ENVIRONMENTAL ASSESSMENT

ISSUANCE OF AN INCIDENTAL TAKE PERMIT

TO

CHARLOTTE COUNTY, FLORIDA

FOR

TAKE OF FLORIDA SCRUB-JAYS AND EASTERN INDIGO SNAKES INCIDENTAL TO COMMERCIAL AND RESIDENTIAL DEVELOPMENT INITIATED UNDER CHARLOTTE COUNTY'S PERMITTING AUTHORITY

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1.0 PURPOSE AND NEED FOR ACTION

1.1 Introduction

The County of Charlotte, Florida (Applicant or County) is seeking an Incidental Take Permit (ITP) from the U.S. Fish and Wildlife Service (Service) pursuant to Section 10(a)(1)(B) of the Endangered Species Act (Act) of 1973, as amended. The ITP would authorize the take of the threatened Florida scrub-jay (*Aphelocoma coerulescens*) (scrub-jay) and Eastern indigo snake (*Drymarchon courais couperi*) (indigo snake) incidental to construction and development permitted and/or conducted by the Applicant (impact area), and habitat management activities conducted or authorized by the Applicant on conservation lands (Reserve) throughout Charlotte County. Together, the impact area and the Reserve area comprise the Action Area.

The Applicant has submitted an HCP in support of the ITP application. Much of the social, economic, and environmental information presented in this Environmental Assessment (EA) has been drawn from the HCP, which is incorporated herein by reference (Attachment A).

The Action Area is comprised of 7,552 acres. The impact area contains about 3,056 acres of undeveloped lands that are located wholly or partially in scrub-jay observation buffers in Charlotte County (Figure 1). The 4,496-acre Reserve (Figure 2) contains 4,496 acres: 3,160 acres of public lands currently managed for scrub-jay conservation, and 1,336 acres of private lands the Applicant would like to acquire from willing sellers or have placed under conservation easements for management as scrub habitat.

Potentially occupied scrub habitat occurs on about 18,000 parcels zoned as residential (including over 14,000 residential parcels that are less than 0.25-acre each), agricultural, agriculture estate and privately owned commercial property throughout the County. Habitat loss and fragmentation related to commercial, residential, and agricultural development, and degradation of habitat because of decades of fire suppression are negatively affecting the long-term persistence of scrub-jays and possibly of indigo snakes in Charlotte County.

1.2 Purpose of the Proposed Action

The principal factors negatively affecting the long-term persistence of scrub-jays and indigo snakes in Charlotte County are habitat loss and fragmentation related to commercial, residential, and agricultural development, and degradation of habitat as a result of fire suppression. The primary purpose of the proposed action is to authorize "take" of scrub-jays and indigo snakes within the Action Area incidental to otherwise lawful activities associated with future

development and scrub habitat management in Charlotte County. Specific activities for which the Applicant seeks coverage for take include:

A. All forms of private residential and commercial development such as single and multi-family homes, commercial projects, and capital improvement projects in the Action Area;
B. Road and utility infrastructure improvements related to development activities in the Action Area; and
C. Habitat management on conservation lands where the Applicant conducts or authorizes such activities.

The Applicant designed the HCP to accomplish the following:

A. Ensure compliance with the Act as Charlotte County implements regulatory permitting programs for building and development;
B. Provide the Applicant and the public with greater regulatory certainty regarding planned development in Charlotte County;
C. Enhance the recovery and long term viability of the scrub-jay and indigo snake within Charlotte County; and
D. Manage and enhance Reserve lands to protect indigenous species characteristic of Florida scrub habitats.

Service issuance of an ITP must be accomplished within the statutory and regulatory framework identified in Section 10 of the Act and its implementing regulations found in Title 50 Code of Federal Regulations § 17. Preparation of this EA fulfills, in part, requirements of the National Environmental Policy Act (NEPA).

1.3 Need for the Proposed Action

In 1991, the Applicant received a letter from the Service stating that Charlotte County contains scrub habitat that is occupied by scrub-jays. Because the County issues permits allowing landowners to develop their property, the County is responsible for ensuring that activities authorized by those permits will not be harmful to scrub-jays or any other listed species. The activities noted above can harm and harass scrub-jays and indigo snakes, and, therefore, constitute take, a prohibited act under Section 9 of the Act. Also explained in the letter was how incidental take may be authorized under Section 10(a)(1)(B) of the Act to accommodate otherwise legal activities while conserving the affected species. To date, private landowners have gained authorization under Section 10 to develop properties in occupied scrub-jay habitat by obtaining individual ITPs. However, the process of gaining an individual ITP is lengthy, and the mitigation options are expensive.

On July 1, 2012, the State of Florida enacted amendments to Florida Statutes sections 125.022 and 161.041. These amendments prohibit counties and municipalities from requiring an applicant to obtain a permit or approval from any state or federal agency as a condition of

processing or issuing a development permit unless the agency has issued a final action denying the permit before the county or municipal action on the local development permit.

To address and streamline compliance with federal, state, county, and local regulatory requirements, provide regulatory assurance and clarity to the public, and meet the long-term conservation needs of the scrub-jay and indigo snake, the Applicant is seeking a 30-year ITP from the Service. The Service is bound by the Act to respond to all applications for such requests.

Charlotte County submitted an HCP as part of their ITP application. The HCP is a statutory component of the permit application and estimates the level or extent of incidental take likely to occur as a result of the proposed action. It also specifies how take will be minimized, and mitigated to the maximum extent practicable. The goals of the HCP are to:

A. Reduce extinction risk, increase population persistence probability, and enhance the long-term viability of the metapopulation of scrub-jays in the central part of Charlotte County;
B. Minimize impacts to remaining scrub-jay populations outside the Reserve by expanding, restoring, and maintaining existing public lands and implementing avoidance and minimization efforts within these areas;
C. Ensure current guidelines to protect the indigo snake during construction will be followed to avoid and minimize take of the species on scrub parcels, thus eliminating the need for additional consultation with the Service on this species; and
D. Provide long-term protection of the biological integrity and species diversity that is characteristic of the scrub ecosystems in Charlotte County.

With respect to its review of Charlotte County's ITP application, the needs and goals of the Service are to:

A. Conserve scrub-jays and indigo snakes and their habitat by authorizing an ITP for the proposed action, as long as such authorization is not likely to appreciably reduce the likelihood of listed species' survival and recovery in the wild; and
B. Ensure compliance with Sections 7, 9, and 10 of the Act, NEPA, and other applicable Federal laws and regulations.

1.4 Decision That Must be Made

The Service must decide whether to issue or deny an ITP. If the ITP evaluation criteria (see Part 1.5 below) set forth in Section 10(a)(2)(B) of the Act are satisfied, the Service is mandated to issue an ITP to the Applicant. Within these guidelines, the Service may decide to issue a permit conditioned on implementation of the HCP, as submitted by the Applicant, or to issue a permit conditioned on implementation of the HCP, as submitted, together with other measures specified by the Service. If the Act's criteria are not satisfied, the Service is required to deny the permit request.

1.5 Issues and Concerns

The principal factors negatively affecting the long-term persistence of scrub-jays in Charlotte County are habitat loss and fragmentation related to development, and degradation of habitat quality as a result of fire suppression. About 70 to 80 percent of Florida's scrub (Woolfenden 1996) has been converted from its natural state for citrus production, housing, and commercial development. Fire suppression to protect these developed areas has caused much of the remaining scrub habitat to become too overgrown for the scrub-jays to successfully carry out their typical activities (*e.g.*, caching acorns, detection of predators, dispersal), and has provided conditions more suitable for predators and competitors of the scrub-jay (*e.g.*, hawks and blue jays). Other threats within suburban areas include predation by free-ranging cats, being struck by cars, and the consumption of pesticide-laden insects (Breininger et al. 1991, Fitzpatrick et al. 1991, Breininger 1999, Service 1999, Stith 1999, Mumme et al. 2000). Also, suburban scrub-jay populations generally have lower adult and juvenile survivability than populations in more natural landscapes, which may lead to higher mortality than recruitment and eventual extirpation (Service 1999, Stith 1999, Bowman and Woolfenden 2001). Since the estimated amount of land needed to support projected development over the next 30 years ranges from 15,325 to 20,970 acres, depending on residential density, local extirpation of scrub-jay populations is expected to continue as development proceeds in the future.

Under current regulatory conditions, off-site mitigation for development in occupied scrub-jay areas ranges from $19,196 to $68,739 per acre, depending on which scrub-jay metapopulation will be affected by the development. Most parcels in scrub-jay affected areas are either not large enough or not located in areas suitable for on-site mitigation to be a viable alternative. The cost of mitigation has caused some owners to decide against developing their land for the foreseeable future. Those landowners who have chosen to develop are few in number, so the mitigation gained from these projects has been sporadic. Since no mechanism exists for the Applicant to receive and use off-site mitigation funds for the benefit of scrub-jays within the County, the off-site mitigation generated by projects in Charlotte County goes into a statewide fund that is charged with spending the mitigation money to acquire and manage land in any of the 34 counties in Florida that contain scrub-jays, starting with the most imperiled population of scrub-jays first. Since the inception of the statewide fund in June 2008, none of the mitigation money has been spent to benefit scrub-jays in Charlotte County.

Although development projections for any specific areas of Charlotte County are difficult to estimate, there are 17,984 parcels in scrub-jay habitat that could be developed over the ITP term. Development costs have historically been higher in areas occupied by scrub-jays because of the high mitigation fees relative to the market value of the affected lots. With the proposed HCP in place, it is assumed that the relative difference in development costs on lots inside and outside occupied scrub-jay areas will be relatively small; therefore, although it is difficult to predict economic conditions and the overall health of the regional housing market over a 30-year planning horizon, it is plausible that the development rate within scrub-jay-occupied areas will be roughly the same as county-wide projections.

In evaluating the HCP developed in support of Charlotte County's ITP application, the Service must primarily consider the issues listed below:

A. Will issuance of the ITP appreciably reduce the likelihood of survival or recovery of scrub-jays or indigo snakes in the wild?
B. Would the HCP, as submitted, minimize and mitigate the taking of scrub-jays and indigo snakes to the maximum extent practicable?
C. What alternative actions to the taking did the Applicant consider, and why were those alternatives rejected?
D. Would issuance of an ITP result in significant adverse impacts to other physical, cultural, or biological resources in the project area?
E. Is the proposed take incidental to an otherwise lawful activity?
F. Has the Applicant ensured that adequate funding will be dedicated to ensure implementation of the programs and measures proposed in the submitted HCP?
G. Are there other measures that should be required as a condition of the ITP?

1.6 Coordination and Consultation

Service personnel at the South Florida Ecological Services Office, Vero Beach, Florida, received and reviewed the ITP application. Staff in the Service's Region 4 Office was also consulted and evaluated key issues related to Act and NEPA regulations. Additionally, the Office of the Solicitor of the Department of Interior reviewed the Applicant's HCP and provided comments to the Service's Region 4 Office. Based on that review, the Region 4 Office concluded that the Applicant's HCP is ready to be published in the Federal Register for public review and comment.

The Florida Fish and Wildlife Conservation Commission (FWC) is the state agency tasked with the monitoring, protection and recovery of state-protected animal species in Florida. Representatives from the FWC served on a Technical Advisory Committee (TAC) to provide guidance and expertise during the planning and development of the HCP. Multiple TAC meetings were held from 2008 to 2012. The Florida Department of State, Division of Historical Resources, provided an assessment as to the effects implementation of the HCP might have on historical structures and archaeological resources within the Action Area (Attachment B).

An Interagency Task Force (ITF) was also assembled to provide recommendations and input regarding scrub-jay reserve concepts, and habitat management and restoration options. This group consisted of public land managers and representatives from Charlotte County, Sarasota County, the Department of Environmental Protection, FWC, local environmental non-profits, the building industry, and Edison College. Two meetings were held with this group during the development of the Reserve alternatives in 2009.

The Service worked closely with the Applicant and the TAC during development of the ITP application to ensure conformance to Act and NEPA requirements. Additionally, Service staff was present during several public meetings to provide participants a perspective of the Service's needs and requirements under NEPA and the Act, and to answer questions about HCPs and the Service's processing procedures. Minimization and mitigation measures contained in the HCP

were developed by Charlotte County with guidance from Service staff and were based on input from the TAC and the ITF.

2.0 ALTERNATIVES, INCLUDING THE PROPOSED ACTION

The Applicant originally considered six alternatives. Under the "No Action" alternative, no ITP would be issued to the Applicant, and the current processes of consulting with the Service on a case-by-case basis and having affected landowners seek individual ITPs would continue. The other five alternatives all assumed issuance of an ITP to the Applicant, but each had a different amount of conservation land included in the Reserve design.

A. Reserve Alternative 1 included all suitable and potentially suitable scrub-jay habitat on public and privates lands where development is less than 40 percent, (development is defined as a parcel containing a structure within suitable and potentially suitable scrub-jay habitat polygons);
B. Reserve Alternative 2 comprised only existing public lands with suitable habitat and potentially suitable scrub-jay habitat;
C. Reserve Alternative 3 included all public lands in Reserve Alternative 2 plus the least fragmented private lands with less than 20 percent development within suitable and potentially suitable scrub-jay habitat;
D. Reserve Alternative 4 included all public lands in Reserve Alternative 2 plus the least fragmented private lands with less than 20 percent development immediately adjacent to public lands, and private lands with suitable or potentially suitable scrub-jay habitat that would be managed as corridors between public lands; and
E. Reserve Alternative 5 included all public lands and privately owned scrub-jay habitat in suburban areas where ≥ 25 acre 'blocks' of habitat free of residential or commercial development could be delineated.

Although almost half the extant scrub-jay groups in Charlotte County are present in the Englewood and Deep Creek neighborhoods, the first four Reserve Alternatives do not include these areas, as development is greater than 40 percent. It is expected that less than 40 percent development is a threshold where management costs could still be reasonable, logistics of management would still be achievable, and the sustainability of scrub-jays possible. However, these areas contain interspersed development, are surrounded by existing or future planned development, and are owned by hundreds of different individuals and entities. As a result, acquisition of lands for conservation in these areas is cost prohibitive and extremely contentious. Even if adequate acreage could be acquired in these neighborhoods, only limited habitat management activities would be possible because of the surrounding levels of development and inholdings. The management activities that could be conducted may not be sufficient to keep the scrub habitat in healthy condition, and would become more costly and difficult in the future, which will negatively affect scrub-jay survival and occupation. We do not expect scrub-jays to persist in these types of neighborhoods, but they may survive long enough to provide a source of emigrants to either move, or be relocated to colonize public lands.

Each of the Reserve Alternatives was tested using a spatially-explicit, individually-based Population Viability Analysis (PVA) in order to identify the best biological alternative based on predicted long-term viability. This analysis considered whether each alternative protected enough scrub habitat in an appropriate spatial structure to minimize the risk of extinction for scrub-jays and used the best available data on scrub-jay demography and movement patterns in similar landscapes. The PVA predicted relatively high extinction rates for Reserve Alternatives 1 through 4, and the TAC considered the blocks of habitat within the suburban matrices of Mid- and West County too difficult to acquire and manage such that optimum scrub-jay demographics would be met. The TAC determined there was a higher likelihood of acquiring and managing the private lands in the portion of Charlotte County east of the Peace River, where the PVA model results predicted lower rates of extinction risk (although still relatively high). However, the TAC agreed that where potential scrub-jay habitat exists adjacent to existing public lands throughout the county, consideration of acquisition of these habitat patches should be included as part of Reserve Alternative 5. The Applicant selected Reserve Alternative 5 as the Preferred Alternative.

The Service is presented with two basic options relative to the Applicant's request for an ITP. It can either deny (No Action Alternative) or issue (Action Alternative) an ITP for the proposed action. However, to comply with NEPA, the Service is required to consider a full range of reasonable alternatives for addressing and responding to major public issues, management concerns, and resource conservation opportunities associated with development activities in Charlotte County. In determining whether these alternatives provided a satisfactory range of options, the Service evaluated the following information:

A. Social, economic, environmental and other relevant issues and concerns identified during both internal and public review of the proposal to issue an ITP;
B. Biological requirements of scrub-jays, indigo snakes, and other protected fauna and flora potentially affected by issuance of a Permit;
C. The legal mandates of the Service under NEPA and the Act; and
D. The concerns of the Applicant.

2.1 Alternative 1: The No Action Alternative

Under this alternative (non-issuance of an ITP), the Applicant would continue to be responsible for issuing development permits in occupied scrub-jay habitat without the benefit of protection from take afforded under Section 10 of the Act. The Applicant would continue to review some individual scrub-jay surveys, and landowners would still consult with the Service on a case-by-case basis. The process for landowners in occupied scrub-jay habitat to obtain individual ITPs can often be lengthy and the mitigation expensive. The Applicant's issuance of development permits according to Florida Statutes while relying on individual landowners to consult with the Service also places the County and the landowners at risk of penalty under Federal law.

The level of uncertainty as to which properties can be developed in a short amount of time, which ones should be covered by an ITP, the cost of mitigation, and how long it would take to get the ITP issued creates a level of frustration not only for the affected landowners, but also for

realtors and builders. Currently, the case-by-case review of properties also causes some landowners to forego building, and some prospective buyers to decide not to purchase and build on scrub-jay affected parcels. Thus, development in many areas of Charlotte County will continue to be depressed, and economic recovery will take longer to happen. Also, without the development of properties in areas where scrub-jays are declining and not expected to persist over the long-term, no mitigation funds will be generated to acquire and manage lands that will contribute to the long-term survival of scrub-jays, indigo snakes, and other species that thrive in scrub habitat, and the habitat on these properties will continue to degrade.

Under this alternative, the continued lack of development would continue to frustrate landowners and builders, the Applicant would be deprived of both the increase in taxes resulting from the development of additional properties as well as the mitigation funds needed to acquire and manage areas for scrub for conservation, and the habitat in partially built-out scrub-jay occupied neighborhoods would continue to decline from fire suppression and lack of proper management, receipt of mitigation for the acquisition of additional land for scrub-jay conservation would continue to be sporadic, and the acquisitions would likely occur outside of Charlotte County.

2.2 Alternative 2: Issuance of the ITP (The Preferred Alternative)

Under this alternative, the Service would issue a Section 10(a)(1)(B) permit to the Applicant to allow for the take of scrub-jays and indigo snakes incidental to all forms of residential and commercial development, including construction of single-family homes, multiple-unit residential dwellings, commercial properties, public works projects, and all associated improvements of road and utility infrastructure that may be needed to service this development, as well as land management activities within the Reserve for long term habitat improvements. The ITP will apply throughout the County wherever these activities may impact habitat that is currently occupied by the scrub-jay.

The ITP would be effective for 30 years, during which the County will implement its HCP. The Applicant has developed minimization and mitigation measures commensurate with the level or extent of take resulting from the proposed action. The Applicant has also designated periodic post-issuance evaluations to determine whether acquisition, development, and fee collection are on track to meet the goal of obtaining and properly managing an additional 1,336 acres of scrub habitat for conservation by the end of the 30-year permit period.

