United States Department of the Interior

U.S. FISH AND WILDLIFE SERVICE
Florida Ecological Services Field Office

January 17, 2025

Brandon Bowman, Colonel
District Commander
U.S. Army Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

Service Consultation Code:	2023-0003475
Date Received:	June 25, 2024
Consultation Initiation Date:	July 8, 2024
Project:	Kingston
Corps Permit Application Number:	SAJ-2024-00967 (SP-SJF)
County:	Lee

Dear Colonel Bowman:

The U.S. Fish and Wildlife Service (Service) has received the U.S. Army Corps of Engineers' (Corps) request for consultation dated June 25, 2024, for Cam 7-Sub, LLC (Applicant) Kingston (Project). This document transmits the Service's biological opinion based on our review of the proposed Project located in Lee County, Florida, and its effects on the threatened Audubon's crested caracara (*Caracara plancus audubonii*; caracara), threatened eastern indigo snake (*Drymarchon couperi*; indigo snake), endangered Florida panther (*Puma concolor coryi*), and proposed-listed endangered tricolored bat (*Perimyotis subflavus*; TCB). It also includes and summarizes our concurrences for the Corps' determinations for the Everglade snail kite (*Rostrhamus sociabilis plumbeus*), Florida bonneted bat (*Eumops floridanus*; FBB), and wood stork (*Mycteria americana*). This document is submitted in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act) (87 Stat. 884; 16 U.S.C. 1531 *et seq.*).

This biological and conference opinion is based on information provided in the April 2024 biological assessment, the June 25, 2024, consultation request, and other sources of information. A complete record of this consultation is on file at the Florida Ecological Services Office in Vero Beach, Florida.

Consultation history

On June 25, 2024, the Corps submitted a request for consultation under section 7 for impacts to wetlands and waters of the U.S. associated with the development of a mixed-use development.

On July 8, 2024, the Service sent an email regarding the effects determinations for the Everglade snail kite and tricolored bat. The Corps provided an email response on July 17, 2024, determining that the proposed Project is not likely to adversely affect the Everglade snail kite and is likely to adversely affect the tricolored bat.

On August 1, 2024, the Service sent an email to the Corps indicating that proposed minimization measures would result in the Project having an insignificant or discountable effect on Florida bonneted bat. On September 18, 2024, the Corps amended their effects determination for Florida bonneted bat to may affect, not likely to adversely affect. As of this date, the Service has received all the information necessary to initiate consultation on the proposed action as required in the regulations governing interagency consultations (50 CFR § 402.14).

BIOLOGICAL OPINION

This Biological and Conference Opinion provides the Service's opinion as to whether the proposed Project is likely to jeopardize the continued existence of the caracara, indigo snake, panther, and tricolored bat (50 CFR § 402.02). There is no designated critical habitat for these species onsite; therefore, this Biological Opinion will not address destruction or adverse modification of critical habitat.

ANALYTICAL FRAMEWORK FOR THE JEOPARDY DETERMINATIONS

Jeopardy determination

Section 7(a)(2) of the Act requires that Federal agencies ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of listed species. "Jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR § 402.02).

The jeopardy analysis in this Biological Opinion relies on four components: (1) the Status of the Species, which describes the range-wide condition of the species, the factors responsible for that condition, and its survival and recovery needs; (2) the Environmental Baseline, which analyzes the condition of the species in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the species; (3) the Effects of the Action, which determine the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the species; and (4) the Cumulative Effects, which evaluate the effects of future, non-federal activities in the action area on the species.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed federal action in the context of the current status of the species, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of the species in the wild.

DESCRIPTION OF THE PROPOSED ACTION

The proposed Project consists of mixed-use residential and commercial development of approximately 3,393.61± acres and the conservation, land enhancement, and restoration of 3,293.89± acres. The Project site totals 6,687.50± acres and is located in Section 35, Township 45 South, Range 27 East, and Sections 2, 3, 10, 11, 14, 15, 23, 24, 25, 26, 34, 35, and 36;

Township 46 South; Range 27 East; Lee County (latitude 26.486828, longitude -81.596549) (Figure 1). The surrounding land uses include single-family home sites to the north; Corkscrew Regional Ecosystem Watershed (CREW) lands and Corkscrew Swamp Sanctuary to the south; CREW lands, single-family home sites, and a segment of Corkscrew Road to the east; and Imperial Marsh Preserve land, mining, and agricultural uses to the west. Additionally, an east-to-west segment of Corkscrew Road bisects the property before it turns and heads north.

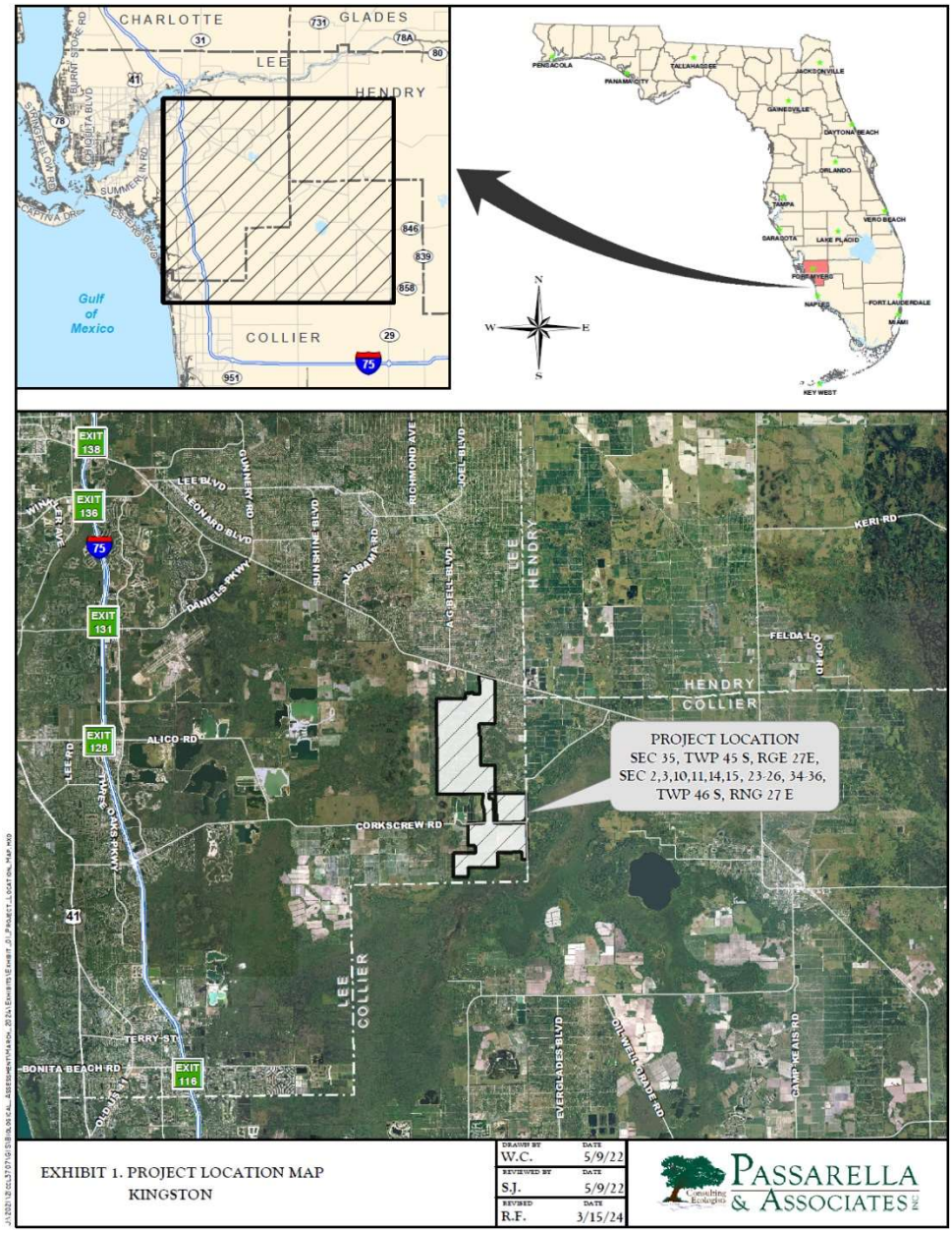

Figure 1. Location map of the Kingston Project in Lee County, Florida (Map credit Applicant's consultant).

The majority of the Project currently supports a distressed and inactive citrus grove and other agricultural operations, while the remainder of the site contains native vegetation with varying amounts of disturbance and exotic vegetation, including but not limited to melaleuca (*Melaleuca*

quinquenervia), torpedograss (*Panicum repens*), West Indian marsh grass (*Hymenachne amplexicaulis*), and Brazilian pepper (*Schinus terebinthifolia*). The native wetland habitats include, but are not limited to, cypress, hydric pine, cypress/pine/cabbage palm, mixed wetland forest, freshwater marsh, and wet prairie habitats. Native upland habitats on the Project site include, but are not limited to, palmetto prairie, pine, and pine flatwoods habitat types. As part of the historical agricultural surface water management, an extensive network of ditches, berms, and reservoirs has been constructed on the property, which has led to the isolation of native wetland systems within the site and neighboring flooding.

Development

Land clearing and construction activities associated with the Project will result in the permanent loss of approximately 3,393.61± acres of habitat (Figure 2). Within these, the Project will impact 12.87± acres of wetlands and 128.32± acres of "Waters of the U.S.".

The land restoration and mixed-use development phase of the Project will begin in Phase 1 (i.e., the lands immediately adjacent to the north and south sides of Corkscrew Road) approximately one year after receiving regulatory permit approval. Construction of land restoration and infrastructure for Phase 1 is expected to take 18 months following regulatory approvals. Once the infrastructure is in place, Project home builders will start staggering the construction of approximately 900 new homes. It is anticipated that the construction of 900 new homes will continue every 12 months, assuming the economy remains healthy. Building approximately 4,000 homes after infrastructure completion within Phase 1 will take approximately eight years after the regulatory permits are approved.

Three years after the commencement of the construction of the infrastructure on the lands adjacent to Corkscrew Road (Phase 1), the Project developer will begin infrastructure construction on Phase 2 (i.e., the remaining Project lands located north of Phase 1). The construction of Phase 2 infrastructure, including the spine road/hurricane evacuation route, is expected to take approximately 2 years. As such, Phase 2 will begin approximately 5.5 years after the commencement of Phase 1. After the infrastructure for the Phase 2 spine road/hurricane evacuation route is in place, the phased clustered pods of residential lots will become accessible for home construction. It is estimated that it will take 12 to 15 months to access these lots.

The estimated build-out for the entire Project will take roughly 15 to 20 years at minimum, subject to future economic conditions. Large and small wildlife crossings within the Project footprint, as well as traffic control and speed reduction measures, are considered part of the infrastructure and will be installed in phases along with the construction of homes.

Enhancement and Restoration of Conservation Area

The proposed Project incorporates the conservation and restoration of approximately 3,293.89 acres of upland and wetland habitat (Figure 2). As mentioned above, the management of the onsite conservation lands will begin in Phase 1 of the Project. Wetland and upland preservation and enhancement of indigenous wetland and forested upland habitats will include the hand-removal/treatment of exotic and nuisance vegetation, including, but not limited to, Brazilian pepper and melaleuca.

Wetland and upland restoration will be conducted within existing non-indigenous forested and herbaceous habitats, as well as existing agricultural lands. In existing forested and herbaceous habitats, exotic vegetation will be removed via hand or mechanical methods. Following the removal of exotic vegetation, supplemental plantings will be installed in portions of the wetland and upland enhancement areas with greater than 50 percent coverage by exotic vegetation and within disturbed land use types. Restoration of agricultural lands will consist of removing existing row crops and citrus trees, backfilling agricultural ditches and detention systems, regrading contours necessary for restoring historical habitat communities, replanting vegetation to achieve target habitat types, and ongoing maintenance and management in perpetuity as required by Lee County. All existing and restored wetland areas will be placed under conservation easements granted to Lee County with third-party enforcement rights to the Service.

