populations in the future based on a specific set of assumptions and assignment of demographic parameters. There have been four substantive modeling efforts evaluating the long-term persistence of gopher tortoises (Tuberville et al. 2009). Two early modeling efforts focused on estimating the minimum number of tortoises needed for a population to persist for 200 years (Cox et al. 1987). Although relatively small population sizes (40 to 50 adults) were modeled to persist over the model duration, all populations declined and were projected to go extinct at some point in the future depending on model parameters.

Miller (2001) assessed the likelihood of tortoises being extirpated from Florida over a 100-year period when evaluating all known tortoise populations, or only those on public lands, considering a variety of assumptions regarding survivorship, carrying capacity constraints, disease, etc. (Miller 2001). The model results suggest gopher tortoises have greater than 80 percent chance of persisting in Florida over the next 100 years whether looking at all known populations or only those on public lands (Miller 2001). Furthermore, they concluded populations as small as 50 individuals can have conservation value under favorable conditions, but under less favorable habitat conditions, populations larger than 250 individuals would be necessary to protect against extinction due to stochastic factors that increase hatchling and adult mortality (Miller 2001).

The most recent modeling effort recognized the need to evaluate the viability of individual populations, rank populations most appropriate for in-situ protection, and determine if nonviable populations are more likely to contribute to conservation through augmentation or translocation (Tuberville et al. 2009). All model scenarios resulted in a population decline of one to three

percent per year, which varied as a function of habitat quality and location within the range (Tuberville et al. 2009). Only modeled populations with at least 250 tortoises were able to persist for 200 years, which is substantially different than earlier model results. Population dynamics of turtles, as long lived animals, have commonly been considered sensitive to demographic changes in adult survival and, in some cases, juvenile survival (Gibbons 1987; Congdon et al. 1993; Heppell and Crowder 1996). Likewise, models and simulations of gopher tortoise populations are most sensitive to adult, hatchling, and juvenile survival rates (Miller 2001; Epperson 2003; Wester 2004). For example, the small but positive population growth rates modeled for a stable base population became negative when mortality of the 3 to 4+ year age class increased from 3.0 to 5.0 percent, or the yearling (0 to 1 year age class) mortality increased from 95 to 97 percent (Miller 2001; McDearman 2006).

Recently, segmented regression models were developed to evaluate the relationship between area of habitat occupied by gopher tortoises and abundance of gopher tortoises to define how many individuals constitute a population and how much area is required for such a population. Data synthesized from 21 study sites in Alabama, Georgia, and Mississippi, with varying tortoise population numbers indicated, that an average gopher tortoise population consists of 444 burrows, covers 1,865 acres, and contains 240 tortoises (Styrsky et al. 2010). This average population contained a density of 0.1 per acre, which is below the threshold identified by Guyer (personal communication) for maintaining a persistent population. The authors noted that this average tortoise population was calculated based on a variety of existing landscapes that differed in their current management and past land use history and, therefore, did not represent what a population of tortoises might be in areas that were all managed with frequent fire and contained the uneven-aged trees of old-growth longleaf pine forests. Thus, it is likely that tortoises could persist on smaller parcels, but only if habitat were aggressively managed (Styrsky et al. 2010). Lack of prescribed fire or ineffective use of prescribed fire is known to be a substantial impediment to the restoration and maintenance of gopher tortoise habitat throughout much of its range. The model results depict a typical tortoise population as one occupying a large area. This seems congruent with existing habitat conditions that are reported throughout much of the tortoise's range. Therefore, the model results show that most existing conservation lands contain too few tortoises and too little suitable habitat to support persistent tortoise populations.

Status and distribution

The gopher tortoise is federally listed as a threatened species in the western part of its range, from the Tombigbee and Mobile Rivers in Alabama west to southeastern Louisiana on the lower Gulf Coastal Plain (Service 1987b). The listed range of the gopher tortoise includes 3 counties in southeastern Alabama, 14 counties in southern Mississippi, and 3 parishes in Louisiana. Most gopher tortoise habitat is privately owned (70 percent), while about 20 percent is owned by the Forest Service, and 10 percent by other public agencies (Noss 1988).

Effectively assessing the status (*i.e.*, whether it is increasing, decreasing, or stable) of the gopher tortoise throughout its range requires evaluation of the distribution of tortoises, number of tortoises and populations, number of individuals in populations, and trends in population growth. As we indicated above, we do not have specific distribution data for most of the tortoise's range, but we estimated where potential habitat existed and where tortoises may still be present. Below,

we provide summaries of survey data about the sizes and, in some cases, trends of gopher tortoise populations. There is a noticeable disparity between the apparently large area (expressed in hectares or acres, or ha/ac) of potential gopher tortoise habitat reported above and actual numbers of individual tortoises known from populations that have been surveyed, as summarized below. Upon cursory examination, there seem to be few tortoises where there are millions of hectares of potential habitat. Many Federal and State agencies, non-governmental organizations (NGO), and timber owners have only recently begun to assess where and how many gopher tortoises are present on lands they own or manage.

