United States Department of the Interior
U. S. FISH AND WILDLIFE SERVICE
7915 BAYMEADOWS WAY, SUITE 200
JACKSONVILLE, FLORIDA 32256-7517

IN REPLY REFER TO:

Jeff S. Collins
Senior Project Manager
U.S. Army Corps of Engineers
Regulatory Division
Cocoa Permits Section
400 High Point Drive, Suite 600
Cocoa, Florida 32926

Subject: Biological Opinion – Antigua Bay Mixed-use Subdivision
[FWS Log **#:** 04EF1000-2018-0214]

Dear Mr. Collins:

This letter transmits the enclosed biological opinion (BO) of the U.S. Fish and Wildlife Service (Service) for the Antigua Bay Mixed-used Subdivision (the Action). The U.S. Army Corps of Engineers (Corps) proposes to provide a Nationwide Permit 7 for the construction of a stormwater outfall structure related to the construction of a 465-acre mixed use subdivision, located in Brevard County, Florida (Latitude: 28º 32' 7.00"N Longitude: 80º 47' 15.13"W. You determined that the Action is likely to adversely affect eastern indigo snake (*Drymarchon couperi*) and Florida scrub-jay (*Aphelocoma coerulescens)*.

The enclosed BO answers your request for formal consultation, and concludes that the Action is not likely to jeopardize the continued existence of the species listed above. This finding fulfills the requirements applicable to the Action for completing consultation under §7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended.

The BO includes an Incidental Take Statement that requires the Corps to implement reasonable and prudent measures that the Service considers necessary or appropriate to minimize the impacts of anticipated taking on the listed wildlife species. Incidental taking of listed wildlife species that is compliance with the terms and conditions of this statement is exempted from the prohibitions against taking under the ESA.

Reinitiating consultation is required if the Corps retains discretionary involvement or control over the Action (or is authorized by law) when:

a. the amount or extent of incidental take is exceeded;
b. new information reveals that the Action may affect listed species or designated critical habitat in a manner or to an extent not considered in this BO;
c. the Action is modified in a manner that causes effects to listed species or designated

critical habitat not considered in this BO; or

d. a new species is listed or critical habitat designated that the Action may affect.

A complete administrative record of this consultation is on file in our office at the letter-head address. If you have any questions about the BO, please contact Anthony Daly-Crews by phone at 904-731-3182 or by email at Anthony_Daly-Crews@fws.gov.

Sincerely,

Jay B. Herrington
Field Supervisor

Enclosure
Biological Opinion

Biological Opinion
Antigua Bay Mixed Use Development

FWS Log #: 04EF1000-2018-F-0214

Prepared by:
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Jay B. Herrington, Field Supervisor

5/23/18
Date

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CONSULTATION HISTORY

This section lists key events and correspondence during the course of this consultation. A complete administrative record of this consultation is on file in the Service's North Florida Ecological Services Field Office.

2018-01-03 The Corps initiated formal consultation for eastern indigo snakes and Florida scrub-jays.

2018-01-31 The Service and the Corps performed a site visit to determine the extent of wetland impacts and confirm occupancy of scrub-jays.

2018-02-02 The Service submitted a request for additional information to the Applicant regarding the status of mitigation, property transfer, and eastern indigo snake impacts.

2018-02-12 The Applicant's representative, Bio-tech Consulting, responded to the request for additional information.

2018-04-03 The Service contacted the Applicant to request permission to translocate scrub-jays within the Action Area. The Applicant's representative returned the email with permission to translocate scrub-jays.

2018-05-12 The Service provided a draft biological opinion to the Corps.

BIOLOGICAL OPINION

1. INTRODUCTION

A biological opinion (BO) is the document that states the opinion of the U.S. Fish and Wildlife Service (Service) under the Endangered Species Act of 1973, as amended (ESA), as to whether a Federal action is likely to:

- jeopardize the continued existence of species listed as endangered or threatened; or
- result in the destruction or adverse modification of designated critical habitat.

The Federal action addressed in this BO is the Army Corps of Engineers' (Corps) issuance of a permit for the Applicant to impact waters of the United States and associated clearing for the construction of the Antigua Bay mixed-use subdivision (the Action). This BO considers the effects of the Action on the eastern indigo snake (*Drymarchon couperi*) and Florida scrub-jay (*Aphelocoma coerulscens)*. The Action does not affect designated critical habitat; therefore, this BO does not further address critical habitat.

A BO evaluates the effects of a Federal action along with those resulting from interrelated and interdependent actions, and from non-Federal actions unrelated to the proposed Action (cumulative effects), relative to the status of listed species and the status of designated critical habitat. A Service opinion that concludes a proposed Federal action is *not* likely to jeopardize species and is *not* likely to destroy or adversely modify critical habitat fulfills the Federal agency's responsibilities under §7(a)(2) of the ESA.

"*Jeopardize the continued existence*" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR §402.02). "*Destruction or adverse modification*" means a direct or indirect alteration that appreciably diminishes the value of designated critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features (50 CFR §402.02).

2. PROPOSED ACTION

The Applicant requests a "Nationwide Permit" from Corps for the construction of a stormwater outfall structure related to the surrounding 465-acre development. The proposed development plan includes single-family residential lots, multi-family residential lots, retail, and commercial land uses. In addition, the overall development plan includes stormwater management ponds, an

amenities center and associated roadway infrastructure. Entrance to the project site is from Columbia Boulevard on the south side of the parcel. Any fill utilized in these activities would consist of clean earthen materials, as required by Corps' permit special condition.

The Action will occur east of and adjacent to US Highway 1, North and adjacent to State Road 405, in Section 35, Township 36 South, Range 35 East, in Brevard County, Florida (Latitude: 28º 32' 6.75N, Longitude: 80º 47' 49.42W).

2.1. Action Area

For purposes of consultation under ESA §7, the action area is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR §402.02). The Action Area for this consultation was identified by the Corps as all areas within the parcel limits. However, the Service is required to evaluate all impacts to the species, including beneficial actions and those that result in incidental take. The Applicant has proposed to donate a 35.0 acre parcel to the FWC and SJWMD to manage for connectivity and habitat for scrub-jays (Appendix I). Due to the inclusion of this property within the Action, the Service includes the off-site parcel as part of the Action Area.

Florida scrub-jays are known to disperse up to 5 miles (<5% of the time), however, research by Coulon et al. (2012) indicates that gaps of 1.2 to 1.9 miles between populations see a reduction in gene flow. As such, the Service will include all areas with suitable scrub-jay habitat that have patch sizes larger than 25 acres within 1.9 miles of the impacted area as part of the Action Area (Appendix II). For a more detailed analysis of scrub-jay dispersal and gene flow, see subsection 3.6.3. Additionally, eastern indigo snakes may disperse to these areas when large roads or development do not impact dispersal. See section 3.1 for a discussion of dispersal and impacts of roads on eastern indigo snakes.

2.2. Conservation Measures

This BO also evaluates the impacts of conservation measures incorporated as part of the Action. Conservation Measures "are actions to benefit to promote the recovery of listed species that are included by the Federal agency as an integral part of the proposed action. These actions will be taken by the Applicant and serve to minimize or compensate for, project effects on the species under review. These may include actions taken prior to the initiation of consultation, or actions which the Federal agency or Applicant have committed to complete in a biological assessment or similar document."

The Applicant has committed to several Conservation Measures, listed below, to offset impacts to the eastern indigo snake and Florida scrub-jay.

Conservation Measure 1

The Applicant acquired habitat within Brevard County that will be conserved to offset the impacts to the Florida scrub-jay within the Action Area. The Action will result in the loss of 17.5 acres of scrub-jay habitat from clearing. As such, the Applicant has proposed to conserve scrub-jay habitat through a donation of 35.0 acres of suitable scrub-jay habitat to the St. Johns River Water Management District (SJRWMD). As part of the donation, the Applicant will provide a one-time management endowment to the SJRWMD that will be used for restoration and management of the parcel for scrub-jays.

The donated parcel will be owned by the SJRWMD and managed by both Florida Fish and Wildlife Conservation Commission (FWC) and SJRWMD.

Conservation Measure 2

To offset unavoidable impacts to eastern indigos in the action area, the permittee proposes to donated $15,000 to the Eastern Indigo Snake Conservation Fund (Fund). The Fund is used for various conservation actions for the eastern indigo snake resulting in a net conservation gain for the species. A Memorandum of Understanding (MOU) was established on May 12, 2016, between the Wildlife Foundation of Florida, Inc. (Foundation), and U.S. Fish and Wildlife Service for the Foundation to manage the Fund. Any donations or mitigations received by the Foundation are used for:

- Land acquisition and conservation easements within suitable and potential eastern indigo habitat on private lands, including those in association with the Everglades Headwaters National Wildlife Refuge;
- Habitat restoration and monitoring;
- Habitat management and monitoring;
- Surveys of public and private lands;
- Ongoing or future research that will gather biological information that can inform conservation decisions or improve survey techniques;
- Costs associated with capture, transport, and long-term care of wild snakes brought into the captive breeding facility;
- Other activities as deemed necessary for the survival or recovery of the indigo snake.

2.3. Gopher tortoise relocation

The Applicant intends to relocate gopher tortoises (*Gopherus polyphemus*) within the Action Area as required by the Florida Fish and Wildlife Conservation Commission (FWC) in order to clear within the Action Area and construct a residential subdivision. Gopher tortoise burrows will be excavated in accordance with FWC regulations and tortoises will be relocated to recipient sites previously approved by FWC. Tortoise relocations involve the excavation of burrows using a backhoe loader or excavator to dig the burrow out until the tortoise is located. Once tortoises

are removed from the burrow, they are safely relocated to a recipient site and the burrow is backfilled.

Should temperatures be too low for gopher tortoise relocations, the Applicant will maintain a 25 ft buffer, as indicated by FWC, from occupied gopher tortoise burrows when clearing.

2.4. Clearing, Grading, and Construction

Approximately 457 acres are anticipated to be cleared and graded. Impacts due to clearing are anticipated to be permanent and will result in a change from the natural ecosystem. Clearing within the Action Area is required to facilitate construction of a mixed-use residential and commercial subdivision and is expected to commence during May 2018 after issuance of this Biological Opinion. The proposed action would involve clearing, mass grading, vegetation piling and removal, earth moving and piling, and transport of aggregate by trucks. Clearing will be accomplished with various types of construction machinery to remove large timber and burn or remove timber from the Action Area. Mass grading of the impacted area will be required at the completion of clearing to facilitate construction.

Construction will commence after completion of clearing and mass grading. Associated storm water management and infrastructure systems will be installed prior to beginning construction of residential homes. Construction is not expected to result in further impacts to previously cleared and graded areas.

2.5. Relocation

As part of the proposed Action, the Applicant has agreed to undertake relocation of any eastern indigo snakes that are detected within the project footprint during gopher tortoise relocation, clearing, grading, and construction. Relocation outside of the project footprint is needed to ensure that eastern indigos are not harmed by heavy machinery moving throughout the project footprint. Moving eastern indigos outside the project area ensures genetic viability of these individuals are not lost from the adjacent population.

Relocation will be conducted by a qualified biologist to minimize harassment and prevent harm. Individuals qualified to move snakes shall submit their qualifications to the NFESO prior to being authorized to move snakes.

2.6. Interrelated and Interdependent Actions

A BO evaluates the effects of a proposed Federal action. For purposes of consultation under ESA §7, the effects of a Federal action on listed species or critical habitat include the direct and indirect effects of the action, plus the effects of interrelated or interdependent actions. “Indirect

effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration" (50 CFR §402.02).

In its request for consultation, the Corps did not describe, and the Service is not aware of, any interrelated or interdependent actions to the Action. Therefore, this BO does not further address the topic of interrelated or interdependent actions.

3. STATUS OF THE SPECIES

3.1. Status of the Eastern Indigo Snake

This section summarizes best available data about the biology and current condition of the eastern indigo snake (*Drymarchon couperi*) throughout its range that are relevant to formulating an opinion about the Action. The Service published its decision to list the eastern indigo snake as threatened on January 31, 1978 (43 FR 4028).