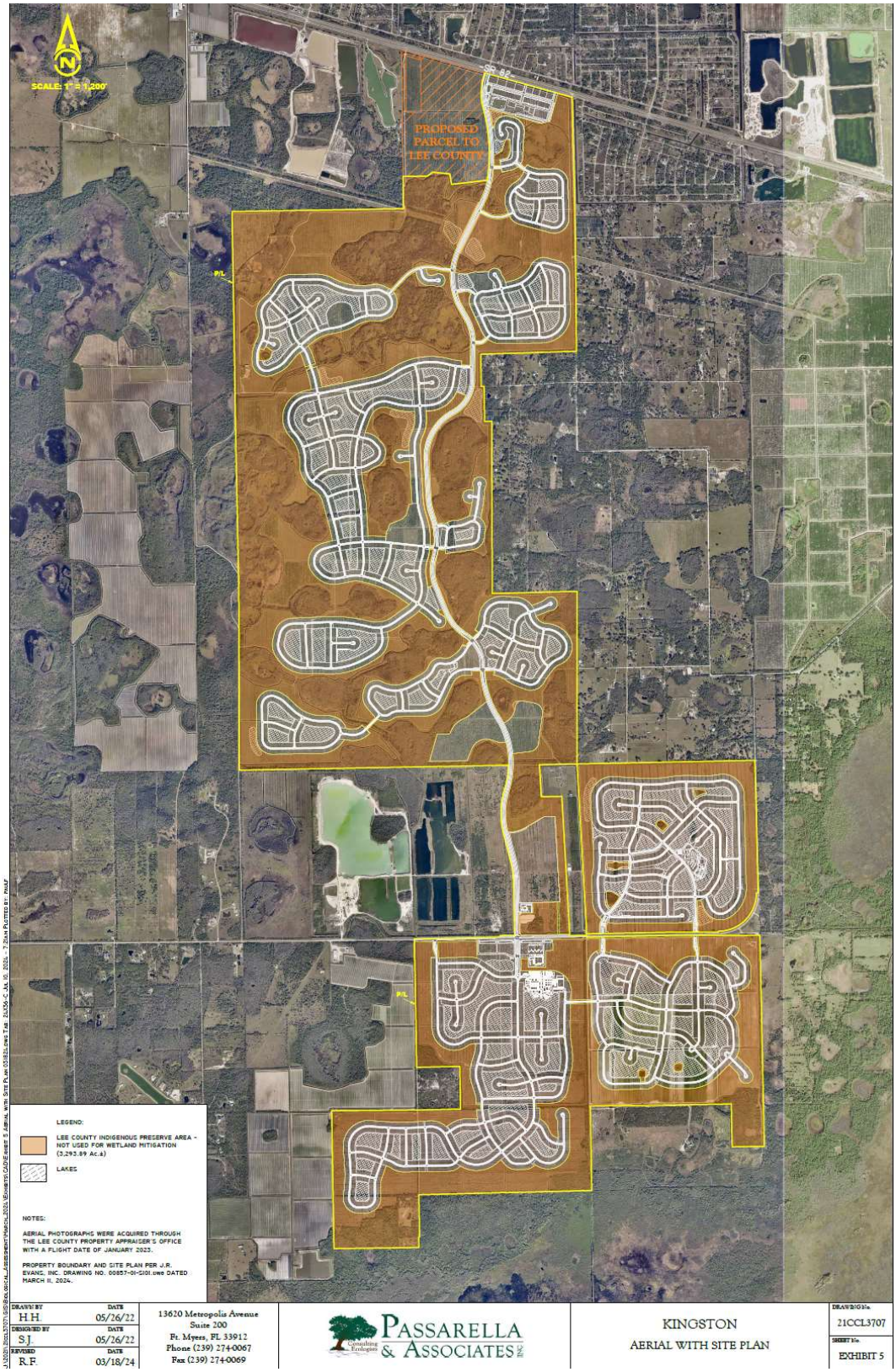

Figure 2. Site plan of the Kingston Project with conservation areas (shaded orange) in Lee County, Florida (Map credit Applicant's consultant).

Minimization and conservation measures

In order to avoid and minimize impacts to listed species and their associated habitats, the Applicant will implement the following measures:

1. Adhere to the Service's Standard Protection Measures (SPMs) for the Eastern Indigo Snake (Service 2021a).
2. Prior to conducting any clearing activities within 4,920 feet (1,500 meters) of any previously documented or newly discovered caracara nest site, the Applicant shall conduct a survey during the caracara nesting season (January 1 through April 30) to determine if the documented or discovered nest is active and if other caracara nests are present. The survey area shall include potential nesting and foraging habitat located in land adjacent to the Project site that is under the Applicant's ownership or neighboring areas where access is allowed.
3. To minimize the potential for disturbance to nesting caracaras, the Applicant shall conduct land-clearing activities outside the nesting season for areas that occur within the primary zone (984 feet or 300 meters) of any documented caracara nest site. Should it be necessary to conduct land-clearing activities during the nesting season, land-clearing within 984 feet (300 meters) of any nest identified during the survey referenced above will not occur until monitoring has determined that the nest has been abandoned or that the chicks within the nest have fledged and left the nest site. Once the nest is empty, clearing of that primary zone and nest tree can proceed.
4. If construction activities are to occur within 984 feet (300 meters) of an active nest identified in the most recent nesting season, the Applicant shall conduct restoration of caracara nesting and foraging habitat on a scale equal to the portion of the breeding territory that is impacted by construction activities. Restoration activities will be conducted by restoring native dry or wet prairie with scattered cabbage palms or creating improved pasture and planting scattered cabbage palms. Restoration activities will occur on existing agricultural lands located within the Project site or on agricultural lands adjacent to the Project site that are under the Applicant's ownership. The Applicant shall contact the Service's Florida Ecological Services Office (FESO) at FW4FLESRegs@fws.gov for technical assistance prior to the start of the construction activities and shall provide the location and extent of proposed restoration activities. Once restoration activities have been completed, the restored habitat will be maintained in perpetuity and managed in a state that supports use by the crested caracara. The Applicant shall report the final location and extent of restored habitat to the Service's FESO upon completion of restoration activities.
5. A Florida bonneted cavity tree and roost survey will be conducted on the Project site within 30 days prior to the removal of trees, snags, or structures. When possible, structures will be removed outside the breeding season (January 1 through April 15). If evidence of use by Florida bonneted bats is observed, the removal efforts will be discontinued, and the Service will be contacted on how to proceed.
6. A 250-foot buffer will be maintained around known or suspected Florida bonneted bat roosts when using heavy equipment to limit disturbance to roosting bats.
7. The creation of the Project's buffer lake system and the preservation and enhancement of 1,179.74± acres of on-site wetlands and restoration of 422± of wetlands from agricultural lands will promote Florida bonneted bat and tricolored bat foraging opportunities.

8. Widespread application of insecticides will be avoided in areas where Florida bonneted bats are known or expected to forage or roost.
9. Mature trees and snags that could provide roosting habitat will be retained within the conservation areas.
10. International Dark-Sky Association lighting initiatives to minimize use of artificial light and retain natural light conditions will be implemented to the greatest extent practicable.
11. Prescribed fire will be implemented as a management tool within the on-site conservation areas to the greatest extent practicable to promote foraging habitat for the Florida bonneted bat and tri-colored bat.
12. The Applicant has or will purchase the equivalent of 3,771.11 panther habitat units (PHUs) from the Panther Passage Conservation Bank and 64.89 PHUs form Corkscrew Regional Mitigation Bank.
13. On-site preserve enhancement activities will include the removal of exotic and nuisance vegetation, and restoration activities will include the removal/treatment of exotic vegetation and the planting of supplemental native vegetation where exotic coverage currently exceeds 50 percent. The proposed restoration plan also includes upland and wetland habitat from existing agriculture fields. Following enhancement and restoration, 3,293.89± acres of on-site restoration lands will provide habitat within the Florida panther Primary and Secondary Zones that panthers could potentially utilize for prey base and for wildlife movement.
14. The Applicant shall provide correspondence from the Fish and Wildlife Foundation of Florida Fund (Fund) confirming contributions for panther conservation and research have been provided as described below. Documentation for each contribution shall be sent to the FESO by e-mail (FW4FLESRegs@fws.gov). The Applicant shall ensure the following is completed and reflected in the documentation provided:
    a. Upon issuance of the permit, the Applicant will pay $350 per development acre of the Project (or approximately $1,186,150) to fund panther conservation and research. Upon deposit of the funds, the Applicant shall provide correspondence from the Fund confirming that the contribution has been provided.
    b. The Applicant will pay $200 per each building permit at date of issuance (or approximately $2,000,000) and $200 per each home resale to the Fund.
    c. The Applicant shall provide an annual report confirming the sale and contribution to the Fund to FESO by e-mail (FW4FLESRegs@fws.gov).
15. The Applicant shall provide correspondence from the Lee County Proportionate Share Fee fund confirming contributions of approximately $20,000,000 for Corkscrew Road roadway improvements, inclusive of pavement widening, flow-way culverts, and wildlife crossings. Documentation for each contribution shall be sent to the FESO by e-mail (FW4FLESRegs@fws.gov).
16. The Applicant will, at its sole cost and expense, ensure the construction of a large wildlife crossing along the four-lane spine road and 12 small wildlife crossings within the Project site to maintain intra-preserve connectivity and hydrologic flow throughout the Project site. The wildlife crossings shall be constructed as per the approved maps, drawings, and specifications in this permit. Prior to the start of construction, the Applicant shall contact the FESO by e-mail (FW4FLESRegs@fws.gov) for technical assistance and shall provide the location and plans of the proposed wildlife crossings for review. The Applicant shall report the final location and provide as-built plans of wildlife crossings to the FESO.

17. The Applicant shall ensure that Homeowners Association (HOA) and/or homeowners' documents for the Project community state that pets within the community should be kept indoors, on leash, supervised when outdoors in common areas, or secured within a covered kennel. Residents shall be informed that vaccinating cats for feline leukemia virus (FLV) can prevent disease transmission from house cats to Florida panthers. The Applicant shall ensure that the HOA and/or homeowners' documents inform residents of the importance of community-wide vaccination of all pet cats for FLV since it protects homeowners' pets from illness, as there is no definitive cure, and assists in preventing illness in Florida panthers.
18. Project residents, community association managers, and maintenance staff will be provided with an educational brochure prepared by the USFWS and the Florida Fish and Wildlife Conservation Commission titled "A Guide to Living with Florida Panthers."
19. The Applicant will remove contaminated soils within areas proposed for wetland creation to avoid affecting the aquatic environment and posing a hazard to Everglade snail kite.

Action area

The Action Area is defined as all areas to be affected directly or indirectly by the action and not merely the immediate area involved in the action. For this Project, the Service considers the action area as all lands within the footprint of the Project, and all lands within 25 miles of the Project footprint (Figure 3). The 25-mile buffer around the Project footprint is designed to encompass mean dispersal distance of sub-adult male panthers, which was reported by Maehr et al. (2002) to be 23.2 miles and by Comiskey et al. (2002) to be 24.9 miles. The 25-mile buffer distance encompasses the dispersal distance of both male and female panthers because male panther dispersal distances are known to exceed those reported for female panthers (Comiskey et al. 2002; Maehr et al. 2002). The size of the Action Area for this consultation is consistent with action areas defined in our recent biological opinions for the panther, and it accounts for the large movements and home ranges of panthers as well as sufficiently consider cumulative effects and impacts to panther baseline conditions. While the Action Area is a 25-mile buffer around the Project footprint, effects to species other than panthers are not expected to extend beyond the Project boundaries.

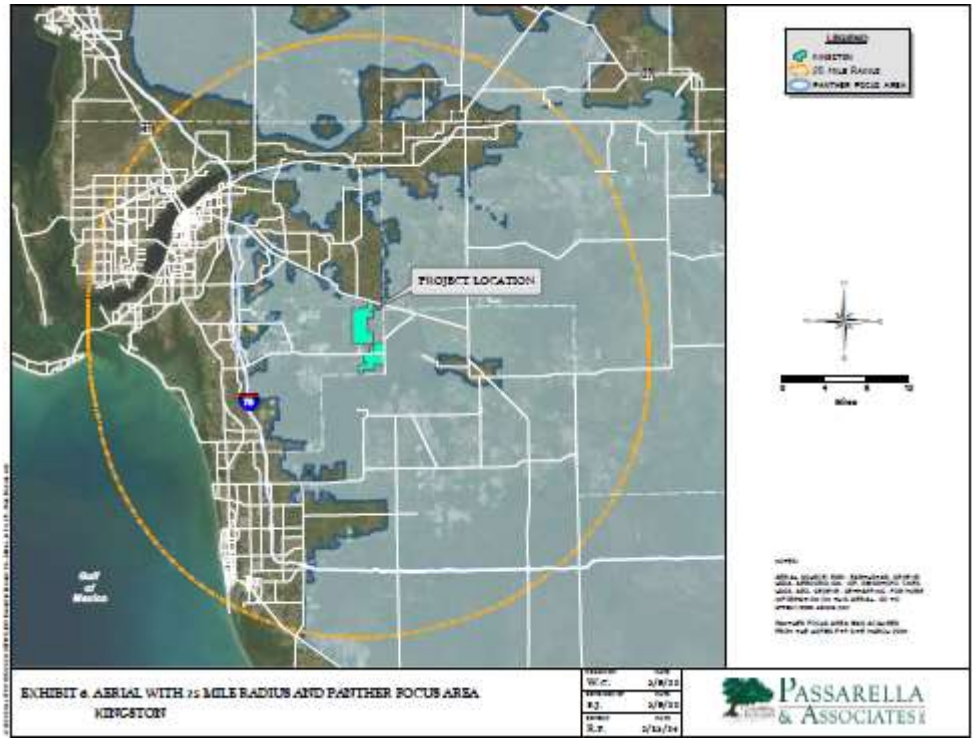

Figure 3. Aerial map depicting the Project site and 25-mile radius Action Area (Map credit Applicant's consultant).

SPECIES NOT LIKELY TO BE ADVERSELY AFFECTED BY THE PROPOSED ACTION

Everglade snail kite

The Project site is located within the consultation area for the snail kite and snail kite have been observed on-site during survey efforts by the Applicant's consultant. Although there currently is limited snail kite foraging and nesting habitat available on the Project site, this is anticipated to increase following restoration activities resulting in a beneficial effect to the snail kite. The Applicant's soil analysis showed that two sites proposed for wetland creation had elevated contaminant levels. One site had a copper concentration of 97.5 mg/kg, which is above the Service's 85 mg/kg threshold for adverse effects to apple snails (*Pomacea paludosa*), the snail kite's main food source (Service 2010a). The other site had a chlordane concentration above consensus-based probably effect concentrations as outlined by the Florida Department of Environmental Protection. To remedy this, contaminated soils in these areas will be removed and used in upland areas where they are not expected to affect the aquatic environment. Based on this information, the Service concurs with the Corps' determination that the Project may affect but is not likely to adversely affect the snail kite.