Review of the literature indicates the status of an individual gopher tortoise population is dependent on the size of the population and its demographic performance. For comparative purposes, and as described in greater detail below, we considered tortoise populations to be large enough to persist in the future (*i.e.*, viable) if they contained 250 or more reproductively active individuals. Ideally, recruitment should exceed mortality, but few long-term studies provide this demographic information. In the absence of these data, burrow surveys that report hatchling- and juvenile-sized burrows indicate that recent recruitment occurred, but we still often lack information about whether the observed level of recruitment is sufficient to offset mortality. The amount of habitat necessary to support a population of at least 250 breeding individuals likely varies depending on habitat quality. Populations in poor-quality habitat, such as those in atypical vegetative communities and in areas not aggressively managed, will likely require more area than populations in high-quality soils where there would be sparse canopy cover, multi-aged pine forests with abundant ground cover, and where prescribed fire is used periodically to maintain habitat conditions. Because of these variations, the density of gopher tortoises in a population that is large and demographically viable will vary.

A wide variety of information is available on the number and density of gopher tortoises and their burrows from many areas throughout their range. These data resulted from numerous surveys and censuses using a variety of methodologies ranging from one-time censuses to repeated surveys over several decades. The diversity of data poses a challenge when trying to evaluate the status of a species from a landscape perspective. For example, in some areas we have more data (*e.g.*, Florida and in portions of the listed range), and we have higher confidence in drawing conclusions about status of tortoises in these areas. In other areas, where there is little or no data, our confidence in assessing the status of tortoises is lower. Because of disparities in the type of data collected, methodologies in collecting data, and differences in the scope of studies, it is not possible to simply combine datasets to evaluate the status of the gopher tortoise throughout its range. Instead, we considered each individual dataset in the context of all other best available science to form general conclusions about the status of the gopher tortoise.

In the western portion of their range, gopher tortoise populations are small and occur in fragmented habitat. The largest and most substantial gopher tortoise populations in the western portion of its range occur on the De Soto National Forest in southern Mississippi. Long-term monitoring here indicates a decline in population sizes, a tendency towards adult-dominated populations, and a lack of, or very low, recruitment. Results of smaller-scale surveys of forest lands in Mississippi and public and private lands in Louisiana are largely consistent with findings on the De Soto National Forest. There are no known populations large enough (*e.g.*, greater than 250 individuals) to persist long-term based on projections resulting from recent modeling efforts.

The gopher tortoise is more widespread and abundant in parts of the eastern portion of its range, particularly southern Georgia and central and northern Florida. Long-term monitoring data indicate that many populations have declined and most are relatively small and fragmented. Smaller-scale, short-term, or one-time surveys throughout the unlisted portion of the range indicate that tortoise populations typically occur in fragmented and degraded habitat, are small, and densities of individuals are low within populations. Unlike the western portion of the range, there are several known populations of tortoises in the eastern portion of the range that appear to be sufficiently large to persist long-term (*e.g.*, Camp Blanding Joint Training Center, Chassahowitzka Wildlife Management Area, Fort White Wildlife and Environmental Area, Jennings Forest Wildlife Management Area, and Three Lakes Wildlife Management Area in Florida; and Fort Benning, Fort Stewart, River Creek Wildlife Management Area, and Townsend Wildlife Management Area in Georgia). There are about 80 other public parcels in Florida that contain a substantial amount of potential gopher tortoise habitat, but surveys or censuses of these areas have not been conducted to estimate the number of tortoises present (FWC 2012).

Current threats

The decline of the gopher tortoise has been linked primarily to the decline of the open, fire maintained, longleaf pine forest and ecosystem (Service 1990b). About 80 percent of the original habitat for the gopher tortoise within its listed range has been lost due to urbanization and agriculture (McDearman 2005). In remaining forests, management practices involving dense pine stands for pulpwood production, the silvicultural conversion from longleaf to other pines, and fire exclusion or infrequently prescribed fire have further reduced habitat for the species. These practices eliminate the open, sunny forest with a well-developed groundcover of grasses and forbs needed by tortoises for burrowing, nesting, and feeding (Landers and Buckner 1981; Auffenberg and Franz 1982). Nest depredation by vertebrates has also been considered substantial, although little quantitative data is available. From studies in southern Georgia, Landers et al. (1980) estimated about 90 percent of nests were destroyed by predators. In a much smaller study from southern Alabama, about 46 percent of nests (n = 11) were destroyed by raccoons, opossums, and armadillos (Marshall 1986). Other threats and causes for decline include habitat fragmentation, fire ants, heavy equipment operations during forest site preparation and timber harvest, and vehicle-caused mortality of gopher tortoises crossing roads (Service 1990b).

Analysis of species/Critical habitat likely to be affected

The Service's recovery plan (Service 1990b) for the gopher tortoise establishes short-term and long-term criteria involving public and private lands to delist the species (U.S. Forest Service 1990). The DeSoto National Forest represents a core area where management actions are required to prevent this threatened species from becoming endangered. This is the first and most immediate objective of the recovery plan. The long-term objective, delisting, involves substantial voluntary commitments from private landowners.

The short-term objective is to establish and maintain populations on the DeSoto National Forest, including Camp Shelby, on 18,144 acres at densities of 1.2 to 2.8 burrows per acre. This is the acreage estimated to consist of deep sandy soils, designated as priority soils, and at burrow densities indicative of large, stable populations on such soils in Florida. By these criteria, and

using a 0.61 burrow occupancy rate, the Service's recovery plan estimates the total recovery population on DeSoto National Forest would consist of 13,437 to 31,354 tortoises. More recent data on the average percentage of active and inactive burrows inhabited by tortoises in the listed range reveals that the 0.61 burrow conversion factor is too large (Mann 1995; Wester 1995). Using Mann's (1995) correction factor of 0.414, then 9,120 to 21,280 tortoises would occur on this DeSoto National Forest acreage with burrow density criteria of 0.5 to 12 tortoises per acre. For a minimally viable population of at least 75 tortoises, the lower range of the recovery criterion of about 9,120 tortoises would represent up to 122 viable populations, or less with larger individual populations.