3.1.1. Description of the Eastern Indigo Snake

Eastern indigo snakes are among the largest non-venomous snakes in North America, obtaining lengths of up to 2.6 m (8.5 ft; 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. The scales are large and smooth with 17 anterior and mid-body scale rows (occasionally 18-19), and 14-15 scale rows above the vent. The 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). A study by Krysko *et al.* 2016 has suggested dividing populations of eastern indigo snakes between an Atlantic and Gulf population segments based on genetic and morphological differences between these populations.

Presently, there are no studies on the longevity of wild eastern indigo snakes, though the oldest published record in captivity for eastern indigo snakes is 25 years and 11 months (Shaw 1959). Other information from captive breeding populations indicates some individuals may have lived up to 28 years old in captivity, though the date of acquisition of specimens older than 26 are not vouchered (Hoffman pers. comm. 2017). Because wild eastern indigos experience higher environmental and anthropogenic pressures than in captivity, life spans are likely reduced.

Critical habitat has not been designated for this species.

3.1.2. Life History of the Eastern Indigo Snake

Most information on the reproductive cycle of eastern indigo snakes is from data collected in

north Florida. In this geographical area, breeding occurs between November and April, and females deposit 4 to 12 eggs during May or June (Moler 1992). Speake et al. (1987) reported an average clutch size of 9.4 for 20 captive bred females. Throughout the entire range, eggs are laid from late May through August, and young hatch in approximately 3 months. Peak hatching activity occurs between August and September, and yearling activity peaks in April and May (Groves 1960, Smith 1987). Limited information on the reproductive cycle in south-central Florida suggests that the breeding and egg-laying season may be extended. In this region, breeding extends from June to January, laying occurs from April to July, and hatching occurs during mid-summer to early fall (Layne and Steiner 1996).

Analogous with many other species of snakes, female eastern indigo snakes can store sperm and delay fertilization of eggs. There is a single record of a captive snake laying five eggs (at least one of which was fertile) after being isolated for more than four years (Carson 1945). It has long been assumed that this event resulted from sperm storage. 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 (P. Moler, GFC, personal communication 1998). There is no information on how long eastern indigo snakes live in the wild. In captivity, the longest an eastern indigo snake has lived was 25 years, 11 months (Shaw 1959).

Eastern indigo snakes spend a great deal of time foraging and searching for mates. The species is diurnal throughout its range (Service 2008). The eastern indigo snake will eat most vertebrates small enough to be overpowered and swallowed. 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; Stevenson et al. 2010).

Population Dynamics

Few detailed studies of population dynamics of eastern indigo snakes have been conducted, primarily because the species is secretive and difficult to study. Although the sex ratio at birth and in juveniles is not different from 1:1 (Moulis 1976, Steiner et al. 1983), adult sex ratios in the wild are strongly biased in favor of males (Layne and Steiner 1996, Stevenson et al. 2009). Stevenson et al. (2009) attributed this bias to lower rates of survival in females, even though males have larger home range sizes and greater daily movement distances than females (Hyslop 2007).

Adult males are also significantly longer and heavier than females, which is attributed to male-male combat in this species (Shine 1994, Stevenson et al. 2009). Although both sexes mature at about the same total length (150 cm), males continue to grow after sexual maturity, whereas females apparently devote most available energy to vitellogenesis (Service 2008, Stevenson et al. 2009). Maturity is reached in 3-4 years (Service 2008).

Within Florida and southern Georgia, the eastern indigo snake occupies a wide range of habitat types including pine flatwoods, scrubby flatwoods, scrub and sandhill, oak and maritime hammocks, wetlands, coastal dunes, and human-altered habitats (Service 2008). Below-ground refugia include the burrows of gopher tortoises, nine-banded armadillos (*Dasypus novemcinctus*), rodents, and land crabs (*Cardisoma guanhumi*), as well as hollow logs, stump holes, and other crevices (Hyslop 2007, Hyslop et al. 2009).

Seasonal shifts in habitat use have been widely reported, especially in areas north of the frost-line, with eastern indigo snakes typically spending the winter in gopher tortoise burrows in xeric uplands and foraging more frequently in wetlands during the warmer months (Layne and Steiner 1996, Hyslop 2007, Hyslop et al. 2009, Stevenson et al. 2009). In addition, many eastern indigos are known to return to the same hibernacula annually for over wintering (Speak 1978, Hyslop 2007).

Behavior and home range size are variable depending on the climate of the region. In the milder climates of south-central and southern Florida, over wintering sites may not be as important. However, gopher tortoise burrows and other refugia are important for refuge from high temperature conditions (Speak and Mount 1973, Lawler 1977, Landers and Speak 1980, Smith 1987). In the Gulf Hammock Wildlife Management Area, hollow root channels and rodent burrows in the base of live oak trees were the most common den sites, and the edges of wetlands were favored foraging locations (Moler 1985).

Radiotelemetry and mark-recapture techniques have been used to estimate home range size (minimum convex polygon; MCP), daily and seasonal movement patterns, habitat use, and the extent of habitat required to support population of this species. Because of the wide range of the species, behavior and home ranges size is variable in different portions of their extant range. In central Florida, Layne and Steiner (1996) estimated the mean home range size of 12 males to be 74.3 ha (183.6 ac) and seven females to be 18.6 ha (46.0 ac). Males also moved significantly more often between successive locations and moved greater distances. In the Gulf Hammock region of Florida, Moler (1985) reported mean home ranges of 48.2 ha - 533.0 ha (119.1 ac - 1,317.0 ac) for four males and 50.8 ha (125.5 ac) for one female. A single male occupied a home range of 185 ha (457.1 ac) in north-central Florida (Dodd and Barichivich 2007). In southern Georgia the mean home range of 19 males (520.0 ha; 1,285.0 ac) was significantly larger than 13 females (103.4 ha; 255.5 ac), and males move more frequently and greater distances (Hyslop 2007). A compilation of home range sizes throughout Florida and Georgia may be found in Table 1.

Using a combination of radiotelemetry and population models, Breininger et al. (2004) investigated the effects of habitat fragmentation on the viability of eastern indigo snake

populations in east-central Florida. In this study males had an average home range size of 120 ha [296.5 ac]and females = 41 ha [101.3 ac]; Breininger et al. 2004), snakes living along primary roads soon died, and edge/area effects were more important than area alone in determining population survival. Studies by Layne and Steiner (1996), Enge and Wood (2002), and Hyslop (2007) also found roads to be an important source of mortality in eastern indigo snakes. A study by Moler (1992) suggested that at least 1,000 ha (2,470 ac) of contiguous habitat is required to sustain eastern indigo snakes long term, though indigos often are present on smaller patch sizes when habitat has become isolated and fragmented.

Eastern indigos are known to utilize large home ranges, which is variable throughout their range (Breininger et al. 2011, Dodd and Barichivich 2007, Moler 1992, Bauder and Jenkins 2013, Ceilley et al. 2014, Hyslop 2007, Kehl and Breininger 1991, Layne and Steiner 1996, Legare and Breininger 2002, Legare et al. 2006, Moler 1985, Smith 1987, Speak et al. 1978). Male eastern indigos are known to have larger home range sizes than females, likely due to searching for mates in the area or due to their larger sexually dimorphic size (Dodd and Barichivich 2007, Moler 1985, Smith 1987). Home range size for the species ranges from 4 ac – 3,780.9 (Layne and Steiner 1996, Bauder and Jenkins 2013, Breininger et al. 2011).

Table 1 Home range size of eastern indigo snakes based on Minimum Convex Polygon (MCP) method in Florida and Georgia compiled from several research papers.

Citation	Study Site	Male (mean)	Male (range)
Ceilley et al. 2014	Martin County, FL	106 ac	57-163 ac
Layne and Steiner 1996	Highlands County, FL	183.6 ac	5-492 ac
Bauder and Jenkins 2013	Highlands County, FL	442 ac	69-1,184 ac
Legare and Breninger 2002	Highlands County, FL	153 ac	133-173 ac
Kehl et al 1991 as cited on NASA/Dynamac website	Brevard County, FL	690 ac	Unk
Breininger et al. 2011	Brevard County, FL	499 ac	96-1,441 ac
Dodd and Barichivich 2007	Putnam County, FL	457 ac	Unk
Moler 1985	Levy County, FL	348 ac	57-694 ac
Hyslop 2007	Southeastern GA, various	1,329 ac	86-3,800 ac

3.1.3. Numbers, Reproduction, and Distribution of the Eastern Indigo Snake

The eastern indigo snake was listed as threatened on January 31, 1978 (43 FR 4028), due to population decline caused by habitat loss, over-collecting for the domestic and international pet trade, and mortality caused by rattlesnake collectors who gas gopher tortoise (*Gopherus*

polyphemus) burrows to collect snakes. At the time of listing, the eastern indigo snake was considered a subspecies, *Drymarchon corais couperi*. Currently, the eastern indigo snake is accepted by the scientific community as a separate species, *Drymarchon couperi* (Crother 2000). In 1991, Collins elevated this lineage to specific status based on allopatric speciation and diagnosibility. Subsequent work has supported this designation (Wuster *et. al.* 2000).

The indigo snake ranges from the southeastern United States to northern Argentina (Conant and Collins 1998). Two species occur in the United States: the eastern indigo and the Texas indigo (*D. corais*). 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. Florida and Georgia 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 population size rangewide is unknown.

3.1.4. Threats to the Eastern Indigo Snake

Throughout the eastern indigo snake's range expanding urban areas are creating barriers to the dispersal of individuals and gene flow between populations, and habitat loss and degradation are a threat to the species (Lawler 1977, Moler 1985b). In northern areas of its range in Georgia and peninsular Florida the species is impacted by a decline in longleaf pine forests, gopher tortoises, and gopher tortoise habitat (Van Lear et al. 2005). In central and southern Florida the eastern indigo snake is less dependent on any one habitat type, but does avoid developed areas (Lawler 1977, Moler 1985a, Hyslop 2007). Throughout Florida developed areas are expanding rapidly with population growth at the expense of wildlife habitat (Cerulean 2008).

At the time of listing, other threats to the eastern indigo snake included commercial collection for the pet trade and mortality during the gassing of gopher tortoise burrows by individuals attempting to drive rattlesnakes out for collection (43 FR 4026 4029). Since their listing additional potential threats to the species have expanded to include disease, road mortality, kills of indigo snakes by land owners and pets, and ATV use in gopher tortoise habitat (Service 2008).

3.1.5. Conservation Needs of the Eastern Indigo Snake

Major threats to the eastern indigo snake include habitat fragmentation, destruction, and reduced gene flow. At the current time, the range wide status of the species is unknown. Range wide surveys and monitoring are required to help understand the current status of the species. The recovery strategy for the eastern indigo snake consists of maintaining and enhancing existing

populations; monitoring the status of existing populations; identifying and securing additional eastern indigo snake populations and habitat; establishing new populations through translocations or reintroductions; and supporting research that guides land management and provides demographic and ecological data. Management plans should be developed and implemented for all recovery populations. Appropriate habitat management includes maintaining road-less corridors allowing dispersal between occupied upland and wetland habitats; minimizing soil disturbance and loss of native herbaceous groundcover vegetation; conducting prescribed burning, particularly during the growing season; maintaining appropriate wetland habitat; and restoring degraded upland habitat.

Monitoring programs to track population trends and the response of this species to habitat management activities are needed for all recovery populations. Gopher tortoise populations should be regularly monitored, and augmented if necessary, at areas where both indigo snakes and tortoises co-occur. Monitoring programs should be critically evaluated and revised as needed. Since recovery of the eastern indigo snake will necessitate finding or creating new, currently unknown populations, assessment of potentially suitable habitat within the range of the species and additional presence/absence surveys are needed. Suitable habitat for translocations/reintroductions needs to be identified, and programs developed and implemented to establish and monitor these new populations and manage the habitat that supports them.

Tracts of habitat in private ownership that could be managed for eastern indigo snakes, need to be identified. Site analyses and habitat management actions that improve the connectivity between upland and wetland habitats utilized by indigo snakes are needed.