Florida bonneted bat

The Project site is located within the Service's Florida bonneted bat (FBB) consultation area (Service 2019). The Corps determined the proposed Project may affect, but is not likely to adversely affect the FBB. Information gathered during numerous site assessments and an

acoustic survey by the applicant's consultant, Passarella and Associates, indicate that there are no FBB roosts on the property. However, the Project will result in the conversion of approximately 3,393.61 ac of FBB foraging habitat (largely consisting of orange grove) into a mixed-use development. Limited information on FBB foraging behavior is currently available. In one study using GPS-satellite tags at Babcock-Webb WMA, researchers found that most FBB activity occurs within one mile of the roost (point of capture) (Ober 2015). However, FBBs also tended to take one longer foray, up to 7 mi, shortly after sunset each night (Ober 2015, Ober 2016). Assuming a foraging area centered on a roost with a 1-mi radius, FBBs could forage from 2,010 ac to 98,470 ac, within a 7-mi radius of the roost, on any given night. It is unknown how foraging behavior and needs differ among individuals (*e.g.*, ages, sexes), seasonally and in different habitat types. The quality of habitat and the prey availability and other factors likely greatly influences the relative importance of any particular area. FBB foraging areas are expected to be greater in areas with lower quality foraging habitat in order to meet their biological needs, which at some point would be expected to lead to a loss in fitness.

The FBB is known to occur in highly urbanized landscapes, showing these areas provide some level of foraging opportunities. Therefore, feeding opportunities would be expected to persist in some capacity above the Project following development. Consequently, based on the lack of impact to FBB roosts and the expected insignificant effect from the conversion of foraging habitat from the proposed development, the Service concurs with the Corps' determination that the Project may affect, but is not likely to adversely affect the FBB.

Wood stork

The Project site is located approximately four miles from the nearest wood stork colony. The agricultural ditches and wetlands provide foraging habitat for the wood stork on the Project site. Based on the proposed on-site mitigation plan and purchase of wetland credits, the Corps has programmatic concurrence through the use of the South Florida Programmatic Concurrence Key for wood stork (Service 2010b, 41420-2007-I-0964) with the sequence A>B>C>E> may affect, but not likely to adversely affect the wood stork.

STATUS OF THE SPECIES

Audubon's caracara

Please see Enclosure A for the Status of the Species for the caracara.

Eastern indigo snake

Please see https://ecos.fws.gov/ServCat/DownloadFile/157073 for the current Species Status Assessment for the indigo snake.

Florida panther

Please see Enclosure B the status of the species for the panther. Critical habitat has not been designated for the panther and will not be affected by the Project.

The Florida Fish and Wildlife Conservation Commission (FWC), Service, National Park Service, and other partners used a minimum count index of panthers to determine trends in the panther population from the 1980s through 2015 (McBride et al. 2008). This method provided an estimate of panther numbers for managers to assess changes in the population. However, this technique did not provide a true population estimate because it did not have an associated measure of variance, and it did not consider changes in detectability or sampling effort. In addition, the minimum count index was used with the understanding that a portion of the population was not counted. Based on this minimum count method, the Service and FWC reported that as of 2015 there were 120 to 230 adult and subadult panthers in the Primary Zone (Kautz et al. 2006, FWC and Service 2017). The last annual count was completed in 2015 and has since been discontinued.

To describe the current population size of the panther, we present the population estimates from 2000 through 2018 provided in Appendix 6 of Onorato et al. 2024 (Figure 4). Onorato et al. (2024) revised the model used by McClintock et al. (2015) with additional panther road mortality and radio collar monitoring data collected from 2013–2018 to estimate the annual, range-wide, size of the panther population. To allow for more flexible (and potentially more parsimonious) population trend models, the revised analysis included multiple spline-based models of abundance. Using this technique, the subadult and adult panther population was predicted to range from 128 individuals in 2000 to 414 individuals in 2016 and 2017 and was predicted as 407 individuals in 2018 (Figure 4). Onorato et al. 2024 acknowledged that the model averaged confidence intervals (Figure 4) were large and in some years the upper bounds of the confidence intervals for their population estimates exceeded reasonable population estimates that could likely be supported within the breeding range of South Florida (e.g., 821 panthers in 2018). Onorato et al. (2024) noted the elevated upper bounds are likely related to: the small sample of radio-collared individuals used in the modelling, the overall low probability of a panther motor vehicle mortality in their study, and the lack of (biologically informed) prior constraints on population size being incorporated into the modeling. Given these issues, Onorato et al. (2024) recommend caution when interpreting the upper bounds of the confidence intervals (Figure 6) and noted that he most informative outputs of this model are the lower bounds for the panther population size, indicating the population may never have exceeded 235 individuals from 2000–2018. Results from the two most recent Population Viability Analysis models (Hostetler et al. [2013] and van de Kerk et al. [2019]) reveal that the South Florida panther population is viable for the next 100 years, although when the impacts of genetic erosion are considered, the population remains at risk, especially if genetic introgression initiatives are not implemented in the future.

Although survival rates for Florida panthers were described by Benson et al. (2011), those values are model-averaged and categorized by sex and age cohort, making them difficult to apply to a panther population of unknown demographics. Specifically, the survival rate for a subadult panther is 0.951 for a female (1 to 2.5 years old), in comparison to 0.713 for a male (1 to 3.5 years old). Similarly, survival rate of a prime adult female (2.5 to 10 years old) panther is 0.872 and 0.799 for a male (3.5 to 10 years old). Given the challenges using these estimated survival rates, coupled with known variability in number of breeding females in the population and litter size, the Service will use the population size description above.

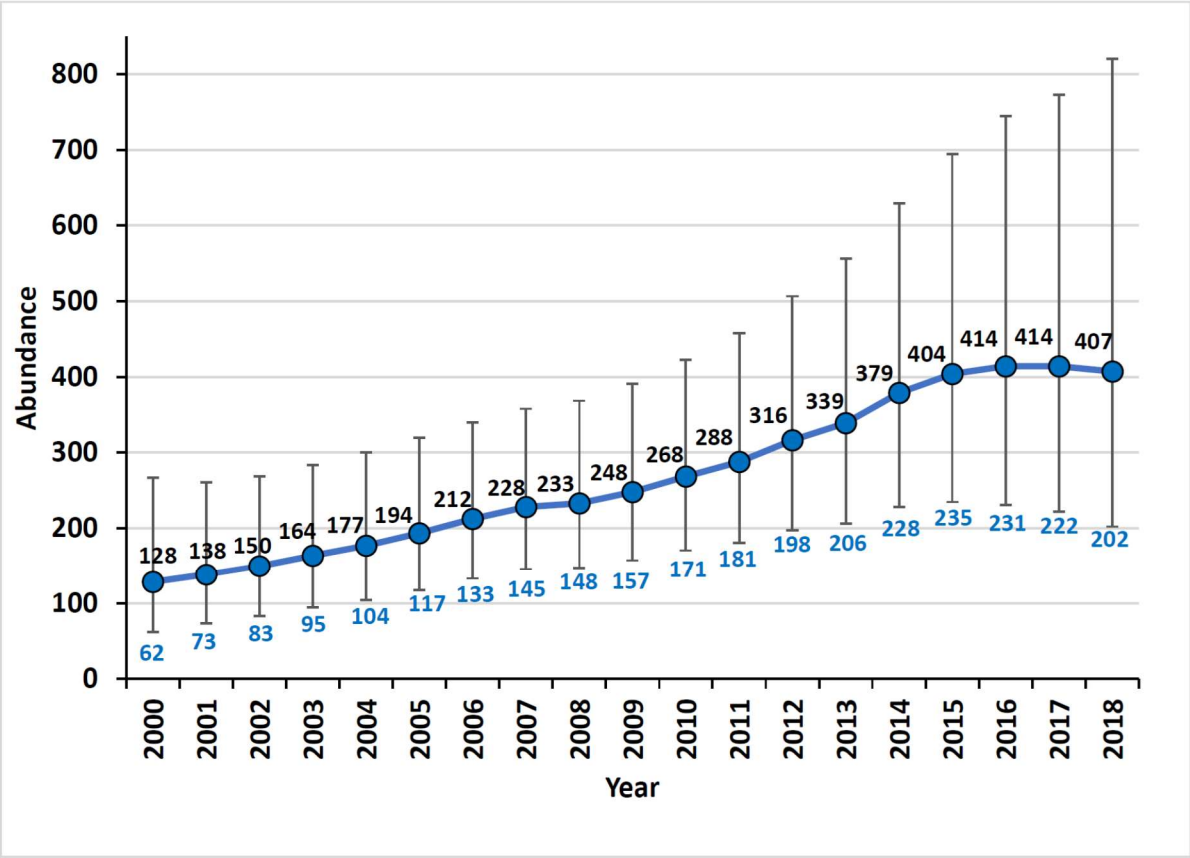

Figure 4. Estimates of the range-wide population size of adult and subadult Florida panthers from 2000–2018 using the motor vehicle mortality (MVM) model of McClintock et al. 2015. Model-averaged abundance estimates (as indicated by blue dots) are presented with 95% confidence intervals. The lower 95% confidence interval values are presented in blue text**.** Source of figure: Appendix A6.1 in Appendix A of Onorato et al. 2024.

Tricolored bat

Please see https://ecos.fws.gov/ServCat/DownloadFile/221212 for the current Species Status Assessment for the tricolored bat.

Summary of threats to the species

Audubon's crested caracara

The modification and destruction of native wet and dry prairie, pasture lands and isolated wetlands in south Florida were a primary consideration in listing caracara. The conversion of prairie and pasture to citrus grove, sugarcane, and residential/commercial development alters habitat making it unusable by caracara. Based on the 2021 National Land Cover Database, approximately 8,151,711.16 acres of suitable habitat remain within the range of the caracara, with approximately 2,008,073 acres in conservation (Figure 4). Suitable habitat was identified

by, among other factors, the surrounding landcover of known caracara nests. Alteration or filling of wetlands destroys important foraging habitat. Lack of habitat management, including prescribed fire, can result in habitat degradation to the point where it is no longer suitable for occupancy or foraging. The ongoing threats relevant to this Project would be the additional conversion/reduction of habitat. The proposed Project would reduce the amount of suitable habitat within the overall range of caracara in Florida and also the territory of the documented nesting pair on the adjacent property. The Project's adverse effects to the caracara will be discussed in the remainder of this Biological Opinion.

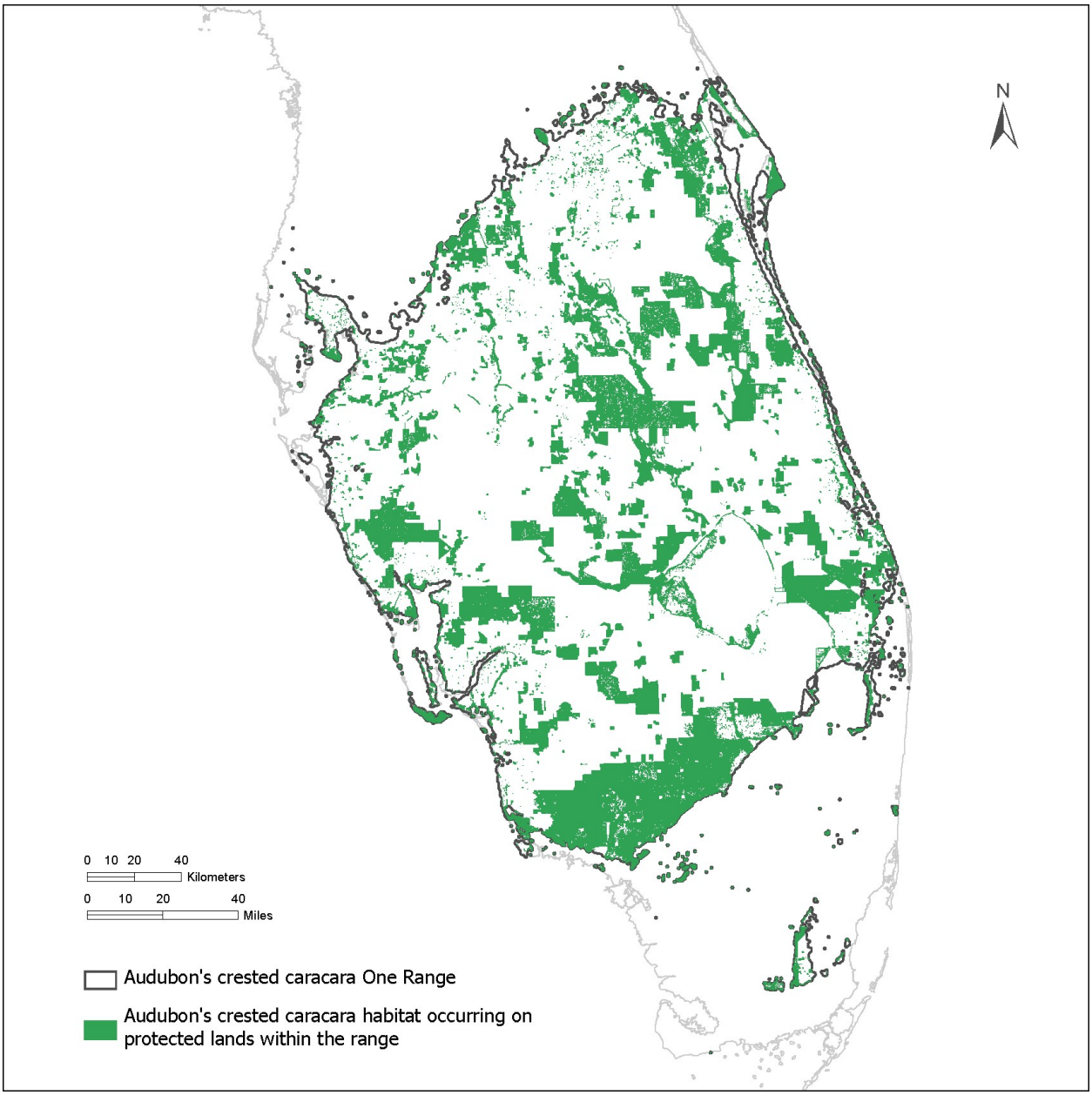

Figure 5. Protected caracara habitat within the species' range, composed of cultivated crops, pasture, hay, developed open space, and woody wetland.