This alternative provides conservation benefits to scrub-jays, indigo snakes, and other scrub dwelling species while also providing regulatory certainty and a streamlined permitting process to the people of Charlotte County.

2.2.1 Avoidance and Minimization Measures

Because of the direct and indirect effects of vegetation clearing, the operation of equipment, and the presence of work crews, it is extremely difficult to avoid impacts on scrub-jays during development of parcels less than 3 acres in size. For parcels of 3 acres or greater in size, where development will occur on 50 percent or less of the parcel, avoidance and minimization of

impacts to scrub-jays will take place where feasible. The development of parcels 3 acres or greater in size will be reviewed by Charlotte County Environmental Resources staff on a case by case basis within the context of the surrounding landscape to determine the level of minimization and potential avoidance measures and may take place in the form of preservation of remaining native habitat, supplemental planting of native scrub oak species where landscaping is required by the County, and the potential for conservation easements on larger parcels. Development impacts on scrub-jay groups will be minimized on all parcels in the impact area by prohibiting the clearing of occupied scrub habitat during the scrub-jay nesting season (March 1 – June 30). Habitat management activities in the Reserve will be conducted to minimize impacts to scrub-jays; however, the Applicant is aware that some activities, such as prescribed burning, are weather dependent, and may have to occur during nesting season (Attachment A, section 4.6).

Development impacts to the indigo snake will be avoided and minimized in the Action Area by implementation of the *Standard Protection Measures for the Eastern Indigo Snake* (Service 2013). These measures will be enforced on all proposed development parcels throughout the Action Area, and the County will provide the guidelines to all recipients of land development permits. The County will also ensure these guidelines are implemented on all of the conservation areas for which it is responsible. Protection of burrows and the retention of unburned stumps and occasional debris piles will help improve the habitat for this species.

Impacts to the gopher tortoise from development and habitat management activities will be avoided and minimized in the Action Area by requiring developers, landowners, and public land managers to adhere to the Gopher Tortoise Permitting Guidelines developed by FWC in April 2008, as revised in 2013 (FWC 2013). Impacts to Florida bonneted bats will be avoided wherever possible in the Action Area. If a possible Florida bonneted bat roosting site is located, and the proposed development or management activity could result in take of this species, the proposed activity will be halted immediately pending reinitiation of consultation with the Service.

2.2.2 Mitigation Measures

The Applicant's mitigation strategy is to develop a Reserve. The overall size of the proposed Reserve is about 4,496 acres, which includes 3,160 acres of public lands throughout the county, and a minimum of 1,336 acres of privately owned land to be acquired from willing land owners (either in fee simple or through conservation easements) primarily in central Charlotte County. The Applicant's HCP assumes about 50 percent of these private lands would be conserved within the first 10 years of the plan.

The Applicant anticipates the future development of about 5,700 acres throughout Charlotte County, encompassing slightly less than 18,000 parcels. Of those 5,700 acres, 3,056 acres are in scrub-jay affected areas, which correspond to the Service's 2011 review areas for scrub-jays; this figure approximates the maximum level of potential habitat take over the life of the ITP. A development fee levied on the undeveloped properties within the scrub-jay review area will be used to acquire the 1,336 acres of privately owned land and to establish a non-wasting fund to be used for the management of the County-owned lands in the Reserve. To ensure that acquisition

of the Reserve is occurring at an equivalent pace to development, the issuing of permits in the Action Area will be suspended if acquisition in the Reserve area has not kept pace with development in the impact area within 1 year of reaching 25%, 50% and 75% development of the acreage in the Plan Area.

Under the proposed Countywide HCP, the burden of mitigation shifts to Charlotte County in exchange for the ITP that would allow development pursuant to local land use regulation. The benefits afforded to prospective development projects in the Action Area by the granting of an ITP will allow the projects to proceed in a timely and relatively cost-effective manner (compared to status quo conditions). In other words, the benefit takes the form of regulatory certainty and streamlined local land use approval of new projects that comply with all other land use regulations (e.g., zoning).

The cost of such mitigation is estimated to be $38.4 million over the 30-year permit period and $533,500 annually over the post-permit period. This cost serves as the basis for the proposed mitigation strategy. The HCP uses a "tiered-fee" structure, where separate, one-time fees will be charged based on the size of lot to be developed within scrub-jay habitat. Certain components of the fee cover one-time fixed costs that would occur over the ITP term, such as expenditures for land acquisition and initial site improvements and habitat enhancements. Other cost components would extend beyond the permit term and constitute expenses in perpetuity. These include habitat management and maintenance, monitoring and adaptive management, and HCP administration. The fees for these other components are structured as contribution to a non-wasting endowment fund.

The Service also encouraged the Applicant to adopt adaptive management strategies. Evaluation of property acquisition progress will occur at 2, 4, and 6 years after ITP issuance, and every 5 years thereafter. Habitat and scrub-jay monitoring will take place on a 3-year rotating basis as well as immediately prior to and 9 months after a management event.

The Service only considered mitigation that would result in direct quantifiable benefits to scrub-jays and indigo snakes when it assessed the cost to benefit aspects of the Applicant's proposed action. The Service understands the results of the PVAs indicated the best mitigation strategy was option 5, and agrees with those results. The conservation measures proposed in the Applicant's HCP will serve to minimize and mitigate for impacts related to scrub-jay habitat loss by focusing preservation and management efforts on areas of the County most likely to support sustainable scrub-jay populations.

2.2.3 Other Conservation Measures

Translocation of isolated scrub-jay groups (those not within dispersal distance of other scrub-jay populations) from the impact area could assist to expedite the colonization of the larger restored scrub patches in the Reserve that would be within dispersal distance to other nearby scrub-jay populations. Translocation activities may have the potential to result in harm, harassment, or direct mortality of scrub-jays during capture, banding, transport, conditioning and release. The scrub-jays targeted for translocation under the HCP will be from urban areas where take will

have already been accounted for upon issuance of the Countywide ITP. Long-term, these scrub-jays will have little habitat remaining and being in suburban areas will eventually be extirpated, as demonstrated by the PVA.

Impacts of translocation activities may result in disruption of social behaviors during capture and captivity, but the effects on individual birds will vary depending on their response to the relocation site. However, since scrub-jays targeted for translocation are within areas of declining populations and habitat availability, these translocation activities will supplement the baseline population within the Reserve and possibly reduce mortality of suburban scrub-jay groups thus enhancing the survival of affected scrub-jays. Although scrub-jays may be harassed by translocation activities, these activities will be planned to minimize take of the species.

3.0 THE AFFECTED ENVIRONMENT

This section of the EA describes the portions of the human environment potentially affected by the proposed and alternative actions. In reviewing a proposed activity for NEPA compliance, the Council on Environmental Quality generally considers the following elements of the human environment:

A. Physical Environment (topography, wetlands, floodplains, coastal zones, subsurface conditions, hydrology, soils, energy and mineral resources, toxic substances, and air);
B. Land Use (zoning, existing land uses, proposed long-range plans, farmland, and timberland);
C. Biological Environment (vegetation, fisheries, wildlife, and threatened/endangered species);
D. Cultural Resources (historical sites and standing structures, architectural issues, and archaeological sites);
E. Social Interests (human population, human health/safety, and public services);
F. Economy (employment, income sources, and economic uses of affected environment); and
G. Aesthetics (scenic value, noise and odor).

For the purpose of researching and assessing various human resource and land use issues arising from the Applicant's proposed action, the Service consulted the following information sources:

A. Smart Charlotte 2050 Comprehensive Plan (Comp Plan; Charlotte County 2010). Adopted in 2010, many of the requisite elements of NEPA review are addressed in the Applicant's Comp Plan. The goal of the Comp Plan is to encourage the most appropriate and efficient use of land, water, and natural resources consistent with the public interest and local, State, and Federal laws.
B. Florida Department of State, Division of Historic Resources. The State Historic Preservation Officer rendered an opinion regarding the proposed action's potential impacts to standing historical structures and significant archaeological resources (Attachment B).

3.1 Physical Environment

Charlotte County is located in Southwest Florida on the Gulf Coast and is bordered to the north by Sarasota County, to the northeast by DeSoto County, to the east by Glades County, to the south by Lee County, and the west by the Gulf of Mexico (Figure 3). The County encompasses approximately 2,154 square kilometers (832 square miles); 334 square kilometers (129 square miles) of which are inland surface waters including Charlotte Harbor, and the Peace and Myakka Rivers. Approximately 40 percent of the available land within the urban service area boundary has been developed.

Charlotte County is composed of four physiographic provinces: Gulf Barrier Chain, Gulf Coastal Lowlands, Caloosahatchee Incline, and DeSoto Plain. The climate is described as humid and subtropical, with a mean annual temperature of 74 degrees Fahrenheit (F). Annual rainfall is approximately 50 inches, the majority of which occurs during the summer.

3.2 Land Use

Significant development in the County began in the 1950s and 1960s, beginning with the rapid development and platting of the Rotonda, Port Charlotte, Deep Creek, and Harbor Heights areas in the western County. Unlike the majority of Florida, which was initially developed as agriculture, residential and commercial development have dominated the County west of the Peace River, while the area east of the Peace River has remained relatively rural with interspersed agriculture. Webb Wildlife Management Area and Babcock Ranch Preserve are large public lands located in the eastern portion of the County composed of flatwoods and wetland systems equating to 140,613 acres, 134,996 acres of which are located within Charlotte County.

There were 159,978 people living in Charlotte County in 2010, which is almost 13 percent greater than the population of 141,627 in 2000. However, the number of housing units added since the 2000 Census (20,874) exceeded the increase in the county population (18,351) and is more than double the increase in the number of households (9,506) (Charlotte 2010). The result is a vacancy rate that surged by more than seven percent, from 19.9 percent in 2000 to 27.1 percent in 2010.

Charlotte County's 2010 Evaluation and Appraisal Report (EAR) report identifies a total of 60,552 acres of residential land use in Charlotte County, and projects housing demand from 2010 to 2040 will require an additional 11,265 acres at a development density of three units per acre. The 2010 EAR report also shows a total of 12,050 acres of commercial, mixed use, and industrial land use in the County, and projects 4,060 additional acres will be needed to accommodate commercial/ industrial demand from 2010 to 2040.

3.3 Biological Environment

Vegetation communities within Charlotte County are typical of those found in Southwest Florida including, but not limited to, pine flatwoods, dry prairies, oak-palm hammocks, depressional marshes, forested wetlands, freshwater tidal swamps, tidal marsh, coastal strand, scrubby

flatwoods, xeric oak scrub, and sand pine scrub. In addition to scrub-jays and indigo snakes, which are the primary focus of this assessment, the Plan Area provides habitat for a variety of other flora and fauna. This portion of the report provides information on the ecological communities that exist in the Action Area, and gives special consideration to the presence of animals and plants that have been designated by the Federal government and/or the State of Florida as "Endangered" or Threatened" or "Species of Special Concern".

3.3.1 General Description of Plant and Animal Communities

General descriptions of the communities most likely to be affected by the implementation of the HCP and dominant vegetation found in each are provided below. Where clearing of native habitats historically occurred in platted areas, exotic and invasive species such as Brazilian pepper (*Schinus terebinthifolius*), Australian pine (*Casuarina equisetifolia*), and cogon grass (*Imperata cylindrica*) are abundant. Where the native habitats were not historically cleared in platted communities, those habitats have become overgrown with tall and dense native vegetation due to fire suppression.

In general, animal species likely to be present in the Action Area include raccoon (*Procyon lotor*), gray squirrel (*Sciurus carolinensis*), bobcat (*Felis rufus*), opossum (*Didelphis virginiana*), a variety of resident and migratory wading and passerine bird species, and several native lizard and snake species.

3.3.1.1 Xeric Oak Scrub

The Florida Natural Areas Inventory (FNAI) ranks scrub habitat as imperiled both in-state and globally (FNAI 2013). Scrub communities tend to be dominated by an understory of scrub oak species and shrubs with or without a closed to open canopy of sand pines (*Pinus clausa*). The most common form, oak scrub, is dominated by three species of shrubby oaks: myrtle oak (*Quercus myrtifolia*), sand live oak (*Q. geminata*), and Chapman's oak (*Q. chapmanii)*. Groundcover, where present, consists of lichens, herbs and subshrubs such as pinweeds (*Lechea* spp.) and jointweeds (*Polygonella* spp.) (FNAI 2010). Common vegetation includes rusty staggerbush (*Lyonia ferruginea*), saw palmetto (*Serenoa repens*), hog plum (*Ximenia americana*), beak rush (*Rhyncospora* spp.), and milk pea (*Galactica* spp.).

Scrub is a fire-maintained community, but is not easily ignited. Support for the natural fire return intervals in scrub have been inferred from life history traits of the dominant plants and species (FNAI 2010). Oak scrub typically burned naturally at intervals from 3 to 20 years based on the habitat requirements of the scrub-jay.

3.3.1.2 Sand Pine Scrub

Sand Pine scrub is a variation on Oak Scrub that is dominated by a canopy of sand pine and is usually found on the high sandy ridgelines or areas somewhat protected from fire. The canopy can range from short scattered trees to a dense canopy of tall thin trees of uniform height (FNAI 2010). The understory is typically composed of the three shrubby oaks and in some areas

Florida rosemary. Although the life history of sand pines indicates an estimated burn interval of 5 to 40 years may be appropriate, sand pine scrub in peninsular Florida probably burned naturally at intervals of more than 10 years.

3.3.1.3 Scrubby Pine Flatwoods

FNAI ranks scrubby flatwoods habitat as imperiled both in-state and globally (FNAI 2013). Scrubby flatwoods are generally characterized by an open widely spaced canopy comprised of longleaf pine (*Pinus palustris*) and South Florida slash pine (*Pinus elliottii* var. *densa*). The understory is short and shrubby consisting of an understory of saw palmetto, scrub oaks, rusty staggerbush, fetterbush (*Lyonia lucida*), and tarflower (*Bejaria racemosa*) (FNAI 2010). The shrub layer is also comprised of grasses and dwarf shrubs, along with interspersed areas of bare sand. Vegetation commonly found in this habitat includes: wiregrass (*Aristida stricta* var. *beyrichiana*), broomsedge bluestem (*Andropogon virginicus*), runner oak (*Q. elliottii*), dwarf huckleberry (*Gaylussacia dumosa*), and shiny blueberry (*Vaccinium myrsinites*).

Scrubby flatwoods burns more readily than scrub, as it has more ground cover. Fire intervals greater than 5 years, but less than 15 years are recommended, dependent upon fuel accumulation rates, for maximum acorn production for scrub-jays.

3.3.2 Protected Species

Existing data are available from a variety of sources about protected flora and fauna that have been observed within the Action Area. Information sources documenting the presence of flora and fauna within the Plan Area include the South Florida Multi-Species Recovery Plan (MSRP; Service 1999), FNAI (2010), and information contained in the Service's Geographical Information Systems database. Review of these data sources combined with field surveys conducted by the Applicant have indicated the presence or likely occurrence of four species of protected animals within the Action Area. The presence and distribution of these species within the Plan Area is affected primarily by the extent and quality of requisite habitat.

3.3.2.1 Florida Scrub-jay

3.3.2.1.1 Biological Information

Species/Critical Habitat Description

Scrub-jays are about 10 to 12 inches long and weigh about 3 ounces. They are similar in size and shape to blue jays (*Cyanocitta cristata*), but differ significantly in coloration (Woolfenden and Fitzpatrick 1996a). Unlike the blue jay, the scrub-jay lacks a crest. It also lacks the conspicuous white-tipped wing and tail feathers, black barring, and bridle of the blue jay. The scrub-jay's head, nape, wings, and tail are pale blue, and its body is pale gray on its back and belly. Its throat and upper breast are lightly striped and bordered by a pale blue-gray "bib" (Woolfenden and Fitzpatrick l996a). Scrub-jay sexes are not distinguishable by plumage (Woolfenden and Fitzpatrick 1984), and males, on the average, are only slightly larger than

females (Woolfenden 1978). The sexes may be identified by a distinct "hiccup" call made only by females (Woolfenden and Fitzpatrick 1984; Woolfenden and Fitzpatrick 1986). Scrub-jays that are less than about 5 months of age are easily distinguishable from adults; their plumage is smoky gray on the head and back, and they lack the blue crown and nape of adults. Molting occurs between early June and late November and peaks between mid-July and late September (Bancroft and Woolfenden 1982). During late summer and early fall, when the first basic molt is nearly done, fledgling scrub-jays may be indistinguishable from adults in the field (Woolfenden and Fitzpatrick 1984). The wide variety of vocalizations of scrub-jays is described in Woolfenden and Fitzpatrick (1996b).

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

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

This species account references the full species name, *Aphelocoma coerulescens*, as listed in the Federal Register (Service 1987). No critical habitat has been designated for this species.

Life History/Population Dynamics

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

Trees and dense herbaceous vegetation are rare. Other vegetation noted along with the oaks includes saw palmetto (*Serenoa repens*) and scrub palmetto (*Sabal etonia*), as well as woody shrubs such as Florida rosemary (*Ceratiola ericoides*) and rusty lyonia (*Lyonia ferruginea*).

Scrub-jays occupy areas with less scrub oak cover and fewer openings on the Merritt Island/Cape Canaveral Complex and in southwest Florida than typical of xeric oak scrub habitat on the Lake Wales Ridge (Schmalzer and Hinkle 1992b; Breininger et al. 1995; Thaxton and Hingtgen 1996). The predominant communities here are oak scrub and scrubby flatwoods. Scrubby flatwoods differ from scrub by having a sparse canopy of slash pine (*Pinus elliottii*); sand pine is rare. The shrub species mentioned above are common except for scrub oak and scrub palmetto runner oak (*Q. mini*ma), turkey oak (*Q. laevis*), bluejack oak (*Q. incana*), and longleaf pine (*Pinus palustris*) also have been reported. The Kennedy Space Center, located in Brevard County, supports one of the largest contiguous populations of scrub-jays. Studies conducted there give good descriptions of this habitat type (Schmalzer and Hinkle 1992b).

Optimal scrub-jay habitat occurs as patches with the following attributes: (1) 10 to 50 percent of the oak scrub made up of bare sand or sparse herbaceous vegetation; (2) greater than 50 percent of the shrub layer made up of scrub oaks; (3) a mosaic of oak scrubs that occur in optimal height (4 to 6 feet) and shorter; (4) less than 15 percent canopy cover; and (5) greater than 984 feet from a forest (Breininger et al. 1998). Much potential scrub-jay habitat occurs as patches of oak scrub within a matrix of little-used habitat of saw palmetto and herbaceous swale marshes (Breininger et al. 1991, Breininger et al. 1995). These native matrix habitats supply prey for scrub-jays and habitat for other species of conservation concern. The flammability of native matrix habitats is important for spreading fires into oak scrub (Breininger et al. 1995; Breininger et al. 2002). Degradation or replacement of native matrix habitats with habitat fragments and industrial areas attract predators of scrub-jays, such as fish crows (*Corvus ossifragus*), that are rare in most regularly burned native matrix habitats (Breininger and Schmalzer 1990; Woolfenden and Fitzpatrick 1991). Matrix habitats often develop into woodlands and forests when there is a disruption of fire regimes. These woodlands and forests are not suitable for scrub-jays, decrease the habitat suitability of nearby scrub, attract predators, and further disrupt fire patterns.