Additional research is needed to gain a better understanding of the natural history of the eastern indigo snake and its habitat for use in developing and implementing management plans. Data gathered from these studies will ensure that recovery efforts are supported by the best available scientific information.

3.2. Environmental Baseline for Eastern Indigo Snake

This section is an analysis of the effects of past and ongoing human and natural factors leading to the current status of the eastern indigo snake, its habitat, and ecosystem within the Action Area. The environmental baseline is a “snapshot” of the species’ health in the Action Area at the time of the consultation, and does not include the effects of the Action under review.

3.2.1. Action Area Numbers, Reproduction, and Distribution of the Eastern Indigo Snake

The Action Area contains several different types vegetative communities, as defined under the Florida Land Use, Cover and Forms Classification System, Level III (FLUCFCS, FDOT, January 2004). The on-site upland land use types/vegetative communities are classifieds as pine flatwoods, xeric oak, Brazilian pepper, disturbed lands, and roads and highways. Wetland/surface water types within the action area include reservoirs, major bodies of water, streams and lake swamps, and mixed wetland hardwoods.

The eastern indigo snake is known to utilize a variety of habitats in Florida, including pine flatwoods, scrubby flatwoods, high pine, dry prairie, xeric oak, xeric oak scrub, turkey-oak barrons, tropical hardwood hammocks, edges of freshwater marshes, agricultural fields, coastal dunes, and human-altered habitats (Service 1999). Additionally, the presence of a mosaic of habitats including uplands and wetlands, and presence of gopher tortoises and other refugia, are important for the eastern indigo snake (Landers and Speak 1980, Auffenberg and Franz 1982).

The Action Area is located adjacent to the Brevard County Enchanted Forest Sanctuary, which is a property managed by Brevard County, where eastern indigo snakes have been observed by land managers and researchers (Breininger pers. com. 2018). Several eastern indigo snakes have been radiotracked along the edge of the Action Area within 2012, however, due to property owner restrictions, researchers were unable to enter the property to continue tracking.

Based on the expected home range size of eastern indigo snakes as described in the *Status of the Species* section, availability of suitable habitat for the species, presence of gopher tortoises within the Action Area, observations of eastern indigos on the edge of the property by researchers, and considering the information about eastern indigo snake life span, the Service is reasonably certain the Action Area is occupied by the species.

Modeling

In addition to observational data within the Action Area from our GIS database, the Service reviewed the Maxent Model for eastern indigo snakes. The Maxent Model for eastern indigo snakes is a statistical model used to determine the probability that the species inhabits an area based on previous observations, soils, land use/land cover, dominant drainage classes, and percent clay. For the current action, the Service utilized the Maxent Model for eastern indigo snakes developed by the Florida Fish and Wildlife Conservation Commission to assist with determining areas of occupancy (FWC 2016). Information in the model indicates the Action Area has a high probability for eastern indigo snake occurrence.

The model further supports the determination that the site is occupied by eastern indigo snakes. Because of the elusive nature of the species, it is difficult to quantify the density or number of eastern indigos which may be within the Action Area. However, the link between eastern indigo

snakes and gopher tortoises, presence of xeric habitat, and use of the Maxent Model show a strong correlation that acres of habitat lost within the Action Area is a surrogate for the loss of individual eastern indigo snakes.

Without reliable survey methods, it is difficult to estimate numbers of eastern indigos in areas of suitable habitat. Only one published study estimates the density of eastern indigo snakes (Layne and Steiner, 1996). The study by Layne and Steiner (1996) estimated that eastern indigos at Archbold Biological Station occur at a density of 2.6 snakes per 247 acres (n=19). Because the species is wide ranging and density may be temporarily higher in overwintering areas or conservation areas actively managed using prescribed fire, density of eastern indigo snakes may be variable depending on the site conditions, timing of the year, and availability of contiguous habitat adjacent to the Action Area.

To estimate the density of individuals within the Action Area, we rely on data from a long-term study by Breininger et al. (2011), which determined the average home range size for male and female eastern indigo snakes in Brevard County. Specifically, snakes from the study by Breininger et al. (2011) were tracked into the Action Area. In that study, male eastern indigo snakes had an approximate average home range size of 499 acres and females 187 acres. These studies utilized the Minimum Convex Polygon (MCP) method for determining home range.

Considering home range overlap between males and females, we estimate the Antigua Bay property supports up to one male and two females. Approximately 22 acres within the Action Area are previously disturbed due to roads, clearing, or other disturbance. For this reason, only 328 acres are considered as suitable habitat for the species within the Action Area. Approximately 78 acres of that habitat will remain on-site as preservation.

Nesting locations of the species are poorly understood and locating nests of eastern indigo snakes are difficult due to the cryptic nature of the species. Eastern indigo snakes are known to breed from November to April and eggs are laid during May to June. Approximately 4-12 eggs are deposited in each clutch. Eggs may be laid under logs, stumpholes, abandoned gopher tortoise burrows, or other unknown areas. Because two female eastern indigo snakes may occur within the Action Area, we expect one to two nests may be present with 8-24 individual eggs present.

3.2.2. Action Area Conservation Needs of and Threats to the Eastern Indigo Snake

The Action Area is relatively isolated by development, water, and highways/feeder roads. Further urban encroachment surrounding the Action Area and possible future expansion of roads are likely to result in local extirpation of the species long term (20+ years). It is also unlikely that the species will remain within the Action Area after clearing and construction, as only 77.4 acres of suitable habitat will not be impacted by the Action. Habitat destruction and fragmentation will

further contribute to threats to the species and roads are a significant source of mortality for the species (Layne and Steiner 1996, Enge and Wood 2002, and Hyslop 2007)

3.3. Effects of the Action on the Eastern Indigo Snake

This section analyzes the direct and indirect effects of the Action on the eastern indigo snake, which includes the direct and indirect effects of interrelated and interdependent actions. Direct effects are caused by the Action and occur at the same time and place. Indirect effects are caused by the Action, but are later in time and reasonably certain to occur. Our analyses are organized according to the description of the Action in section 2 of this BO.

3.3.1. Conservation Measures

The Applicant has proposed to donate a 35.0 acre property, which is contiguous with other conservation properties, to offset impacts to scrub-jays and eastern indigo snakes. The property is presently overgrown and unsuitable scrub-jays, however, the parcel will likely provide conservation benefit to any eastern indigo snakes within the area before and after restoration. The parcel is adjacent to more than 1000+ hectares of conservation lands that will benefit eastern indigo snakes in the area.

3.3.2. Effects of Gopher Tortoise Relocation on the Eastern Indigo Snake

The Applicant intends to relocate gopher tortoises (*Gopherus polyphemus*) within the Action Area as required by the Florida Fish and Wildlife Conservation Commission (FWC) in order to clear within the Action Area and construct a residential subdivision. Gopher tortoise burrows will be excavated in accordance with FWC regulations and tortoises will be relocated to recipient sites previously approved by FWC. Tortoise relocations involve the excavation of burrows using a backhoe loader or excavator to dig the burrow out until the tortoise is located. Once tortoises are removed from the burrow, they are safely relocated to a recipient site and the burrow is backfilled.

Should temperatures be too low for gopher tortoise relocations, the Applicant will maintain a 25 ft buffer, as indicated by FWC, from occupied gopher tortoise burrows when clearing.

3.3.3. Effects of Clearing on the Eastern Indigo Snake

Approximately 328 acres within the Action Area has the ability to support the eastern indigo snake. Of the total 328 acres within the Action Area, it is anticipated that a total of 250 acres of suitable eastern indigo snake habitat will be impacted. The remaining habitat (78 acres) will remain as on-site preservation for wildlife and beautification (Figure 2). All 250 acres of vegetated lands which are anticipated to be cleared are considered to be suitable habitat for eastern indigo snakes. While the density of eastern indigos within the Action Area is unknown,

we estimate there may be up to two females and one male snake that may be impacted by clearing activities (see section 3.2.1). The development footprint will impact all three eastern indigos home range.

The timing and duration of clearing would vary with the activities proposed at specific locations. Construction personnel will have worker education and implement the “Standard Protection Measures for the Eastern Indigo Snake” (Service 2013), which directs them to avoid eastern indigo snakes. However, despite education measures, the eastern indigo snake is difficult to detect and the species may still be unknowingly harmed or mortality may occur.

The Action would involve clearing, mass grading, vegetation piling and removal, earth moving and piling, and transport of aggregate by trucks. These actions are reasonably certain to cause harm or mortality to eastern indigos, nests, or eggs that are present at the time of those actions. Because snakes are difficult to observe under thick brush and debris, harm or injury by entombment or crushing may occur incidentally. Snakes can be slow moving, especially during periods of low temperature, and may have difficulty dispersing from construction equipment within the Action Area.

Brush piles during clearing are often created and left on site for several weeks or months. Eastern indigo snakes, and many other snakes species, may use brush piles as refugia sites when other areas are not available. After several weeks or months, brush piles are then either burned or transported off property by trucks. Burning brush piles may result in harm of eastern indigo snakes if the snakes are surrounding by flames or do not have sufficient time to flee brush piles. Equipment lifting limbs and other materials out of brush piles may also result in harm to the species by crushing individuals or their nests.

Nesting locations of the species are poorly understood and locating nests of eastern indigo snakes are difficult due to the cryptic nature of the species. Because two female eastern indigos may occur within the Action Area, one to two nests may be impacted as a result of the Action. Eastern indigo snakes are known to breed in November to April and eggs are laid during May to June. Approximately 4-12 eggs are deposited in each clutch. Eggs laid under logs, inside stumpholes, gopher tortoise burrows, or other areas, may be inadvertently crushed by machinery during clearing and grading.

Figure 2 Extent of impacts to the eastern indigo snake within the Antigua Bay project area.

Enlarging the developed areas on the Antigua Bay property would increase impervious surfaces to approximately 272 acres, which is a permanent habitat loss. Because some areas have been previously disturbed, only 250 acres of habitat within the Action Area are suitable to support eastern indigo snake breeding, sheltering, and feeding behaviors. Although indigo snakes use a variety of habitats within and adjacent to human-altered altered areas, the new buildings and pavement would not provide such habitats. While there is not an uninterrupted corridor to adjacent undeveloped lands, eastern indigos may disperse across roads to adjacent areas.

3.3.4. Effects of Relocation on the Eastern Indigo Snake

As part of the proposed Action, the Applicant has agreed to undertake relocation of eastern indigo snakes that are detected within the project footprint during gopher tortoise relocation, clearing, grading, and/or construction. During relocations, eastern indigo snakes may be harassed due to the need to capture and transport the species outside of the project footprint. Relocation of the species may result in a temporary interruption of feeding, sheltering, or breeding behaviors. Harm during relocation is unlikely due to the gentle nature of capture and relocation by hand.

Relocations will be performed by a qualified biologist, approved by the Service. Additionally, all field equipment used for relocations will be disinfected prior to moving snakes to ensure there is no transmission of known diseases among snake populations.

3.4. Cumulative Effects on the Eastern Indigo Snake

For purposes of consultation under ESA §7, cumulative effects are those caused by future state, tribal, local, or private actions that are reasonably certain to occur in the Action Area. Future Federal actions that are unrelated to the proposed action are not considered, because they require separate consultation under §7 of the ESA. Because the entire Action Area will be cleared under the Corps' permit, no future federal action will likely result in cumulative effects to the species.

3.5. Conclusion for the Eastern Indigo Snake

In this section, we summarize and interpret the findings of the previous sections for the eastern indigo snake (status, baseline, effects, and cumulative effects) relative to the purpose of a BO under §7(a)(2) of the ESA, which is to determine whether a Federal action is likely to:

a) jeopardize the continued existence of species listed as endangered or threatened; or
b) result in the destruction or adverse modification of designated critical habitat.

"Jeopardize the continued existence" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR §402.02).