Eastern indigo snake

The modification and destruction of natural upland and freshwater wetland communities in south Florida were a primary consideration in listing the indigo snake as threatened. Another threat to the indigo snake is loss of converted habitat, such as citrus orchard and canals, where the species is known to occur. Collisions with motor vehicles on Florida's extensive roadway system may also be a significant source of indigo snake injury and mortality. Additionally, habitat degradation due to lack of management, including prescribed fire, is a threat to indigo snakes. The Project's adverse effects to indigo snakes will be discussed in the remainder of this biological opinion.

Florida panther

The panther is a wide-ranging species that requires large areas of diverse landscape to survive. Dispersing sub adult males wander widely through unforested and disturbed habitat. Habitat loss from residential, commercial, and agricultural development and other human related activities associated with the continually increasing human population in Florida represents the primary threat to the long-term viability of the panther. The human population in South Florida has dramatically increased, from 1 million in 1950 to 6.6 million in 2010, resulting in secondary disturbances such as increased human presence and noise, light, air, and water pollution. In southwest Florida, where the reproducing panther population is primarily located, human population has increased from 833,892 in 2000, to an estimate of 1,231,100 in 2010, representing an increase of 47.6 percent over the 10-year period (University of Florida 2009). Increasing human population has resulted in increasing impacts on native habitat, and flora and fauna. Resulting threats to panthers include human disturbance during Project construction, habitat loss and fragmentation, road mortality, human disturbance following construction, exposure to toxins, and intra-specific aggression. Vehicle collisions with panthers appears to be one of the primary threats to the species and range-wide, and as shown in figure 6 (below) between 1 and 35 panthers are known to have been killed annually via panther-vehicle mortality (PVM). Quantifying the exact number of PVM is not possible because not all animals are recovered. Further, as described in the remainder of this BO/CO (below) estimating the likelihood of PVM relies on multiple variables that all contain substantial uncertainty.

The threats posed by human disturbance during and after Project construction, habitat loss and fragmentation, road mortality, and intra-specific aggression are relevant to this Project and will be discussed in the remainder of this Biological Opinion.

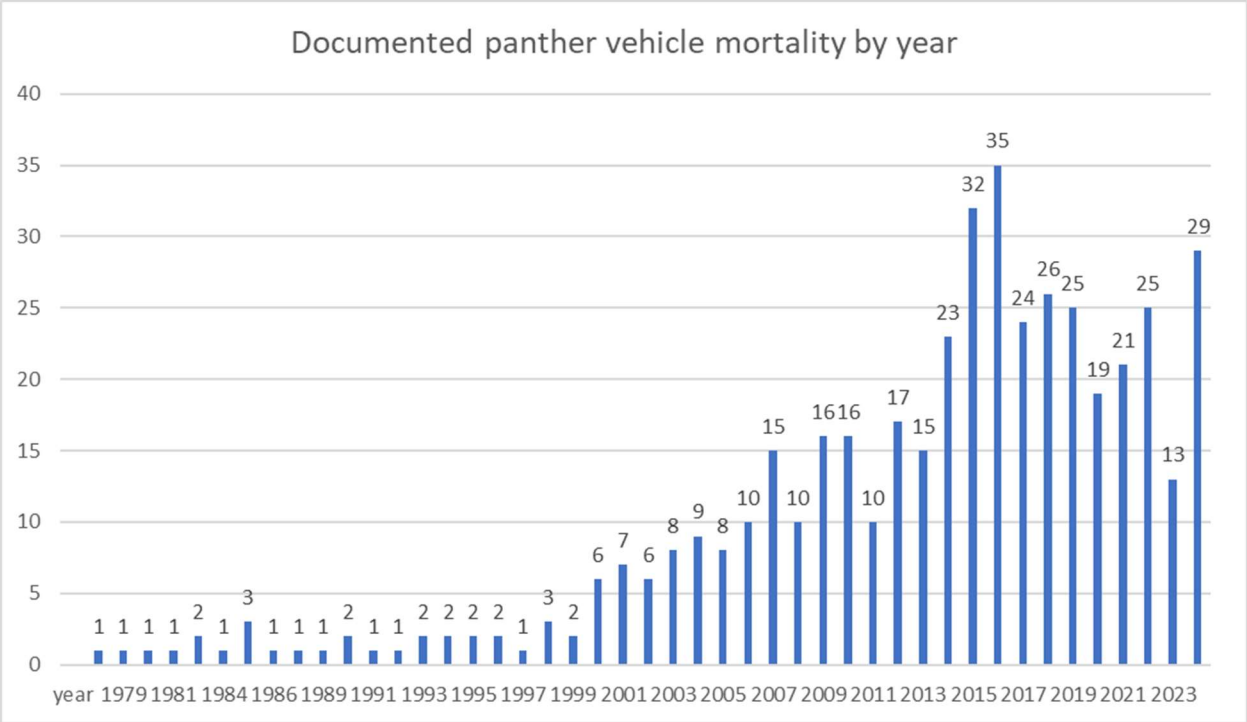

Figure 6. Yearly PVM counts for the state plotted along with annual panther counts (McBride & McBride, 2015), on the original scale.

Tricolored bat

The primary threat to this species is the disease white-nose syndrome, but TCB is also adversely affected by the loss of suitable foraging and roosting habitat. Threats to the survival and recovery of the tricolored bat that are relevant to this consultation are conversion and degradation of suitable roosting and foraging habitat. The Project's adverse effects to TCB will be discussed in the remainder of this biological opinion.

ENVIRONMENTAL BASELINE

Environmental baseline refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. The impacts to listed species or designated critical habitat from Federal agency activities or existing Federal agency facilities that are not within the agency's discretion to modify are part of the environmental baseline.

Status of the species within the action area

Audubon's caracara

The Project lies within the consultation area for the Audubon's crested caracara (caracara) and contains approximately 5,460.83 acres of foraging and/or nesting habitat, dominated by citrus grove (4,052.42 acres). A caracara survey conducted in 2022 identified an active nest on the Project site, which successfully fledged juvenile caracara that year. Additional adult caracara were observed throughout the property during the survey effort, but no other nests were found. Because the Service's survey protocol is designed to determine caracara presence and nesting activity only, the shape and size of the pairs' territory is unknown. Caracara home ranges are known to vary from approximately 1,000 ac to approximately 5,000 ac, with an average home range of approximately 3,000 ac (Morrison 2001). Using the average territory size of 3,000 ac in a circular configuration, the Service expects that 929.93 ac of the Project site is within the documented pair's territory. Based on this calculation, the unknown true size and shape of the known caracara pair territory, and observation of additional adult caracara during the survey, it is expected that other caracara pair may be using the remaining suitable habitat on the proposed Project site, supporting portions of up to six caracara territories.

Eastern indigo snake

The indigo snake is a habitat generalist with a large home range (Layne and Steiner 1996, Service 1999), and is known to use most of the habitat types found within the Project footprint. Though indigo snakes have been found in all available habitats of South Florida, it is thought they prefer hammocks and pine forests since most observations occur there and use of these areas is disproportionate compared to the relatively small total area of these habitats (Steiner *et al*. 1983). The Services' Geographic Information System (GIS) database contains multiple records of indigo snakes located from 1.43 miles east to 2.3 miles west of the Project. Although these observations are outside of the typical 0.62 mile consultation buffer for this species, contiguous habitat has remained unchanged between the recorded occurrences and the Project footprint. Provided the proximity of confirmed presence of the species and abundance of suitable habitat onsite, the Service considers all suitable habitat onsite to be occupied by the indigo snake, encompassing a total of 5,462.52 acres.

It is difficult to estimate the density of indigo snakes occurring within the Project site due to the lack of reliable survey methods for the species. In Bauder *et al*. (2016), indigo snake radio telemetry data was summarized to provide an estimated mean annual home-range size of 369 acres for males and 121 acres for females. Considering overlap between the sexes, we estimate the 5,462.52 acres of suitable habitat within the Project site could support up to 46 females (5, 462.52 /121 = 45.14, rounded to 46) and 15 males (5, 462.52 /369 = 14.8, rounded to 15) if all suitable habitat was occupied. In addition, we expect each female snake to be active during breeding season, accounting for up to 46 nests with eggs.

The Project site has experienced varying levels of land conversion and habitat degradation over the last 50 years. Of the 5,462.52 ac indigo snake habitat onsite, approximately 4,818.5 ac have been used for agricultural pursuits, largely converted to citrus (2,806.8 ac). To facilitate this land use, ditches and swales were created throughout the Project site, drastically altering the

hydrology of the site. Additionally, fire was suppressed to maintain the viability of the commercial operations, contributing to the degradation of the remaining natural habitat on the property. Collectively, this human activity has adversely affected the amount and quality of the available indigo snake habitat in the action area.

Panther

This Project contains approximately 6,350.80 acres of Florida panther (panther) habitat and is within the Primary and Secondary Zones of the focus area (Service 2007). Collectively, the Primary and Secondary zones comprise approximately 3,082,600 acres of land in south Florida, with approximately 2,183,721.38 acres in conservation. Panther sign was observed onsite during site assessments conducted by the Applicant's consultant in 2022. The closest identified panther den is approximately 0.45 miles west of the Project site. The number of panthers that may use the Project area is not known but based on varying density estimates of between 1.37 and 4.03 panthers per 100 square kilometers (Onorato et al. 2011), between 0.35 and 1.03 panthers could include the Project site as part of their home territory. Furthermore, using estimated home range sizes (Lotz et al. 2005), roughly 10.15 to 21.85 percent of an individual male (62,542 acres) or female (29,059) panther's home range, respectively, is within the Project site. For context, the 2,183,721.38 acres within the primary and secondary zones under conservation could account for the home ranges of 34 male and 75 female panthers. Male and female panther home range size is inversely related to habitat quality, the greater the extent of agricultural land and wetland habitats, the larger the home range, and the greater the extent of mixed hardwood forests and dry pine forests, the smaller the home range. High-quality habitat produces abundant prey and promotes female panther reproductive success (Maehr 1992b; Maehr et al. 1989). We assume panthers are present within the action area and will be affected by the project from habitat loss but a population estimate cannot be made. Based on average home range size, no more than 1 or 2 panthers are likely to be present on the Project site at any given time.

According to the Service's GIS database, since monitoring of panthers began in 1982, there have been 427 documented panther deaths within the Action Area (e.g. within 25 miles of the proposed Project) through January 10, 2025 (Figure 7). Specifically, 315 of those deaths were attributed to motor vehicles, 43 were due to intraspecific aggression, 4 were illegally killed, and 65 were due to other causes (disease, starvation, etc.). We acknowledge that these totals are a snapshot of a dynamic statistic and may not reflect the most up to the minute information; however, we provide this data insofar as, based on population size, these causes represent the variety of ways that panthers are most often killed. Based on the data above, the majority of panther deaths within the Action Area occurring since 1982 have been attributed to motor vehicle collision. However, evaluation of both the Action Area and range-wide 2014 through 2022 datasets (FWC 2023) indicates no clear trend in panther deaths, while traffic has increased statewide and by more than 50 percent on Corkscrew Road and State Road 82 alone since 2018 (FDOT 2023). The Service acknowledges there may be a lag effect in terms of species response to an external stressor such as vehicle traffic but also acknowledges the potential biases of documenting a panther killed by a motor vehicle as opposed to another cause.

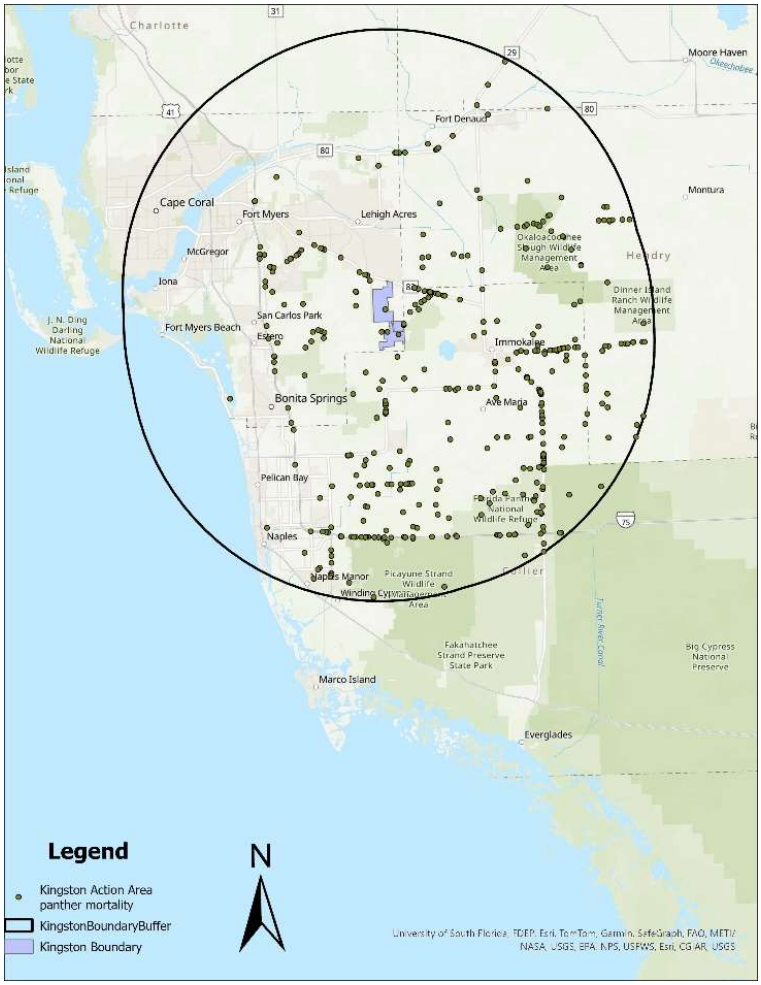

Figure 7. Documented panther mortality from all causes within the Action Area of the Kingston Project.