On July 26, 1990, the Forest Service and Service completed formal section 7 consultation on the effect of a proposed management plan for the gopher tortoise on DeSoto National Forest. The objective of the Forest Service's plan is to promote recovery by maintaining and improving gopher tortoise habitat. Management measures to attain these objectives included prescribed fire, timber thinning, and regeneration to longleaf pine. Because of recent surveys documenting a declining gopher tortoise population, primarily due to poor habitat associated with encroaching shrubs and hardwoods in response to infrequent fire, the Service and Forest Service have reinitiated an informal section 7 consultation phase to remedy management problems that have impaired successful habitat restoration and maintenance. The successful implementation of a modified gopher tortoise habitat management plan is crucial to stabilize declining populations and to prevent the species from becoming endangered. This will require an increase in the frequency of growing season prescribed fire, with thinning and selective herbicide treatment in some areas with inadequate ground fuels to restore and maintain habitat. Also, management needs to be prioritized and designated on core patches of priority soils as well as adjoining areas of suitable soils to establish and maintain habitat areas of sufficient size for future viable populations. Depending on burrow density and home range overlap, the minimal reserve size for a single minimally viable population may range from 50 to 200 acres (Eubanks et al. 2002).

On private lands, the long-term objective for recovery is the establishment of 1.2 gopher tortoise burrows per acre on 45,945 acres of sandhill communities, where such burrow densities are most likely (U.S. Forest Service 1990). This acreage represents the area of privately-owned upland forests on sandy soils estimated by Lohoefener and Lohmeier (1984) at about the time of listing, although recovery objectives for private lands are not necessarily restricted to priority soil types. Using the 0.414 burrow conversion factor, recovery on private lands would represent about 23,094 tortoises by these criteria, or about 300 or fewer individual populations, each with 75 or more tortoises with good, long-term habitat management commitments.

Most of the timberland in the listed range of gopher tortoise is privately owned. In south Mississippi, for example, only about 14 percent of upland pine forests are publicly-owned and managed (Kelly and Sims 1987). Recovery for the gopher tortoise on private lands will require substantial voluntary commitments. Private landowners are not required by the Act to implement voluntary management to restore or maintain habitat by preventing or controlling forest succession that leads to habitat degradation in the absence of frequently occurring natural fire. A primary limiting factor for the recovery of the gopher tortoise is the absence of habitat restoration, which includes frequent prescribed fire and other active management measures to control and eliminate encroaching hardwoods and shrubs.

About 400,500 acres of longleaf pine stands remained within the listed range of the gopher tortoise by the 1990's. Gopher tortoises are not restricted to longleaf pine stands, but the best opportunity for recovery on both public and private lands will be in managed longleaf stands. The normal silviculture for the production of longleaf pine timber for poles and sawlogs, with frequent prescribed fire, is highly compatible with gopher tortoise habitat. In the listed range, voluntary landowner programs and technical assistance to private landowners by the Service, state, and private organizations have recently been initiated or are being planned as further incentives to the economic and ecological benefits for longleaf pine habitat restoration. These programs include Partners for Wildlife, Mississippi Partners for Fish and Wildlife, the Healthy Forest Reserve Program, the Emergency Conservation Reserve Program, and the Safe Harbor Program. Currently, about 2,000 acres of longleaf pine and potential gopher tortoise habitat has been treated by some form of habitat restoration management. These and other efforts will have to increase substantially to achieve recovery on private lands.

The gopher tortoise is federally listed as a candidate species in the eastern part of its range, which is defined as east of the Mobile and Tombigbee Rivers in Alabama, Florida, Georgia, Louisiana, Mississippi, and South Carolina. Threats to the gopher tortoise, as identified in the Service's 12-month finding (Service 2011), include mortality associated with the unregulated harvest of rattlesnakes, diseases such as upper respiratory tract disease, nest depredation, inadequacy of regulatory mechanisms, herbicide application, road mortality, and climate change. In addition, the destruction, modification, or curtailment of its habitat or range was identified as the most significant threat. Even though recovery criteria have not been characterized for the gopher tortoise in this part of its range, specific actions that can be taken to reduce threats to this species were recommended in the 12-month finding (Service 2011). Measures to reduce destruction, modification, or curtailment of gopher tortoise habitat or range include restoring and managing appropriate habitat through techniques such as mechanical vegetation reduction and burning at short-term fire return intervals. Securing habitat that supports viable populations through land acquisition, conservation easements, and landowner incentive programs will also help alleviate this threat.

Recovery for the gopher tortoise on private lands will require substantial voluntary commitments. Private landowners are not required by the Act to implement voluntary management to restore habitat. Likewise, the Act does not require private landowners to implement active management that would prevent the natural processes of forest succession, leading to a further decline of habitat in the absence of a frequently occurring natural fire. A primary limiting factor for the recovery of the gopher tortoise is the absence of habitat restoration, with frequent prescribed fire and other active management measures to control and eliminate encroaching hardwoods and shrubs. The gopher tortoise will not be recovered simply by landowners complying with the prohibitions of section 9 of the Act to avoid incidental take. Active management to restore habitat is required, as well as active fire management to sustain existing suitable habitat.