Scrub-jays have a social structure that involves cooperative breeding, a trait that the other North American species of scrub-jays do not show (Woolfenden and Fitzpatrick 1984; Woolfenden and Fitzpatrick 1990). Scrub-jays live in families ranging from two birds (a single-mated pair) to extended families of eight adults (Woolfenden and Fitzpatrick 1984) and one to four juveniles. Fledgling scrub-jays stay with the breeding pair in their natal (birth) territory as "helpers," forming a closely-knit, cooperative family group. Prebreeding numbers are generally reduced to either a pair with no helpers or families of three or four individuals (a pair plus one or two helpers) (Woolfenden and Fitzpatrick 1996a).

Scrub-jays have a well-developed intrafamilial dominance hierarchy with breeder males most dominant, followed by helper males, breeder females, and, finally, female helpers (Woolfenden and Fitzpatrick 1977; Woolfenden and Fitzpatrick 1984). Helpers take part in sentinel duties (Woolfenden and Fitzpatrick 1984; McGowan and Woolfenden 1989), territorial defense (Woolfenden and Fitzpatrick 1984), predator-mobbing, and the feeding of both nestlings

(Stallcup and Woolfenden 1978) and fledglings (Woolfenden and Fitzpatrick 1984; McGowan and Woolfenden 1990). The well-developed sentinel system involves having one individual occupying an exposed perch watching for predators or territory intruders. When a predator is seen, the sentinel scrub-jay gives a distinctive warning call (McGowan and Woolfenden 1989; McGowan and Woolfenden 1990), and all family members seek cover in dense shrub vegetation (Fitzpatrick et al. 1991).

Scrub-jay pairs occupy year-round, multipurpose territories (Woolfenden and Fitzpatrick 1978; Woolfenden and Fitzpatrick 1984; Fitzpatrick et al. 1991). Territory size averages 22 to 25 acres (Woolfenden and Fitzpatrick 1990; Fitzpatrick et al. 1991), with a minimum size of about 12 acres (Woolfenden and Fitzpatrick 1984; Fitzpatrick et al. 199l) the availability of territories is a limiting factor for scrub-jay populations (Woolfenden and Fitzpatrick 1984). Because of this limitation, nonbreeding adult males may stay at the natal territory as helpers for up to 6 years, waiting for either a mate or territory to become available (Woolfenden and Fitzpatrick 1984). Scrub-jays may become breeders in several ways: (1) by replacing a lost breeder on a non-natal territory (Woolfenden and Fitzpatrick 1984); (2) through "territorial budding," where a helper male becomes a breeder in a segment of its natal territory (Woolfenden and Fitzpatrick 1978); (3) by inheriting a natal territory following the death of a breeder; (4) by establishing a new territory between existing territories (Woolfenden and Fitzpatrick 1984); or (5) through "adoption" of an unrelated helper by a neighboring family followed by resident mate replacement (Woolfenden and Fitzpatrick 1984). Territories also can be created by restoring habitat through effective habitat management efforts in areas that are overgrown (Thaxton and Hingtgen 1994).

To become a breeder, a scrub-jay must find a territory and a mate. Evidence presented by Woolfenden and Fitzpatrick (1984) suggests that scrub-jays are monogamous. The pair retains ownership and sole breeding privileges in its particular territory year after year. Courtship to form the pair is lengthy and ritualized, and involves posturing and vocalizations made by the male to the female (Woolfenden and Fitzpatrick l996b). Copulation between the pair is generally out of sight of other scrub-jays (Woolfenden and Fitzpatrick 1984). These authors also reported never observing copulation between unpaired scrub-jays or courtship behavior between a female and a scrub-jay other than her mate. Age at first breeding in the scrub-jay varies from 1 to 7 years, although most individuals become breeders between 2 and 4 years of age (Fitzpatrick and Woolfenden 1988). Persistent breeding populations of scrub-jays exist only where there are scrub oaks in sufficient quantity and form to provide an ample winter acorn supply, cover from predators, and nest sites during the spring (Woolfenden and Fitzpatrick l996b).

Scrub-jay nests are typically constructed in shrubby oaks, at a height of 1.6 to 8.2 feet (Woolfenden 1974). Sand live oak and scrub oak are the preferred shrubs on the Lake Wales Ridge (Woolfenden and Fitzpatrick l996b), and myrtle oak is favored on the Atlantic Coastal Ridge (Toland 1991) and southern Gulf coast (Thaxton 1998). In suburban areas, scrub-jays nest in the same evergreen oak species, as well as in introduced or exotic trees; however, they build their nests in a significantly higher position in these oaks than when in natural scrub habitat (Bowman et al. 1996). Scrub-jay nests are an open cup, about 7 to 8 inches outside diameter and 3 to 4 inches inside diameter. The outer basket is bulky and built of course twigs from oaks and

other vegetation, and the inside is lined with tightly wound palmetto or cabbage palm (*Sabal palmetto*) fibers. There is no foreign material as may be present in a blue jay nest (Woolfenden and Fitzpatrick 1996b).

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

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

Fledglings depend upon adults for food for about ten weeks, during which time they are fed by both breeders and helpers (Woolfenden 1975; McGowan and Woolfenden 1990). Survival of scrub-jay fledglings to yearling age class averages about 35 percent in optimal scrub, while annual survival of both adult males and females averages around 80 percent (Woolfenden and Fitzpatrick 1996b). Data from Archbold Biological Station, however, suggest that survival and reproductive success of scrub-jays in suboptimal habitat is lower (Woolfenden and Fitzpatrick 1991). These data help explain why local populations inhabiting unburned, late successional habitats become extirpated. Similarly, data from Indian River County show mean annual productivity declines significantly in suburban areas where Toland (1991) reported productivity averaged 2.2 young fledged per pair in contiguous optimal scrub, 1.8 young fledged per pair in fragmented moderately-developed scrub, and 1 .2 young per pair fledged in very fragmented suboptimal scrub. The longest observed lifespan of a scrub-jay is 15.5 years at Archbold Biological Station in Highlands County (Woolfenden and Fitzpatrick 1996b).

Scrub-jays are nonmigratory and permanently territorial. Juveniles stay in their natal territory for up to 6 years before dispersing to become breeders (Woolfenden and Fitzpatrick 1984; Woolfenden and Fitzpatrick 1986). Once scrub-jays pair and become breeders, generally within two territories of their natal area, they stay on their breeding territory until death. In suitable habitat, fewer than 5 percent of scrub-jays disperse more than 5 miles (Fitzpatrick et al. unpublished data). All documented long-distance dispersals have been in unsuitable habitat such

as woodland, pasture, or suburban plantations. Scrub-jay dispersal behavior is affected by the intervening land uses. Protected scrub habitats will most effectively sustain scrub-jay populations if they are located within surrounding habitat types that can be used and traversed by scrub-jays. Brushy pastures, scrubby corridors along railway and road rights-of-way, and open burned flatwoods offer links for colonization among scrub-jay populations. Stith et al. (1996) believe a dispersal distance of 5 miles is close to the biological maximum for scrub-jays.

Scrub-jays forage mostly on or near the ground, often along the edges of natural or man-made openings. They visually search for food by hopping or running along the ground beneath the scrub or by jumping from shrub to shrub. Insects, particularly orthopterans (e.g., locusts, crickets, grasshoppers, beetles) and lepidopteran (e.g., butterfly and moth) larvae form most of the animal diet throughout most of the year (Woolfenden and Fitzpatrick 1984). Small vertebrates are eaten when encountered, including frogs and toads (*Hyla femoralis*, *H. squirella*, rarely *Bufo quercicus*, and unidentified tadpoles), lizards (*Anolis carolinensis*, *Cnemidophorus sexlineatus*, *Sceloporus woodi*, *Eumeces inexpectatus*, *Neoseps reynoldsi*, *Ophisaurus compressus*, *0. ventralis*), small snakes (*Thamnophis sauritus*, *Opheodrys aestivus*, *Diadophis punctatus*), small rodents (cotton rat [*Sigmodon hispidus*, *Peromyscus polionotus*, black rat [*Rattus rattus* young), downy chicks of the bobwhite (*Colinus virginianus*), and fledgling common yellowthroat (*Geothlypis trichas*). In suburban areas, scrub-jays will accept supplemental foods once the scrub-jays have learned about them (Woolfenden and Fitzpatrick 1984).

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

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

Status and Distribution

The scrub-jay was federally listed as threatened in 1987 primarily because of habitat fragmentation, degradation, and loss (Service 1987). No critical habitat has been designated for this species.

Historically, oak scrub occurred as numerous isolated patches in peninsular Florida. These patches were concentrated along both the Atlantic and Gulf coasts and on the central ridges of the peninsula (Davis 1967). Probably until as recently as the l950s, scrub-jay populations occurred in the scrub habitats of 39 of the 40 counties south of, and including Levy, Gilchrist, Alachua, Clay, and Duval Counties. Historically, most of these counties would have contained hundreds or even thousands of breeding pairs (Fitzpatrick et al. 1994). Only the southernmost county, Monroe, lacked scrub-jays (Woolfenden and Fitzpatrick 1996a). Although scrub-jay numbers probably began to decline when European settlement began in Florida (Cox 1987), the decline was first noted in the literature by Byrd (1928). After 40 years of personal observation of the Etonia scrub (now known as Ocala National Forest), Webber (1935) observed many changes to the previously-undisturbed scrub habitat found there, noting that "The advent of man has created a new environmental complex."

A statewide scrub-jay census was last conducted in 1992 and 1993, at which time there were an estimated 4,000 pairs of scrub-jays left in Florida (Fitzpatrick et al. 1994). At that time, the scrub-jay was considered extirpated in ten counties (Alachua, Broward, Clay, Duval, Gilchrist, Hernando, Hendry, Pinellas, and St. Johns), and functionally extinct in an additional five counties (Flagler, Hardee, Levy, Orange, and Putnam), where 10 or fewer pairs remained. Recent information indicates there are at least 12 to 14 breeding pairs of scrub-jays located within Levy County, higher than previously thought (Miller 2004), and there is at least one breeding pair of scrub-jays remaining in Clay County (Miller 2004). A scrub-jay has been documented in St. Johns County as recently as 2003 (Miller 2003). Populations are close to becoming extirpated in Gulf coast counties (from Levy south to Collier) (Woolfenden and Fitzpatrick 1996a). In 1992 and 1993, population numbers in 21 of the counties were below 30 or fewer breeding pairs (Fitzpatrick et al. 1994). Based on the amount of destroyed scrub habitat, scrub-jay population loss along the Lake Wales Ridge is 80 percent or more since pre-European settlement (Fitzpatrick et al. 1991). Since the early l980s, Fitzpatrick et al. (1994) estimated that, in the northern third of the species' range, the scrub-jay has declined somewhere between 25 and 50 percent. The species may have declined by as much as 25 to 50 percent in the last decade alone (Stith et al. 1996).

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

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

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

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

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

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

Coulon et al. (2008) completed and published a genetic analysis of a cross section of scrub-jays. They determined that the 21 metapopulations established by Stith (1999) fall within 10 distinct genetic groups.

3.3.2.1.2 Site-specific Information for Charlotte County

Based on the Coulon et al. (2008) findings, two of the three metapopulations identified by Stith (1999) in Charlotte County (Northwest Charlotte and Central Charlotte) (Figure 3) were found to be genetically similar and are identified by Coulon et al. as Genetic Group F. The boundaries of Genetic Group F extend eastward from the Myakka River to the Prairie Creek area, and from the Caloosahatchee River in Lee County northward through Charlotte and DeSoto Counties to the Alafia River in Manatee County. Public lands within the Northwest Charlotte metapopulation that currently support scrub-jays are Charlotte County's Tippecanoe and Charlotte Harbor State Buffer Preserve, Prairie Creek Preserve, Shell Creek Preserve, the Southwest Florida Water Management District's Burcher's Tract Property, and the county-managed Biscayne Trust Easement. Other public lands that do not support scrub-jay, but have the potential to do so include Charlotte County's Water Treatment Plant and the Deep Creek Conservation Area. The Myakka River State Forest historically supported scrub-jays, but has not been occupied in recent years, and limited scrub habitat exists within this parcel. Private lands where scrub-jays are present include the Eleanor Avenue area, Deep Creek, Harbour Heights, Peace River Estates, Washington Loop, Prairie Creek Estates, and the Jones Loop area.

The third metapopulation in Charlotte County identified by Stith (Sarasota) (Figure 3) corresponds with Coulon's Genetic Group E, which is west of the Myakka River and extends north into Sarasota County. Within the Charlotte County portion of Group E, scrub-jays are found on public lands that include Charlotte Harbor State Buffer Preserve and Amberjack Slough. Private areas where scrub-jays are found include Rotonda, Englewood, and North and South Gulf Cove.

Coulon et al. (2008) also found that some genetic units encompass "water gaps that do not always act as barriers to scrub-jay gene flow", such as the Peace River. In addition, TAC member and FWC biologist Karl Miller provided scrub-jay dispersal data indicating five scrub-jays from Deep Creek/Harbour Heights have dispersed across the Peace River and have been found in Washington Loop, and similarly, Miller's data indicate five scrub-jays have dispersed west from Deep Creek/Harbour Heights to the Eleanor Avenue and Tippecanoe areas in Charlotte County, and North Port in Sarasota County.

About 136 scrub-jay groups will be directly affected by issuance of the ITP. Since the number of individuals in any scrub-jay group can vary from year to year, take for this species is usually measured in acres of habitat. The total estimate of currently occupied scrub-jay habitat that has the potential to be impacted by development is 3,056 acres.

3.3.2.2 Eastern Indigo Snake

3.3.2.2.1 Biological Information

<u>Species/Critical Habitat Description</u>

The Eastern indigo snake is the largest non-venomous snake in North America, reaching lengths of up to 8.5 feet (Moler 1992). Its color is uniformly lustrous-black, dorsally and ventrally,

except for a red or cream-colored suffusion of the chin, throat, and sometimes the cheeks. Its scales are large and smooth (the central 3 to 5 scale rows are lightly keeled in adult males) in 17 scale rows at mid-body. Its anal plate is undivided. In the Florida Keys, adult Eastern indigo snakes seem to have less red on their faces or throats compared to most mainland specimens (Lazell 1989). Several researchers have informally suggested that Lower Keys Eastern indigo snakes may differ from mainland snakes in ways other than color. No critical habitat has been designated for this species.

Life History/ Population Dynamics

Depending on the time of year and environmental conditions, indigo snakes may actively spend much time foraging and searching for mates. They may also spend much time in burrows and other cavities underground and move very little. They are one of the few snake species that may be active during the day but rest at night. The indigo snake is a generalized predator and will eat any vertebrate small enough to be overpowered. They swallow their prey alive. Food items include fish, frogs, toads, snakes (venomous, as well as non-venomous), lizards, turtles, turtle eggs, small alligators, birds, and small mammals (Keegan 1944; Babis 1949; Kochman 1978; Steiner et al. 1983).

Indigo snakes need a mosaic of habitats to complete their annual lifecycle. Over most of its range, the indigo snake frequents several habitat types, including pine (*Pinus* spp.) flatwoods, scrubby flatwoods, high pine, dry prairie, tropical hardwood hammocks, edges of freshwater marshes, agricultural fields, coastal dunes, and human-altered habitats. Indigo snakes also use some agricultural lands (such as citrus) and various types of wetlands (Service 1999). A study in Georgia found that interspersion of tortoise-inhabited sandhills and wetlands improve habitat quality for the snake (Landers and Speake 1980). Indigo snakes are known to shelter in gopher tortoise (*Gopherus polyphemus*) burrows, hollowed root channels, hollow logs, ground litter, or the burrows of rodents, armadillos, or land crabs (Lawler 1977; Moler 1985a; Layne and Steiner 1996). Throughout peninsular Florida, this species may be found in all terrestrial habitats which have not experienced high density urban development. They are especially common in the hydric hammocks throughout this region (Service 1999).

In central and coastal Florida, Eastern indigo snakes are mainly found within many of the State's high, sandy ridges. In extreme south Florida (*i.e.*, the Everglades and Florida Keys), Eastern indigo snakes are found in tropical hardwood hammocks, pine rocklands, freshwater marshes, abandoned agricultural land, coastal prairie, mangrove swamps, and human-altered habitats (Steiner et al. 1983; Service 1999). It is thought that they prefer hammocks and pine forests, since most observations occur there and use of these areas is disproportionate compared to the relatively small total area of these habitats (Steiner et al. 1983). Observations over the last 50 years made by maintenance workers in citrus groves in east-central Florida indicate that Eastern indigo snakes are occasionally observed on the ground in the tree rows and more frequently near the canals, roads, and wet ditches (Zeigler 2006). Ceilly (2013) used radio tracking of 6 indigo snakes in a former citrus grove at the C-44 Reservoir and STA Project site to determine home ranges and seasonal movements. In the sugar cane fields at the A-1 Reservoir Project site in the

EAA, Eastern indigo snakes have been observed (including one mortality) during earthmoving and other construction-related activities (C. Fury, personal communication 2006).

Eastern indigo snakes range over large areas and use various habitats throughout the year, with most activity occurring in the summer and fall (Smith 1987; Moler 1985). Adult males have larger home ranges than adult females and juveniles; their ranges average 554 acres, decreasing to 390 ac in the summer (Moler 1985). In contrast, a gravid female may use from 3.5 to 106 acres (Smith 1987). In Florida, home ranges for females and males range from 5 to 371 ac and 4 to 805 acres, respectively (Smith 2003). At Archbold Biological Station (ABS), average home range size for females was determined to be 46 acres and overlapping male home ranges to be 184 acres (Layne and Steiner 1996). Ceilly (2013) reported home ranges of 111 and 163 acres for two males (over 1 year) and 33 acres for one female (over 16 months) at the C-44 site.

Status and Distribution

The indigo snake ranges from the southeastern United States to northern Argentina. This species has eight recognized subspecies, two of which occur in the United States: the Eastern indigo and the Texas indigo (*D. c. erebennus*). The Eastern indigo snake was listed as threatened on January 31, 1978 (43 Federal Register 4028; Service 1978), due to population declines caused by habitat loss, over-collecting for the domestic and international pet trade, and mortality caused by rattlesnake collectors who gas gopher tortoise burrows to collect snakes.

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

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. It may have occurred in southern South Carolina, but its occurrence there cannot be confirmed. Georgia and Florida currently support the remaining, endemic populations of the Eastern indigo snake. The Eastern indigo 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).

To protect and manage this species for recovery, large expanses of land must be protected. Management of these lands must be directed towards maintaining and enhancing the diversity of plant and animal assemblages within these properties. Where these goals are achieved, Eastern indigo snakes will directly benefit because of improved habitat conditions. Land managers are encouraged to utilize fire as a tool to maintain biodiversity in fire dependent ecosystems.

3.3.2.2.2 Site-specific Information for Charlotte County

This species is difficult to observe even in locations where it is known to occur and thus difficult to survey or monitor and the viability of existing populations is unknown (Service 2008).