After reviewing the current status of the eastern indigo snake, the environmental baseline for the action area, the direct and indirect effects of the proposed residential subdivision and any cumulative effects, it is the Service's opinion that the proposed action is not likely to jeopardize the continued existence of the eastern indigo snake. We base this decision on the following:

1) Eastern indigo snakes require large tracks (1000 ha+) of unfragmented conservation lands to persist long term (Moler 1992). The proposed Action Area does not consist of 1000+ hectares, nor is it connected with large tracks of unfragmented lands. As such, the Action Area would not support eastern indigos for recovery purposes.

2) The loss of habitat is relatively small (272 acres) compared to the total amount of potential habitat for eastern indigo snakes across their range. While the current status of the eastern indigo snake population is currently unknown, primarily due to their cryptic nature, the species is known to be wide ranging across most of peninsular Florida (Enge et al. 2013).

3) The permitee has offset impacts to eastern indigos in the action area by donating $15,000 to the Eastern Indigo Snake Conservation Fund (Fund). The Fund is used for various conservation actions for the eastern indigo snake resulting in a conservation gain for the species (Conservation Measure 2).

4) The Applicant has proposed to donate a 35.0 acre property, which is contiguous with other conservation properties, to offset impacts to Florida scrub-jays and eastern indigo snakes. While this piece of property is less acreage than what is being impacted, the value of the habitat due to connectivity for existing managed lands provides great conservation benefit to the species. This project site will provide connectivity to over 1000+ ha of conservation lands which have the ability to support eastern indigo snakes.

5) Any eastern indigo snakes which are able to be captured within the Action Area will be relocated out of harms way, which reduces the likelihood of mortality to the species.

Critical habitat has not been designated for the eastern indigo snake and therefore, it will not be affected.

3.6. Status of the Florida Scrub-jay

This section summarizes best available data about the biology and current condition of the Florida scrub-jay (*Aphelocoma coerulscens*) throughout its range that are relevant to formulating an opinion about the Action. The Service published its decision to list the Florida scrub-jay as threatened on in 1987 (52 CFR 20719).

3.6.1. Description of the Florida Scrub-jay

Appearance/Morphology

Florida Scrub-Jays are about 25 to 30 centimeters [cm] (10 to 12 inches [in]) long and weigh about 77 grams [g] (3 ounces [oz]). 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 Florida 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 Florida 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). Florida 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 vocalized only by females (Woolfenden and Fitzpatrick 1984, 1986). Florida Scrub-Jays that are less than about five months of age are easily distinguishable from adults; their plumage is smokey grey 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 Florida Scrub-Jays may be indistinguishable from adults in the field (Woolfenden and Fitzpatrick 1984). The wide variety of vocalizations of Florida Scrub-Jays is described in detail by Woolfenden and Fitzpatrick (1996b).

Taxonomy

Florida Scrub-Jays (*Aphelocoma coerulescens*) are in the order Passeriformes and the family Corvidae. The genus *Aphelocoma* is made up of three groups: Mexican Jays, Scrub-Jays, and Unicolored Jays. 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 was considered a subspecies (*A. c. coerulescens*). It regained recognition as a full species from the American Ornithologists' Union (AOU 1995) because of genetic, morphological, and behavioral differences from the other members of this group; the Western Scrub-Jay (*A. californica*), the Island Scrub-Jay (*A. insularis*), and the Woodhouse's Scrub-Jay (*A.* woodhouseii) occur in western United States and Central America. Other jays of the same genus include the Transvolcanic Jay (*A. ultramarina*), the Unicolored Jay (*A. unicolor*), and the Mexican Jay (*A. wollweberi*) of Central America and southwest North America (AOU 2016).

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 most recent Service Federal Register notice of Endangered and Threatened Wildlife and Plants (50 Code of Federal Regulations [CFR] §§ [sections] 17.11 and 17.12).

3.6.2. Life History of the Florida Scrub-jay

Habitat Characteristics

Scrub-jays are restricted to scrub and scrubby flatwoods occurring on relict dunes and sand ridges throughout Florida, primarily concentrated along the Atlantic Coast, Gulf Coast, and on the central ridges of the peninsula (Laessle 1958, Davis 1967, Myers 1990, Woolfenden and Fitzpatrick 1996b). At the landscape scale, scrub-jays require suitable quantity and configuration of habitat to persist long-term. Given the size of scrub-jay territories and the short dispersal distances exhibited by the species, it is critical to maintain large, contiguous blocks of scrub-jay

habitat to support local populations that are relatively resistant to local extinction (Fitzpatrick *et al.* 1991). The probability of persistence increases with increasing connectivity to other scrub-jay populations (Coulon *et al*. 2010, 2012).

Within each territory, scrub-jays require low, shrubby oaks, few tall trees, and bare patches of sand or sparse herbaceous vegetation (Breininger *et al.* 1998). Optimal habitat conditions include patches of oak shrubs 1.2-1.7 meters [m] (4-5.5 feet [ft]) tall, 10-50 percent bare sand, and less than one canopy tree per acre (Breininger 2004), though scrub-jays can tolerate one to two pine trees per acre. The arrangement of shrub heights in a scrub-jay territory is an important indicator of habitat quality (Breininger and Carter 2003, Breininger *et al.* 2013). Scrub-jays need scrub oaks of sufficient height to provide nest sites, acorns, and cover from predators; however, mortality exceeds recruitment when the average shrub height exceeds 1.7 m (5.5 ft), and scrub-jays disappear from long-unburned, overgrown scrub (Woolfenden and Fitzpatrick 1996a, Breininger and Carter 2003, Breininger *et al.* 2006).

In Florida, scrub-jay habitat is broken down into three (3) types, defined by its quality to scrub-jays. These habitat types are used to determine areas of occupancy under section 7 consultation, as well as when restoring areas for the species. The types of scrub-jay habitat are defined by Fitzpatrick et al. (1991) as follows:

- Type I Habitat: Any upland plant community in which the percent cover of the substrate by scrub oak species is 15% or more.
- Type II Habitat: Any plant community, not meeting the definition of Type I habitat, in which one or more scrub oak species is represented.
- Type III: Any upland or seasonally dry wetland within ¼ mile of any designated as Type I or Type II habitat.

Diet

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 and lepidopteran larvae, comprise the majority of the animal diet throughout most of the year (Woolfenden and Fitzpatrick 1984). Acorns are by far the most important plant food (Fitzpatrick *et al*. 1991). From August to November each year scrub-jays harvest and cache thousands of scrub oak acorns throughout their territory. Each scrub-jay may cache 6,500 to 8,000 acorns per year (DeGange *et al*. 1989). Acorns are mainly cached by hammering into the sand, but are also stuffed into pine needle tufts, Spanish or ball moss, and palmetto fronds (Woolfenden and Fitzpatrick 1996b). Acorns are typically buried 1 to 2 cm (0.4 to 0.8 in) beneath the surface of bare sand in openings in the scrub during fall, and retrieved and consumed in winter and early spring. Other small nuts, fruits, and seeds also are eaten.

Vertebrate prey items comprise the minority of the diet, but may include a wide array of species weighing up to 25 g (0.9 oz) (Toland 1996). Notable vertebrate prey species documented for scrub-jays on both the Lake Wales Ridge and the Atlantic Coastal Ridge include: green treefrog (*Hyla cinerea*), squirrel treefrog (*H. squirella*), green anole (*Anolis carolinensis*), brown anole (*A. sagrei*), Florida scrub lizard (*Sceloporus woodi*), six-lined racerunner (*Cnemidophorus sexlineatus*), black racer (*Coluber constrictor*), peninsula crowned snake (*Tantilla relicta relicta*), rough greensnake (*Opheodrys aestivus*), house mouse (*Mus musculus*), cotton mouse (*Peromyscus gossypinus*), oldfield mouse (*P. polionotus*), and Florida mouse (*Podomys floridanus*) (Woolfenden and Fitzpatrick 1984).

In suburban areas, scrub-jays will accept supplemental foods offered by humans, such as peanuts, corn, and sunflower seeds. The bulk of this food is purposely provided for the birds by feeders; however, hand offering by humans also occurs.

Social Structure

Scrub-jays have a social structure that involves cooperative breeding, a trait that the western North American populations of other scrub-jay species do not exhibit (Woolfenden and Fitzpatrick 1984). Scrub-jays live in groups ranging from two (a single mated pair) up to large, extended families of eight adults and one to four juveniles. Fledgling scrub-jays remain with the breeding pair in their natal territory as "helpers," forming a closely-knit, cooperative family group. Pre-breeding 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).

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). Helpers participate in sentinel duties (McGowan and Woolfenden 1989), territorial defense, predator-mobbing, and the feeding of both nestlings (Stallcup and Woolfenden 1978) and fledglings (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 observed, the sentinel scrub-jay gives a distinctive warning call, and all group members seek cover in dense shrub vegetation (Fitzpatrick *et al*. 1991).

Territoriality

Scrub-jay pairs occupy year-round, multi-purpose territories (Woolfenden and Fitzpatrick 1984, Fitzpatrick *et al*. 1991). Territory size averages 9 to 10 ha (22 to 25 ac), with a minimum size of about 5 ha (12 ac). The availability of territories is a limiting factor for scrub-jay populations. Because of this limitation, non-breeding adult males may remain at the natal territory as helpers for up to five years, waiting for either a mate or territory to become available (Fitzpatrick *et al*. 1991). New territories are established several ways: by replacing a lost breeder on a territory

(Woolfenden and Fitzpatrick 1984); through "territorial budding," where a helper male becomes a breeder in a segment of its natal territory (Woolfenden and Fitzpatrick 1978); by inheriting a natal territory following the death of a breeder; by establishing a new territory between existing territories (Woolfenden and Fitzpatrick 1984); or through "adoption" of an unrelated helper by a neighboring family followed by resident mate replacement (Toland 1996). Territories also can be obtained by creating suitable habitat in areas that were previously unsuitable through effective habitat management efforts (Thaxton and Hingtgen 1994).

3.6.3. Numbers, Reproduction, and Distribution of the Florida Scrub-Jay

Reproduction and Demography

To become a breeder, a scrub-jay must acquire a territory and a mate. Evidence presented by Woolfenden and Fitzpatrick (1984) suggests that scrub-jays are permanently monogamous. The pair retains ownership and sole breeding-privileges in their 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, nor courtship behavior between a female 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 to provide an ample winter acorn supply, cover from predators, and nest sites during the spring (Woolfenden and Fitzpatrick 1996).

Scrub-jay nests are typically placed in shrubby oaks, at a height of 1 to 2 m (3 to 6 ft). *Quercus inopina* and *Q. geminata* are the preferred shrubs on the Lake Wales Ridge (Woolfenden and Fitzpatrick 1984), and *Q. myrtifolia* 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 construct 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 18 to 20 cm (7 to 8 in) outside diameter, and 8 to 9 cm (3 to 3.5 in) inside diameter. The outer basket is bulky and constructed of coarse twigs from oaks and other vegetation, and the inside is lined with tightly wound palmetto or cabbage palm 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 1 March through 30 June (Woolfenden and Fitzpatrick 1990; Fitzpatrick *et al*. 1994). On the Atlantic Coastal Ridge and southern Gulf Coast, nesting may be protracted through the end of July (Toland 1996, Thaxton 1998). In suburban habitats, nesting is consistently initiated earlier (March) than in natural scrub habitat (Fleischer 1996). Food supplementation studies have shown the importance of resources in the

timing of reproduction and supplemented scrub-jays breed earlier (Bowman and Woolfenden 2001; Schoech and Bowman 2001; Schoech *et al.* 2004, 2008). Other variables attributed to advanced egg laying in suburban areas include artificial lighting and temperature. Nesting failures are almost always caused by predation, most frequently by ground-based predators including eastern coachwhip (*Masticophis flagellum*), eastern indigo snake (*Drymarchon couperi*), rat snake (*Elaphe obsoleta*), corn snake (*E. guttata*), raccoon *(Procyon lotor*), and domestic cat (*Felis catus*) (Fitzpatrick *et al*. 1991; Schaub *et al*. 1992).