ENVIRONMENTAL BASELINE

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, etcetera). 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

Scrub-jay

The Project site is part of a larger complex of scrub-jays known as the Martin-North Palm Beach Metapopulation (M15) (Fitzpatrick et al. 1994; Stith 1999; Breininger et al. 2003). The M15 metapopulation declined from about 136 families in 1992 to 115 families in 1999. The metapopulation decline was due to a decrease in habitat quality and availability resulting from habitat fragmentation and degradation associated with urban development, increased predation from domestic animals, and competition from more urban-adapted birds (Thaxton and Hingtgen 1996; Bowman 1998; Breininger et al. 2003).

M15 is the largest metapopulation in southeast Florida, and includes JDSP and other County, State, and Federal preserves, as well as other private lands. This metapopulation is located primarily in Martin County, but also extends south into Palm Beach County. Stith et al. (1999) described the M15 area as having a protected population size of 85 and a maximum population

size of 120, if all occupied habitat was acquired for conservation. The Applicant's Project will occur in the central portion of the M15 metapopulation, and is bordered on three sides by JDSP. According to the Management Plan for JDSP, dated February 2003, there are approximately 2,309.81 acres of scrub, 593.23 acres of scrubby flatwoods, and 141.74 acres of sandhill habitat on JDSP, for a total of 3,044.78 acres of potential scrub-jay habitat. The scrub on JDSP is managed through the use of controlled burns where possible and by mechanical means where burning is not practical. Data obtained from JDSP shows that scrub-jays have historically occurred adjacent to the site and may have utilized the scrub on the site, though JDSP did not confirm use of the project site. Based on discussions with JDSP, multiple surveys are conducted each year. Scrub-jays have not been documented in the vicinity of the project site since 2010. Data from the Jay Watch survey for 2010 shows that there are 17 scrub-jay groups on JDSP with an average group size of 3.18 and 0.76 juveniles per group.

Scrub-jay surveys conducted at the Project in March 2012 revealed no scrub-jays on or in the immediate vicinity of the site. Controlled burns conducted on JDSP to the north and northeast of the site improved the scrub habitat on JDSP and, according to park biologists, scrub-jays moved into these areas following the burning. Controlled burns were planned for the Summer or Fall of 2012, but conditions were not conducive to burning in the area adjacent to Sandy Pines. JDSP biologists anticipate that scrub-jays would reoccupy the area once they are able to conduct additional management. The Project would result in the loss of 2.99 acres of potential scrub-jay habitat and the conservation of 6.0 acres. Thus, the impact acreage is approximately 0.09 percent of the scrub-jay habitat in this area of M15. Furthermore, approximately 2,879.6 acres of additional scrub habitat is in public ownership within this metapopulation.

Eastern indigo snake

This species is present in a wide variety of habitats, including those within the action area. Although we do not have specific information on the eastern indigo snake's abundance within the action area, we can make assumptions about the maximum number of snakes that could be present on the Project site. Layne and Steiner (1996) determined the average home range for female indigo snakes to be 47 acres and overlapping male home ranges to be 185 acres on Archbold Biological Station. Assuming those estimates are comparable to the Project site, it is possible for 1 female snake and 1 male snake to have the Project site within their home ranges. The relatively large range of this snake and its use of a wide variety of natural and modified habitats mean that the action area comprises only a very small fraction of this species' range.

Gopher tortoise

This species has a broad range that includes Florida, Georgia, Alabama, Mississippi, and Louisiana. Gopher tortoises require well-drained, sandy soils for burrowing and nest construction, an abundance of herbaceous ground cover for food, and a generally open canopy that allows sunlight to reach the forest floor. This species has 20 apparently active burrows on the Project site: 7 in the construction area, and 13 in the proposed conservation area. Using the 0.414 correlation rate, it is assumed that about eight gopher tortoises are present on the Project site; three are likely to be in the area to be cleared, and five in the proposed conservation area. The density of tortoises on neighboring areas of JDSP was not determined.

Factors affecting the species' environment within the action area

Over the last 50 years, human occupation of southeast Florida resulted in direct habitat loss through land clearing, habitat fragmentation, and habitat degradation through fire suppression. The distribution and numbers of all species inhabiting scrub likely declined in response to these increasing urban pressures. These same factors continue to act synergistically against scrub-jays, eastern indigo snakes, and gopher tortoises. In addition, as populations of these species become smaller and more isolated, the adverse demographic effects of urbanization influences may be magnified. Under these circumstances, small populations of all three species are likely to be more susceptible to extirpation than larger populations.

Results from Stith's (1999) simulation model included estimates of extinction, quasi-extinction (the probability of a scrub-jay metapopulation falling below 10 pairs), and percent population decline. These were then used to rank the different state-wide metapopulations by vulnerability. The model predicted that M15 and four other metapopulations (Northeast Lake, Merritt Island, Ocala National Forest, and Lake Wales Ridge) have low risk of quasi-extinction. However, two of the five, M15 and Northeast Lake, experienced significant population decline under the "no acquisition" option. The probability for survival of both of these metapopulations could be improved with more acquisition of habitat.