Occasional sightings have been reported in Charlotte County, but only one mortality has been recorded in FWC's database. Lack of observations combined with survey data indicate limited occurrence of this species within the County. The actual number of Eastern indigo snakes in the Action Area is difficult to ascertain because of their tendency to avoid areas where humans are active, and their extensive use of leaf litter and underground refugia for shelter. By dividing the average home range of an indigo snake into 7,552 acres, the Service estimates the take of 201 individual Eastern indigo snakes could occur in the Action Area.

3.3.2.4 Florida Bonneted Bat (*Eumops floridanus*)

3.3.2.4.1 Biological Information

Species/Critical Habitat Description

The Florida bonneted bat is a large free-tailed bat approximately 5.1 to 6.5 inches in length (Timm and Genoways 2004), and the largest bat in Florida (NatureServe 2009). The body mass of the species averages 1.4 ounces (oz), with a range from 1.1 oz to at least 2.0 oz in pregnant females (Belwood 1981, 1992; Timm and Genoways 2004; NatureServe 2009). Timm and Genoways (2004) found that males and females are not significantly different in size, and there is no pattern of size-related geographic variation in this species. Fur is short and glossy with hairs sharply bicolored with a white base (Timm and Genoways 2004; NatureServe 2009). Color is highly variable from black to brown to brownish gray or cinnamon brown with ventral pelage paler than dorsal (Timm and Genoways 2004; NatureServe 2009). Leathery rounded ears are joined at the midline and project forward (NatureServe 2009). No critical habitat has yet been designated for this species.

Life History/Population Dynamics

Relatively little is known of the ecology of the Florida bonneted bat and long-term habitat requirements are poorly understood (Robson 1989; Robson et al. 1989; Belwood 1992; Timm and Genoways 2004). Recent information on foraging habitat has been obtained largely through acoustical surveys, designed to detect and record bat echolocation calls (Marks and Marks 2008a).

In general, open fresh water and wetlands provide prime foraging areas for bats (Marks and Marks 2008c). Bats will forage over ponds, streams, and wetlands and drink when flying over open water (Marks and Marks 2008c). During dry seasons, bats become more dependent on remaining ponds, streams, and wetland areas for foraging purposes (Marks and Marks 2008c). The presence of roosting habitat is critical for day roosts, protection from predators, and the rearing of young (Marks and Marks 2008c). For most bats, the availability of suitable roosts is an important limiting factor (Humphrey 1975). South Florida bats roost primarily in trees and manmade structures (Marks and Marks 2008a).

Major habitat types where this species is known to occur include dry prairie, freshwater marsh, wet prairie, and pine flatwoods (Marks and Marks 2008a). They have been known to roost in

buildings, tree cavities, outcrops, and bat houses (Marks and Marks 2008a). The discovery of an adult for which the specimen tag says "found under rocks when bull-dozing ground" suggests this species may roost in rocky crevices and outcrops on the ground (Timm and Genoways 2004). It is not known to what extent such roost sites are suitable. Robson (1989) indicated Florida bonneted bats are closely associated with forested areas because of their tree-roosting habits. They roost singly or in groups of up to a few dozen individuals (NatureServe 2009). The Florida bonneted bat is not migratory (Timm and Genoways 2004; NatureServe 2009). However, there may be seasonal shifts in roosting sites because Belwood (1992) reported bonneted bats were found "during the winter months in people's houses."

Florida bonneted bats feed on flying insects (e.g., Coleoptera, Diptera, Hemiptera) (Belwood 1981, 1992; NatureServe 2009). They forage in open spaces and use echolocation to detect prey at relatively long range, roughly (10 to 16 feet; Belwood 1992). Based upon information from G. T. Hubbell, Belwood (1992) indicates these bats leave their roosts to forage after dark, seldom occur below 33 feet in the air, and produce loud, audible calls as they fly that are easy to recognize. Precise foraging and roosting habits and requirements are not known (Belwood 1992).

The Florida bonneted bat has a fairly extensive breeding season during summer months (Timm and Genoways 2004; NatureServe 2009). Pregnant females have been found in June through September (Marks and Marks 2008a). Timm and Genoways' (2004) examination of limited data suggests that this species may be polyestrous, with a second birthing season possibly in January through February. However, the Florida bonneted bat has low fecundity, producing a litter size of one (NatureServe 2009).

There is only one record of natural predation upon this species (Timm and Genoways 2004). A skull of one specimen was found in a regurgitated owl pellet in June 2000 at the Fakahatchee Preserve (Timm and Genoways 2004; C. Marks, pers. comm. 2006; Marks and Marks 2008a).

Status and Distribution

The Florida bonneted bat is recognized in FWC's 2012 State Wildlife Action Plan as one of Florida's species of greatest conservation need (FWC 2012a). This species is listed as endangered by the FWC as the Florida mastiff bat (*Eumops glaucinus floridanus*) (i.e., the previously accepted taxonomic designation). The FNAI and NatureServe consider the global status of the Florida bonneted bat to be G1, critically imperiled (FNAI 2013; NatureServe 2009). The 2009 International Union for Conservation of Nature (IUCN) Red List of Threatened Species lists the Florida bonneted bat as critically endangered because "its population size is estimated to number fewer than 250 mature individuals, with no subpopulation greater than 50 individuals, and it is experiencing a continuing decline" (Timm and Arroyo-Cabrales 2008). The Florida bonneted bat was listed as endangered on November 1, 2013 (Service 2013).

The Florida bonneted bat exists only in Florida (Timm and Genoways 2004; C. Marks and G. Marks, pers. comm. 2008). This species has one of the most restricted distributions of any bat species in the New World (Belwood 1992; Timm and Genoways 2004) and its global range is

estimated at 40 to 100 square miles (NatureServe 2009). Its current range includes Charlotte, Collier, Lee, Miami-Dade, Okeechobee, and Polk Counties (Timm and Genoways 2004; NatureServe 2009; Marks and Marks 2008b). Surveys conducted in the Kissimmee River area for the FWC recorded Florida bonneted bat calls at two locations (Marks and Marks 2008b; 2008c). The findings along the Kissimmee River are significant as it is the first time the species has been found north of Lake Okeechobee except in fossil records and effectively moves the known range 50 miles north (Marks and Marks 2008b).

Although older literature lists Fort Lauderdale as an area where the species occurred (Belwood 1992), none of the recent specimens examined by Timm and Genoways (2004) were from Broward County. However, Hipes et al. (2001) included Broward County as part of the range. Marks and Marks (2008a) did not record any Florida bonneted bat calls in the Fort Lauderdale area; surveys were conducted in Long Key Park, Miramar Pinelands, and the Plantation area. No calls were recorded on the east coast of Florida north of Coral Gables (Marks and Marks 2008a).

Overall, based upon all available historic and current surveys, the species exists within a very restricted range (Timm and Genoways 2004; Marks and Marks 2008a). Results of the range-wide survey indicate that the Florida bonneted bat is a rare species with limited range and low abundance (Marks and Marks 2008a). Based upon results of both the range-wide study and survey of select public lands, the species has been found at twelve locations (Marks and Marks 2008b), but the number and status of the bat at each location is unknown. Marks and Marks (2008a) state "it is possible that the entire population of Florida bonneted bats may number less than a few hundred individuals." Marks and Marks (2008a) base this upon the small number of locations where calls were recorded, the low numbers of calls recorded at each location, and the fact that the species forms small colonies. Results of the 2006-2008 acoustical range-wide survey indicate that of 5,016 calls recorded and analyzed, only 79 (1.6 percent) were from Florida bonneted bats (Marks and Marks 2008b).

3.3.2.4.2 Site-specific Information for Charlotte County

In Charlotte County, a highway construction project in Punta Gorda in 1979 destroyed a roost tree (Belwood 1981, 1992). The roost was located in a longleaf pine tree cavity that had been excavated by a red-cockaded woodpecker and later enlarged by a pileated woodpecker (Belwood 1981). In 2006, the species was found roosting in bat boxes at Fred C. Babcock/Cecil M. Webb Wildlife Management Area in the general vicinity of the colony found by Belwood (1981); this was the first documentation of the Florida bonneted bat in Charlotte County since 1979 (Marks and Marks 2008a). Florida bonneted bats have consistently used the bat boxes at Fred C. Babcock/Cecil M. Webb Wildlife Management Area since 2008 (J. Myers, personal communication 2013). The species has also been recorded vocalizing in flight over Babcock Ranch Preserve (Marks and Marks 2008a). Although it has not been confirmed, this species may also occur at Charlotte Harbor Preserve State Park (P. Small, personal communication 2012). Currently, it is unclear to what extent Florida bonneted bats in Charlotte County use the habitat within the Action Area.

3.3.2.5 Gopher Tortoise (*Gopherus polyphemus*)

3.3.2.5.1 Biological Information

Unless otherwise cited, the biological information for the gopher tortoise was obtained from the Service's 12-Month Finding on a Petition to list the Gopher Tortoise as Threatened in the Eastern Part of its Range; Final Rule date July 27, 2011(Service 2011) and the Florida Fish and Wildlife Conservation Commission's Gopher Tortoise Management Plan dated September 2012 (FWC 2012b).

Species/Critical Habitat Description

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

Life History/Population Dynamics

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

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

In stable populations with fire-maintained, open longleaf pine habitat, females may use an average of 5 burrows each while males occupy an average of 10 burrows. In poor habitat due to encroaching, fire intolerant shrubs and hardwoods, gopher tortoises tend to excavate and use fewer burrows, probably because of limited sites that are sufficiently open. Males tend to use more burrows and move more frequently among their different burrows than females as they seek breeding opportunities with females. The term "active burrow" is applied to burrows exhibiting indications it is likely inhabited by a gopher tortoise. Characteristics of active

burrows include fresh soil excavated from the interior of the burrow and deposited on the apron at the burrow entrance, tortoise feces on the apron or near the burrow entrance, eggshells, and tracks. Inactive burrows, which display conditions of recent use and occupancy by a tortoise, are considered to be used as part of the annual home range of one or more tortoises, but are not currently occupied by a tortoise. Indicators of inactive burrows include suitable size and shape of the burrow entrance, a recognizable apron of bare soil without encroachment of grasses or shrubs, and small amounts of leaf litter in the entrance that have not been moved by a tortoise. Abandoned burrows are unlikely to be used by a tortoise and normally exhibit indications of erosion, a loss of shape and structure, vegetative overgrowth, and no apron.

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

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

Burrows are not randomly located in the environment. Tortoises select and prefer burrow sites in open sunny areas. Such sites reflect areas where herbaceous plants for food are more abundant on the forest floor and, for females, sunlight and soil temperatures for egg incubation are more suitable. Also, males select sites and burrows that increase their proximity to females and breeding opportunities. The repeated use and travel to the same burrows by individual tortoises in stable habitat reveal that tortoises know the geography of their home range, burrows, and the location of neighboring tortoises.

Tortoises breed from May through October. Females ovulate during spring, but likely store sperm so that active breeding during ovulation may not always be required for fertilization. Males travel to female burrows and copulation occurs above ground at the burrow entrance, more frequently during July to September, a period of peak sex and adrenal steroid hormones. In earlier work described the gopher tortoise's "colonial" tendencies with aggregations of burrows in which dominant males competitively and behaviorally exclude other males at female burrows to maintain a loose female harem as a mating system. More recent studies do not indicate the clear existence of an exclusive dominance hierarchy. Also, aggregations of burrows in some habitat and study sites is probably an artifact of fragmentation and the concentration of burrows in the available remaining suitable habitat.

Females do not reproduce every year. In the listed range, about 80 percent of the females at Marion County Wildlife Management Area (WMA) in Mississippi and 85 percent of the females at Ben's Creek WMA in Louisiana were gravid each year. Females excavate a shallow nest to lay and bury eggs, usually in the apron of soil at the mouth of the burrow, but they may lay elsewhere if the apron is excessively shaded. Range-wide, average clutch size varies from about 4 to 12 eggs per clutch. Average clutch size in the listed range, from 4.8 to 5.6 eggs per clutch, is comparably low. Clutch size generally is positively correlated with adult female size.

Females usually lay about five to seven eggs from mid-May through mid-July in the soil of the apron at the burrow entrance and egg incubation lasts 80 to 110 days. Incubation at temperatures from 81°F to 90°C is required for successful development and hatching. Egg hatching success at experimentally protected nests has ranged from 28 to 97 percent in Florida and Georgia. In the listed range in Mississippi, mean hatching success from protected nests in the field has ranged from 28.8 to 56 percent. As in other species, sex determination is temperature dependent.

Hatchlings excavate themselves from the nest and emerge from the middle of August through October. Hatchlings and yearlings (0 to 1 year old) may temporarily use the adult burrow, bury under sand or leaf litter, or excavate a small burrow nearby. Growth is most rapid during the juvenile stage, becoming slower at the onset of adulthood and reproductive maturity, followed by little or no adult growth. Generally, tortoises become adults at about 20 years of age, although the minimal stage to reach reproductive maturity is determined by size rather than age. Growth rates and sizes at sexual maturity can vary among populations and habitat types.

Hatchlings and yearlings initially move up to about 50 feet from their nest to establish their first burrow, from which they will subsequently excavate and use about five burrows in a home range from 0.5 to 11.8 acres. Yearlings move, on average, relatively short distances to establish new burrows, although they are known to have traveled up to 1,485 feet to new burrows. Hatchlings and yearlings may take shelter beneath litter and woody debris during longer distances or times encountered to move to a new burrow. Yearlings and juveniles usually forage within about 23 feet of their burrow.

Home range size and movements increase with age and body size. The burrows of a gopher tortoise represent the general boundaries of a home range, which is the area used for feeding, breeding, and sheltering. Home range area tends to vary with habitat quality, becoming larger in areas of poor habitat. Males typically have larger home ranges than females. Mean home ranges of individual tortoises in Alabama, Florida, and Georgia outside the federally listed area have varied from 1.3 to 5.2 acres for males and 0.2 to 2.5 acres for females. In comparison to females, male tortoises use more burrows, and during breeding season, move among burrows more frequently over longer distances.

A burrow may or may not be exclusively used by just one gopher tortoise. Two or more tortoises may share the same burrow, although the burrow is used at different times of the year by different individuals. Home ranges overlap when a burrow is used by more than one tortoise. About 50 percent of the area occupied by 123 tortoises was shared by two or more tortoises in relatively pristine, stable habitat in southwestern Georgia. At Camp Shelby, Mississippi, average

home range varied from 7.3 to 10.4 acres for males and from 12.1 to 32.9 acres for females. At another population on timber industry land in Alabama, average home range was 10.4 acres for males and 32.9 acres for females. These home ranges are larger than those typically determined for tortoises at populations in Alabama, Georgia, and Florida outside the listed range. Since gopher tortoise movements and distance increase as herbaceous biomass and habitat quality decrease, larger home ranges at these two study sites in the listed range probably reflect differences in habitat quality. Habitat conditions on the timber industry study site were highly heterogeneous, with patches and stands of suitable habitat mixed among patches of unsuitable habitat. These tortoises moved relatively long distances to different burrows located in suitable habitat patches within a matrix of poor and unsuitable habitat.

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

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

Gopher tortoises have a well-defined activity range where all feeding and reproduction take place and that is limited by the amount of herbaceous ground cover. Tortoises are primarily herbivores eating mainly grasses, plants, fallen flowers, fruits, and leaves. Gopher tortoises prefer grassy, open-canopy microhabitats, and their population density directly relates to the density of herbaceous biomass and a lack of canopy. Grasses and grass-like plants are important in gopher tortoise diets. A lack of vegetative diversity may negatively impact the long-term sustainability of gopher tortoise populations.

Gopher tortoises require a sparse canopy and litter-free ground not only for feeding, but also for nesting. In Florida, the number of active burrows per tortoise was lower where canopy cover was high. Females require almost full sunlight for nesting because eggs are often laid in the burrow apron or other sunny spot and require the warmth of the sun for appropriate incubation. One site in southwest Georgia had most tortoises in areas with 30 percent or less canopy cover, and ecotones created by clearing were also favored by tortoises in north Florida. When canopies become too dense, usually due to fire suppression, tortoises tend to move into ruderal habitats such as roadsides with more herbaceous ground cover, lower tree cover, and significant sun exposure. In Georgia, open pine areas (*e.g.*, pine forests with canopies that allow light to penetrate to the forest floor) were more likely to have burrows, support higher burrow densities, and have more burrows used by large, adult tortoises than closed-canopy forests. Historically, open-canopied pine forests were maintained by frequent, lightning-generated fires.

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

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

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

The most recent modeling effort recognized the need to evaluate the viability of individual populations, rank populations most appropriate for in-situ protection, and determine if nonviable populations are more likely to contribute to conservation through augmentation or translocation. All model scenarios resulted in a population decline of one to three percent per year, which varied as a function of habitat quality and location within the range. Only modeled populations with at least 250 tortoises were able to persist for 200 years, which is substantially different than earlier model results. Population dynamics of turtles, as long lived animals, have commonly been considered sensitive to demographic changes in adult survival and, in some cases, juvenile survival. Likewise, models and simulations of gopher tortoise populations are most sensitive to adult, hatchling, and juvenile survival rates. For example, the small but positive population growth rates modeled for a stable base population became negative when mortality of the 3 to 4+ year age class increased from 3.0 to 5.0 percent, or the yearling (0 to 1 year age class) mortality increased from 95 to 97 percent.

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

Status and Distribution

The gopher tortoise is federally listed as a threatened species in the western part of its range, from the Tombigbee and Mobile Rivers in Alabama west to southeastern Louisiana on the lower Gulf Coastal Plain. The listed range of the gopher tortoise includes 3 counties in southeastern Alabama, 14 counties in southern Mississippi, and 3 parishes in Louisiana. Most gopher tortoise habitat is privately owned (70 percent), while about 20 percent is owned by the Forest Service, and 10 percent by other public agencies. This species is also a candidate for federal listing in the eastern part of its range (Service 2011), which includes 19 counties in southern Alabama east of the Tombigbee and Mobile Rivers, 83 counties in southern Georgia, 5 counties in southwestern South Carolina, and all 67 counties in Florida. Nearly 88 percent of the potential gopher tortoise

habitat in the eastern part of this species' range is privately owned, and the remainder is controlled by local, State, Federal, or private conservation entities (Hoctor and Beyeler 2010).

Effectively assessing the status (*i.e.*, whether it is increasing, decreasing, or stable) of the gopher tortoise throughout its range requires evaluation of the distribution of tortoises, number of tortoises and populations, number of individuals in populations, and trends in population growth. As we indicated above, we do not have specific distribution data for most of the tortoise's range, but we estimated where potential habitat existed and where tortoises may still be present. Below, we provide summaries of survey data about the sizes and, in some cases, trends of gopher tortoise populations. There is a noticeable disparity between the apparently large area (expressed in hectares or acres, or ha/ac) of potential gopher tortoise habitat reported above and actual numbers of individual tortoises known from populations that have been surveyed, as summarized below. Upon cursory examination, there seem to be few tortoises where there are millions of hectares of potential habitat. Many Federal and State agencies, non-governmental organizations (NGO), and timber owners have only recently begun to assess where and how many gopher tortoises are present on lands they own or manage.