Tricolored bat

This Project lies within the range of the proposed Federally endangered tricolored bat (TCB). The entire Project site contains suitable TCB foraging and/or roosting habitat, which commonly forage along waterways and forest edges, and roost primarily in deciduous hardwood trees (Service 2021b). According to data available through the U.S. Geological Survey North American Bat Monitoring Program, the TCB has been detected via acoustic surveys in the area of Corkscrew Swamp Sanctuary in 2007 (USGS 2023). TCB will use leaf clusters, moss, lichens, and some evergreen trees to roost during the non-hibernating season, and move to more robust (caves, mines, etc.) shelter to hibernate. In the southern portions of its range where caves are limited, TCB typically hibernate in road-associated culverts (Service 2021b). A recent study on TCB by Smith et al. (2022) found evidence that suggests TCB at the southern edge of its range (i.e. south Florida) may move north to find cooler hibernacula to support torpor and reproductive success. Furthermore, as TCB generally move between winter hibernacula and summer roosting sites, up to 151 miles (Samoray et al. 2019), this species may only use the Project site seasonally. There are no density estimates for TCB within this portion of the species' range, therefore the number of individuals within the Action Area is unknown.

Climate Change

Our analyses under the Act include consideration of observed or likely environmental effects related to ongoing and projected changes in climate. As defined by the Intergovernmental Panel on Climate Change (IPCC), "climate" refers to average weather, typically measured in terms of the mean and variability of temperature, precipitation, or other relevant properties over time; thus, "climate change" refers to a change in such a measure which persists for an extended period, typically decades or longer, due to natural conditions (*e.g.,* solar cycles) or human-caused changes in the composition of the atmosphere or in land use (IPCC 2013, p. 1450). Because observed and projected changes in climate at regional and local levels vary from global average conditions, rather than using global scale projections, we use "downscaled" projections when they are available. In our analysis, we use our expert judgment to weigh the best scientific and commercial data available in our consideration of relevant aspects of climate change and related effects. Based on the observed trends in the climate record gathered from thousands of temperature and precipitation recording stations around the world and changes observed in physical and biological systems, the scientific community is certain that the earth's climate is changing and a warming trend in the climate is occurring (USGS 2019).

Florida is vulnerable to pulse events and sea level rise as well as to changes in rainfall and temperatures expected due to changes in environmental trends. National Oceanic and Atmospheric Administration (NOAA) (2017) model simulations using the more recent Coupled Model Intercomparison Project Phase 5 (CMIP5) predicts changes in precipitation seasonally for South Florida with increases in dry season rainfall up to 20 percent and decreases in wet season rainfall up to 30 percent. The change in timing of rainfall will likely stress ecosystems and cause changes in vegetation types. Increased rainfall associated with climate change could reduce the ability to effectively use prescribed burning to manage habitat in optimal conditions for panthers and their prey, TCB roost trees, and caracara foraging areas. Increased rainfall could also reduce the amount of area suitable for caracara, indigo snakes, panther denning, and TCB roosting by increasing the area covered with standing water or the duration of inundation of seasonally wet areas. A decrease in precipitation or prolonged drought could affect food availability for these species and ultimately affect their productivity and survivorship.

It is difficult to estimate, with any degree of precision, which species will be affected by climate change or exactly how they will be affected. The Service will use Strategic Habitat Conservation planning, an adaptive science-driven process that begins with explicit trust resource population objectives, as the framework for adjusting our management strategies in response to climate change (Service 2006).

EFFECTS OF THE ACTION

Effects of the action are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action but that are not part of the action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action. (50 CFR 402.02).

Audubon's crested caracara

Development

The Applicant proposes to develop a mixed-use community, as well as preserve and enhance native upland and wetland habitats on an approximately 6,687 acres site. Through these actions, approximately 3,238.85 acres of suitable caracara habitat will be converted to development. Of the 3,238.85 acres development, approximately 2,806.8 acres is current citrus grove in various stages of production. Caracara home ranges are known to vary from approximately 1,000 acres to approximately 5,000 acres, depending on habitat suitability and proximity to other caracara territories (Morrison 2001). To account for this variation in home range size and lack of more specific data, we will use an average home range of approximately 3,000 acres for our analysis. Based on the results of the caracara survey, known nest location, observations of adult caracara, and average home range sizes, the Project site could support portions of six caracara territories. Accordingly, the development of 3,238.85 acres would constitute a complete loss of an average caracara territory. However, this conversion of habitat is expected to occur across the Project footprint and is not anticipated to be located within any one caracara territory. In addition, most of this available habitat is citrus grove and largely considered marginally suitable for caracara. Nevertheless, this habitat loss could result in increased intraspecific aggression with adjacent caracaras if the pair(s) move into neighboring territories in search of forage and nesting sites. This aggression and/or decrease in foraging area could also ultimately result in a lower reproductive potential for the displaced pair as well as the pair occupying the area receiving the displaced pair. As we do not know the territory boundaries of any affected caracara, overall resource availability, or an individual bird's tolerance of another, the Service cannot reliably predict how the Project will affect caracara aside from acknowledging the caracara nesting onsite are anticipated to experience a shift in foraging area.

In addition to habitat loss, we anticipate the noise and activity from personnel and vehicles during site preparation and construction would disturb foraging or nesting caracara, potentially leading birds to change their behavior and abandon a foraging or nesting area. The degree of disturbance is related to the distance of these activities from the nest, as well as the nesting pairs' tolerance to human activities. Adverse effects could range from abandoning a nesting attempt, if construction is close to the nest during breeding season, to general avoidance of the area for foraging. The avoidance and minimization measure of maintaining a 984-foot exclusion buffer around an active nest is expected to reduce this risk of abandoning a nest attempt; however, avoidance of the Project site for foraging could still adversely affect the breeding pair through lowering the adult fitness and/or reproductive success of a nest (via lower adult fitness or decreased food availability for young). Because we expect the caracara that use the Project site to also utilize suitable habitat offsite, we anticipate that these caracara may be less disturbed by noise, equipment, and human activity. Furthermore, the suitable caracara habitat onsite will be ultimately converted to development, eliminating suitability for use by caracara. Therefore, the effect of disturbance is expected to be superseded by the habitat loss described above.

Conservation and Restoration

Intense habitat restoration work will take place on portions of the 3,293.9 acres within the conservation areas on the Project site. Activities associated with the restoration and management

have the potential to adversely affect the caracara. Restoration work includes conversion of citrus grove to native land cover types via clearing, earth moving, and planting of appropriate vegetation, converting approximately 422 acres of grove and cropland to wet prairie. In addition, existing areas of native land cover types would undergo mechanical and chemical invasive vegetation treatment. Disturbance due to noise and vibration from personnel and equipment during restoration activities could adversely affect caracara by causing them to temporarily avoid the area. Conversely, the clearing of citrus and other crops may expose prey items that could attract caracara. Because of the temporary nature of the disturbance and expected improvement of habitat suitability for caracara, the conservation and restoration actions proposed are not expected to increase risk factors to this species and are anticipated to be beneficial to caracara.

Eastern indigo snake

Residential Development

Due to the nature of the proposed action (i.e., vegetation removal, earth moving and piling, earth scraping, grading, transport of construction materials by trucks), the Service finds that indigo snakes present on the Project site at the time of the action could be incidentally injured or killed. Motorized vehicles and heavy equipment used during land clearing have the potential to crush indigo snakes, their nests, and eggs. Indigo snakes can also be buried in their burrows and other refugia. The Service notes that the Standard Protection Measures (SPMs) (Service 2021) will be implemented during construction of the Project. The SPMs require: the education of contractors and equipment operators; posting of speed limit signs on all roadways during Project construction and operation; on-site signs explaining the penalties of intentionally running over indigo snakes; and that construction will cease if indigo snakes are observed. Further, any observations of indigo snakes shall be reported to the Service both during construction and in final report submitted at the completion of construction activities. Reports shall be sent via email to FW4FLESRegs@fws.gov within 48 hours of observing a live, injured, or dead indigo snake and notice of completion within 30 days following construction. Based on the implementation of these protective measures, we find that the potential for injuries and deaths of indigo snakes due to land clearing will be reduced, but injuries and mortalities could occur. The permanent loss of habitat resulting from the proposed Project will adversely affect the indigo snake by reducing the amount of habitat available for breeding and feeding. The Project will result in the loss of approximately 3,242.08 acres of habitat within the development footprint. The land will be converted to land uses (i.e., commercial and residential development) that are not expected to be used by indigo snakes or their prey. The acreage lost represents a small portion of habitat remaining for the indigo snake in Florida. Habitat lost due to the Project will also result in a minor reduction in the geographic range of the species, as well as the fragmentation of existing indigo snake habitat in the region.

Disturbance due to noise and vibration from personnel and equipment during site preparation, clearing, and construction activities will likely adversely affect indigo snakes by causing them to vacate their territory. Some snakes may move into the Project's interior preserve areas, though they are likely too small and isolated to support indigo snakes long-term. The loss of habitat within the development footprint could force indigo snakes to leave the Project site, or move into the Project's conservation area, and establish new home ranges. Individuals that move into the

Project's conservation area would be affected by the restoration and management activities described below. Indigo snakes may be killed or injured while crossing the major roads along the northern and southern borders of Project site, State Road 82 and Corkscrew Road, while attempting to leave the area. Individuals that successfully cross the road or leave the Project site would be more vulnerable to predation and intraspecific aggression as they attempt to establish new home ranges. The loss of a home range would be expected to impair the indigo snake's ability to feed, breed, and shelter until a new home range is established.

Individuals that leave an established territory may miss foraging and mating opportunities and these individuals may be more vulnerable to predation as they are forced into other areas. We anticipate that some of the snakes that leave the development footprint because of the disturbance from construction would establish new territories or modify existing territories. However, others may die of predation or lack of food. It is difficult to determine the exact number of indigo snakes (adults, juveniles, hatchlings and nests) that would be affected by disturbance due to the Project. However, as previously described, we estimate that at least 36 adult indigo snakes and 27 nests could be present within the development footprint and would be affected by land clearing and construction activities.

The activities of humans living in the residential development following completion of the Project may indirectly adversely affect indigo snakes. The presence of humans and their pets will increase the potential for injuries or mortalities of any indigo snakes remaining in the conservation area or migrating into the development area. Some humans fear snakes and may indiscriminately attack or kill indigo snakes when encountered. Free-roaming pets of residents may also injure or kill snakes. Finally, collisions from motor vehicles using the roads in and near the new development will increase the potential that any indigo snakes remaining in the Project area will be injured or killed. The number of indigo snakes injured or killed resulting from these activities is expected to be small.

Conservation and Restoration

Intense habitat restoration work will take place on portions of the 3,293.9 acres within the conservation areas on the Project site. Activities associated with the restoration and management have the potential to adversely affect the indigo snake. Due to the nature of the proposed restoration work (i.e., vegetation removal, earth moving and piling, earth scraping, grading, transport of construction materials by trucks), the Service estimates that indigo snakes present at the time of the action could be adversely affected by the Project. The earth moving, scraping, and piling have the potential to crush indigo snakes, their nests, and eggs. Snakes can also be buried in their burrows and other refugia. To help minimize the potential for injuries and mortalities of indigo snakes during the restoration work all personnel involved in the restoration effort will follow the indigo snake SPMs. The Service finds that the protection measures to be employed by the Applicant will reduce the potential that injuries and mortalities of indigo snakes will occur during the restoration work. However, injuries and mortalities of indigo snakes could still occur.

Disturbance due to noise and vibration from personnel and equipment during restoration activities will likely adversely affect indigo snakes by causing them to temporarily vacate their territory. This temporary disturbance may cause them to miss foraging and mating opportunities

and these individuals may be more vulnerable to predation and intraspecific aggression as they are forced into other areas. Once restoration is complete, the conservation area will provide improved habitat for the indigo snake. Periodic monitoring and management (such as exotic plant treatment and prescribed fires) may also cause temporary disturbances to indigo snakes. However, the number of indigo snakes injured or killed due to these activities is expected to be small.

Florida panther

Development

The proposed Project incorporates the conversion of approximately 3,393.61 acres of panther habitat to commercial and residential development. More specifically, habitat loss would amount to 498.06 acres in the Primary Zone and 2895.55 acres in the Secondary Zone of the Service's Panther Focus Area. Most of the developed area (3,213.7 acres of 3,393.61 acres) consists of row crops or citrus groves that provide only minimal habitat value to the panther. The remaining 179.91 acres of the development areas consists of open water (129.22 acres), disturbed lands (46.67 acres), and scattered native cover types (4.02 acres). The land will be converted to residential and commercial development and is not expected to be used by panthers or their prey following construction of the Project.