The project site is surrounded by JDSP and either 6.0 acres of scrub habitat will be placed into a conservation easement and managed in perpetuity for optimum scrub conditions, or the Applicant will contribute $219,348.00 ($36,558.00 per acre multiplied by 6 acres) to the Conservation Fund. There are approximately 5,988 acres of scrub-jay habitat in the M15 metapopulation, of which about 2,880 acres, or 48 percent, are in public ownership.

EFFECTS OF THE ACTION

Factors to be considered

Although a 5-day survey conducted in 2012 did not reveal scrub-jays on the Sandy Pines property, the Project occurs within habitat adjacent to lands historically occupied by scrub-jay, and which, after implementation of a planned prescribed fire, are expected to again be occupied. The construction timeframe for this project is approximately 6 months and land clearing is expected to take less than 4 weeks. The Applicant has agreed to conduct a nest survey just prior to land clearing and, if scrub-jays are nesting on site, land clearing will be postponed until after nesting season (March 1 through June 30). While the Project may not result in the mortality of scrub-jays, it will result in the permanent alteration and loss of 2.99 acres of scrub-jay habitat.

The 2.99 acres of habitat to be impacted is occupied by gopher tortoises, and could potentially be occupied by eastern indigo snakes. Since gopher tortoises will be relocated to the onsite conservation area prior to site preparation, per the Applicant's FWC permit, there could be mortality of this species during burrow excavation. The Applicant has agreed to implement the Service's February 12, 2004, *Standard Protection Measures for the Eastern Indigo Snake (Drymarchon corais couperi)* (Service 2004) to reduce the likelihood of "take" of the eastern indigo snake.

Analyses for effects of the action

Direct effects

Because of their mobility, fledgling and adult scrub-jays are unlikely to be killed during land clearing. Since the Applicant has agreed to conduct a nest survey and postpone land clearing outside of the nesting season (March 1 to June 30) if nesting scrub-jays are found, adverse effects to nesting scrub-jays, their eggs, or dependent chicks should be avoided or minimized. About 2.99 acres of habitat currently unoccupied by scrub-jays will be permanently altered by Project construction.

Seven potentially occupied gopher tortoise burrows were located within the area proposed for development. To relocate gopher tortoises to the on-site preserve prior to construction, the burrows will have to be excavated. It is possible that eastern indigo snakes and gopher tortoises could be injured or killed during burrow excavation. Future habitat management activities conducted on the conservation area also have the possibility to interfere with the breeding, feeding, and sheltering behaviors of all three species.

Indirect effects

Construction impacts consist of clearing and grading for the construction of buildings and associated infrastructure, parking areas, and the service road, and excavation of dry detention to meet Martin County and SFWMD requirements for stormwater management. The clearing and grading activities will be completed within 4 weeks of the start of construction. The areas not proposed for impact will be fenced in accordance with the approved Martin County requirements to avoid incidental encroachment into the area. Construction access will be from existing roads, drives, and previously cleared areas within the existing developed area. Construction staging will occur within existing developed areas or in areas cleared as part of the expansion. Thus, there are no additional impacts associated with haul roads, temporary access roads, or construction staging.

The operation of the facility should not adversely affect the scrub-jay. The operation of the facility is considered low impact and generates limited traffic. Staff and volunteers enter and exit the facility daily, but the patients are full time residents during their period of treatment with only limited visitation. Based on the traffic projections performed for the site planning approval process, the peak traffic hour from 4:00 pm to 5:00 pm (PM Peak Hour) is used to determine the impact of the expansion on the existing road network and the number of trips entering and leaving the facility. This provides some measure of the amount of traffic entering and exiting the expanded facility on a daily basis. The PM peak hour traffic is 35 trips leaving the facility and 8 trips arriving at the facility. Thus, unlike other hospitals, this facility is not a large generator of traffic and the risk to birds in flight from a vehicle or other wildlife that might attempt to cross the road would be considered minimal.

The residents of the facility are supervised on-campus throughout the day and night, and their outside activities are concentrated in courtyards or other open spaces that are either already cleared or will be cleared as part of the expansion. The existing scrub-jay habitat is not accessed

by the students, teachers, or other staff at the facility. Passive recreation may be implemented as part of the educational component of the facility. Supervised walks on trails may occur, but would be prohibited from March 1 through June 30.

The proposed expansion and future expansion within the limits of the proposed service road will occur adjacent to already cleared areas associated with the existing development. The preserved scrub area is contiguous to public lands within JDSP and within unobstructed scrub-jay dispersal distance from the preserved lands of JDSP. Thus, habitat fragmentation will not occur as a result of this project.

Interrelated and interdependent effects

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. No interrelated of interdependent actions are expected to result from the project.

Beneficial effects

The Applicant will place 6.0 acres in a conservation easement to JDSP, or find a suitable alternate to accept the easement, provide funding of $32,500 to enhance, manage, and monitor the easement for the first 5 years of the permit, subsequent monitoring in years 10 and 15, and deposit $14,000.00 into a non-wasting account managed by the Wildlife Foundation of Florida Mitigation Trust Funds, Incorporated, to yield $2,100.00 every 5 years for the management of the easement in perpetuity. If an easement cannot be granted to a suitable grantee, the applicant shall pay into the Conservation Fund. The establishment of the conservation easement and provision of funds for the restoration and management of the mitigation site in perpetuity will functionally contribute to the size of the overall preserved scrub adjacent to JDSP, thus providing additional protected habitat to which future generations can disperse to interbreed with the other scrub-jay families in JDSP. Payment into the Conservation Fund would provide preservation and maintenance of scrub-jay habitat, likely in other portions of the species' range.