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

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

In the western portion of their range, gopher tortoise populations are small and occur in fragmented habitat. The largest and most substantial gopher tortoise populations in the western portion of its range occur on the De Soto National Forest in southern Mississippi. Long-term monitoring here indicates a decline in population sizes, a tendency towards adult-dominated populations, and a lack of, or very low, recruitment. Results of smaller-scale surveys of forest lands in Mississippi and public and private lands in Louisiana are largely consistent with findings on the De Soto National Forest. There are no known populations large enough (*e.g.*, greater than 250 individuals) to persist long-term based on projections resulting from recent modeling efforts. The gopher tortoise is more widespread and abundant in parts of the eastern portion of its range, particularly southern Georgia and central and northern Florida. Long-term monitoring data indicate that many populations have declined and most are relatively small and fragmented. Smaller-scale, short-term, or one-time surveys throughout the unlisted portion of the range indicate that tortoise populations typically occur in fragmented and degraded habitat, are small, and densities of individuals are low within populations. Unlike the western portion of the range, there are several known populations of tortoises in the eastern portion of the range that appear to be sufficiently large to persist long-term (*e.g.*, Camp Blanding Joint Training Center, Chassahowitzka Wildlife Management Area, Fort White Wildlife and Environmental Area, Jennings Forest Wildlife Management Area, and Three Lakes Wildlife Management Area in Florida; and Fort Benning, Fort Stewart, River Creek Wildlife Management Area, and Townsend Wildlife Management Area in Georgia). There are about 80 other public parcels in Florida that contain a substantial amount of potential gopher tortoise habitat, but surveys or censuses of these areas have not been conducted to estimate the number of tortoises present.

3.3.2.5.2 Site-specific Information for Charlotte County

No specific county-wide survey has been conducted for gopher tortoises in Charlotte County. However, given this species' habitat requirements, the Service assumes the gopher tortoise is present in all upland habitat types throughout Charlotte County where the soils are suitable for burrowing and the vegetation cover is suitable for foraging.

3.3.3 Natural and Human Threats to Scrub-jays and Other Protected Species in Charlotte County

3.3.3.1 Florida Scrub-jays

Destruction, Modification, or Curtailment of Habitat or Range

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

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

Habitat destruction not only reduces the amount of area scrub-jays can occupy, but may also increase fragmentation of habitat. As more scrub habitat is altered, the habitat is cut into smaller and smaller pieces, 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

To our knowledge, those individuals who have studied or are actively studying the scrub-jay are sensitive to its rarity and endemism (restricted range). Consequently, collection for scientific and educational purposes is extremely limited. The Service is not aware of any known commercial or recreational uses for the species.

Disease and Predation

Most scrub-jay mortality probably results from predation (Woolfenden and Fitzpatrick 1996b). The second most frequent cause may be disease, or predation on disease-weakened scrub-jays (Woolfenden and Fitzpatrick 1996b). Known predators of scrub-jays are listed by Woolfenden and Fitzpatrick (1990), Fitzpatrick et al. (1991), Schaub et al. (1992), Woolfenden and Fitzpatrick (1996a, 1996b), Breininger (1999), and Miller (2004); the list includes Eastern coachwhip (*Masticophis flagellum*, known to eat adults, nestlings, and fledglings), Eastern indigo snake (known to eat adults and fledglings), black racer (*Coluber constrictor*, known to eat eggs), pine snake (*Pituophis melanoleucus*), and corn snake (*Elaphe guttata*). Mammalian predators include bobcats (*Lynx rufus*), raccoons (*Procyon lotor*), sometimes cotton rats (known

to eat eggs), black rats, and domestic cats (*Felis catus*, known to eat adults). Franzreb and Puschock (2004) also have documented spotted skunks (*Spilogale putorius*) and grey fox (*Urocyon cinereoargenteus*) as mammalian predators of scrub-jay nests. Fitzpatrick et al. (1991) postulated that populations of domestic cats are able to eliminate small populations of scrub-jays. Avian nest predators include the great horned owl (*Bubo virginianus*), Eastern screech-owl (*Otus asio*), red-tailed hawk (*Buteo jamaicensis*), northern harrier (*Circus cyaneus*), fish crow, boat-tailed grackle (*Quiscalus major*), common grackle (*Q. quiscula*), American crow (*Corvus brachyrhynchos*), blue jay, and swallow-tailed kites (*Elanoides forficatus*).

Fitzpatrick et al. (1991) reported overgrown scrub habitats are often occupied by the blue jay, which may be one factor limiting scrub-jay populations in such areas. Raptors which seem to be important predators of adult scrub-jays are merlin (*Falco columbarius*), sharp-shinned hawk (*Accipiter striatus*), Cooper's hawk (*A. cooperii*), and northern harrier. During migration and winter, these four raptor species are present in areas which contain scrub habitat, and scrub-jays may experience frequent confrontations (as many as one pursuit a day) with them (Woolfenden and Fitzpatrick 1990). In coastal scrub, Woolfenden and Fitzpatrick (1996b) report that scrub-jays are vulnerable to predation by raptors in October, March, and April, when high densities of migrating accipiters and falcons are present. Woolfenden and Fitzpatrick (1996b) and Toland (1999) suggest hunting efficiency for scrub-jay predators is increased in overgrown scrub habitats. Bowman and Averill (1993) noted scrub-jays occupying fragments of scrub found in or near housing developments were more prone to predation by free-roaming cats and competition from blue jays and mockingbirds. Woolfenden and Fitzpatrick (1996a, 1996b) stated proximity to housing developments (and increased exposure to free-roaming cats) needs to be taken into consideration when designing scrub preserves. Young scrub-jays are especially vulnerable to ground predators (*e.g.*, snakes and mammals) before they are fully capable of sustained flight.

The scrub-jay hosts two protozoan blood parasites (*Plasmodium cathemerium* and *Haemoproteus danilewskyi*), but incidence is low (Woolfenden and Fitzpatrick 1996b). Several scrub-jays sick from these two agents in March 1992 survived to become breeders. The scrub-jay carries at least three types of mosquito-borne encephalitis (Saint Louis, Eastern equine, and "Highlands jay") (Woolfenden and Fitzpatrick 1996b). Of particular concern is the arrival of West Nile virus (the agent of another type of encephalitis) in Florida during 2001 (Stark and Kazanis 2001); since corvids have been particularly susceptible to the disease in states north of Florida, it is expected 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 cohort and almost half of the breeding adults died (Woolfenden and Fitzpatrick 1984; Woolfenden and Fitzpatrick 1990). The 1979 through 1980 incident coincided with a known outbreak of Eastern equine encephalitis among domestic birds in central Florida (Woolfenden and Fitzpatrick, 1996b). From the fall of 1997 through the spring of 1998, the continuing population decline of scrub-jays along the

Atlantic coast and in central Florida may have been augmented by an epidemic of unknown origin (Breininger 1999).

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

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

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

Inadequacy of Existing Regulatory Mechanisms

Woolfenden and Fitzpatrick (1996a) state the importance of enforcing existing Federal laws on the management of Federal lands as natural ecosystems for the long-term survival of the scrub-jay. The Service consults regularly on activities on Federal lands which may affect scrub-jays and also works with private landowners through the section 10(a)(1)(B) incidental take permitting process of the Act when take is likely to occur and no Federal nexus is present. Florida's State Comprehensive Plan and Growth Management Act of 1985 is administered mostly by regional and local governments. Regional Planning Councils administer the law through Development of Regional Impact reviews; at the local level, although comprehensive plans contain policy statements and natural resource protection objectives, they are only effective

if counties and municipalities enact and enforce ordinances. As a general rule, counties have not enacted and enforced ordinances that are effective in protecting scrub-jays (Fernald 1989).

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

Other Natural or Man-made Factors Affecting Continued Existence

Human interference with natural fire regimes has continued to play a major part in the decline of the scrub-jay and today may exceed habitat loss as the single most important limiting factor (Woolfenden and Fitzpatrick 1991; Woolfenden and Fitzpatrick 1996a; Fitzpatrick et al. 1994). Lightning strikes cause all naturally-occurring fires in south Florida scrub habitat (Abrahamson 1984; Hofstetter 1984; Woolfenden and Fitzpatrick 1990). Fire has been noted to be important in maintenance of scrub habitat for decades (Nash 1895; Harper 1927; Webber 1935; Davis 1943; Laessle 1968; Abrahamson et al. 1984). Human efforts to prevent and control natural fires have allowed the scrub to become too dense and tall to support populations of scrub-jays, resulting in the decline of local populations of scrub-jays throughout the state (Fernald 1989; Fitzpatrick et al. 1994, Percival et al. 1995; Stith et al. 1996; Thaxton and Hingtgen 1996; Woolfenden and Fitzpatrick 1990; Woolfenden and Fitzpatrick 1996a; Toland 1999). Woolfenden and Fitzpatrick (1996a) cautioned, however, that fire applied too often to scrub habitat also can result in local extirpations. Data from Archbold Biological Station show fire-return intervals varying between 8 and 15 years are optimal for long-term maintenance of productive scrub-jay populations in central Florida (Woolfenden and Fitzpatrick 1996b). These intervals also correspond with those yielding healthy populations of listed scrub plants (Menges and Kohfeldt 1995; Menges and Hawkes 1998). Optimal fire-return intervals may, however, be shorter in coastal habitats (Schmalzer and Hinkle 1992a; Schmalzer and Hinkle 1992b).

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

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

Housing and commercial developments within scrub habitats are accompanied by the development of roads. Since scrub-jays often forage along roadsides and other openings in the scrub, they are often killed by passing cars. Research by Mumme et al. (2000) along a two-lane paved road indicated that clusters of scrub-jay territories found next to the roadside represented population sinks (breeder mortality exceeds production of breeding-age recruits), which could be supported only by immigration. Since this species may be attracted to roadsides because of their open habitat characteristics, vehicular mortality presents a significant and growing management problem throughout the remaining range of the scrub-jay (Dreschel et al. 1990; Mumme et al. 2000), and proximity to high-speed, paved roads needs to be considered when designing scrub preserves (Woolfenden and Fitzpatrick 1996a).

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

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

Fernald (1989) reported 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, white cypress-pine (*Callitris glaucophylla*), and Australian pine (*Casuarina equisetifolia*) also was a problem. Other human-induced impacts identified by Fernald (1989) include the introduction of domestic dogs and cats, black rats, greenhouse frogs (*Eleutherodactylus planirostris*), giant toads (*Bufo marinus*), Cuban tree frogs (*Osteopilus septentrionalis*), brown anoles (*Anolis sagrei*), and other exotic animal species. These exotic species may compete with scrub-jays for space and food.

Climate change will result in the loss and degradation of scrub-jay habitat in the future, particularly in Florida. According to the Intergovernmental Panel on Climate Change (IPCC) Synthesis Report, evidence of warming of the earth's climate is "unequivocal," from observations of increases in average global air and ocean temperatures, widespread melting of snow and ice, and rising sea level. Temperatures are predicted to rise from 3.6 degrees to 9.0 degrees F for North America by the end of this century (IPCC 2007). Other processes to be affected by this projected warming include rainfall (amount, seasonal timing, and distribution), storms (frequency and intensity), and sea level rise. The 2007 IPCC report found a 90 percent probability of 7 to 23 inches of sea level rise by 2100. Rising sea levels will have direct and indirect impacts to scrub-jays. In certain areas (e.g., coastal scrub-jay populations), sea level rise may inundate habitat or substantially raise water table levels making currently occupied habitat unsuitable. The largest scrub-jay population at risk from habitat loss and degradation due to climate change is on Merritt Island, Florida.

Indirect impacts to scrub-jays and their habitat may occur due to the relocation of people from flood-prone urban areas to inland areas, including the relocation of millions of people to currently undeveloped interior natural areas. Others have proposed implementation of a large-scale systematic translocation of at-risk human populations to interior locations. Florida's interior natural ecological communities will likely be impacted with the increasing need of urban infrastructure to support retreating coastal inhabitants. Increases in scrub-jay habitat loss related to climate change would be in addition to the 20 percent loss projected to occur by 2060 due solely to people immigrating into Florida. The timing of these impacts will be dependent on the rate at which the sea level rises, and a gradual coastal retreat and concurrent impacts to scrub-jays are likely during this time.

3.3.3.2 Eastern Indigo Snakes

Unless otherwise cited, the information contained in the sections below was obtained from the Service's five-factor analysis contained in the most recent 5-Year Review of the Eastern Indigo Snake dated April 29, 2008 (Service 2008). The five-factor analysis considers the following as possible impacts to indigo snakes:

A. Destruction, Modification, or Curtailment of Habitat or Range,
B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes,
C. Disease and Predation,
D. Inadequacy of Existing Regulatory Mechanisms, and
E. Other Natural or Man-made Factors Affecting Continued Existence.

Because of its relatively large home range, the indigo snake is especially vulnerable to habitat loss, degradation, and fragmentation of its habitat. Throughout the range of the species, natural communities continue to be altered for agricultural, residential, and commercial purposes, most of which are incompatible with the habitat needs of indigo snakes. Extensive tracts of wild land are the most important refuge for large numbers of indigo snakes.

In the more northern parts of the indigo snake's range, the loss and degradation of longleaf pine forests is a threat because of this species' close affiliation with gopher tortoises and their burrows. Thermally stable, below-ground shelter is an important habitat component of the indigo snake's habitat. Shelter requirements may vary seasonally depending on the climate in which the populations occur. In more northern parts of their range, indigo snakes use gopher tortoise burrows extensively, so decline of gopher tortoise populations represents a threat to the species. A number of other shelter types are also used, typically in summer. These include root and stump channels, natural ground holes, debris piles created during timber harvest and site preparation, armadillo burrows, shelters associated with fallen woody debris, and burrows created by mammals other than armadillos. Loss of these shelter types due to expansion of agriculture into forested areas, urban development, clear-cutting and site preparation during timber harvest operations, or other activities also represents a threat to the species.

Natural fires are suppressed, and use of fire as a management tool by foresters has decreased, allowing for increased growth of underbrush that reduces the amount of herbaceous groundcover that is the food source for the tortoise. Incompatible forestry practices, which reduce the number and availability of below-ground shelters, also have a negative effect. Pesticides used on crops or for silviculture could also be hazardous for this species. Agricultural interests (principally citrus) also continue to destroy large expanses of suitable natural indigo snake habitat throughout much of southern Florida.

Indigo snake habitat has also been destroyed by residential and commercial construction, agriculture, and timbering. Although indigo snakes may occupy areas of low density residential housing in the southern portions of its range in Florida, this also represents a potential threat to the species since there is increased likelihood of snakes being killed by property owners and domestic pets. The effects of habitat destruction and alteration on the indigo snake are likely most substantial along the Florida coasts, in the Keys, and along the high ridges of south-central Florida, where human population growth is expected to continue to accelerate. The use of all-terrain vehicles in sandhill habitats of the tortoise can also destroy groundcover and soil stability.

Indigo snakes move long distances; as a result, habitat connectivity needs to be maintained. An increase in roads creates habitat fragmentation and an increase in direct mortality when snakes try to cross highways. At some point, the size of fragmented habitat patches will become too small to support viable populations. The indigo snake will likely persist in localities where large, unfragmented pieces of natural habitat remain. It has been suggested that indigo snake populations that occur on Federal, state, or other privately managed preservation lands of at least 2,500 acres, with few roads or human-altered habitats which increase habitat fragmentation and mortality, may have the best chance of long-term viability.

There was concern, at the time of listing, that publicity from the listing of the indigo snake would generate an increased demand for this species, resulting in over-collecting in the wild. State and Federal law enforcement agencies have not reported a subsequent increase in cases of illegal take of eastern indigo snakes, thus it appears this effect has not materialized. Over-utilization for commercial, recreational, scientific, or educational purposes is not considered to be a threat to the species at this time.

The effects of disease and predation were unknown at the time this species was listed; however, further investigation is needed. Health assessments conducted on the indigo snake in southeastern Georgia found a high percentage of snakes examined during the winter months had skin lesions varying from superficial wounds to ones extending down to muscle tissue. The lesions were seasonal and were not observed during the summer. *Aspergillus niger* pneumonia was documented in one indigo snake. The effect of these two diseases on the health of eastern indigo snake populations is unknown. A health protocol has been developed to decrease the risk of infectious disease transfer when multiple snakes are handled by researchers studying indigo snakes in Georgia.

In captive populations, hatchlings do not all emerge at the same time. There may be periods of as long as 2 weeks between the beginning of hatching of the first and last neonates of a single clutch. If this phenomenon occurs in the wild, the odors present at the initiation of the hatching process could attract predators such as fire ants, skunks, raccoons, and even other snakes.

The indigo snake was listed because of a population decline caused by habitat loss, over-collecting for the pet trade, and mortality from gassing gopher tortoise burrows to collect rattlesnakes. As a result of effective law enforcement, exploitation for the pet trade has declined but still remains a concern. Gassing of burrows is illegal in both Florida and Georgia, but probably still occurs to some extent. Although still a threat, it is unlikely that gassing is having a large negative impact on most indigo snake populations. Each state within the historic range of the eastern indigo snake, with the exception of South Carolina, provides some protection for the species. The protections vary from state to state; however, most state laws focus on prohibitions against taking eastern indigo snakes from the wild and possessing, exporting, or selling them. Through an extensive land acquisition program, only the state of Florida provides protection from some habitat destruction.

The FWC completed a Gopher Tortoise Management Plan for the state of Florida. The overarching conservation goal of this management plan is to restore and maintain secure, viable populations of gopher tortoise throughout the species' current range in Florida by addressing habitat loss. Objectives of the plan include increasing protected, potential gopher tortoise habitat by acquiring additional habitat and restocking gopher tortoises where they no longer occur or where densities are low. Indigo snakes in Florida should benefit from these actions taken on behalf of the gopher tortoise.

Climate change will result in the loss and degradation of gopher tortoise habitat, and thus indigo snake habitat, in the future, particularly in Florida. According to the IPCC Synthesis Report, evidence of warming of the earth's climate is "unequivocal," from observations of increases in

average global air and ocean temperatures, widespread melting of snow and ice, and rising sea level (IPCC 2007). The 2007 IPCC report found a 90 percent probability of 7 to 23 inches of sea level rise by 2100 as a result of climate change. In certain areas, sea level rise may inundate habitat or substantially raise water table levels making currently occupied habitat unsuitable.

Indirect impacts to indigo snakes and their habitat will likely be impacted with the increasing need of urban infrastructure to support the relocation of people from flood-prone coastal urban areas to inland areas, including the relocation of millions of people to currently undeveloped interior natural areas. Increases in indigo snake habitat loss related to climate change would be in addition to the 20 percent loss projected to occur by 2060 due solely to people immigrating into Florida.

3.3.3.3 Florida Bonneted Bats

Unless otherwise cited, the information contained in the sections below was obtained from the Service's five-factor analysis contained in the Endangered Species Status for the Florida Bonneted Bat; Final Rule (Service 2013). The five-factor analysis considers the following as possible impacts to Florida bonneted bats:

A. Destruction, Modification, or Curtailment of Habitat or Range,
B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes,
C. Disease and Predation,
D. Inadequacy of Existing Regulatory Mechanisms, and
E. Other Natural or Man-made Factors Affecting Continued Existence.