Clutch size ranges from one to five eggs, but is typically three or four eggs. Clutch size is generally larger (up to six eggs) in suburban habitats, and the birds attempt to rear more broods (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 (Toland 1996, Thaxton 1998). Scrub-jay eggs measure 27.08 millimeters [mm] (1 in) x 20.18 mm (0.8 in) (length x breadth) (Woolfenden and Fitzpatrick 1996b), and coloration varies from a pea green to pale glaucous green, blotched and spotted with irregularly shaped markings of cinnamon rufous and vinaceous cinnamon, these being heaviest about the larger end (Bendire 1895, Bent 1946). Eggs are incubated for 17 to 18 days, and fledging occurs 16 to 21 days after hatching (Woolfenden 1974, 1978; Fitzpatrick *et al*. 1994). 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*. 1994), and the presence of helpers improves fledging success (Mumme 1992). Annual productivity must average at least two young fledged per pair for a population of scrub-jays to maintain 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 33 percent in optimal scrub; while annual survival of breeding adults averages 78 percent (Woolfenden and Fitzpatrick 1996b). Scrub-jays that become breeders average 4.2 breeding seasons with 10-20 percent of the breeding-population age equal or greater than 10 years. The maximum observed lifespan of a scrub-jay at ABS is 15.5 years (Woolfenden and Fitzpatrick 1996b). Additional lifespan longevity examples include a scrub-jay banded in April of 1993 that was last observed in April of 2009 (16 yrs) at Avon Park Air Force Bombing Range (M. Dent pers. comm.) and a scrub-jay from Cape Canaveral Air Force Station banded as a juvenile in June of 2001 (mostly like hatched in April) that was last observed in March 2018 (currently 17 yrs) (A. Chambers, R. Brust pers. comm.).

Dispersal

Scrub-jays are non-migratory, extremely sedentary, and permanently territorial. Juveniles remain in their natal territory for up to five years before dispersing to become breeders (Woolfenden and Fitzpatrick 1984). The length of time scrub-jays remain helpers in their natal territories is

influenced by many factors including sex, age, breeding opportunities, and mate availability (Breininger *et al.* 2010). Once they pair and become breeders, they remain on their breeding territory until death. Dispersal distances are skewed sharply toward short-distance dispersals, with most individuals dispersing within two territories from their natal territory (Breininger *et al.* 2006, Coulon *et al.* 2010). In suitable habitat, fewer than 5 percent of scrub-jays disperse more than 8 km (5 mi) (Fitzpatrick *et al*. 1994). Dispersal distances differ between sexes, with females dispersing significantly farther than males (Breininger *et al.* 2006, Coulon *et al.* 2010). Scrub-jay dispersal behavior is affected by the intervening landscape matrix. Protected scrub habitats will most effectively sustain scrub-jay subpopulations if they are located within a matrix of surrounding habitats that can be utilized and traversed by scrub-jays. Additionally, the distance between patches of potential habitat has a strong influence on scrub-jay dispersal. Recent research has shown that gene flow decreases dramatically as the gap between scrub patches increases (Coulon *et al.* 2012). The authors concluded that gap widths beyond 2 to 3 km (1.2 to 1.9 mi) resulted in a reduction in gene flow. This is consistent with behavioral observations and analyses of dispersal data, which indicated that dispersal events and patch occupancy decreased beyond a gap size of 3.5 km (2.2 mi) (Stith *et al.* 1996).

Status and Distribution

The scrub-jay was federally listed as threatened in 1987 primarily because of habitat fragmentation, degradation, and destruction (52 CFR 20719). Scrub-jays once occupied 39 of the 40 counties south of, and including Levy, Gilchrist, Alachua, Clay, and Duval counties. Historically, many 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).

A decline in scrub-jay population numbers was first noted in the literature by Byrd (1928), though Cox (1987) posited that scrub-jay numbers probably had been declining since well before that time. Others continued to report population declines throughout the 20th century due to habitat loss from development and agriculture and habitat degradation from the exclusion of fire (Grimes 1940, 1943; Sprunt 1946; Early 1952; Longstreet 1954; Brigham 1973; Austin 1976; Woolfenden 1978; Cox 1987; Fitzpatrick *et al.* 1994; Toland 1999). By 1984, scrub-jays had become extirpated from Broward, Dade, Duval, Gilchrest, Pinellas, and St. Johns counties, and Cox (1987) estimated that 15,600-22,800 scrub-jays remained.

An extensive, state-wide survey of scrub-jays in 1992-1993 estimated 3,961 scrub-jay family groups with 10,972 individuals (Fitzpatrick *et al.* 1994). The survey most likely overestimated the abundance of scrub-jays at Merritt Island National Wildlife Refuge and CCAFS (Boughton and Bowman 2011) but underestimated the abundance of scrub-jays in Ocala National Forest (ONF), some areas in southwest Florida, and some areas in southern Brevard and northern Indian River counties (Miller and Stith 2002; Breininger *et al.* 2003; K. Miller, unpublished data). By

the early 1990s, scrub-jays had become extirpated from two more counties (Alachua and Clay), though at least one scrub-jay group was later discovered in Clay County (Bowman and Boughton 2011). Ten or fewer scrub-jay pairs remained in an additional seven counties (Flagler, Hardee, Hendry, Hernando, Levy, Orange, and Putnam) (Fitzpatrick *et al*. 1994). Population numbers in 27 of the original 39 counties had 30 or fewer breeding pairs (Fitzpatrick *et al.* 1994). Fitzpatrick *et al.* (1994) estimated that scrub-jays had declined between 25 and 50 percent in the northern third of the species' range since the surveys by Cox (1987). Woolfenden and Fitzpatrick (1996b) estimated that scrub-jay populations had declined by 90 percent or more since European settlement.

Based primarily on the 1992-93 statewide scrub-jay survey, Stith (1999a) used a spatially-explicit individual-based population model to evaluate the vulnerability of remaining scrub-jay populations. Stith identified 21 demographically-isolated metapopulations of scrub-jays throughout the species' range. Assuming fully restored habitat with high occupancy rates, results of simulations indicated that 16 of the 21 metapopulations had a moderate or high risk of quasi-extinction (the probability of a scrub-jay metapopulation falling below 10 pairs in 60 years), though the risk of quasi-extinction could be improved for 13 of the metapopulations through habitat acquisition (Stith 1999).

scrub-jay populations have continued to decrease since the 1992-93 statewide survey and Stith's metapopulation model. For example, Toland (1999) estimated a decline of over 50 percent in areas in Brevard County that were re-surveyed in 1998-99. Part of this decline may be attributed to a possible rare epidemic in 1997-1998 (Breininger *et al.* 2003, cited in Toland 1999). Reductions have not been confined solely to unprotected lands. scrub-jay populations have declined by 25 percent on managed conservation lands, excluding ONF, from 1992-93 to 2009-2010 due to inadequate habitat management (Boughton and Bowman 2011). Although population estimates were not available for ONF, the amount of suitable scrub-jay habitat decreased by 22 percent from 1999-2012 (U.S. Forest Service, unpublished data). On average, scrub-jay populations on managed conservation lands are estimated to be well below the potential carrying capacity.

The decline of scrub-jay populations has been even more severe on unprotected lands, especially in suburban areas, where scrub-jays have reduced demographic success compared to wildlands (Bowman 1998, Breininger 1999). For example, a suburban population in Highlands County (Lake Placid Estates) decreased from over 100 groups in the early 1990s to 7 groups by 2013 (R. Bowman, unpublished data). Similarly, scrub-jays in the city of Palm Bay declined from 54 groups in 1993 to 16 groups by 2009 (Toland 1999, Larson 2012). Beginning in 2010, the Service and other interested parties began translocating family groups from the city of Palm Bay to managed conservation lands. As of 2014, there were four groups remaining (Larson 2013).

Scrub-jays are now extirpated from 8 of the 39 counties previously occupied (Alachua, Broward, Dade, Duval, Flagler, Gilchrist, Pinellas, and St. Johns), and only 9 counties had more than 30 scrub-jay groups on managed conservation lands as of 2012 (Boughton and Bowman 2011, Faulhaber 2013). Coulon and *et al.* (2008) identified 10 major genetic groups (units) of scrub-jays, each encompassing one or more of Stith's (1999) metapopulations (Figure 3). Only 4 of the 10 genetic units had 100 or more scrub-jay groups on managed conservation lands in 2010 (Boughton and Bowman 2011).

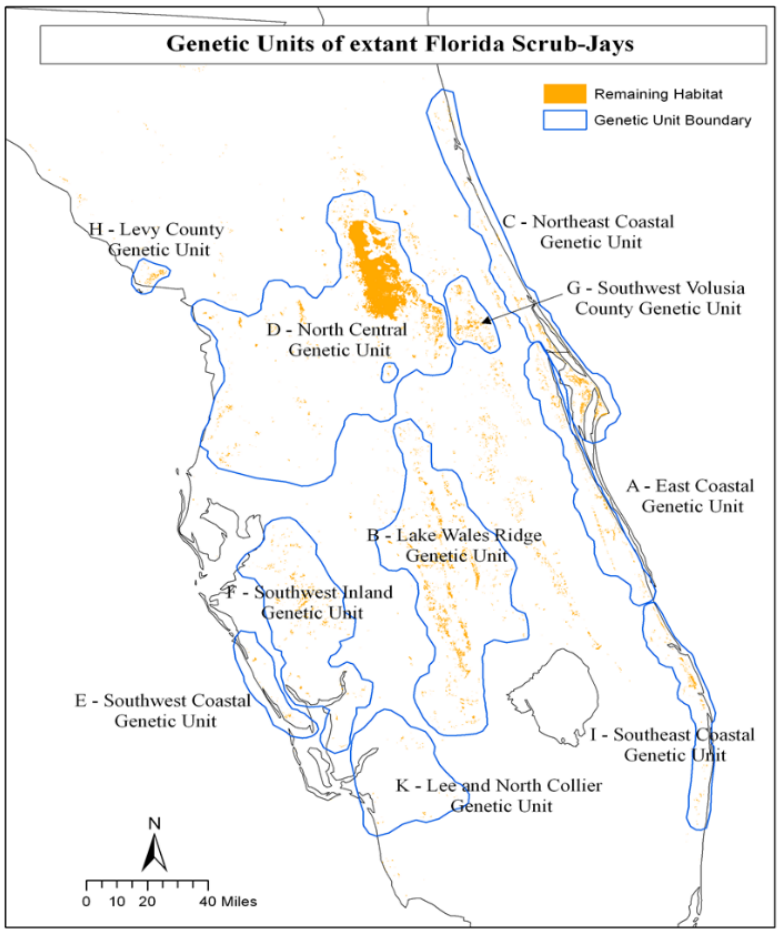

Figure 3. Genetic Units of Florida Scrub-Jays, adapted from Coulon et al. (2008).

Boughton and Bowman (2011) estimated 2,400-2,600 scrub-jay groups currently remain rangewide, excluding Ocala National Forest. The Forest Service estimates approximately 1,100-1,250 scrub-jay groups remain in Ocala National Forest (Trager 2015). Based on the data from both studies, the Service estimates approximately 3,500-3,850 groups scrub-jay groups remain in the state of Florida (Boughton and Bowman 2011; Trager 2015).

3.6.4. Threats to the Florida Scrub-jay

Current and Past Threats

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

The Present or Threatened Destruction, Modification, or Curtailment of its 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). Fernald (1989), Fitzpatrick *et al*. (1991), and Woolfenden and Fitzpatrick (1996a) noted that 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. State-wide, estimates of scrub habitat loss range from 70 to 90 percent (Woolfenden and Fitzpatrick 1996a; Fitzpatrick *et al*. unpubl. data). 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.

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 4,312 ha (10,656 ac) of scrub and scrubby flatwoods remain in Brevard County (excluding federal ownership), of which only 648 ha (1,600 ac) (15 percent) is in public ownership for the purposes of conservation. Less than 800 ha (1,977 ac) of an estimated pre-settlement of 6,000 ha (14,826 ac) of scrubby flatwoods habitat remain in Sarasota County, mostly occurring in patches averaging less than 1 ha (2.5 ac) in size (Thaxton and Hingtgen 1996). Only 4,319 ha (10,673 ac) 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 also increases fragmentation of habitat. As more scrub habitat is altered, the habitat is cut into smaller and smaller pieces, 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).

Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

The USFWS knows of only a few cases where scrub-jays have been shot. One was in Volusia County, which was investigated and prosecuted under MBTA (J. Oliveros, USFWS, pers. comm.). The Florida Fish and Wildlife Conservation Commission (FWC) investigated a case, in which three scrub-jays were shot in Highlands County (N. Douglass, FWC, pers. comm.). It does not seem that the small number and infrequent occurrence of scrub-jays taken in this manner has had an impact on the species.

Disease or Predation

Most scrub-jay mortality probably is 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, b), Breininger (1999), and K. Miller (FWC, in litt. 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 (*Pituophus melanoleuous*), and corn snake (*E. guttata*). Mammalian predators include bobcats (*Lynx rufus*), raccoons (*Procyon lotor*), sometimes cotton rats (*Sigmodon hispidus*, known to eat eggs), black rat (*Rattus rattus*), 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) suspect 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 (*Corvus ossifragus*), boat-tailed grackle (*Quiscalus major*), common grackle (*Q. quiscula*), American crow (*C. brachyrhynchos*), blue jay (*Cyanocitta cristata*), and swallow-tailed kites (*Elanoides forficatus*). Fitzpatrick *et al*. (1991) reported that 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 that scrub-jays occupying fragments of scrub found in or near housing developments were more prone to predation by house cats and competition from blue jays and mockingbirds. Woolfenden and Fitzpatrick (1996a, 1996b) stated that proximity to housing developments (and increased exposure to domestic 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 (M. Garvin pers. comm.., cited in 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 (St. Louis, eastern equine, and "Highlands jay"; M. Garvin and J. Day pers. comm., cited in 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 (G. Wallace, FWC, in litt. 8/3/01; Stark and Kazanis 2001); since corvids have been particularly susceptible to the disease in states north of Florida, it is expected that 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 cohorts and almost half of the breeding adults died (Woolfenden and Fitzpatrick 1984, 1990). The 1979-1980 incident coincided with a known outbreak of eastern equine encephalitis among domestic birds in central Florida (J. Day pers. comm., cited in 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 only 22 percent in 1997-98. It stayed low (only 25 percent) in 1998-99 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 1997-98. 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 state-wide epidemic.

In winter-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 a fly, *Philornis* (= *Neomusca*) *porteri*, occur irregularly on scrub-jay nestlings. The species pupates in the base of the nest; larvae locate in nares (nasal openings), mouth flanges, bases of remiges, and toes; apparently no serious effect on the scrub-jay host occurs (Woolfenden and Fitzpatrick 1996b). Additionally, one undescribed chewing louse (*Myrsidea* sp., R. Price pers. comm.., cited in Woolfenden and Fitzpatrick 1996b), one wing-feather mite (*Pterodectes* sp.), two chiggers (*Eutrombicula lipovskyana*), and a flea (*Echidnophaga gallinacea*; J. Kinsella pers. comm., cited in 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 *Amblyomma maculatum* (L. Durden and J. Keirans pers. comm., cited in Woolfenden and Fitzpatrick 1996b). These naturally-occurring parasites are not believed to have a negative impact on scrub-jay population levels.

The Inadequacy of Existing Regulatory Mechanisms

Woolfenden and Fitzpatrick (1996a) state the importance of enforcing existing federal laws regarding the management of federal lands as natural ecosystems for the long-term survival of the scrub-jay. The USFWS 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 ESA 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/or municipalities enact and enforce ordinances. As a general rule, counties have not enacted and/or 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 Manmade Factors Affecting its 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, 1996a; Fitzpatrick *et al*. 1994). Lightning strikes cause virtually 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/or 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, unpubl. data; Percival *et al*. 1995; Stith *et al*. 1996; Thaxton and Hingtgen 1996; Woolfenden and Fitzpatrick 1990, 1996a; Toland 1999). Woolfenden and Fitzpatrick (1996a) cautioned, however, that fire applied too often to scrub habitat also can result in local extirpations. Experimental data at Archbold Biological Station (Fitzpatrick and Woolfenden, unpubl. data) show that fire-return intervals varying between 5 and 15 years are optimal for long-term maintenance of productive scrub-jay populations in central Florida. 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, b).

Stith *et al*. (1996) estimated that at least 2,100 breeding pairs of scrub-jays were living in overgrown habitat state-wide. Toland (1999) reported that most of Brevard County's remaining scrub (estimated to be only 15 percent of the original acreage) is overgrown due to fire suppression. He further suggests that 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 that 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 that 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 that 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, 1994) and Woolfenden and Fitzpatrick (1996a) expressed concern for the management practices taking place on federal lands at Ocala National Forest, MINWR/Kennedy Space Center, and Cape Canaveral Air Force Station, all supporting large

contiguous populations of scrub-jays. They predicted that fire suppression and/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 ESA. 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-aged recruits), which could be supported only by immigration. Since this species may be attracted to roadsides because of their open habitat characteristics, road 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; R. Bowman unpubl. data, cited in 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 (R. Bowman and G.E. Woolfenden unpubl data, cited in Woolfenden and Fitzpatrick 1996b; Bowman 1998).

Hurricanes 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 3 to 5 hurricane 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.

Fernald (1989) reported that 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 (*Schinus terebinthifolius*), cypress pine (*Callitris* sp.), and Australian pine (*Casuarina equisetifolia*) also was a problem. Other human-induced impacts identified by Fernald (1989) include the introduction of domestic dogs (*Canis familiaris*) and cats, black rats (*Rattus rattus*), 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 both space and food, although scrub-jays sometimes feed on them.

Climate Change

Climate change is evident from observations of increases in average global air and ocean temperatures, widespread melting of snow and ice, and rising sea level, according to the Intergovernmental Panel on Climate Change Report (IPCC 2007). The 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 (FWS 2007).

Temperatures are predicted to rise from 2^{o} Celsius (C) to 5^{o} C (3.6^{o} Fahrenheit [F] - 9.0^{o} F) for North America by the end of this century (IPCC 2007a, b). Other processes to be affected by this projected warming include rainfall (amount, seasonal timing and distribution), storms (frequency and intensity), and sea level rise.

Climatic changes in Florida could amplify current land management challenges involving habitat fragmentation, urbanization, invasive species, disease, parasites, and water management. 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 FWS 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 (FWS 2006). As the level of information increases concerning the effects of global climate change on the scrub-jay the FWS will have a better basis to address the nature and

magnitude of this potential threat and will more effectively evaluate these effects to the range-wide status of the scrub-jay.

Analysis of the Species/Critical Habitat Likely to be Affected

The scrub-jay's status since its listing in 1987 has not improved. The status and trends that we discussed above, clearly shows what two items are essential for recovery of this species: (1) additional purchase of scrub lands for preservation in some key areas; and (2) restoration and management of publicly-owned scrub lands already under preservation. Without both, it is unlikely that recovery can be achieved.

3.6.5. Conservation Needs of the Florida Scrub-jay

Scrub-jays are currently protected through federal, state, and local statues and regulations. Ongoing conservation efforts to protect scrub-jays and their habitat include land preservation, habitat protection, restoration and management, research and monitoring, translocation, outreach and education.

Since the 1990 Recovery Plan for scrub-jays, a continuing statewide effort to purchase habitat and manage publicly-owned scrub, will help stabilize scrub-jays over time. An updated Species status Assessment for the scrub-jay is currently under way that will help provide a consistent, integrated, conservation-focused and scientifically robust approach to assessing a species biological status to inform Endangered Species Act decisions. There are approximately 139,716 ha (345,233 ac) in conservation, roughly 78% of the potential remaining scrub habitat in peninsular Florida. Habitat restoration and management works to create optimal habitat conditions for the long-term persistence of scrub-jay populations. Better management strategies have been developed using prescribed fire, and when necessary mechanical treatment to maintain appropriate structure. Habitat restoration across the largest, most contiguous patches of habitat eliminate barriers to dispersal and increase the connectivity of existing habitats. Conservation lands that have increased scrub-jay occupancy through restoration include USFS Ocala National Forest (Marion), Seminole State Forest (Lake), St. Sebastian River Preserve State Park (Brevard), Duette County Preserve (Manatee), Cross Florida Greenways (Marion), Lyonia Preserve (Volusia), and Oscar Scherer State Park (Sarasota).

The majority of scrub-jay populations are small thus susceptible to extinction. Translocation is the deliberate and mediated movement of species from one place to another. Translocation of individuals from stable or growing populations has been utilized to augment these small populations onto conservation lands. Translocation has also been used to increase genetic diversity in populations known or likely to be suffering from inbreeding depression as well as reintroducing scrub-jays to areas where they have been extirpated. As of 2018, 145 individual scrub-jays have been translocated to conservation lands. A large percentage of these translocated

individuals met one of the following criteria for short-term success: (1) remained on site for a year or more, (2) established a territory and attempted to breed, or (3) defended a territory as a helper. The Brevard Zoo has led a broad, partnership-based translocation effort with St. Johns River Water Management District, Brevard County Environmentally Endangered Lands program, USFWS, FWC, David Breininger, and others since 2008. By 2015, this effort translocated 40 scrub-jays from areas permitted for development to conservation lands in Brevard and Volusia Counties. Thirty-nine of 50 individuals (78%) met the criteria for short term success. So far, the three major case studies suggest:

1. Translocated birds are better able to establish territories if moved in November-January, when scrub-jays tend to be less territorial.
2. Translocating entire groups may be more effective for augmenting existing populations. Insights learned from the case studies informed the development of the USFWS/FWC Florida Scrub Jay Translocation Guidelines (see USFWS Jacksonville Field Office website). The guidelines contain details on capture, transport, and monitoring of translocated scrub-jays as well as characteristics of appropriate source populations and recipient sites. Translocation appears to be a promising tool for scrub-jays, but additional information is needed to inform more widespread application.

Efforts through research and monitoring continue to influence regulatory decisions and restoration and management practices. Periodic monitoring can provide information on the location of scrub-jays relative to management units and the status and trend of populations. Annual monitoring by biologists now occurs on many conservation lands important to scrub-jays (Boughton and Bowman 2011). Since 2002, the Jay Watch program has recruited citizen scientists to assist with surveys where land managers lack the resources necessary for monitoring. The Jay Watch program uses consistent protocols (Fitzpatrick et al. 1991) to collect data on managed conservation lands throughout much of scrub-jay's range. Since 2011, annual surveys have taken place in Ocala National Forest through a partnership between the FWC and USFS. At the local scale, periodic monitoring has assisted land managers with planning and evaluation of management actions. At the statewide scale, periodic monitoring programs provided the data necessary to document the changes in scrub-jay populations on managed conservation lands since 1992-93 (Boughton and Bowman 2011). Although the scrub-jay is extensively studied, much remains to be learned. Research priorities include demographic monitoring, translocation, demography and genetics of small populations, dispersal in fragmented landscapes, and best practices for habitat management.

Education and outreach programs raise awareness and understanding to the public about actions that are needed for the long-term persistence of scrub-jays. Archbold Biological Station has an education program in which over 1,300 children participate annually in their education programs

for grades 3-5 in south central Florida. In 2009, the Lyonia Environmental Center opened and offers field trips, educational programs, hands-on displays, and a summer camp. There have been notable developments in education and outreach for both conservation partners and the public since the original recovery plan in 1990.

3.7. Environmental Baseline for the Florida Scrub-jay

This section is an analysis of the effects of past and ongoing human and natural factors leading to the current status of the eastern indigo snake, its habitat, and ecosystem within the Action Area. The environmental baseline is a "snapshot" of the species' health in the Action Area at the time of the consultation, and does not include the effects of the Action under review.