The habitat enhancement and maintenance, whether it takes place on-site or in another county, will also provide for the future protection of the eastern indigo snake and gopher tortoise.

Species' response to a proposed action

The permanent alteration of scrub-jay habitat is likely to have adverse effects to the scrub-jays that inhabit the adjacent land. With proper habitat restoration and adequate resources, scrub-jays can increase in numbers (Thaxton and Hingtgen 1996). The rate of recovery depends on the size of the habitat preserved and availability of new recruits from surrounding territories. The loss of habitat from the proposed construction reduces the overall scrub habitat available in M15. However, because establishment of the conservation easement and provision of funds for the restoration and perpetual management of the mitigation site will functionally contribute to the size of the scrub habitat near JDSP, this portion of M15 may continue to provide dispersers to contribute to maintaining the genetic diversity of scrub-jays in the central portion of M15.

The permanent alteration of the scrub-jay habitat will also permanently alter the habitat for gopher tortoises. Based on gopher tortoise surveys conducted in the proposed preserve, there is adequate habitat available to relocate the tortoises to the preserve. Though there may be increased competition in the preserve, there is unobstructed access between the site and JDSP with sufficient habitat to minimize the effects to the gopher tortoise as a result of the proposed action.

CUMULATIVE EFFECTS

Cumulative effects include those 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.

The project is located within the M15 scrub-jay metapopulation. This is one of the largest metapopulations in southeast Florida and includes JDSP and other County, State and Federal preserves, as well as other private lands. This metapopulation is located primarily in Martin County, but also extends south into Palm Beach County near the Jupiter Inlet. As discussed in the HCP, the project area is bordered on three sides by JDSP. There are approximately 3044.78 acres of potential scrub-jay habitat within JDSP, which can also support eastern indigo snakes and gopher tortoises. JDSP is implementing an on-going plan to manage this acreage for scrub-jays. The Project would result in the loss of 2.99 acres of potential scrub-jay habitat, and either the on-site preservation of 6.0 acres or a contribution to the Conservation Fund. The impact acreage is approximately 0.09 percent of the scrub-jay habitat in the area. Furthermore, approximately 2879.6 acres of scrub habitat are in public ownership within M15. Though there is habitat in private ownership, it is anticipated that avoidance, minimization and mitigation would be required for any proposed impacts on private land, if occupied by scrub-jays. Thus, the impacts from this project would not significantly contribute to adverse cumulative impacts.

CONCLUSION

After reviewing the current status of the scrub-jay, the environmental baseline for the action area, the effects of the proposed Project and the cumulative effects, it is the Service's biological opinion that the Project, as proposed, is not likely to jeopardize the continued existence of the scrub-jay or the eastern indigo snake for the following reasons:

The proposed action and resulting construction will permanently alter 2.99 acres of scrub-jay, gopher tortoise, and eastern indigo snake habitat in Martin County. The conversion of scrub habitat is expected to adversely affect the scrub-jay, eastern indigo snake, and gopher tortoise. However, effects of this loss will be minimized through timing of construction activities to avoid scrub-jay nests if they are present, expansion in developed or disturbed areas to the extent practical, and the preservation and management of scrub habitat either adjacent to JDSP or in another county. Habitat management activities on the conservation easement, while ultimately beneficial, could also temporarily interrupt the normal breeding, feeding and sheltering behavior of these species.

Mitigation for unavoidable effects will comprise establishment of a 6.0-acre conservation easement, $32,500.00 earmarked for the enhancement, management, and monitoring of the eased lands for the first 5 years, continued monitoring in years 10 and 15, and deposit of $14,000.00 into a non-wasting account managed by the Wildlife Foundation of Florida Mitigation Trust Funds, Incorporated, to yield $2,100.00 every 5 years for the management of the easement in perpetuity; payment to the Conservation Fund will occur if a grantee for the easement is not approved. Cumulatively, we anticipate benefits to the security and viability of the covered species as a result of implementation of the mitigation and minimization measures in the Permit.

After reviewing the current status of the gopher tortoise, the environmental baseline for the action area, the effects of the proposed Project, and the cumulative effects, it is the Service's conference opinion that the Project, as proposed, is not likely to jeopardize the continued existence of the gopher tortoise for the following reasons:

Gopher tortoises will be relocated to the preserve and a silt fence installed to help contain them with the preserve. In addition, the contractor will be required to conduct a walkthrough of the site and confirm that gopher tortoises have not penetrated the silt fence and moved into the construction area. Silt fences will be repaired as soon as possible to reduce further encroachment. Habitat management activities on the conservation easement, while ultimately beneficial, could also temporarily interrupt the normal breeding, feeding and sheltering behavior of the gopher tortoise. Increased numbers of vehicles using the Project site could result in an increase of vehicle-caused mortality to this species. However, the temporary effects of the habitat management activities and the possibility of vehicle-caused mortality are anticipated to affect no more than a fraction of a percent of the gopher tortoise population in the action area.

No critical habitat has been designated for these three species; 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 a 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.