Although this species' habitat preferences and extent of range are not well understood, habitat loss and alteration in forested and urban areas are major threats to the Florida bonneted bat. In natural areas, this species may be impacted when forests are converted to other uses or when mature trees with cavities are removed. In urban settings, this species may be impacted when buildings with suitable roosts are demolished or modified to exclude bats. Since the Florida bonneted bat is suspected to have high roost site fidelity, the loss of a roost site may cause greater hardship to the species than the loss of a roost site for other, more labile species.

Significant land use changes have occurred through time in south Florida, including major portions of the species' historical and current range, and habitat loss caused by human population growth in south Florida is continuing. The human population in south Florida has increased from fewer than 20,000 people in 1920, to more than 4.6 million by 1990. According to human population distribution models, south Florida is expected to become mostly urbanized, with the exception of some of the agricultural lands north and south of Lake Okeechobee. Even the central Florida region, at what would be the northern limit of this species' distribution, will likely be almost entirely urbanized.

Approximately 90 percent of the forested habitats in Florida have been altered or eliminated, and losses are expected to continue. With the loss of forested habitat, tree cavities will become

increasingly rare in southern Florida, and the intensity of competition between species for available cavities (e.g., southern flying squirrel [*Glaucomys volans*], red-headed woodpecker [*Melanerpes erythrocephalus*], corn snake [*Elaphe guttata guttata*]) will likely become more intense.

Although species occurrences on conservation lands are inherently more protected than those on private lands, habitat alteration during management practices (e.g., thinning, pruning, prescribed fire, exotic species treatment, or trail maintenance) may impact natural roosting sites because the locations of such sites are unknown. Loss of an active roost or removal during critical life-history stages (e.g., when females are pregnant or rearing young) can have severe ramifications, considering the species' small population size and low fecundity.

Since the Florida bonneted bat will use human dwellings and other artificial structures, it is also vulnerable to habitat loss and alteration in urban environments. All recent specimens collected within the suburbs of greater Miami were obtained from structures built in the 1920s and 1930s. Removal of buildings with spaces suitable for roosting is a threat to this species, so seemingly innocuous activities like destroying abandoned buildings and sealing barrel-tile roof shingles may have a severe impact on remaining populations in urban areas. Florida bonneted bats can also move into new buildings and their adaptation to manmade structures has most likely been a large factor in their decline because the use of buildings or other structures inhabited by or near humans places bats at risk of inadvertent or purposeful removal and displacement.

Key features of the basic life history, ecology, reproductive biology, and habitat requirements of many bats, including the Florida bonneted bat, are unknown. Species-specific ecological requirements have not been determined (e.g., natural roost sites, seasonal changes in roosting habitat, dietary needs, seasonal changes in diet, prime foraging habitat). The majority of information comes from examination of dead specimens, chemical analyses of samples taken from dead specimens, analysis of guano, and collection and analysis of nonintrusive acoustical recordings. To our knowledge, those individuals who have studied or are actively studying the Florida bonneted bat are sensitive to its rarity and restricted range. Consequently, collection for scientific and educational purposes is extremely limited. The Service is not aware of any known commercial or recreational uses for the species.

Although the effects of disease or predation on Florida bonneted bats are not well known, given this species' overall vulnerability, both disease and predation could pose threats to its survival. White-nose syndrome (WNS) is an emerging infectious disease affecting insectivorous, cave-dwelling bats. WNS is caused by the cold-loving fungus, *Geomyces destructans*, a newly described fungus, and is named after the white fungal growth that often occurs on the muzzle of affected bats. In North America, *G. destructans* appears to infect bats only during winter hibernation. Mortality rates have been observed to vary by species and site, but have been as high as 100 percent at some hibernacula. It was first documented in 2006, in caves west of Albany, New York, and has since spread rapidly throughout the eastern and central United States and southeastern Canada, killing millions of bats. As of June 2013, the number of affected sites is rapidly changing, and bats with WNS have now been confirmed in 22 States and 5 Canadian provinces. It has not yet been documented in Florida, nor in bats that typically live outside of

caves. Since the fungus is believed to need the cave environment to survive, and the Florida bonneted bat spends its entire life cycle outside of caves and mines and in subtropical environments where no torpor or hibernation is required, we do not anticipate that it will be adversely affected by WNS. However, since the fungus is new to science and North America, it is not known how it may evolve or change in the future.

In general, animals such as owls, hawks, raccoons, skunks, and snakes prey upon bats; however, few animals consume bats as a regular part of their diet. There is only one record of natural predation on the Florida bonneted bat. A skull of one specimen was found in a regurgitated owl pellet at the Fakahatchee Strand Preserve State Park in June 2000. Although evidence of consistent predation is lacking, the species is presumably affected by some level of predation from native wildlife and the large number of introduced and nonnative reptiles (e.g., young Burmese pythons, boa constrictors). Due to limited information, we are not able to determine the extent to which predation may be impacting the Florida bonneted bat at this time. However, given the species' apparent small population size and overall vulnerability, it is reasonable to assume that predation is a potential threat, which may increase in the future.

Despite the fact that regulatory mechanisms provide several protections for the Florida bonneted bat, Federal, State, and local laws have not been sufficient to prevent past and ongoing impacts to the species and its habitat within its current and historical range. As part of the FWC's revision to Florida's imperiled species rule, management plans will be developed for all species (F.A.C. chapter 68A-27), including the Florida bonneted bat. A first draft for the Florida bonneted bat management plan is in development, and when completed, should allow for tailored protections for the species, which may improve the ability of FWC to address habitat issues in addition to take of individuals. Objectives of the State plan will be to reverse threats causing the decline of the species.

Humans often consider bats to be a nuisance species when they occur in or around human dwellings or infrastructure. In Florida, property owners can take nuisance wildlife or may authorize another person to take nuisance wildlife on their behalf, as long as the take is incidental to the use of excluder devices, chemical repellants, or home repairs that prevent the egress of bats from August 15 to April 15. Use of bat exclusion devices or any other intentional device or materials at a roost site that may prevent or inhibit the free ingress or egress of bats is prohibited from April 16 through August 14. While these restrictions help to limit potential impacts during the maternity season for many bat species in Florida, regulations do not require definitive identification of the bat species to be excluded prior to the use of the device. In addition, it is not clear if this time period is broad enough to prevent potential impacts to the Florida bonneted bat, which is possibly polyestrous and more tropical in nature, with a potentially prolonged sensitive time window where females and young are especially vulnerable.

The FWC, Bat Conservation International, and other groups maintain a list of qualified exclusion devices, but it is not clear how often work is performed by recommended personnel or if it is in accordance with State regulations. It is also not clear if those who install exclusion devices can readily distinguish between Florida bonneted bats and other bat species in Florida. Despite regulations, in some cases, nuisance bats are likely being removed by nuisance wildlife trappers

through methods that are not approved (e.g., removed from roosts with vacuum cleaner-like apparatuses) or excluded during time periods that are not permitted (e.g., inside the maternity season). Pest control companies unaware of or not complying with the regulations that apply to bats have been known to remove them through methods other than legal exclusions. Private landowners and individual property owners may also be unaware of regulations.

According to the State's Structural Pest Control Act (Florida Statutes, chapter 482) bats may be considered pests, and pest control including methods to prevent, destroy, control, or eradicate pests in, on, or under a structure, lawn, or ornamental are allowable under certain rules and provisions. The use of poisons on bats is not permitted. The use of a repellant (e.g., naphthalene) by professional pest control or wildlife management personnel to remove bats from a structure requires a pest control operator's license.
Various changes in climate may have direct or indirect effects on this species. Downscaled projections suggest that sea-level rise is the largest climate-driven challenge to low-lying coastal areas and refuges in the subtropical ecoregion of southern Florida. Although not strictly tied to coastal areas, the Florida bonneted bat uses forests and other habitats near sea level in areas of south Florida where considerable habitat is projected to be lost to sea level rise by 2100.

Climate change is also likely to increase the occurrence of saltwater intrusion as sea level rises. Changes in plant species composition and a decline in the extent of coastal hardwood hammocks and buttonwood forests are predicted to occur before the onset of inundation, based upon tolerance to salinity and drought. For the Florida bonneted bat, this means that some habitat in coastal areas will likely change as vegetation changes and additional human developments encroach, which could further diminish the likelihood of the species' survival and recovery.

In the southeastern United States, drier conditions and increased variability in precipitation associated with climate change are expected to hamper successful regeneration of forests and cause shifts in vegetation types through time. A study on the impact and implications of climate change on bats suggested that bats specialized in individual roost sites (i.e., cave and tree roosts) at distinct life-history stages are at great risk from changing vegetation and climatic conditions. Decreases in forest regeneration may further limit available roosting sites for the Florida bonneted bat or increase competition for them.

Drier conditions and increased variability in precipitation are also expected to increase the severity of wildfire events. Climate changes are forecasted to extend fire seasons and the frequency of large fire events throughout the Coastal Plain. Increases in the scale, frequency, or severity of wildfires could also have severe ramifications on the Florida bonneted bat, considering its forest-dwelling nature and general vulnerability due to its small population size, restricted range, few colonies, low fecundity, and relative isolation.

Climate changes may also affect foraging habitat and prey availability. Increased plant water stress is likely to impact vegetation community composition and chemical composition of plants, which would likely affect insect availability and the timing of insect availability to foraging bats. A study that examined water stress on plants (e.g., changes in nitrogen, allelochemistry) and consequences for herbivorous insects found that water stress in plants affected the population

dynamics of herbivorous insects. Another study found that climatic variability is leading to later seasonal flowering of plants in Florida. Although the dietary needs of the Florida bonneted bat are not understood, climate changes may affect foraging habitat and insect availability in ways not readily apparent.

3.3.3.4 Gopher Tortoises

Unless otherwise cited, the information contained in the paragraphs below was obtained from the Service's five-factor analysis contained in the 12-Month Finding on a Petition to List the Gopher Tortoise as Threatened in the Eastern Portion of Its Range (Service 2011). The five-factor analysis considers the following as possible impacts to gopher tortoises:

A. Destruction, Modification, or Curtailment of Habitat or Range,
B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes,
C. Disease and Predation,
D. Inadequacy of Existing Regulatory Mechanisms, and
E. Other Natural or Man-made Factors Affecting Continued Existence.

The decline of the gopher tortoise throughout its range has been linked primarily to the decline of the open, fire maintained, longleaf pine forest and ecosystem. About 80 percent of the original habitat for the gopher tortoise within its listed range has been lost, fragmented, or degraded due to urbanization, mining, conversion to agriculture, and fire suppression. These activities eliminate the open, sunny forest with a well-developed groundcover of grasses and forbs needed by tortoises for breeding, feeding and sheltering.

Although gopher tortoises are protected by various laws in all States where they occur, tortoise exploitation persists. Organized rattlesnake round-ups still occur in some areas, as does the unregulated collection of rattlesnakes for skins, curios, and antivenin by individuals in any of the States within the range of the gopher tortoise. Both individual and organized rattlesnake captures typically extract snakes from gopher tortoise burrows using noxious liquids or gases, which undoubtedly harms or harasses gopher tortoises in active burrows. While the Service believes the various States' regulatory measures will reduce incidental mortality of gopher tortoises during rattlesnake collections, effective enforcement of these regulations would likely be enhanced with development of either a regulated harvest of rattlesnakes or a prohibition on rattlesnake harvest.

A number of diseases have been documented in the gopher tortoise, including fungal keratitis, iridovirus, herpes virus, bacterial diseases related to Salmonella, Mycoplasma, and Dermatophilus, and numerous internal and external parasites. Upper Respiratory Tract Disease (URTD) resulting from Mycoplasma infection has received the most attention recently and has been implicated in mortality of gopher tortoises on State and Federal lands in Mississippi and Florida where URTD was documented. It is considered an emerging infectious disease which may threaten populations of free-ranging tortoises. While current hypotheses suggest that differences in virulence of Mycoplasma and increased susceptibility to infection due to

environmental stressors (e.g., poor habitat quality) may increase risk of URTD outbreaks and associated mortality, correlations between exposure to Mycoplasma species and population declines appear to be variable among geographic locations and often transient when viewed over a 10-year timeframe. While current hypotheses suggest that differences in virulence of Mycoplasma and increased susceptibility to infection due to environmental stressors (e.g., poor habitat quality) may increase risk of URTD outbreaks and associated mortality.

Predators destroy more than 80 percent of gopher tortoise nests. Survivorship of tortoise hatchlings is low throughout their range, and in some cases no hatchlings survive past 1 year because of predation. Of all predators, raccoons (*Procyon lotor*) were the most frequent to take tortoise eggs and young. Other predators include gray foxes (*Urocyon cinereoargenteus*), skunks (*Mephitis mephitis*), opossums (*Didelphis virginiana*), coyotes (*Canis latrans*), snakes (*Agkistrodon piscivorous*, *Crotalus adamanteus*, *Drymarchon corais*, *Masticophis flagellum*), fire ants (*Conomyrma* sp., *Solenopsis invicta*), and red-tailed hawks (*Buteo jamaicensis*), which have all been known to take juveniles. Adult gopher tortoises are less likely to experience predation except by canines (e.g., domestic dogs, coyotes, foxes) and humans.

The gopher tortoise is a long-lived species, which should naturally experience high levels of mortality in early life stages; however, at the current rates of predation, a small increase in predation (either on the limited number of surviving hatchlings or on an adult female) could have a substantial effect on present and long-term recruitment. Low recruitment because of heavy predation rates may confound a tortoise population's ability to withstand environmental stressors (e.g., poor habitat quality, stochastic events) and chronic demographic effects due to small population size and reduced genetic diversity.

The Department of Defense (DOD) must conserve and maintain native ecosystems, viable wildlife populations, Federal and State listed species, and habitats as vital elements of its natural resource management programs on military installations, to the extent these requirements are consistent with the military mission (DOD Instruction 4715.3). Amendments to the Sikes Act (16 U.S.C. 670 *et seq*) require each military department to prepare and implement an integrated natural resource management plan (INRMP) for each installation under its jurisdiction. Each INRMP must provide for wildlife, land and forest management, wildlife-oriented recreation, wildlife habitat enhancement, wetland protection, sustainable public use of natural resources that are not inconsistent with the needs of wildlife resources, and enforcement of natural resource laws (16 U.S.C 670a). However, the effectiveness of individual INRMPs to protect gopher tortoises varies between military departments and installations.

In the national forests in Florida, the gopher tortoise is not designated as a species for which special management prescriptions are implemented, except that a 25-foot buffer around burrows is provided during silvicultural activities to comply with State requirements. Otherwise, there are no specific land management objectives for tortoises on the national forests in Florida. Resource managers are implementing management prescriptions not called for in the forest plan to enhance longleaf-pine ground cover for gopher tortoises on the Ocala National Forest. The Apalachicola National Forest is currently assessing a proposed project to begin gopher tortoise

habitat restoration efforts on up to 2,000 acres of currently unsuitable, but restorable, pine forests using herbicides to control hardwood midstory vegetation.

Early research associated movement of tortoises by humans (including translocation and relocation) with erosion of the existing baseline of habitat for the species, disruption of social structure, unnatural genetic mixing, and spread of disease, particularly at unnaturally high densities. Historically, dispersal of relocated tortoises from relocation sites has been shown to be high, particularly during the first year post-relocation, although stabilization in subsequent years is likely.

Based on anticipated future habitat destruction and degradation resulting from urban development, we expect gopher tortoises will continue to disperse to find better quality habitat, thus increasing their risk of being killed on highways. Tortoises in the vicinity of urban areas will be particularly vulnerable. This threat is ongoing and will continue to occur throughout this species' range as human populations increase in the future. Quantification of road mortality is difficult because there is no current rangewide monitoring effort for tortoise road mortality.

Climate change will result in the loss and degradation of gopher tortoise habitat in the future, particularly in Florida. According to the Intergovernmental Panel on Climate Change (IPCC) Synthesis Report, evidence of warming of the earth's climate is "unequivocal," from observations of increases in average global air and ocean temperatures, widespread melting of snow and ice, and rising sea level (IPCC 2007). The 2007 IPCC report found a 90 percent probability of 7 to 23 inches of sea level rise by 2100 as a result of climate change. In certain areas (e.g., coastal tortoise populations), sea level rise may inundate habitat or substantially raise water table levels making currently occupied habitat unsuitable. Gopher tortoises and their habitat will likely be impacted by the increasing need of urban infrastructure to support the relocation of people from flood-prone urban areas to inland areas, including the relocation of millions of people to currently undeveloped interior natural areas. Increases in gopher tortoise habitat loss related to climate change would be in addition to the 20 percent loss projected to occur by 2060 due solely to people immigrating into Florida.

3.4 Cultural Resources

The National Historic Preservation Act (16 USC Section 470) of 1966, as amended, calls for the preservation of historic and cultural properties so that sites of cultural heritage will be maintained and enriched for future generations of Americans. The location of known resources was determined by a search of the Florida Master Site File maintained by the Florida Department of State, Division of Historical Resources, Bureau of Archaeological Research. This GIS database denotes the general location of standing historical structures and archaeological resources.

The State's GIS database indicated the presence of historic buildings in the downtown area of Punta Gorda. As the urban center of the city of Punta Gorda is not part of the Action Area, implementation of the Applicant's HCP will not affect any historic structures. Known (and unknown) archaeological sites occur in the coastal environment of Charlotte County; however,

since none of these areas are in the Action Area, the Service anticipates implementation of the Applicant's HCP will also not affect any archaeological sites.

Based on a review of the Florida Master Site File, the State Historic Preservation Officer rendered an opinion as to the potential effects of the Applicant's proposed action. It was concluded that no historic or culturally significant properties will be affected by development of vacant properties in scrub-jay review areas or by the habitat restoration and maintenance activities in the Reserve areas (Attachment B).

3.5 Social Interests

Housing is the largest consumer of urban land in Charlotte County. In the twelve years since and including year 2000, 70 percent of the permits issued for new housing units were for single family homes, the largest consumer of urban land. Projected demand for housing in future years is anticipated to be less than the number of units added per year in the past decade because of the lingering collapse of the national and state housing markets and continuing high unemployment levels. However, like Florida in general, Charlotte County remains a popular area in which to build second and vacation homes, which tend to be converted to permanent residences over time.

3.6 Economy

Continued uncertainty as to which properties can be developed in a short amount of time, which ones should be covered by an ITP, the cost of mitigation, and how long it would take to get the ITP issued will continue to frustrate not only affected landowners, but also realtors, and builders. Currently, the case-by-case review of properties also causes some landowners to forego building, and some prospective buyers to decide not to purchase and build on scrub-jay affected parcels. Thus, residential and commercial development in many areas of Charlotte County will continue to be depressed, which will detrimentally affect the Applicant's economic base; thus, economic recovery in Charlotte County will take longer to happen.