The habitat lost due to the Project may adversely affect the panther by decreasing the spatial extent of lands available to the panther and its prey. According to the most current home range estimates of the panther (Lotz et al. 2005), the 3,393.61 acres of habitat lost represents 11.67 percent of a female panther's average home range or territory (29,059 acres) and 5.42 percent of a male panther's average home range or territory (62,542 acres). Based on the habitat preference values in Onorato et al. 2011, the loss of approximately 3,393.61 acres of panther habitat approximates the loss of habitat carrying capacity for between 0.18 and 0.55 panthers, based on varying density estimates of between 1.37 and 4.03 panthers per 100 square kilometers. Using the higher end of the range (0.55), the anticipated level of take-associated habitat loss on the Project is 0.55 (rounded to 1). Therefore, we expect no more than 1 female and 1 male panther to be adversely affected by this habitat loss. We do not expect direct mortality of panthers to result from the habitat lost due to the Project. The Consultant used the Service's Panther Habitat Assessment Methodology (2012) to determine the amount of panther habitat units (PHUs) needed to compensate for the panther habitat lost on the Project site (Enclosure C). Based on the use of this methodology, it is the Service's judgement that the PHUs provided by the conservation and restoration of the onsite preservation areas and the credits acquired from the Panther Passage Conservation Bank, and Corkscrew Regional Mitigation Bank adequately compensate for the habitat lost to development and any resulting harm to panthers.

Habitat loss due to the Project has the potential to increase intraspecific aggression among panthers in the Project area. As discussed in the section entitled "Status of the species in the action area," panther mortalities resulting from attacks of conspecifics are known to occur in the panther population (e.g., males may kill other rival males when defending a territory). Habitat loss may increase the potential for intraspecific aggression among panthers in the action area by reducing the amount of land available to a panther for its territory. A reduction in territory size due to habitat lost due to the Project may cause a panther to attempt to expand its territory in

search of a requisite resource (e.g., prey, mates, etc.) and increase the potential for interactions with conspecifics (i.e., other panthers). Such interactions usually result in a fight that often ends in the death of one of the participants. We acknowledge that we currently do not have a method to estimate the future number of panther mortalities in the action area resulting from intraspecific aggression due to habitat lost. However, because the development area is only expected to support a portion of a panther's territory, we do not anticipate any change in the potential for intraspecific aggression due to habitat lost from the Project to translate into a measurable increase in panther deaths in the action area.

The operation of heavy equipment (e.g., bulldozers, graders, skip loaders, etc.) and other motor vehicles in the construction footprint have the potential to injure or kill panthers (i.e., panthers could be crushed due to collisions with construction vehicles). Panthers are intelligent and highly vagile. Moreover, construction vehicles are likely to move at relatively slow speeds, and operate when panthers are less active (i.e., daytime). Therefore, we expect that panthers will be able to avoid construction vehicles during construction of the Project and find that injuries and mortalities of panthers resulting from construction vehicles are unlikely to occur.

The increase in noise and human activities due to construction activities will increase disturbance to panthers in the Project vicinity during construction of the Project. Consequently, the Service notes that these activities may cause resident or dispersing panthers to avoid the Project site during construction. Moreover, resident panthers may adjust their territories due to the disturbance. The effect of the disturbance to the panther due to construction activities is expected to be temporary and will not result in permanent changes in the use of lands by panthers adjacent to the Project footprint.

Motor vehicles use the main roadways adjacent to the Project footprint (Corkscrew Road and State Road 82) and the principal highways and roads in the action area (i.e., State Road 29, Interstate 75, Alico Road) currently, and will continue to, provide a threat to panthers in the Action Area. Injuries and mortalities of panthers due to collisions with motor vehicles can result when panthers attempt to cross roads that contain cars and trucks travelling at high speeds. This risk may be increased when panthers attempt to cross a roadway at night because they can be easily blinded and disoriented by motor vehicle lights and may misjudge the speed and location of moving vehicles. As indicated above, panther injuries and mortalities due to motor vehicle strikes are commonly documented in the Action Area (315 panther deaths resulting from vehicle collisions have been recorded in the Action Area by the FWC from December 23, 1979, through January 10, 2025 [Figure 7]).

The construction of new residential and commercial development associated with the Project is expected to contribute to additional motor vehicle traffic on roadways near the Project site and in the action area. The increase in motor vehicle traffic is expected to result from 1) the motor vehicles of new residents that purchase and live in the newly constructed homes associated with the Project; and 2) motor vehicles resulting from new workers commuting to jobs established at the newly constructed office space for commercial and civic/institutional developments, and 3) delivery or service vehicles travelling to the newly constructed Kingston development and 4) workers traveling to and from the development sites during construction. All internal roads constructed as a component of the Project will be fenced or separated by water features. These internal roads have been designed to be inaccessible to panthers. Therefore, any increase in

traffic associated with the project that could pose a risk to panthers will join existing vehicles on existing roads.

Although vehicle traffic is a prominent risk to panthers and other wildlife, the Service is unable to describe, with any certainty, how the project would alter (increase or decrease) the likelihood of motor vehicle strikes regardless of any traffic changes expected from the Project. Many factors, including the number of panthers in proximity to roadways, the vagaries of panther movement, the availability of suitable panther habitat near roadways, traffic speed, driver error, and road design (Schwab and Zandbergen, 2011), influence the probability of motor vehicle strikes and subsequent injuries or deaths of panthers when attempting to cross a roadway. Moreover, panthers may change their behavior in response to increased traffic density in unpredictable ways. In addition, non-construction traffic generated by the Project would occur incrementally as houses are built and become occupied over a 20-year time period, possibly changing behavior patterns resulting in panther avoiding the area and congested roadways. Regardless, to minimize any potential traffic related effects on panthers and other wildlife, the proposed Project will provide funds for roadway improvements (fencing, wildlife crossing, signage, etc.) within the Action Area. Indirectly, the Project will also reduce the length of roadway accessible to panthers which may lower risk of vehicle collision as the individual may be directed towards a wildlife crossing.

The Service has given this issue extensive consideration. When providing "Technical Assistance" documents for other proposed developments, in compliance with a process set forth in FWS's Biological Opinion for EPA's approval of the Florida State 404 permitting program which was subsequently vacated, the Service has previously attempted to use the past number of panther vehicle-related injuries and mortalities documented either within segments of roadways in or near a project site or range wide coupled with modeled future traffic numbers to describe the future number of panther motor vehicle strikes anticipated from a development project. However, through defending this technical assistance, the Service recognized that the variability of the estimates calculated with these methods was substantial and, in fact not plausible based on existing information about the number and distribution of panthers on the landscape. Further, additional studies show that an increase in panther vehicle mortality does not directly correlate with an increase in traffic volume (see figures 8 and 9 below). Accordingly, we find that the best scientific and commercial data available does not allow us to reasonably conclude how the project would impact panther vehicular injuries and mortality, nor attribute such cases to the proposed Project. Instead, as it relates to developments such as this, the Service believes that general traffic impacts to panther are more appropriately addressed in the environmental baseline or cumulative effects, as appropriate. The Service will continue to consider this issue in the context of the best scientific and commercial data available.

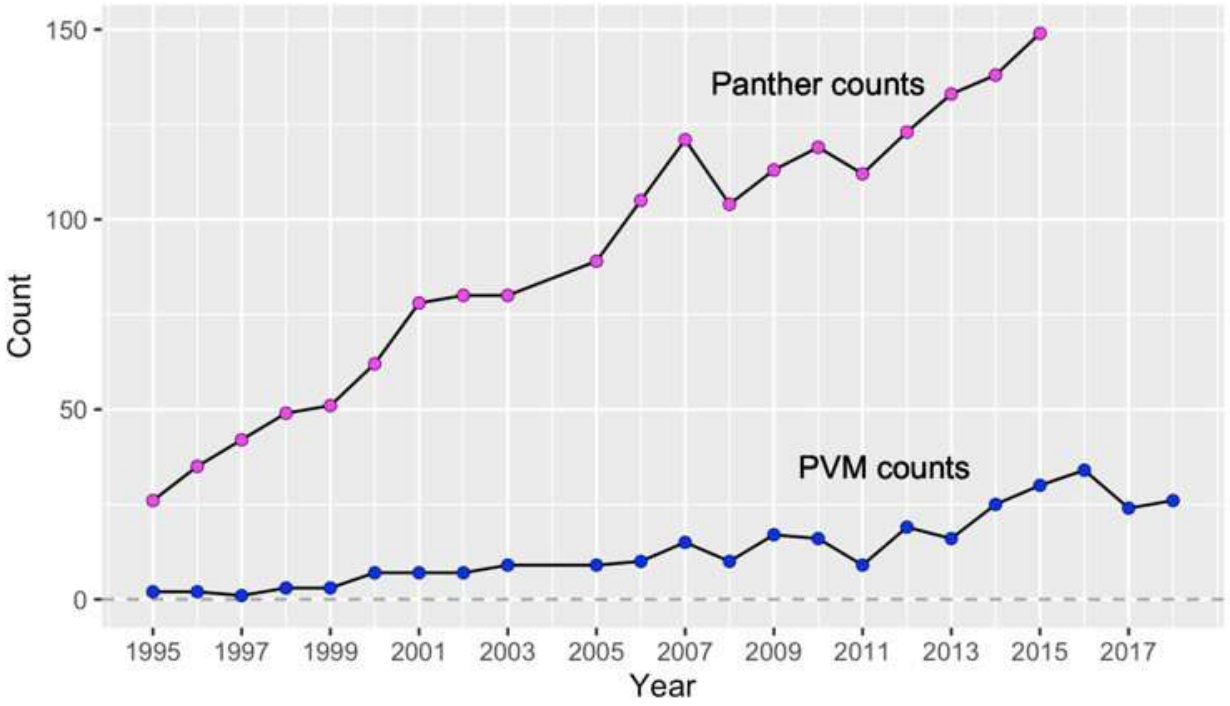

Figure 8. Showing relationship between the minimum number of panthers known alive in each year and the recorded number of panther vehicle collisions (Higgs 2020 Technical Memorandum).

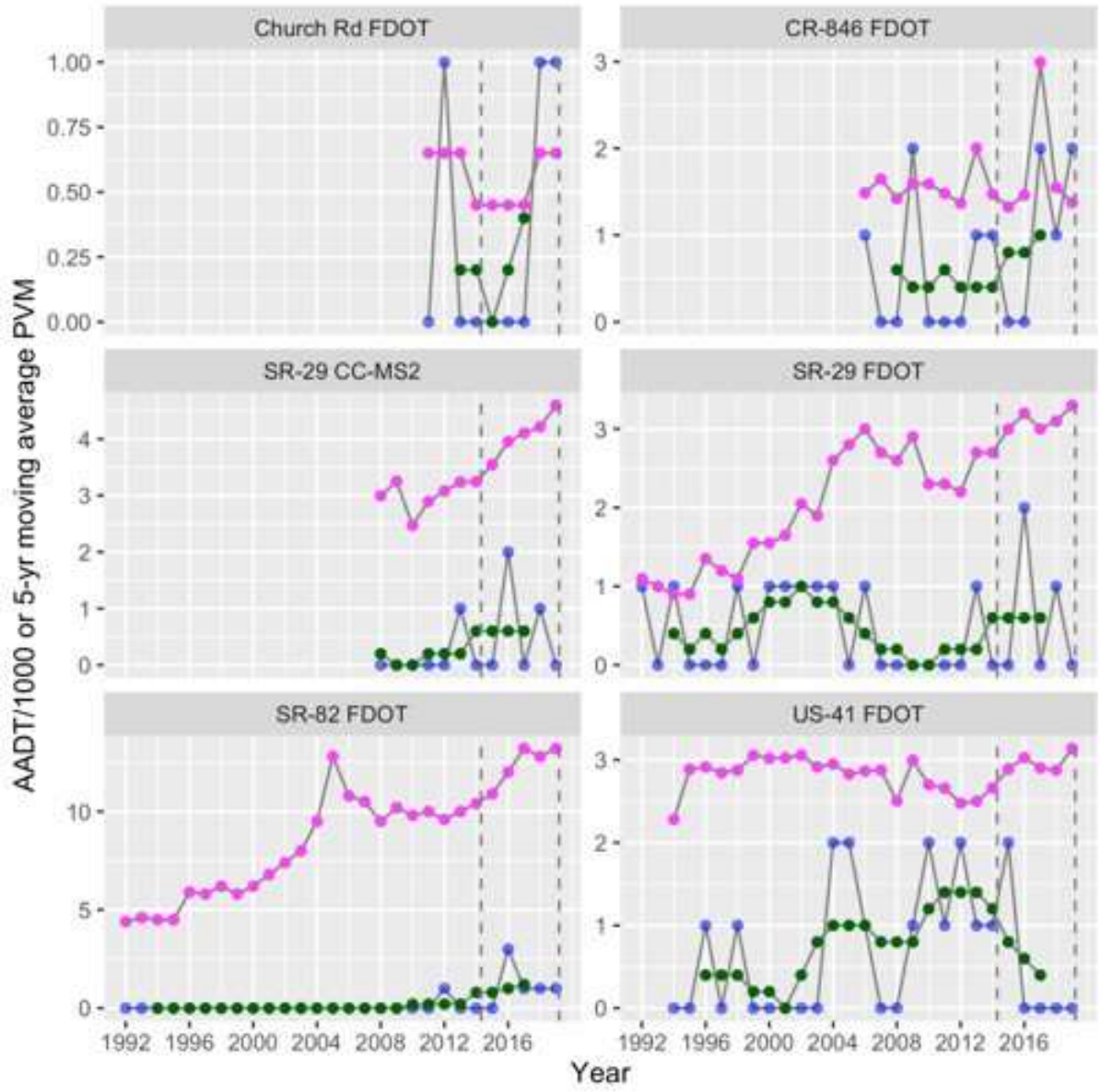

Figure 9. 5-yearly AADT divided by 1000 (pink data points), yearly PVM (blue data points), and the 5-year moving averages plotted at the midpoint year (green data points). SR-29 has AADT data from Collier County (CC-MS2) and FDOT starting in 2008 and these are shown in two different panels. Note the y-axis scales differ across panels (Higgs 2020 Technical Memorandum).