In our effects analysis, we have identified the following adverse effects would result in take:

1. Permanent alteration of 2.99 acres of scrub-jay, eastern indigo snake, and gopher tortoise habitat;
2. Increased human use of the area; and
3. Habitat management activities on the conservation easement.

The Applicant's HCP and its associated documents describe the following minimization and mitigation strategy to be employed by the Applicant to offset the effects of the proposed Project to the scrub-jay:

1. The expansion of Sandy Pines was planned to locate the expansion and staging areas as much as practical in the currently developed area, areas impacted by exotics and in areas as close to the existing facility as possible. This allowed for the impacts to native habitats to be reduced;
2. A scrub-jay nest survey will be conducted onsite just prior to site clearing and the results reported to the Service. If no scrub-jay nests are found, site clearing can begin within 3 days of the survey. If scrub-jay nests are found, clearing and grading will be postponed until after the scrub-jay nesting season (March 1 through June 30);
3. Standard Protection Measures for the Eastern Indigo Snake will be implemented during construction;
4. Gopher tortoises will be relocated to the preserve and a silt fence installed to help contain them within the preserve. In addition, the contractor will be required to conduct a walkthrough of the site and confirm that gopher tortoises have not penetrated the silt fence and moved into the construction area. Silt fences will be repaired as soon as possible to reduce further encroachment;
5. Mitigation for the unavoidable effects associated with the alteration of 2.99 acres of occupied scrub-jay habitat will be accomplished by the enhancement and perpetual management of 6.0 acres of upland scrub that will be placed under a conservation easement within 6 months after Permit issuance. The Applicant will earmark funds in the amount of $32,000.00 for maintenance and monitoring activities during the first 5 years of the Permit, and monitoring in years 10 and 15. These funds will be kept and managed by Sandy Pines Board of Trustees, and used to fund the mitigation activities. To guarantee the funding of the perpetual management of the eased lands, a separate Endowment Fund in the amount of $14,000.00 will be established by SP Behavioral, LLC, within 6 months after Permit issuance. This account will be held and managed by the Wildlife Foundation of Florida Mitigation Trust Funds, Incorporated, and is anticipated to yield $2,100.00 every 5 years to ensure the mitigation area is managed in perpetuity;
6. The scrub preserve will be managed so that the habitat remains suitable for scrub-jays as described in the Applicant's HCP; and
7. If the Applicant cannot find a suitable entity to be the grantee on the conservation easement, the Applicant will contribute $219,348.00 to the Conservation Fund.

Such measures are nondiscretionary and must be undertaken for the exemptions under section 10(a)(1)(B) and section 7(o)(2) of the Act to apply. If the Applicants fail to implement the measures outlined in the HCP and its accompanying section 10(a)(1)(B) permits, the protective coverage of the section 10(a)(1)(B) permits and section 7(o)(2) may lapse. The amount or extent of incidental take expected under the HCP, associated reporting requirements, and provisions for disposition of dead or injured animals are as described in the HCP and its accompanying section 10(a)(1)(B) permits.

AMOUNT OR EXTENT OF TAKE

The Service anticipates that 2.99 acres of scrub habitat will be permanently altered because of construction of the proposed project. Scrub-jays, eastern indigo snakes, and gopher tortoises will be adversely affected by the loss of habitat. These factors will likely affect feeding, breeding, or sheltering habitat for these three species. The Service also anticipates direct mortality of up to one eastern indigo snake and up to three gopher tortoises could result from excavation of gopher tortoise burrows and the relocation of gopher tortoises. Habitat management activities on the conservation easement, while ultimately beneficial, could also temporarily interrupt the normal breeding, feeding and sheltering behavior of the three species.

EFFECT OF THE TAKE

As a result of the consultation and the issuance of this Biological Opinion, the Service determined that the level of anticipated take is not likely to result in jeopardy to the scrub-jay, eastern indigo snake, or the gopher tortoise. Since no critical habitat has been designated for these species, none will be affected. The proposed Project will permanently alter a fraction of the scrub habitat available in the action area; however, the adverse effects of the habitat alteration will be reduced by the implementation of the minimization and mitigation measures. The adverse effects, when added to the baseline conditions in the action area, are not likely to result in significant adverse effects any of the three species either in the action area or throughout the species' range. Also, the mitigation offered by the Applicant is expected to increase the amount of protected and managed scrub habitat.

REASONABLE AND PRUDENT MEASURES

The Applicant's HCP prescribes methods to minimize on-site habitat disturbances and address unforeseen future circumstances. These methods represent actions to minimize and mitigate adverse effects to the scrub-jay to the maximum extent practicable. Based on the conservation actions in the HCP and the biology of the scrub-jay, the Service does not have any reasonable and prudent measures to add to the proposed action.

TERMS AND CONDITIONS

Since there are no "Reasonable and Prudent Measures," there are no "Terms and Conditions" for their implementation.

In order to be exempt from the prohibitions of the Act, the Service must issue a Permit with the conservation measures as identified in the HCP and any standard special conditions necessary. The proposed Project and conditions of the section 10(a)(1)(B) permit are designed to minimize the effects of incidental take that might otherwise result from the proposed action. The Service believes no more than 2.99 acres of scrub habitat will be permanently altered. If, during the course of this action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the project design and special conditions of the incidental take permit. The Service must immediately provide an explanation of the causes of the taking and review the need for possible modification of the project.