3.7 Aesthetics

Most of the undeveloped parcels in the scrub-jay affected areas of Charlotte County are dispersed throughout partially or mostly built-out neighborhoods. Fire suppression in these neighborhoods has cause the vegetation on many vacant parcels to become overgrown. The public perception of these overgrown lots is that they are unsightly, harbor unwanted pests such as rats and snakes, and possibly hazardous either from the presence of dying trees that could fall on adjacent homes, or as a fire hazard.

Many undeveloped parcels have also become overgrown with invasive exotic plants such as Brazilian pepper. The existence of these plants acts as a seed source that enables this unwanted species to recolonize other developed and undeveloped parcels. As scrub-jays often use Brazilian pepper as surrogate habitat, the removal of this invasive exotic, while aesthetically desirable, is problematic from a regulatory standpoint.

4.0 ENVIRONMENTAL CONSEQUENCES

The purpose of this section is to discuss the consequences of each of the alternatives described in Section 2.0 above. Components of the natural and human environment potentially affected by one or more of the alternatives were described in Section 3. Analyses of both direct and indirect effects, as well as cumulative impacts, are included in the evaluation of each alternative. Direct effects are those that occur immediately or directly as a result of the proposed action. Indirect effects are those "which are caused by the action and are later in time or farther removed in distance but are still reasonably foreseeable" (40 CFR 1508.8). Cumulative impacts are the sum of the incremental impacts of past, present, and reasonably foreseeable future actions (40 CFR 1508.7).

The Service believes that Charlotte County's Comp Plan sufficiently addresses existing and anticipated future effects of urban growth on natural and human environments. That document provides a 30-year planning and growth management outlook that identifies current and projected future impacts on the environment and describes measures that will be undertaken by the Applicant to minimize those impacts. All of the elements of the human environment identified under NEPA and not specifically included below are adequately addressed in the County's Comp Plan. Thus, further analyses of elements unaffected by any of the alternatives would be redundant.

4.1 Alternative 1: The No Action Alternative

Under the No Action Alternative, the Service would not issue an ITP to Charlotte County, and individual landowners would continue to consult with the Service on a case-by-case basis regarding the take of scrub-jays incidental to development initiated under the Applicant's permitting authority. For the purpose of this analysis it is assumed that in the absence of an ITP, the Applicant would continue to issue permits for development in the Action Area based on the County's and the Service's determination that parcels are either not in an occupied scrub-jay territory, or the Service's issuance of individual ITPs. Thus, keeping the "status quo" would provide no regulatory certainty to the owners of undeveloped land in scrub-jay affected areas of Charlotte County, or to the realtors, builders, or developers who work with them.

Environmental impacts associated with the Service's continued issuance of individual ITPs would be essentially the same as those described under the Preferred Alternative, with the exceptions that without the Countywide ITP, mitigation would be gained at a slower pace, the mitigation cost per landowner would be greater, and the benefits of those mitigation funds to scrub-jays and other species present in scrub habitat within Charlotte County would be lacking. Thus, when evaluating environmental consequences of the No Action Alternative, the principal issue is the absence of both an increased opportunity to gain mitigation in a timely manner and the ability to use said mitigation for the benefit of species within Charlotte County.

4.1.1 Physical Environment

Under the No Action Alternative, the Service anticipates the physical environment of Charlotte County will not appreciably change. The County Comp Plan describes areas that are slated for

continued commercial and residential development, and areas where agriculture is allowed through 2050. Since these activities were anticipated to be in the same general areas prior to the Comp Plan's adoption in 2010, there would not appear to be any substantial difference in the types of development activities that would take place in the Action Area with or without Service issuance of a countywide ITP.

4.1.2 Land Use

Housing is the largest consumer of urban land in the Action Area, and since an extensive network of platted roads exists throughout the western half of Charlotte County, the Service expects this situation will continue. Neighborhoods will become more fully developed as building continues on the undeveloped parcels; although, development will be slower in the urban portions of the Action Area because of the need for landowners to obtain ITPs. Undeveloped mown parcels are likely to continue to be mown, and the woody vegetation on undeveloped parcels will likely continue to become or remain overgrown. Existing conservation lands would continue to be maintained by their existing managing entities as their budgets allow, but expansion of these existing areas and acquisition of new areas for scrub conservation is less likely to happen.

4.1.3 Biological Environment

4.1.3.1 Covered Species

The incidental take of scrub-jays and Eastern indigo snakes on an individual basis is difficult to detect due to numerous variables. While the number of scrub-jay family groups in Charlotte County has remained fairly consistent over the past several years (about 136), the number of individuals in any particular area can vary from year to year. Without annual nesting surveys throughout the County, variations in the success of raising nestlings to the adult stage from year to year cannot be quantified. Since scrub-jays are relatively small (and thus easily carried away by predators), the number of natural mortalities in the County is also unknown. Thus, take for this species is usually measured in acres of habitat. The total estimate of currently occupied scrub-jay habitat that has the potential to be impacted by development is 3,056 acres. About 3,160 acres of scrub-jay habitat is currently impacted by ongoing habitat management activities, and a minimum of 1,336 acres of scrub-jay habitat will be impacted by future habitat management activities.

Similar problems are encountered when trying to determine take of Eastern indigo snakes on an individual basis. Although indigos are thought to be one of the few snakes native to south Florida that are most active during daylight hours, their preference to avoid areas of human activity combined with their habit of taking shelter in leaf litter or underground makes it difficult to determine the presence of this species, and because recovery of dead or impaired specimens is also unlikely. Although very few, if any, indigo snakes are likely present in the urban portions of the impact area, and best management practices will be required by the Applicant during clearing, construction, and habitat management, by dividing the average home range of an indigo

snake into 7,552 acres, the Service estimates the take of 201 individual Eastern indigo snakes could occur in the Action Area.

Under the No Action Alternative, owners of undeveloped parcels in the Action Area would still be able to develop their properties by going through the current process of having the County and the Service review their scrub-jay survey reports and applying for ITPs for those lots that are determined to be in occupied scrub-jay areas. Since current mitigation rates tend to be cost prohibitive for many owners of residential parcels in the impact area under current economic conditions, development within the impact area would continue to be depressed relative to other areas in the County, and the habitat on the unmanaged undeveloped parcels will continue to degrade. Also, the lack of building on these properties could have further cumulative impacts because mitigation funds will not be generated either in the quantities or in the timeframe needed to contribute to the long-term survival of either the covered species or any other species that live in scrub habitat in Charlotte County.

4.1.3.1.1 Direct Effects

The clearing of lots for development, installation of infrastructure, impervious surfaces, construction of buildings and ancillary structures could result in the harm, harassment, or mortality of the covered species. The permanent alteration of scrub-jay and Eastern indigo snake habitat will also cause harm to these species as a result of the loss of breeding, feeding, and sheltering habitat.

Current land management techniques include, herbicide treatment, mechanical reductions and prescribed burning. These practices have the potential to result in harm, harassment, or direct mortality of scrub-jays and Eastern indigo snakes. Adult and juvenile scrub-jays can avoid flames and smoke, but prescribed burns may impact existing nests. The prescribed burn and associated preparations may temporarily disrupt the birds' daily behavior patterns and ability to forage for a short period. However, since overgrown scrub is typically uninhabited, it is unlikely that burns will impact nesting sites. While it is possible that prescribed burns could conceivably kill or injure snakes, indigo snakes have evolved in pyrogenic habitats and are expected to be able to respond to fire by seeking refuge in burrows or fleeing the area.

Although scrub-jays may be harassed by management activities, management events are planned to minimize the possibility of take of this species and Best Management Practices are implemented to minimize the risk of losing nests. To reduce the potential impact to indigo snakes, equipment used to for mechanical vegetation reduction, maintenance of fire breaks, and conducting prescribed burns will have rubber tires whenever possible.

4.1.3.1.2 Indirect Effects

Indirect impacts that may also occur as a result of development include: an increase in degraded, overgrown, or unmanaged habitat in urban areas; increased habitat fragmentation; increased 'edge effect'; introduction of exotic flora; introduction of predatory or competetive fauna; introduction of non-native food items; reduction of native food sources; reduction of breeding,

feeding, and sheltering habitats; impacts with motor vehicles; and increased exposure to natural predators (because of habitat conversion and fragmentation). Additionally, should either scrub-jays or Eastern indigo snakes attempt to disperse from their natal territories, dispersal will be more difficult due to the above indirect impacts associated with urban and suburban habitats.

4.1.3.1.3 Cumulative Effects

When addressing cumulative impacts under NEPA, the Service must consider all past, present, and reasonably foreseeable future actions similar to those proposed by the applicant, including those carried out by the Federal government (40 CFR 1508.7). Any cumulative impacts that accompany future development within suburban areas will continue to occur under the current issuance of individual ITPs, and is likely to affect the overall long-term viability of scrub-jays and indigo snakes in Charlotte County because there is no guarantee the mitigation funds gained from these ITPs will be used to acquire, restore, or manage scrub habitat within the County.

4.1.3.2 Other Federally-listed Species

As identified in the five factor analysis for the gopher tortoise, the same direct, indirect, and cumulative impacts that apply to the Eastern indigo snake also apply to the tortoise. Many of the same impacts could also apply to the Florida bonneted bat, but development would primarily affect this species' ability to breed and shelter if mature trees containing large cavities are cut down. Also, being active at night, the Florida bonneted bat is unlikely to flee during a prescribed burn during daylight hours, and mortality can result from smoke inhalation. However, the Service currently has no knowledge of the presence of Florida bonneted bats in the Action Area. Threats to gopher tortoises and Florida bonneted bats would continue to be handled on a case-by-case basis under the No Action Alternative.

4.1.4 Cultural Resources

The No Action Alternative is not anticipated to have any direct effect on historic structures, as none exist in the Action Area. Additionally, Florida's State Historic Preservation Officer has concluded that no significant archaeological resources are likely to be affected development or habitat management activities in the Action Area (Attachment B).

4.1.5 Social Issues

Under the No Action Alternative, the Applicant would continue to be responsible for issuing development permits in occupied scrub-jay habitat without the benefit of protection from take afforded under Section 10 of the Act. The Applicant would continue to review some individual scrub-jay surveys, and landowners would still consult with the Service on a case-by-case basis. The process for landowners in occupied scrub-jay habitat to obtain individual ITPs can often be lengthy (greater than one year to obtain an ITP) and the mitigation expensive. The Applicant's issuance of development permits according to Florida Statutes while relying on individual landowners to consult with the Service also places the County and the landowners at risk of penalty under Federal law. The level of uncertainty as to which properties can be developed in a

short amount of time, which ones should be covered by an ITP, the cost of mitigation, and how long it would take to get the ITP issued creates a level of frustration not only for the affected landowners, but also for realtors and builders.

4.1.6 Economic Concerns

Currently, the case-by-case review of properties causes some landowners to forego building, and some prospective buyers to decide not to purchase and build on scrub-jay affected parcels. Thus, development in many areas of Charlotte County will continue to be depressed, and economic recovery will take longer to happen.

Those landowners who do decide to develop in the Action Area usually have to hire an environmental consultant to conduct a scrub-jay survey on their parcel. Since the price of conducting a scrub-jay survey is determined by each consulting business based on their individual service cost structures, the cost of a scrub-jay survey to a landowner can vary widely between consultants and also from year to year. Currently, scrub-jay survey costs for a single-family residential lot average about $1,750. When extrapolated to the total number of applicable parcels in the Action Area, consultant costs for surveys under the current Service permitting options would exceed $30 million.

Further, those owners whose land is determined to be occupied by scrub-jays must pay an ITP application fee. When applied to the applicable parcels in scrub-jay affected areas, this would total $920,000. The cost to comply with Service habitat mitigation requirements under the individual HCP or State-wide Umbrella HCP process ranged from $23,400 per acre for the central part of Charlotte County to $84,600 for the Cape Haze Peninsula in 2011 (the year the Applicant's ITP application process began). When applied to a quarter acre lot at the currently required 2:1 mitigation ratio, the mitigation cost per lot ranged from $11,700 to $42,500 (depending on the location of the lot relative to scrub-jay metapopulations); costs that likely exceed the value of many undeveloped lots in the county. When these mitigation fees were extrapolated to the entire developable acreage within the Action Area, the total mitigation cost to Charlotte County residents using the 2011 fees was estimated at between $140 and $350 million.

4.1.7 Aesthetics

The No Action Alternative is not expected to appreciably affect the overall aesthetics of the existing neighborhoods in the Action Area. Parcels that are currently overgrown will likely remain so unless the owner obtains an ITP to clear the occupied vegetation. The Service currently has an agreement with Charlotte County environmental staff that allows for the cutting and removal by hand of trees on undeveloped parcels where those trees pose an imminent threat to adjacent structures. The agreement also has a provision for the cutting of vegetation where it has encroached upon neighboring properties, but the cutting is restricted to no more than the first 2 feet of vegetation inside the boundary of the vacant parcel that is adjacent to the developed parcel. Also, any development occurring in the Action Area is subject to County zoning and permitting restrictions, and some areas also have separate requirements imposed by property owners or home owners associations (POA and HOA, respectively). In abiding by zoning

requirements and any additional POA or HOA requirements, the aesthetic aspects of neighborhoods in Charlotte County is expected to remain the same under this alternative.

4.2 Alternative 2: Issuance of the ITP (The Preferred Alternative)

The Preferred Alternative is Service issuance of a Section 10(a)(1)(B) permit to allow for the take of scrub-jays and Eastern indigo snakes over a 30-year period, incidental to the construction of all forms of residential and commercial development, capital improvement projects, road and utility infrastructure improvements, and habitat management on conservation lands where the Applicant conducts or authorizes such activities in the Action Area.

Environmental impacts associated with the Service's issuance of an ITP to the Applicant would be essentially the same as those described under the No Action Alternative, with the exception that with the Countywide ITP, off-site mitigation will be significantly less expensive for individual landowners, and it should be gained at a faster pace. Those mitigation funds would also be used to benefit the covered species and other species present in scrub habitat in Charlotte County in a more timely manner than under the No Action Alternative (Table 1).

4.2.1 Physical Environment

Under the Preferred Alternative, the Service anticipates the physical environment of Charlotte County will not appreciably change. The County Comp Plan describes areas that are slated for continued commercial and residential development, and areas where agriculture is allowed through 2050. Since these activities were anticipated to be in the same general areas prior to the Comp Plan's adoption in 2010, there would not appear to be any substantial difference in the types of development activities that would take place in the Action Area with or without Service issuance of a countywide ITP.

4.2.2 Land Use

The Service expects neighborhoods will become more fully developed as building continues on the undeveloped parcels in Charlotte County; however, development may occur at a faster pace in the urban portions of the Action Area because affected landowners will no longer need to obtain individual ITPs. The Service anticipates development of scrub-jay affected parcels may occur at a faster rate than without the countywide ITP, and realizes this could affect property values and result in changes in ownership. However, the expansion of existing scrub conservation areas, acquisition of new areas for scrub conservation, and the proper management of both is also more likely to happen, and at a faster pace than without issuance.

4.2.3 Biological Environment

4.2.3.1 Covered Species

Issuance of the requested ITP to Charlotte County will streamline the permitting process and reduce the regulatory and financial burden on individual landowners in Charlotte County. As the

economy continues to recover, the increase in development in the impact area will generate funds to acquire and manage scrub habitat in the Reserve. Thus by providing a more convenient and less expensive means of generating funds for acquisition, restoration, and management of scrub habitat, his alternative provides conservation benefits to scrub-jays, indigo snakes, and other scrub dwelling species in Charlotte County that either might not be obtainable, or if it is obtainable, would take many more years to realize, under the No Action Alternative.

The incidental take of scrub-jays and Eastern indigo snakes on an individual basis is difficult to detect due to numerous variables. About 136 scrub-jay groups will be directly affected. While the number of scrub-jay family groups in Charlotte County has remained fairly consistent over the past several years, the number of individuals in any particular area can vary from year to year. Without annual nesting surveys throughout the County, variations in the success of raising nestlings to the adult stage from year to year cannot be quantified. Since scrub-jays are relatively small (and thus easily carried away by predators), the number of natural mortalities in the County is also unknown. Thus, take for this species is usually measured in acres of habitat. The total estimate of currently occupied scrub-jay habitat that has the potential to be impacted by development is 3,056 acres, and the area to be impacted by habitat management activities is 4,496 acres.

Similar problems are encountered when trying to determine take of Eastern indigo snakes on an individual basis. Although indigos are thought to be one of the few snakes native to south Florida that are most active during daylight hours, their preference to avoid areas of human activity combined with their habit of taking shelter in leaf litter or underground makes it difficult to determine the presence of this species, and because recovery of dead or impaired specimens is also unlikely. By dividing the average home range of an indigo snake into 7,552 acres, the Service estimates the take of 201 individual Eastern indigo snakes could occur in the Action Area.

The ITP would be effective for 30 years, during which the County will implement its HCP. The Applicant has developed minimization and mitigation measures commensurate with the level or extent of take resulting from the proposed action. The Applicant has also designated periodic post-issuance evaluations to determine whether acquisition, development, and fee collection are on track to meet the goal of obtaining an additional 1,336 acres of scrub habitat for conservation by the end of the 30-year permit period.

4.2.3.1.1 Direct Effects

The clearing of lots for development, installation of infrastructure, impervious surfaces, construction of buildings and ancillary structures could result in the harm, harassment, or mortality of the covered species. The permanent alteration of scrub-jay and Eastern indigo snake habitat will also cause harm to these species as a result of the loss of breeding, feeding, and sheltering habitat.

Land management techniques including, herbicide treatment, mechanical reductions and prescribed burning may have the potential to result in harm, harassment, or direct mortality of

the covered species. To limit the potential impact to scrub-jays during land management activities, mechanical vegetation reduction events will occur outside of scrub-jay nesting season. Weather conditions necessary for optimal prescribed burns in scrub typically occur during the growing season and coincide with scrub-jay nesting season. Adult and juvenile scrub-jays can avoid flames and smoke, but prescribed burns may impact existing nests. The prescribed burn and associated preparations may temporarily disrupt the birds' daily behavior patterns and ability to forage for a short period. However, since overgrown scrub is typically uninhabited, it unlikely that burns will impact nesting sites. While it is possible that prescribed burns could conceivably kill or injure snakes, indigo snakes have evolved in pyrogenic habitats and are expected to be able to respond to fire by seeking refuge in burrows or fleeing the area.

Although scrub-jays may be harassed by management activities, these management events will be planned to minimize the possibility of take of this species and Best Management Practices will be implemented to minimize the risk of losing nests. To reduce the potential impact to indigo snakes, equipment used to for mechanical vegetation reduction, maintenance of fire breaks, and conducting prescribed burns will have rubber tires whenever possible.

Additional direct impacts to scrub-jays may occur during translocation. The scrub-jays targeted for translocation under the HCP will be from the urban areas where upon issuance of the Countywide IPT take will have already been accounted for. Impacts of translocation activities may result in disruption of social behaviors during capture and captivity, but the effects on individual birds will vary depending on their response to the relocation site. While scrub-jays may be harassed by translocation activities, these activities will be planned to minimize take of the species, and will be carried out by qualified and properly permitted persons.