Conservation and Restoration

The proposed Project incorporates the conservation and restoration of approximately 3,293.89 acres of panther habitat, with approximately 1,520.37 acres located in the Primary Zone and approximately 1,773.53 in the Secondary Zone. According to the home range estimates described above, this conservation area could support 11.34 percent of a female panther's territory and 5.2 percent of a male panther's. These lands will be comprised of pine forest (1,606.25 acres), forested wetland (650.05 acres), herbaceous wetland (423.85 acres), and 613.74

acres of other native cover types. Restoration activities include the planting of approximately 120,000 trees and 4,500,000 ground cover plants to enhance the habitat for on-site wildlife species. This includes the restoration of 422± acres of wetland flow-ways that will re-establish the north to south flow of water through the Project that existed historically. The wetland flow-way system will provide an extensive treatment train for nutrients, significant water quality benefits, and high-quality wildlife habitat from agricultural lands that have been degraded for decades. The Project has been designed to conserve and restore native habitat that maintains and improves existing wildlife corridors. Restoration and habitat management activities within the conservation areas may temporarily disturb panthers but this disruption is not expected to significantly alter panther behavior and is anticipated to benefit panther and their prey.

As described above in the *Minimization and conservation measures* section, the Project will also provide funding to the Fish and Wildlife Foundation of Florida, the Lee County Corkscrew Road proportionate share fund, as well as acquire 4.57 credits from the Corkscrew Regional Mitigation Banks and 3,774.11 conservation bank credits from the Panther Passage Conservation Bank. Collectively, Project implementation will contribute to roadway improvements to provide safer travel of panther on the landscape as well as conserve and manage panther habitat in perpetuity.

Tricolored bat

Development

Potential effects to the TCB due to the proposed development include a number of direct and indirect effects on the bat and its habitat. Potential direct effects include: (1) direct mortality from conversion of 3,371.3 acres, of which 3.2 acres are native forested areas and potential roosting sites; (2) harassment by construction activities; and (3) disruption of normal behaviors from the conversion of available habitat for roosting, foraging, breeding, and dispersing. Potential indirect effects include reduced foraging and roosting opportunities due to habitat loss. The timing for construction of this Project, relative to sensitive periods in the life history of the TCB, is unknown.

Any actions that occur in areas known to be occupied by the TCB and result in the removal of potential roost sites (i.e., snags, trees, utility poles, buildings, etc.) or impact foraging habitat (i.e., filling in of canals and ditches) are likely to have direct and indirect adverse effects to the TCB and its habitat. The Service evaluated the Project in the context of how the action has the potential to result in both beneficial and adverse effects to the TCB, at the individual, population, and landscape scales. The use of specific minimization measures as part of the action such as pre-construction roost surveys, preservation of roost trees, the use of avoidance buffers around known roosts, and retention of potential roosting habitat (wherever possible) are expected to significantly reduce the potential adverse effects to the TCB as a result of construction activities. However, some adverse effects to the TCB are likely to occur despite the inclusion of these measures into the proposed action.

TCB that occupy a removed roost may be able to flee to nearby refugia, though flightless young would be expected to be lost. Fleeing TCB could be exposed to additional predators as well as elevated body temperatures as a result of daytime flight. With limited roost size data and no site-specific roost locations, there is no reliable method to estimate how many TCB may be affected

by this action. However, based on the life history of the species, we expect that the majority of TCB affected by construction activities would be limited to harassment of bats capable of flight.

Following development, the Project site is expected to be a source of light pollution as well as insecticide use which could limit the future use of the area by TCB. As described in the 'Avoidance and Minimization Measures' section above, lighting initiatives and insecticide best practices will be implemented to minimize the effects of these stressors.

Conservation and Restoration

Restoration activities within the 3,293.9 acres conservation area will include the removal of potential TCB roosts if present in exotic vegetation or hazardous trees, as well as contribute to disturbance of any TCB in the area. Effects of these actions are expected to be similar to those discussed in the 'Development' section above, ranging from temporary harassment to injury or mortality. Reclamation of agricultural lands to native land cover types and habitat enhancement via treatment of exotic vegetation is anticipated to be beneficial to the species.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, Tribal, local or private actions that are reasonably certain to occur in the action area considered in this Biological Opinion. Future Federal actions unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. The following section includes an analysis of the potential cumulative effects on the Florida panther from known projects located within the action area.

The panther action area has been defined to include the portion of the current panther range in which panthers are likely to be directly or indirectly affected by the proposed action. The Service action area includes all lands within a 25-mile radius of the Project site.

Our projection of non-Federal actions (*i.e.,* cumulative effects) in the Action Area incorporates Florida Land Use Cover and Forms Classification System (FLUCCS) mapping to decide if a property may be exempt from Federal Clean Water Act, section 404 wetland regulatory review by the Corps. We acknowledge it is difficult to forecast development related to non-Federal actions in the Action Area and it comes with unknown uncertainty. To assess if a development project would likely be exempt from regulatory review, we identified the percentage of the project site that was classified as wetland habitat based on FLUCCS 600 series (wetland), and the 411 and 419 (hydric pine flatwood) mapping unit classifications. Projects on properties with less than 5 percent wetlands were considered exempt from the Corps' regulatory review because impacts to wetlands could likely be avoided by project design.

Based on this approach, and information provided by the Applicant's consultant, the Service finds that from 2020 through 2023, 1,442 projects in the Action Area affecting approximately 30,599.34 acres were exempt from regulatory review. Therefore, the Service estimates approximately 7,649.835 acres per year (30,599.34 acres/4 years = 7,649.835 acres per year) would be exempt from regulatory review in the Action Area. We find this value is representative of future yearly development likely to occur in the Action Area. The Service notes many unforeseen factors can affect development in the Action Area. However, the Service believes the

rate of development based on 2020-2023 development provides a reasonable approximation of non-Federal actions reasonably certain to occur and meets our definition of a cumulative effect. This level of development represents 26.3 percent of a female panther's average home range (29,059 acres) and 12.2 percent of a male panther's average home range (62,542 acres), annually. However, we expect the development to be spread over multiple home ranges instead of that belonging only to one female and one male Florida panther. This level of development also represents 0.85 percent of the 898,967.784 acres of non-urban private lands at risk of development in the panther primary and secondary zones in the Service's focus area. In relation to the anticipated buildout timeline of the proposed Project, non-Federal actions could develop approximately 152,996.7 acres (7,649.835 acres per year multiplied by 20 years) without regulatory review. In conjunction with the project, this would amount to 156,960.31 acres or 17.46 percent of the estimated 898,967.784 acres of non-urban private lands at risk of development in panther primary and secondary zones in the Service's focus area by 2045. It should be noted that lands within the panther focus area are not the only areas available for development and we would expect a subset to occur within those 898,967.784. In addition, it is also expected that as this Project is built out, there will be a reduced likelihood that smaller, non-Federally reviewed actions will be needed to meet the commercial and residential needs of the rapidly growing human population in this area.

Based on the above analysis, we believe the effects to the panther due to habitat loss associated with these lands will be minor in the short term but may increase as development continues to occur in the future in the Action Area. Consequently, the Service continues to monitor the effects of habitat loss to the panther throughout its range, and we encourage project proponents to develop Habitat Conservation Plans and seek Incidental Take Permits under section 10 of the Act to receive take coverage and minimize and mitigate any adverse effects to the panther resulting from non-Federal actions if not covered under Section 404 permitting.

In addition to land development, these non-Federal projects have contributed, and are expected to continue to contribute, to additional motor vehicle traffic in the Action Area as a cumulative effect. As discussed in the Effects of the Action section above, there have been 222 documented panther-vehicle collisions within the 25-mile action area between December 1979 and September 2023. Non-federal projects are typically small, isolated developments that contribute to the risk of panther vehicle mortality but provide little to no mitigating efforts. All vehicles that operate on roadways where and when panthers may be present have the potential to strike an animal, regardless of Federal involvement in a project. Time of day, travel route, speed, attentiveness, and many other factors contributing to the possibility of hitting a panther are decided by the vehicle's driver. The Service continues to engage with local and county governments, the Florida Department of Transportation, and other stakeholders to educate drivers and fund projects that contribute to a panther's ability to safely cross a roadway and minimize any potential cumulative effects. As outlined in the Effects of the Action section, the Service does not have a reliable method to predict the number of panthers that may be hit by vehicles in a given time period, irrespective of a project's implementation. However, the value of mitigation measures such as fencing and wildlife crossings along roads is well documented (Rytwinski et al. 2016) and will continue to be pursued by the Service in concert with Federal and non-Federal actions. We will continue to monitor the panther population and investigate panther vehicle strikes. If there are efforts that can be implemented to prevent future strikes, we will work with appropriate partners to implement them. Such activities could include repairing any damaged

fences, adding additional signs alerting drivers of the presence of panthers in the area, installing or improving crossings, or clearing vegetation near the road margins.

Successful implementation of the Project is expected to reduce the likelihood that smaller, non-federally reviewed actions such as those referenced in this section will be needed to meet the commercial and residential needs of the rapidly growing human population in this area. The Service has been very clear in its position that the conservation measures included in larger, well-regulated projects such as the proposed Project will provide greater benefits to panthers compared to smaller non-federally reviewed projects because they include measures to maintain high-quality habitats that are strategically connected, install fencing and crossings to reduce roadway mortality, and are planned to reduce human and wildlife conflicts.

CONCLUSION

After reviewing the current status of the caracara, indigo snake, panther, and tricolored bat, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the Kingston project, as proposed, is not likely to jeopardize the continued existence of the caracara, indigo snake, panther, and tricolored bat. We have reached this conclusion because:

Caracara

1. Disturbance from site preparation and construction activities is anticipated to cause caracara to permanently shift their territory; however, as the development is not expected to occur wholly in one caracara territory and these caracaras likely use suitable habitat offsite, we expect the caracara to acclimate and resume normal behavior following the first year of construction. A reduction in breeding success during this time is expected to occur, but abandonment of this territory by caracara is not anticipated.
2. The habitat loss (3,238.85 acres) is a small (0.13%) reduction in the approximately 2,387,201 acres of suitable habitat within the overall range of the species.
3. The reduction of the breeding success is only expected for a short period, while birds adjust, and given that the number of breeding pairs is believed to be near carrying capacity, this loss in breeding is expected to have minimal effect on the overall population.
4. The permanent loss of approximately 3,238.85 acres of suitable caracara habitat could lead to increased competition for suitable foraging habitat and a reduction in nest productivity, but as discussed above the loss in breeding is not expected to measurably affect the overall population.

Indigo snake

1. The number of indigo snakes and their nests that are expected to be injured or killed due to land clearing associated with the Project's development and restoration activities is expected to be small as snakes are able to move to adjacent suitable habitat.
2. Although 3,242.08 acres of occupied indigo snake habitat will be permanently lost, this amount represents a small reduction in the geographic range of the species.
3. The loss of this indigo snake habitat is expected to be minimized by the restoration and preservation of 3,293.9 acres onsite.

4. The Applicant will implement the SPMs for the indigo snake (Service 2021a) during land clearing, construction, and operation of the proposed Project, which should reduce mortality caused by vehicles, equipment, or if a snake is encountered by workers or residents.
5. The likelihood of an indigo snake to be killed due to interactions from humans and their pets living in the new residential development is expected to be discountable.
6. Motor vehicle use and the potential for injuries and deaths of indigo snakes due to collisions will increase on the Project site and in the Action Area, but the Service does not expect this increase to jeopardize the species. Indigo snakes are not expected to frequent the developed portion of the Project and the construction of wildlife crossing would provide safe passage across roadways if snakes use them.

Panther

1. Due to their mobility and large home ranges, panthers are not expected to be killed or injured during land clearing associated with the project's development and restoration activities.
2. Although 3,393 acres that are currently used by the panther and their prey will be permanently lost, this acreage represents a small portion (less than a tenth of one percent) of panther habitat available in south Florida. Also, the loss of 3,393 acres of panther habitat would reduce carrying capacity in this area for between 0.18 to 0.55 panthers, depending on panther densities of between 1.37 and 4.03 panthers per 100 square kilometers.
3. The small reduction in panther habitat from the Project is not expected to affect more than 2 panthers via intraspecific aggression because of the small proportion of any individual panther's home range that will be impacted in the Action Area.
4. The effect of the loss of this habitat is expected to be minimized by the restoration and perpetual preservation of 3,273.62 acres of habitat that will remain available to the panther onsite. Further, panther habitat units will be purchased for the Service approved Panther Passage conservation bank and Corkscrew Regional Mitigation Bank to offset the effects of onsite habitat loss. In the absence of the Project and the conservation measures included, this area would likely be divided into smaller isolated projects that may not require Service review. Habitat retention in large contiguous blocks and the significant financial contributions aimed at promoting panther recovery would likely not occur.
5. This project is in an area where panther movement to the north is limited by existing development and is not crucial to the anticipated range expansion. This area serves as somewhat of a sink for the panther population and is not crucial for maintain the population as a whole or facilitating range expansion. Other intact habitat areas of public conservation lands further to the south will continue to support the existing panther population. Further, the habitats occupied by panthers in the Corkscrew Regional Ecosystem watershed will become even more isolated in the future because of human population growth in southern Lee County and northwestern Collier County independent of the Kingston project.
6. Any potential for an increase in vehicle-related panther deaths from traffic in the action area is expected to be minimized through the Applicant's funding of wildlife crossings on area roads and increased understanding and maintenance of permanent wildlife corridors. We cannot conclude with certainty that increases in vehicle traffic will necessarily result in increases in panther vehicle collisions for the reasons described in previous sections and reiterated below.