Upon locating a dead, injured, or sick individual of an endangered or threatened species, initial notification must be made to the Service's Law Enforcement Office (20501 Independence Boulevard; Groveland, Florida 34736; 352-429-1037). Additional notification must be made to the Service's South Florida Ecological Services Office (1339 20th Street; Vero Beach, Florida 32960-3559; 772-562-3909). Care should be taken in handling sick or injured individuals and in the preservation of specimens in the best possible state for later analysis of cause of death or injury.

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 further minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. We do not have any conservation recommendations to add at this time.

REINITIATION NOTICE

This concludes the formal consultation and conference for the proposed issuance of the Permit by the Service. The Service may confirm the conference opinion issued through this formal consultation if the gopher tortoise is listed or critical habitat is designated in peninsular Florida. If the Service reviews the proposed action and finds that there have been no significant changes in the action as planned or in the information used during the conference, the Service will confirm the conference opinion as the biological opinion on the Project, and no further section 7 consultation will be necessary.

As provided in 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary Service 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 Service's 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. The incidental take statement provided in this conference opinion does not become effective until the species is listed and the conference opinion is adopted as the biological opinion issued through formal consultation. At that time, the Project will be reviewed to determine whether any take of the gopher tortoise or critical habitat has occurred. Modifications of the opinion and incidental take statement may be appropriate to reflect that take. No take of the gopher tortoise may occur between the listing of the gopher tortoise and the adoption of the conference opinion through formal consultation, or the completion of a subsequent formal consultation.

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Figure 1. Location of Project site.

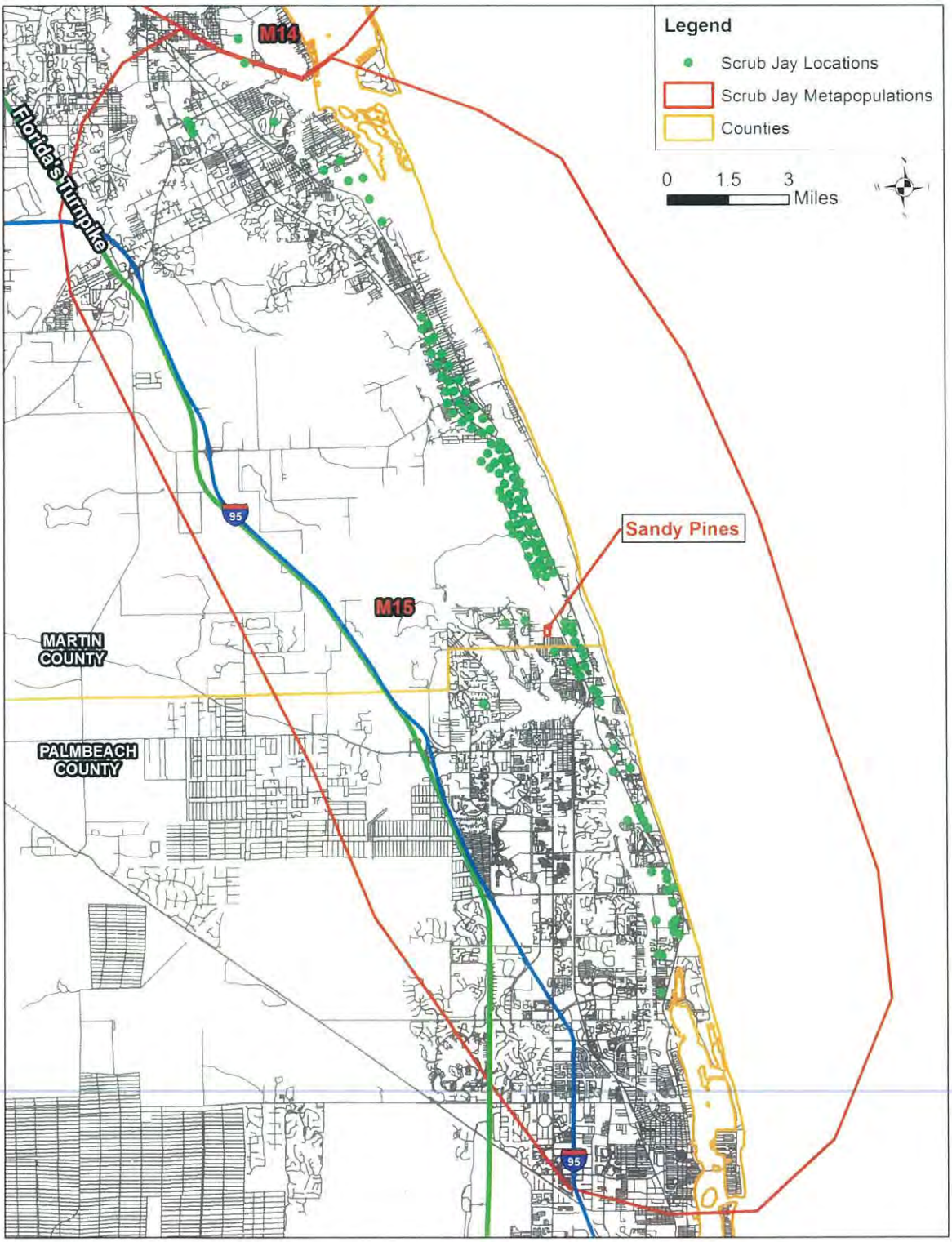

Figure 2. The Martin metapopulation of scrub-jays.