3.7.1. Action Area Numbers, Reproduction, and Distribution of the Florida Scrub-jay

Quality of Scrub within the Action Area

The Action Area contains several different types vegetative communities, as defined under the Florida Land Use, Cover and Forms Classification System, Level III (FLUCFCS, FDOT, January 2004). The on-site upland land use types/vegetative communities are classified as pine flatwoods, xeric oak, Brazilian pepper, disturbed lands, and roads and highways. Wetland/surface water types within the action area include reservoirs, major bodies of water, streams and lake swamps, and mixed wetland hardwoods. Approximately 17.5 acres of xeric oak and pine flatwoods are considered Type I habitat for scrub-jays and likely to support the species. within the Action Area. Some Type II and Type III habitat remain on site, but according to survey results, the species is not utilizing those areas.

Scrub-Jay Utilization of the Site

The Applicant's representative, Bio-tech Consulting, Inc. (Consultant), conducted a formal scrub-jay survey across the extent of the Antigua Bay property from May 8-12, 2017. During the 5-day survey, weather conditions were favorable for the scrub-jay. Two scrub-jays were observed at eleven (11) of the seventy-six (76) playback stations within the Action Area. The total habitat that being used by scrub-jays, which was estimated by the Consultant, was approximately 17.5 acres. While it is unknown if these scrub-jays are a mated pair, it possible that at least one scrub-jay nest may be present on the site during breeding season (March-June)

On January 31, 2018, the Service visited the Action Area with the Corps to determine the extent of suitable habitat in comparison to scrub-jay usage. The Action Area had some remaining Type I habitat, however, sand pine encroachment within the Action Area limits the amount of available habitat for scrub-jays. Additionally, the site is isolated by water on one side, and overgrown hammock and disturbed areas on the remaining three sides.

Conservation Significance

The impacted area is part of "Genetic Group C" based on research by Coulon et al. (2008) and is also known as the Merrit Island metapopulation by Stith 1999. The Genetic Group C consists of approximately 424 family groups of scrub jays on conservation lands (848-1,696 individual scrub-jays), the status of scrub-jays on private lands is unknown (Boughton and Bowman 2011, Mecklenborg 2018). However, the Action Area is isolated from surrounding contiguous conservation areas and scrub-jays considered in this BO are unlikely to breed with other scrub-jays within the genetic unit. Limited patches of habitat are available within 1.9 miles of the impacted area that scrub-jays may disperse to. In the event scrub-jays from the impacted area breed with isolated populations of scrub-jays in adjacent areas, there is no availability of connectivity with larger tracks of conservation lands within realistic dispersal distances.

3.8. Effects of the Action on the Florida Scrub-jay

This section analyzes the direct and indirect effects of the Action on the scrub-jay, which includes the direct and indirect effects of interrelated and interdependent actions. Direct effects are caused by the Action and occur at the same time and place. Indirect effects are caused by the Action, but are later in time and reasonably certain to occur. Our analyses are organized according to the description of the Action in section 2 of this BO.

3.8.1. Conservation Measures

The Applicant has proposed to donate a 35.0 acre property, which is contiguous with other conservation properties, to offset impacts to scrub-jays and eastern indigo snakes. The 35.0 acre property represents a net gain of 17.5 acres of overgrown scrub, which will be restored for use as a habitat corridor in the greater Fox Lake area of Brevard County. There will be a temporal loss of habitat for the scrub-jay, as the existing parcel is not presently suitable for the species. However, within 1-2 years, prescribed fire and mechanical cutting will be used to restore the conservation parcel to suitable scrub-jay habitat and will provide connectivity for the species.

3.8.2. Effects of Gopher Tortoise Relocation on the Florida Scrub-Jay

Gopher tortoise relocation is unlikely to cause harm or death of scrub-jays. Equipment used on site may temporarily disturb scrub-jays in the area, causing them to disperse to the other side of the Action Area. However, after disturbance from machinery has subsided, the species will likely return the area.

3.8.3. Effects of Clearing, Grading, and Construction on the Florida Scrub-jay

Clearing for the proposed mixed-use commercial subdivision result in the permanent loss of 17.5 acres of occupied scrub-jay habitat. Land clearing will result in harm through habitat modification, mortality, and physical harm or harassment of individual scrub-jays. The Service

anticipates the Action may impact up to two (2) adult scrub-jays and at least one (1) nest of up to five (5) nestlings

Scrub-jays are dependent on large contiguous fire-maintained ecosystems, with specific habitat requirements as discussed in *3.6 Status of the Florida scrub-jay* section. Modification of occupied habitat through clearing and grading will make the Action Area unsuitable for the species, which will result in harm by significantly changing breeding, sheltering, and breeding behaviors of the pair of scrub-jays within the Action Area. As such, habitat modification creates the likelihood of harm or mortality for the species nestlings, possible fledglings, or adults.

Nests are difficult to detect due to their small size and density of vegetation where nests are created. Because the Action is likely to occur during scrub-jay breeding season, impacts to at least one scrub-jay nest, which may have up to five (5) nestlings, are expected to occur. During clearing, nests may be inadvertently crushed or otherwise impacted. Nestlings are unlikely to fledge prior to clearing and/or development and will harm or mortality is likely during clearing.

Due to the isolation of the site from contiguous suitable habitat, dispersal of the species is limited. During dispersal after clearing, the species may be harmed by predators when crossing through dense vegetated areas in attempts to find suitable habitat. Road crossings may also create the likelihood of mortality or harm, as the species flight patterns are low to the ground and roads have been shown to be a significant source of mortality for scrub-jays (Dreschel et al. 1990; Mumme et al. 2000).

After clearing and grading are complete, construction of the mixed-use subdivision will occur. It is unlikely that scrub-jays will still remain on site after clearing and grading due to the level of disturbance or resultant harm. Because scrub-jays are unlikely to be in the area, construction will have insignificant or discountable effects on the species.

3.9. Cumulative Effects on the Florida Scrub-jay

For purposes of consultation under ESA §7, cumulative effects are those caused by future state, tribal, local, or private actions that are reasonably certain to occur in the Action Area. Future Federal actions that are unrelated to the proposed action are not considered, because they require separate consultation under §7 of the ESA. Because the entire Action Area will be cleared under the Corps' permit, no future federal action will likely result in cumulative effects to the species.

3.10. Conclusion for the Florida Scrub-jay

In this section, we summarize and interpret the findings of the previous sections for the eastern indigo snake (status, baseline, effects, and cumulative effects) relative to the purpose of a BO under §7(a)(2) of the ESA, which is to determine whether a Federal action is likely to:

c) jeopardize the continued existence of species listed as endangered or threatened; or
d) result in the destruction or adverse modification of designated critical habitat.

"Jeopardize the continued existence" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR §402.02).

After reviewing the current status of the scrub-jay, the environmental baseline for the Action Area, the direct and indirect effects of the proposed mixed-use subdivision, and any cumulative effects, it is the Service's opinion that the proposed action is not likely to jeopardize the continued existence of the scrub-jay. We base this decision on the following:

1) The most recent study by Miller (2012) estimated that approximately 3,500-3,850 groups of scrub-jays remain across the entire range of the species. The loss of one family group represents a 0.052-0.057% loss of individuals from the total population, which represents a very small percentage when compared to the total population of the scrub-jay.

2) The scrub-jays impacted by the Action are part of Genetic Group C, which consists of approximately 424 family groups (Boughton and Bowman 2011 Mecklenborg 2018), with approximately 848-1,696 individual scrub-jays. The loss of one family group represents a loss of approximately 0.12-0.24% of the entire genetic unit. Under 1% loss to the total Genetic Unit population represents a very small impact.

3) The project site is isolated from contiguous tracks of protected scrub. Due to the isolation, it is unlikely that the individual scrub-jays within the Action Area will contribute their genetic material to other populations in Brevard County.

4) The Applicant has proposed to donate a 35.0 acre property, which is contiguous with other conservation properties, to offset impacts to scrub-jays and eastern indigo snakes. The 35.0 acre property represents a net gain of 17.5 acres of overgrown scrub, which will be restored for use as a habitat corridor in the greater Fox Lake area of Brevard County.

Critical habitat has not been designated for the scrub-jay and therefore, it will not be affected.

4. INCIDENTAL TAKE STATEMENT

ESA §9(a)(1) and regulations issued under §4(d) prohibit the take of endangered and threatened fish and wildlife species without special exemption. The term "take" in the ESA means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" (ESA §3). In regulations at 50 CFR §17.3, the Service further defines:

- "harass" as "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering;"
- "harm" as "an act which actually kills or injures wildlife. Such act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering;" and
- "incidental take" as "any taking otherwise prohibited, if such taking is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity."

Under the terms of ESA §7(b)(4) and §7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered prohibited, provided that such taking is in compliance with the terms and conditions of an incidental take statement (ITS).

The Action considered in this BO includes a conservation measure to capture and move eastern indigo snakes from the Action Area outside of the impacted area, referenced in subsection 3.3.2. Through this statement, the Service authorizes this conservation measure as an exception to the prohibitions against trapping, capturing, or collecting listed species. This conservation measure is identified as a Reasonable and Prudent Measure below, and we provide Terms and Conditions for its implementation.

For the exemption in ESA §7(o)(2) to apply to the Action considered in this BO, the Corps must undertake the non-discretionary measures described in this ITS, and these measures must become binding conditions of any permit, contract, or grant issued for implementing the Action. The Corps has a continuing duty to regulate the activity covered by this ITS. The protective coverage of §7(o)(2) may lapse if the Corps fails to:

- assume and implement the terms and conditions; or
- require a permittee, contractor, or grantee to adhere to the terms and conditions of the ITS through enforceable terms that are added to the permit, contract, or grant document.

In order to monitor the impact of incidental take, the Corps must report the progress of the Action and its impact on the species to the Service as specified in this ITS.

4.1. Amount or Extent of Take

This section specifies the amount or extent of take of listed wildlife species that the Action is reasonably certain to cause, which we estimated in the "Effects of the Action" section(s) of this BO. We reference, but do not repeat, these analyses here.

4.1.1. Eastern Indigo Snake

The Service anticipates that the Action is reasonably certain to cause incidental take of individual eastern indigo snakes consistent with the definition of harass resulting from gopher tortoise relocation and capture/relocation of eastern indigo snakes within the Action Area (see subsections 3.3.1 and 3.3.2. The Service anticipates that the Action is reasonably certain to cause incidental take of individual eastern indigo snakes consistent with the definition of harm resulting from clearing, grading, and construction (see subsection 3.3.2).

The number of individual eastern indigo snakes was estimated in section 3.3 of this BO. Due to the difficulty of detecting take of eastern indigo snakes caused by the Action, the Corps will monitor the extent of taking using the surrogate measures specified in the table below. Section 402.14 of the regulations which implement section 7(b)(4) of the Act allow the use of surrogates to express the amount or extent of take in an Incidental Take Statement. Within the project footprint, approximately 250 acres which will be impacted provide ideal habitat for the eastern indigo snake, with a total of approximately 328 acres which may be used by the species. Approximately 77 acres of suitable habitat will remain as on-site preservation areas. As such, the Service estimates take of eastern indigo snakes will occur within 250 acres of the Action Area.

Anticipated Take of Eastern Indigo Snakes

Amount or Extent	Life Stage	Form of Take
3 individuals	Adults	Harass
3 individuals	Adults	Harm
250 acres suitable breeding habitat (surrogate)	Adults, Eggs	Harm

Instructions for monitoring and reporting take are provided in section 4.4.

4.1.2. Florida Scrub-Jay

The Service does not anticipate harassment of individual scrub-jays within the Action Area. The Service anticipates that the Action is reasonably certain to cause incidental take of individual scrub-jays consistent with the definition of harm resulting from clearing, grading, and construction (see subsection 3.8.2).

The number of individual scrub-jays likely to be impacted was estimated in section 3.7 of this BO. Monitoring of take of adult scrub-jays will be accomplished by monitoring individuals within the Action Area, monitoring of nestlings will be monitored by acres of suitable breeding habitat available. Due to the difficulty in detecting take of scrub-jay nests and/or eggs caused by

the Action, the Corps will monitor the extent of taking using the surrogate measure specified in the table below. Section 402.14 of the regulations which implement section 7(b)(4) of the Act allow the use of surrogates to express the amount or extent of take in an Incidental Take Statement. Within the project footprint, approximately 17.5 acres which will be impacted provide suitable nesting habitat and the Service anticipates take of one nest within the Action Area.