4.2.3.1.2 Indirect Effects

Indirect impacts that may also occur as a result of development under the Preferred Alternative include: increased habitat fragmentation; increased 'edge effect'; introduction of exotic flora; introduction of predatory or competetive fauna; introduction of non-native food items; reduction of native food sources; reduction of breeding, feeding, and sheltering habitats; impacts with motor vehicles; and increased exposure to natural predators (because of habitat conversion and fragmentation). Additionally, should either of the covered species disperse from their natal territories, dispersal will be more difficult due to the above indirect impacts associated with urban and suburban habitats.

While many of the same indirect impacts will occur under the Preferred Alternative as under the No Action Alternative, these impacts may occur more rapidly under the Preferred Alternative. However, unlike the No Action Alternative, under the Preferred Alternative the anticipated beneficial effects of having mitigation generated and used for the benefit of scrub species within Charlotte County are anticipated to occur at almost the same pace as development.

4.2.3.1.3 Cumulative Effects

When addressing cumulative impacts under NEPA, the Service must consider all past, present, and reasonably foreseeable future actions similar to those proposed by the applicant, including

those carried out by the Federal government (40 CFR 1508.7). The cumulative impacts that accompany future development within suburban areas will continue to occur if this ITP is issued; however, under the Preferred Alternative, a mechanism will exist to provide for the expansion, acquisition, and management of scrub conservation areas in Charlotte County, which the Service anticipates will achieve the overall long-term viability of scrub-jays and indigo snakes in the Reserve areas of Charlotte County.

4.2.3.2 Other Federally-listed Species

The same direct, indirect, and cumulative impacts that apply to the gopher tortoise and Florida bonneted bat under the No Action Alternative are still likely to occur under the Preferred Alternative. However, under the Preferred Alternative, a mechanism will exist to provide for the expansion, acquisition, and management of scrub conservation areas in Charlotte County, which the Service anticipates will increase overall long-term viability of the gopher tortoise within the County.

The Applicant chose not to cover the endangered Florida bonneted bat in its HCP at this time; however, County Environmental Resources staff is aware of the Service's current recommendations for avoiding impacts to Florida bonneted bats, and have incorporated those recommendation into the habitat management portion of the HCP. The Applicant also realizes that should any proposed activity covered by the HCP have the possibility of causing take of this species, the activity will not occur until the Applicant has reinitiated consultation with the Service.

4.2.4 Cultural Resources

The Preferred Alternative is not anticipated to have any direct, indirect, or cumulative effects on historic structures, as none exist in the Action Area. Additionally, Florida's State Historic Preservation Officer has concluded that no significant archaeological resources are likely to be affected by development or habitat management activities in the Action Area (Attachment B).

4.2.5 Social Issues

Under the Preferred Alternative, the Applicant would have the benefit of protection from take afforded under Section 10 of the Act when issuing development permits in occupied scrub-jay habitat. The Applicant will also be able to comply with Florida Statutes regarding the issuance of development permits without the risk of violating Federal law. Neither the Applicant nor individual landowners would have to consult with the Service on a case-by-case basis. Landowners who wish to develop properties in occupied scrub-jay habitat will only have to comply with the County's terms as outlined in the HCP to be able obtain a development permit in a timely manner. The Service anticipates the public's current level of frustration regarding the uncertainty surrounding property development in scrub-jay occupied areas of Charlotte County will be greatly reduced under this alternative.

4.2.6 Economic Concerns

Under the Preferred Alternative, the streamlined process of obtaining a development permit combined with lower mitigation costs are anticipated to help spur new housing construction in Charlotte County. The Applicant projects that implementation of the HCP will cause land prices within scrub-jay affected areas to be more comparable with those outside the areas, thus making them as likely to be developed as parcels in those outside areas. Increasing development should also increase the need for realtors, contractors, and those in the building trades. Thus, issuance of the ITP and implementation of the HCP could help the County with economic recovery.

The landowners who decide to develop in the Action Area will no longer need to hire an environmental consultant to conduct a scrub-jay survey on their parcels. The price of having a scrub-jay survey conducted for a single-family residential lot currently averages about $1,750. When extrapolated to the total number of applicable parcels in the Action Area, the elimination of the need for scrub-jay surveys equals a savings exceeding $30 million for all the affected landowners combined. Of course, this figure also represents an equal loss of potential future revenue for the environmental consultants who would have conducted those surveys.

Further, owners whose land is determined to be occupied will not be required to pay an ITP application fee. When applied to the applicable parcels in the Action Area, this equals a total savings of $920,000. Also, according to the proposed cost tier structure, compliance with mitigation requirements under the Countywide HCP will range from $1,100 to $1,240,000 per lot (Table 2). When these mitigation fees were extrapolated to the entire developable acreage within the Action Area, the total cost to Charlotte County landowners is projected to be $56.2 million (Table 1).

4.2.7 Aesthetics

The Preferred Alternative is not expected to appreciably affect the overall aesthetics of the existing neighborhoods in the Action Area. Parcels that are currently overgrown will likely remain so until the owner applies for a permit to clear the vegetation. Also, any development occurring in the Action Area will be subject to County zoning and permitting restrictions, and some areas also have separate requirements imposed by property owners or home owners associations (POA and HOA, respectively). In abiding by zoning requirements and any additional POA or HOA requirements, the aesthetic aspects of neighborhoods in Charlotte County is expected to remain the same under this alternative.

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Table 1. Comparison of With and Without a Charlotte County-Wide HCP

Parameter	Without County-wide HCP		With County-wide HCP	Notes
	Standard HCP	State-wide Umbrella HCP		
Number of Qualifying Parcels	416	17,568	17,984	
Qualifying Parcel	>1 acre, any proposed use	≤ 1 acre, single-family residential lot	No restrictions	
Affected Acreage	1,943 acres	3,723 acres	5,666 acres	
Permit Review Timeframes	Service estimate 6 -12 months, but can take 2+ years	Service estimate 3 – 6 months, average is 3 – 4	Concurrent with County Building and Development Services review	Implementation of Plan will preclude any delay caused by need for Service review
Costs to Applicant				
Service Application Fee	$100 / HCP	$50 / HCP	Not required	County-wide HCP precludes $920,000 in federal application fees
Scrub-Jay Survey Costs	$1,750+, survey costs increase with parcel size	$1,750 /parcel	Not required	County-wide HCP should preclude need for most surveys, saving an estimate $30+ million
Consultant Fees	$5,000 -$10,000+ permitting consultant costs increase with project size and complexity	$5,000 - $10,000	Significantly reduced to not required	County-wide HCP should preclude need for consultants on single-family residential parcels, saving an estimated $130+ million
Mitigation Ratio	2 acres of mitigation required for each 1 acre of impact Mitigation ratios could be increased by Service in future		Mitigation requirements fixed for 30-year duration of HCP	
Mitigation Fees	$23,400 - $42,500/acre Depending on location in County		$1,100 - $1,240,000 per lot	Mitigation fee must offset any County-wide Plan costs not covered by other funding strategies
¼-acre Parcel Mitigation Cost	$11,700 - $42,500 Depending on location in County		$2,200/lot	
Total Mitigation /Plan Costs	Projected cost to mitigate all scrub-jay habitat $140 - $350 million		Plan total costs $56.2 million	
Disposition of Mitigation Funds	Mitigation Funds Leave Charlotte County		Mitigation Funds Stay in Charlotte County	

Table 2. Mitigation Fees, by Acreage Tier

Tier	Fee ($/Lot)
1: 0.00 - 0.22 acres	$1,100
2: 0.23 - 0.49 acres	$2,200
3: 0.50 - 1.00 acres	$5,500
4: 1.01 - 3.00 acres	$12,800
5: 3.01 - 5.00 acres	$34,100
6: 5.01 - 20.00 acres	$76,700
7: 20.01 - 99.99 acres	$319,000
8: > 100.00 acres	$1,240,000

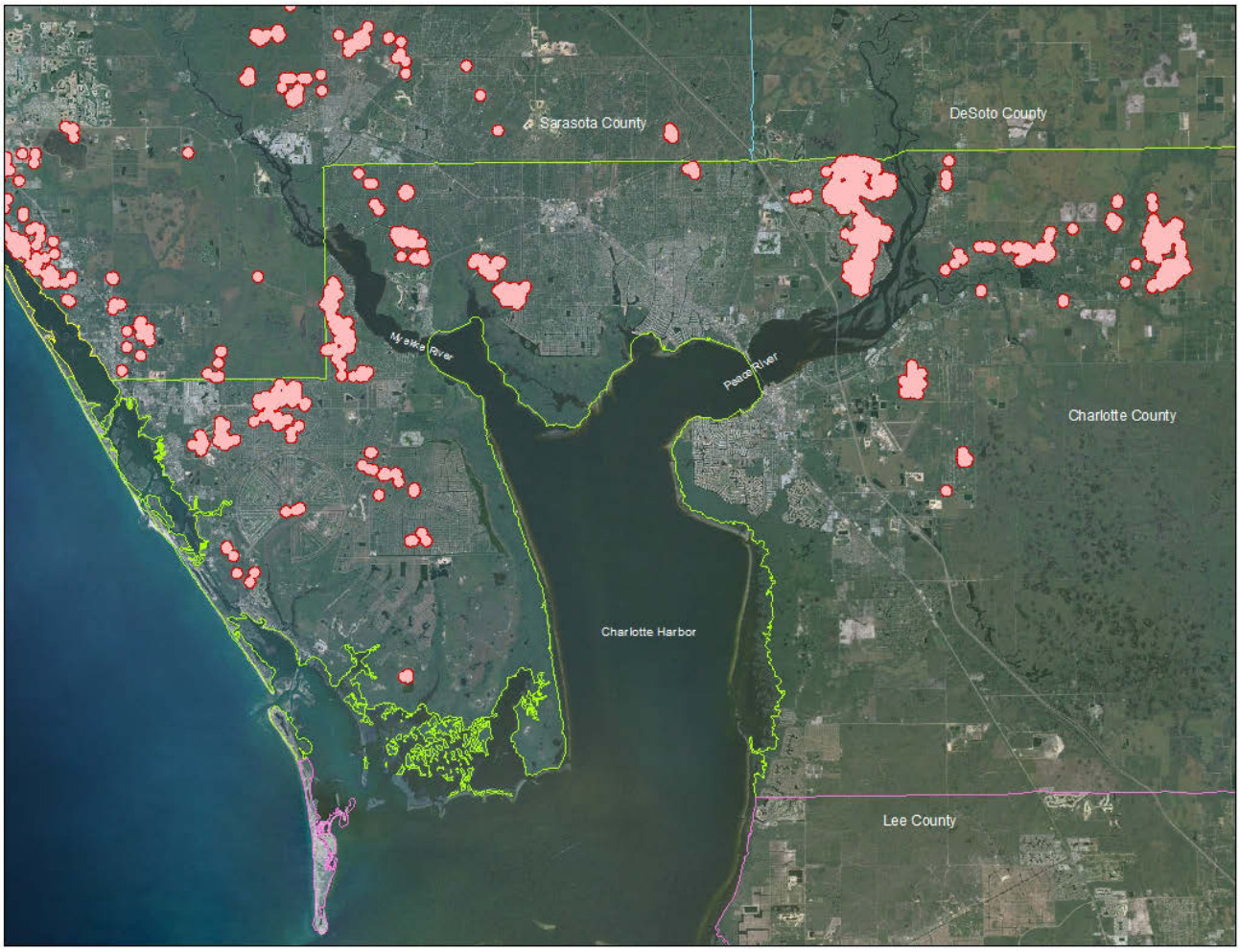

Figure 1. Scrub-jay observation buffers that comprise the potential impact area in Charlotte County.

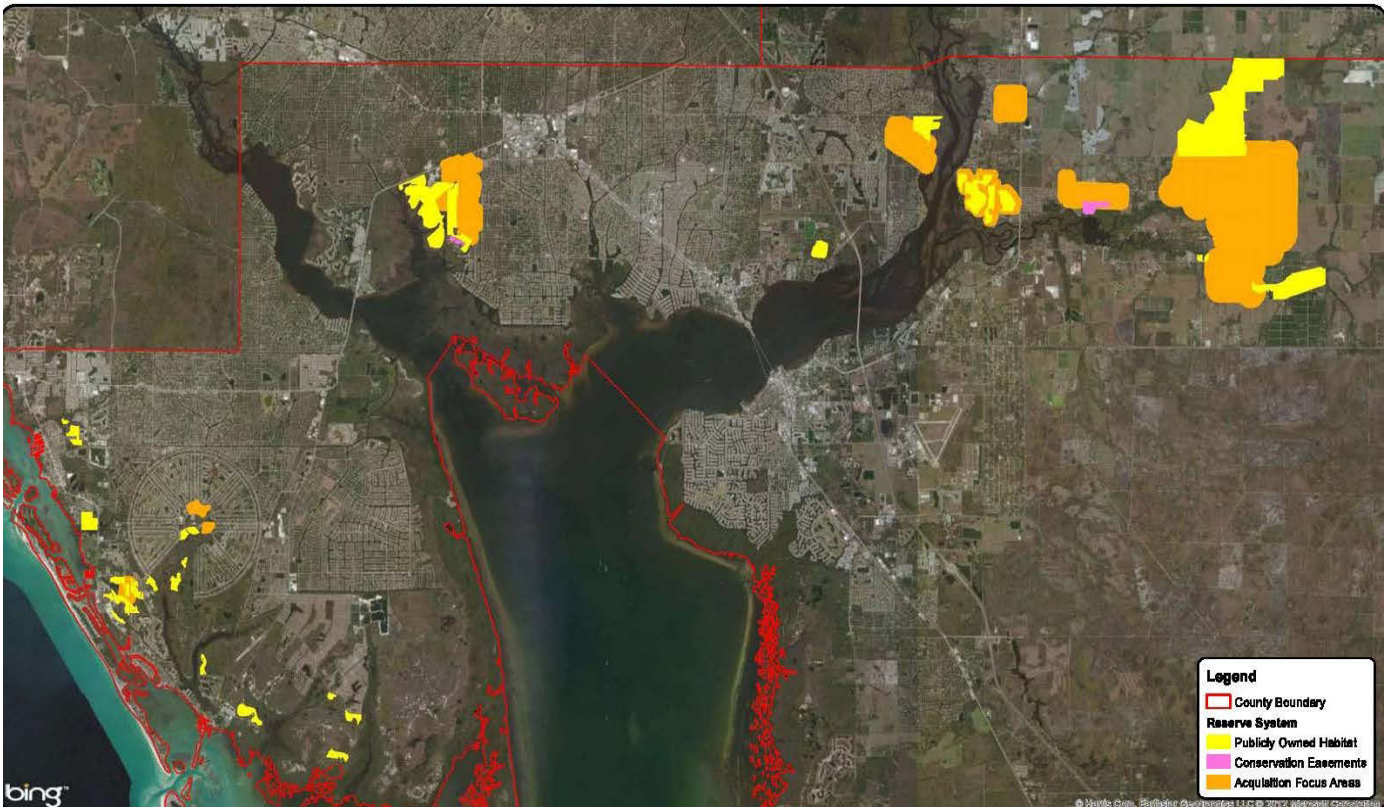

Figure 2. Prospective Reserve areas for scrub-jay conservation.

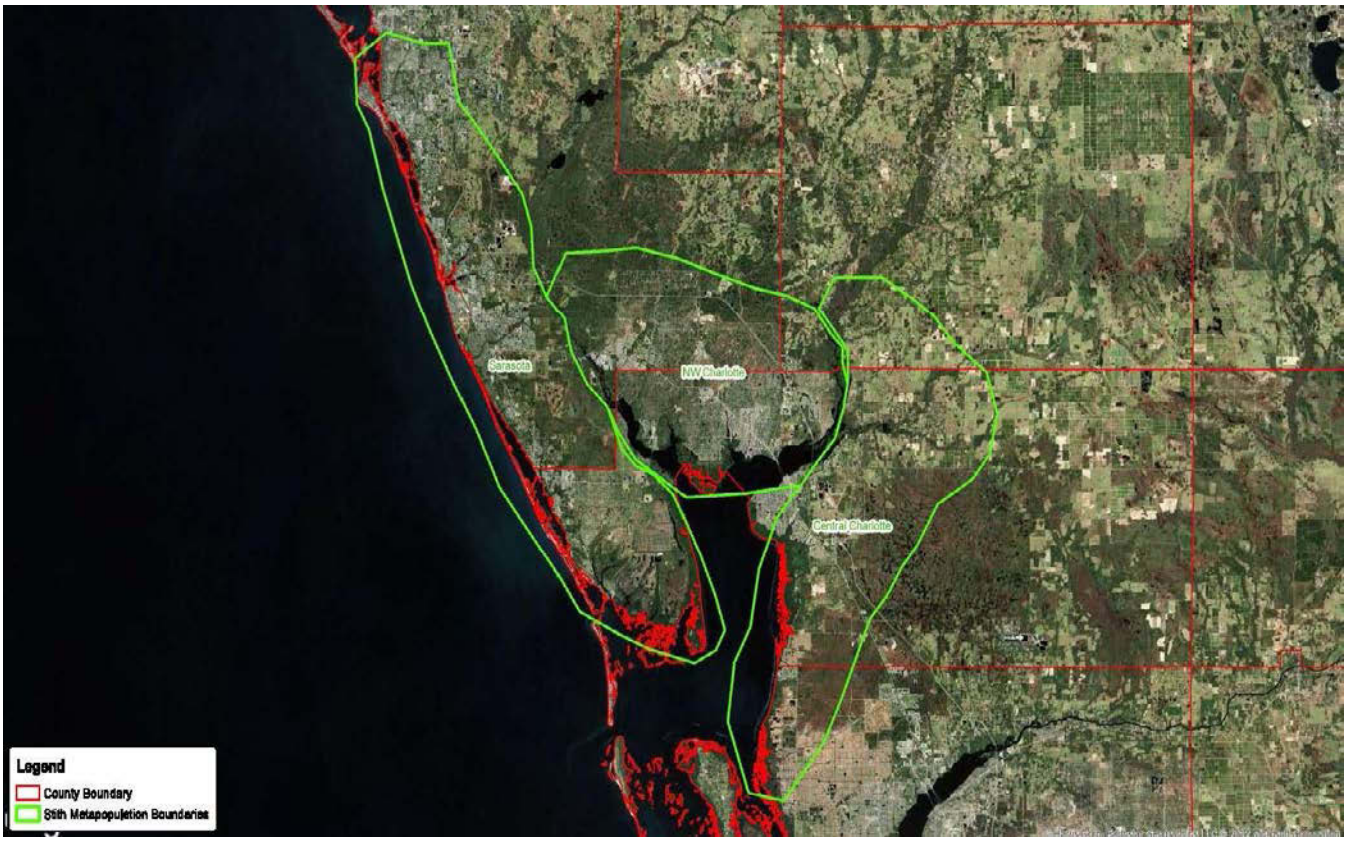

Figure 3. Scrub-jay metapopulations in Charlotte County as identified by Stith (1999).

ATTACHMENT A

CHARLOTTE COUNTY
COUNTY-WIDE FLORIDA SCRUB-JAY
HABITAT CONSERVATION PLAN

ATTACHMENT B

SHPO CULTURAL RESOURCES REVIEW