Anticipated Take of Eastern Indigo Snakes

Amount or Extent	Life Stage	Form of Take
2 individuals	Adults	Harm
17.5 acres suitable breeding habitat (surrogate)	Adults, Eggs	Harm

Instructions for monitoring and reporting take are provided in section 4.4.

4.2. Reasonable and Prudent Measures

The Service believes the following reasonable and prudent measures (RPMs) are necessary or appropriate to minimize the impact of incidental take caused by the Action on listed wildlife species. RPMs are described for each listed wildlife species in the subsections below.

4.2.1. Eastern Indigo Snake

RPM 1. Standard Protection Measures. Protection measures are designed to reduce the chance of harm of eastern indigo snakes found within the Action Area.

RPM 2. Debris Pile Destruction Conditions. Removal or burning of debris piles must be performed with care to reduce the likelihood of incidental take of eastern indigo snakes.

RPM 3. Relocation. Any eastern indigo snakes which are detected within the Action Area that are likely to be harmed or harassed during gopher tortoise relocations, clearing, or construction, will be moved outside the impacted area.

RPM 4. Disposition of Sick, Injured, or Dead Specimens. Any eastern indigo snakes injured as a result of the Action will be provided veterinary care and/or dead specimens preserved for later inspection.

4.2.2. Florida Scrub-Jay

RPM 1. Pre-construction Surveys. Surveys will be performed of the occupied scrub-jay area to ensure no nests are impacted as a result of the Action.

RPM 2. Disposition of Sick, Injured, or Dead Specimens. Any scrub-jays injured as a result of the Action will be provided veterinary care and/or dead specimens preserved for later inspection.

4.3. Terms and Conditions

In order for the exemption from the take prohibitions of §9(a)(1) and of regulations issued under §4(d) of the ESA to apply to the Action, the Corps must comply with the terms and conditions (T&Cs) of this statement, provided below, which carry out the RPMs described in the previous section. These T&Cs are mandatory. As necessary and appropriate to fulfill this responsibility, the Corps must require any permittee, contractor, or grantee to implement these T&Cs through enforceable terms that are added to the permit, contract, or grant document.

4.3.1. Eastern Indigo Snake

T&C #1. Standard Protection Measures (RPM #1). The Applicant shall incorporate the Standard Protection Measures for the Eastern Indigo Snake, found on the Service's website at https://www.fws.gov/northflorida/indigosnakes/20130812_EIS%20Standard%20Protection%20Measures_final.pdf.

T&C #2. Debris Pile Destruction Conditions (RPM 2). The Applicant shall remove, dispose of, or burn any debris or limb piles left during clearing and construction as soon as possible. For debris piles that are burned on site, fire ignition shall be set on one side of the pile and be allowed to burn slowly to allow any eastern indigo snakes within the debris piles to flee.

T&C #3. Relocation (RPM 3). Eastern indigo snakes observed within the impacted area shall be captured by hand and placed in a secure container with ample ventilation and placed in a temperature controlled area until snake is released. Individual eastern indigo snakes shall be released within 24 hours of capture.

T&C #4. Injury mitigation (RPM 4). Any eastern indigo snakes which are found injured within the Action Area shall be placed within a secure container with ample ventilation and notification shall be made to the Service and the Corps immediately. If the Service is unable to be reached, the Applicant shall notify the Florida Fish and Wildlife Conservation Commission Wildlife Alert Hotline at 1-888-404-3922, and follow up notification to the Service shall be made the next business day.

4.3.2. Florida Scrub-Jay

T&C #1. Pre-construction Surveys (RPM 1). Prior to any land clearing activities during nesting season (March 1- June 30), a scrub-jay nest survey will be conducted. If any active nests are found within 25' of areas to be cleared, the area will be delineated and protected until after all birds have fledged. Upon discovery of a nest, contact the NFESO at 904-731-3336.

T&C #2. Injury mitigation (RPM 2). Upon locating a dead, injured, or sick threatened or endangered species, notification must be made to the North Florida Ecological Services Field Office (NFESO) at 904-731-3336. If an injured or sick specimen is found and NFESO staff are unable to be reached, contact the Florida Fish and Wildlife Conservation Commission Wildlife Alert Hotline at 1-888-404-3922. And;

Care should be taken in handling sick or injured specimens to ensure effective treatment and care in the handling of dead specimens to preserve biological material in the best possible state for later analysis as to the cause of death. If a dead specimen is found in the project area, the specimen should be thoroughly soaked in water and frozen for later analysis of cause of death. In conjunction with the care of sick or injured scrub-jays, for preservation of biological materials from a dead animal, the finder has the responsibility to carry out instructions provided by Law Enforcement to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.

4.4. Monitoring and Reporting Requirements

In order to monitor the impacts of incidental take, the Corps must report the progress of the Action and its impact on the species to the Service as specified in the incidental take statement (50 CFR §402.14(i)(3)). This section provides the specific instructions for such monitoring and reporting (M&R). As necessary and appropriate to fulfill this responsibility, the Corps must require any permittee, contractor, or grantee to accomplish the monitoring and reporting through enforceable terms that are added to the permit, contract, or grant document. Such enforceable terms must include a requirement to immediately notify the Corps and the Service if the amount or extent of incidental take specified in this ITS is exceeded during Action implementation.

M&R #1. Post-Development Report. Acres of habitat were used to determine the extent of take of eastern indigo snakes and scrub-jays within the Action Area. As such, upon completion of clearing, a report shall be submitted to the Corps and the NFESO indicating the extent of clearing that occurred and delineated using a GPS unit. In the event a listed species was injured or died incidental to the Action, include details of the date, time, individuals involved, and circumstances of what led to the "take".

M&R #2. Restoration Report. The Applicant shall provide notification to the NFESO when the 35.0 acre parcel, along with the management endowment, has been transferred to the SJWMD and/or FWC. After the property has been transferred, the recipient (SJWMD or FWC) shall provide notice to the NFESO when restoration of the property has been completed.

5. CONSERVATION RECOMMENDATIONS

§7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by conducting conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary activities that an action agency may undertake to avoid or minimize the adverse effects of a proposed action, implement recovery plans, or develop information that is useful for the conservation of listed species. The Service offers the following recommendations that are relevant to the listed species addressed in this BO and that we believe are consistent with the authorities of the Corps.

1) The Applicant previously agreed to allow translocation of scrub-jays out of the Action Area, however, because May is not within the recommended translocation season, the likelihood of a successful translocation is low. As such, the Service made the decision not to translocate scrub-jays out of the Action Area. In the event that the Action is postponed to when translocation of scrub-jays is ideal (November-January), the Service recommends the Applicant work with the Service and Brevard Zoo to translocate scrub-jays within the Action Area. The Service recommends the translocation be performed by biologists from the Brevard Zoo, under an existing 10(a)(1)(A) permit for translocations in Brevard County and follow the *2011 Florida Scrub-jay Translocation Guidelines* written by the Service and Florida Fish and Wildlife Conservation Commission.
2) Prepare and distribute an informational brochure to all the homeowners and commercial entities within the development that explains the basic habitat requirements of the Florida scrub-jay and eastern indigo snake, the threats to their continued existence, and the adverse effects of human-related disturbances such as vehicular traffic, domestic pets (particularly cats) and invasive exotic/ornamental vegetation.

6. REINITIATION NOTICE

Formal consultation for the Action considered in this BO is concluded. Reinitiating consultation is required if the Corps retains discretionary involvement or control over the Action (or is authorized by law) when:

a. the amount or extent of incidental take is exceeded;
b. new information reveals that the Action may affect listed species or designated critical habitat in a manner or to an extent not considered in this BO;
c. the Action is modified in a manner that causes effects to listed species or designated

critical habitat not considered in this BO; or

d. a new species is listed or critical habitat designated that the Action may affect.

In instances where the amount or extent of incidental take is exceeded, the Corps is required to immediately request a reinitiation of formal consultation.

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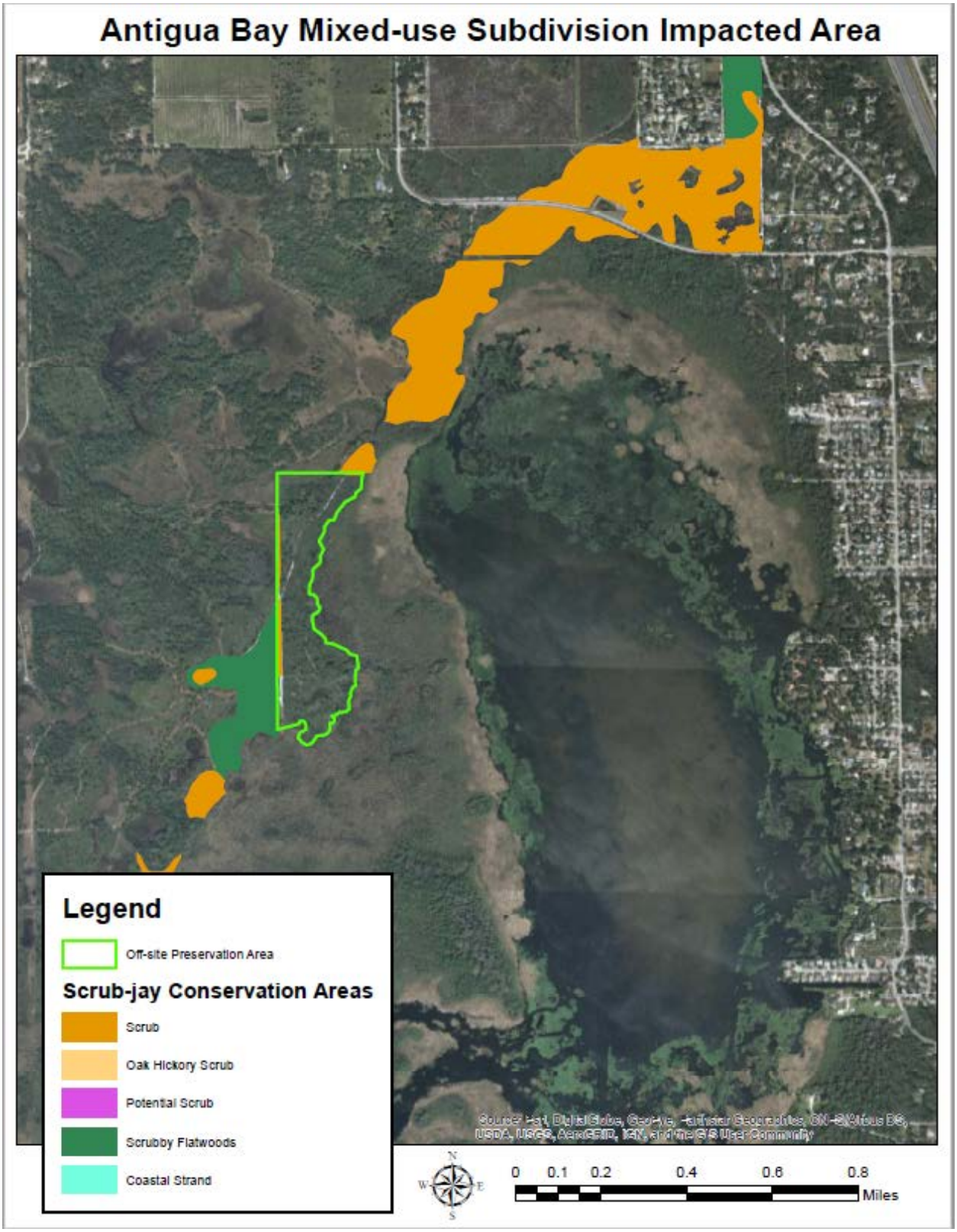
8. APPENDIX I


Antigua Bay Mixed-use Subdivision Impacted Area
Legend
Off-site Preservation Area
Scrub-jay Conservation Areas
Scrub
Oak Hickory Scrub
Potential Scrub
Scrubby Flatwoods
Coastal Strand
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0 0.1 0.2 0.4 0.6 0.8
Miles

9. APPENDIX II