7. Any potential increase in panther mortality due to vehicle strikes cannot be quantified due to the multiple factors that are related to the likelihood of a panther – vehicle collision. However, the Service will rely on monitoring the number of vehicle collisions with panthers and take steps necessary to reduce this number if it exceeds the annual current average of 3 panthers per year within 10 miles of the project. If these PVM are determined to be a result of the Project, these steps can include construction of additional fencing, recommending installation of additional crossings, reducing speed limits, adding signage or other methods to increase driver awareness.

With respect to reason 2, the Service notes that many thousands of acres of panther habitat remain in Florida. Therefore, we do not expect this minor loss of habitat resulting from the project to substantially affect the range-wide population size of this species. However, we acknowledge that collectively over time, habitat loss could threaten the survival and recovery of this species. Therefore, we will continue to monitor the effects of habitat loss on the panther throughout its range. With respect to reason 5, the Service also acknowledges that motor vehicle-related injuries and mortalities of panthers, in concert with other threats to the panther, could collectively threaten the survival and recovery of this species. Therefore, we will continue to monitor the effects of motor vehicle-related injuries and mortalities on the panther throughout its range. Actions specifically aimed at reducing traffic impacts, such as those included in the design for this project, will continue to be high-priority recommendations and permit conditions for projects moving forward.

Tricolored bat

1. Although construction activities for the Project will result in the conversion of 3,371.3 acres of potential TCB roosting and foraging habitat, only 3.2 acres consists of forested area. Because of the wide range, habitat generatlist, and semi-migratory nature of the species, this loss is not expected to have a measurable impact on the species as a whole.
2. The Project will result in the preservation of approximately 3,293.9 acres of suitable TCB roosting and foraging habitat in the TCB consultation area. 3) The Corps permit, if issued, will include conditions to implement a bat roost survey prior to tree removal, reducing the likelihood that individual bats that use the roost will be injured or killed. 4) The TCB is expected to be able to forage over the development area following construction completion.

INCIDENTAL TAKE STATEMENT

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

as part of the agency action, is not considered to be prohibited taking under the Act provided such taking is in compliance with the terms and conditions of this incidental take statement. The terms and conditions described below are nondiscretionary and must be undertaken by the Corps so they become binding conditions of any grant or permit issued to the Cam 7-Sub, LLC, as appropriate, for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps 1) fails to assume and implement the terms and conditions or 2) fails to require the Cam 7-Sub, LLC to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Corps and the applicant must report the progress of the action and its impact on the species to the Service as specified in the Incidental Take Statement [50 CFR § 402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE ANTICIPATED

Caracara

The Service has reviewed the biological information for caracara, information presented by the Applicant's consultant, and other available information relevant to this action. The Project will result in take of caracara in the form of harm due to the disturbance from development and construction activities, as well as loss of foraging and nesting habitat in the Project footprint that is expected to result in a loss of reproductive success. Therefore, the Service expresses the amount of incidental take from the Project as: 1) the loss of caracara reproductive success for the known breeding pair for the first year of the Project conducting land clearing or construction work within its territory; and 2) loss of 3,238.85 acres of suitable caracara foraging and nesting habitat in the Project footprint.

Indigo snake

The Service has reviewed the biological information for the indigo snake, information presented by the Applicant's consultant, and other available information relevant to this action. The Project will result in take of indigo snakes in the form of harm due to the disturbance from development and construction activities, as well as loss of foraging and nesting habitat in the Project footprint. Direct mortality could result from the operation of construction equipment in occupied habitat. Based on the calculations above, up to 61 indigo snakes and 46 nests may be present on the Project site, with 36 snakes potentially occupying the development area. Because of the nonuniform and disjointed configuration of development and unknown distribution of the snakes on the landscape, it is not expected that each snake would be affected equally. The Service anticipates incidental take of the EIS will be difficult to detect for the following reasons: 1) indigo snakes have limited detectability due to their cryptic behavior including, but not limited to, their use of burrows or holes for shelter; 2) juveniles have limited detectability due to their affinity for thick vegetation; 3) individuals that die from starvation or intraspecific aggression once leaving a disturbed area would not be found; and 4) nests will not be identified prior to development. Additionally, individual calculations above assume suitable habitat is saturated with EIS, which is not supported by their population status. Therefore, the Service will use habitat as a surrogate for the number of individuals lost. As such, take will be considered exceeded if more than 3,242.08 acres of indigo snake habitat is lost.

Florida panther

The increase in noise and human activities due to construction activities may increase disturbance to panthers in the Project vicinity during construction. Consequently, the Service notes that these activities may cause resident or dispersing panthers to avoid the Project site during construction. Moreover, resident panthers may adjust their territories to avoid the disturbance. To quantify the effect of habitat lost due to the Project, we considered the reduction of panther habitat carrying capacity due to the loss of 3,393 acres of panther habitat. We used panther habitat selection ranking (Onorato et al. 2011) to estimate the loss of panther habitat carrying capacity. Based on the habitat preference values in Onorato et al. 2011, the loss of 3,393 acres of panther habitat approximates the loss of habitat carrying capacity for between 0.18 and 0.55 panthers based on varying density estimates of between 1.37 and 4.03 panthers per 100 square kilometers. Therefore, the Service expects no more than two (2) Florida panther to be harmed by this loss in habitat carrying capacity and a potential increase in intraspecific aggression.

In addition to habitat loss, the Service has evaluated the potential impacts to panthers based on an increase in traffic in the Action Area. Based on our analysis and the lack of any responsible method to quantify risk of PVM, we treat these impacts to the panther population as part of the environmental baseline condition or cumulative effects within the Action Area.

Tricolored bat

The Service anticipates that incidental take will be in the form of harm as well as injury and mortality for any TCB that occupy a roost(s) within the Action Area as a result of mechanical vegetation removal. If an occupied roost is lost, we expect a subset of the affected bats will be injured or killed, while the remaining bats may experience only a temporary disturbance and escape to another available roost. Any flightless young present when the roost is lost are expected to be killed. Since the locations of any roosts within the Action Area are unknown, they could be lost as a result of mechanical removal or otherwise natural causes without knowledge of its contents, and we will not be able to document how many bats escaped or were killed. Furthermore, we have no means to monitor the loss in fitness and productivity of the disturbed TCBs, because the location of the roosts may continue to be unknown for the duration of the proposed action. Therefore, the Service will use habitat as a surrogate for the number of individuals lost and take will be considered exceeded if more than 3,371.3 acres of suitable TCB habitat is subject to mechanical treatment as a result of the proposed Project. If, during the course of this action, this level of take is exceeded, such take would represent new information requiring review of the reasonable and prudent measures provided, the Corps must immediately reinitiate consultation with the Service.

EFFECT OF THE TAKE

In the accompanying Biological and Conference Opinion, the Service determined that this level of expected take is not likely to result in jeopardy to the caracara, indigo snake, panther, or tricolored bat. Critical habitat has not been designated for these species and will not be affected.

REASONABLE AND PRUDENT MEASURES

Reasonable and prudent measures refer to those actions the Director considers necessary or appropriate to minimize the impact of the incidental take on the species. When providing an incidental take statement, the Service is required to give reasonable and prudent measures it considers necessary or appropriate to minimize the take along with terms and conditions that must be complied with, to implement the reasonable and prudent measures. Because the Conservation Measures includes as part of the proposed action serve to minimize and mitigate potential adverse effects to the listed species that may be present within the Action Area, no additional reasonable and prudent measure(s) are necessary and appropriate to minimize effects of the project on the species covered in this Biological/Conference Opinion.

TERMS AND CONDITIONS

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

As described in the Minimization and Conservation Measures and Description of the Proposed Action, the applicant and the Corps shall ensure and demonstrate that each measure is implemented at the time it occurs. Annual reporting and funding assurances shall be transmitted to the Service as described.

MONITORING AND REPORTING REQUIREMENTS

Pursuant to 50 CFR § 402.14(i)(3), the Corps must provide adequate monitoring and reporting to determine if the amount or extent of take is approached or exceeded. In addition to the species specific survey and monitoring described in the *Minimization and conservation measures* section above, the Applicants and Corps shall provide a report notifying the Service as to the acreage of each habitat or land cover type cleared within the Project footprint annually. Reports should be sent by February 28th to FW4FLESRegs@fws.gov and the ECOSphere Project Code (2023-0003475) must be included in the email subject line.

DISPOSITION OF DEAD OR INJURED SPECIMENS

Upon locating a dead, injured, or sick threatened or endangered species, initial notification must be made to the nearest Service Law Enforcement Office: 20501 Independence Blvd., Groveland, Florida 34736; 352-429-1037, as well as the Florida Fish and Wildlife Conservation Commission's Wildlife Alert number; 888-404-3922. Secondary notification should be made to the biologist identified below at FW4FLESRegs@fws.gov. Care should be taken in handling sick or injured specimens to ensure effective treatment and in the handling of dead specimens to preserve biological material in the best possible state for later analysis as to the cause of death. In conjunction with the care of sick or injured specimens, or preservation of biological materials from a dead animal, the finder has the responsibility to carry out instructions provided by Law Enforcement to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The Service recommends the following:

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the conservation recommendation carried out.

REINITIATION NOTICE

This concludes formal consultation on the action(s) outlined in the Project consultation request. As written in 50 CFR § 402.16, reinitiation of consultation is required and shall be requested by the Federal agency, where discretionary Federal involvement or control over the action has been retained or is authorized by law and if: 1) the amount or extent of incidental take is exceeded 2) new information reveals effects of the Corps action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; 3) the Corps action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or 4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease until reinitiation is complete.

Thank you for your cooperation and effort in protecting federally listed species and fish and wildlife resources. If you have any questions regarding this project, please contact Adam Knutson at adam_knutson@fws.gov or 772-226-8152.

Sincerely,

ROBERT CAREY

Digitally signed by ROBERT CAREY
Date: 2025.01.17 11:36:39 -05'00'

Robert L. Carey
Manager, Division of Environmental Review
Florida Ecological Services Office
Gainesville

Enclosure

cc: electronic only
Corps, Fort Myers, Florida (Michael Ornella)
FWC, Tallahassee, Florida (FWC-CPS)
NOAA Fisheries, St. Petersburg, Florida (David Rydene)
Service, Vero Beach, Florida (David Shindle)

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Enclosure A

Status of the Species – Audubon's crested caracara

STATUS OF THE SPECIES – Audubon's crested caracara (*Polyborus plancus audubonii* = *Caracara cheriway*; *aka* Northern crested caracara)

Legal Status – Federal Status*: threatened,* State: *threatened*

The U.S. Fish and Wildlife Service (Service) listed the Audubon's crested caracara (caracara) as threatened under the Endangered Species Act of 1973, as amended (Act) (87 Stat. 884; 16 U.S.C. 1531 *et seq*.) on July 6, 1987, (52 *FR* 25229). Critical habitat has not been designated for the caracara.

State of Florida Status: Listed as threatened by the state in accordance with the Service's Federal notice.

Species Description

Appearance/Morphology

The caracara is a large falcon with a head crest, naked face, heavy bill, elongated neck, long legs, and a bright yellow-orange face and legs (Service 1999; Morrison and Dwyer, 2012). The total length of an individual ranges from about 19.7 inches (in) (50.04 centimeters [cm]) to 25.2 in (64.01 cm) with a maximum wingspan of 47.2 in (119.9 cm). Adult caracaras have dark brownish-black feathers on their crown, wings, back, lower abdomen and tail (Service 1999). The base of the head, throat, upper abdomen and underside of the tail coverts is usually white, although some individuals contain yellow to tan feathers. The breast and upper back are whitish with heavy black barred feathers and the tail feathers are white with thin, dark crossbars and an extensive, dark terminal band (Service 1999). A caracara's feet are also a noteworthy identification trait. The feet have talons that are flatter than those of other raptor species. This adaptation aids in foraging because it allows the caracara to walk or run on the ground more easily (Service 1999).

Taxonomy

Caracaras were originally described by John James Audubon (1834) and assigned the scientific name *Polyborus vulgaris.* John Cassin changed the name to *P. audubonii* in 1865, although it had several other names at that time (Service 1999). Dove and Banks (1999) provided a historical review of the taxonomy of the caracara prior to listing. The authors noted that Ridgway (1876) treated the caracara as three species in the genus *Polyborus*: *P. tharus* (designated by Molina in 1782) occurring in southern South America; *P. cheriway* (designated by Jacquin in 1784) occurring from northern South America to southern North America; and *P. lutosus* (designated by Ridgeway in 1876) occurring on Guadalupe Island, Mexico. This nomenclature remained unchanged until 1949, with the exception of replacing *P. tharus* with *P. plancus*, as previously designated by Miller in 1777 (Brabourne and Chubb 1912; Swann 1925). Hellmayr and Conover (1949) grouped both *P. cheriway* and *P. tharus* into one species: *P. plancus*. At the time of listing in 1987, the caracara was considered a sub-species of *P. plancus, P. plancus audubonii.* Banks and Dove (1992) placed *P. plancus* in the genus *Caracara* in 1992. Finally, Dove and Banks (1999) evaluated plumage characters and body

dimensions of *C. plancus* from the northern populations with those from Bolivia and southern Brazil south to Tierra del Fuego, and concluded that *C. plancus* consists of three distinct species and sub-specific names were not warranted. The unique subspecies are: *C. lutosus* (the insular Guadalupe caracara, *C. cheriway* (the Northern crested caracara, referred to in this document as Audubon's crested caracara [caracara]), and *C. plancus* (the Southern caracara) (Dove and Banks 1992).

Life history

Caracaras are diurnal and non-migratory. Adult caracaras establish territories, which average approximately 3,000 acres (ac) [1,200 hectares (ha)], where they are typically found year round (Morrison and Humphrey 2001). This average territory size equates roughly to a territory within a radius of 1.9 miles from the nest site (Morrison 2001). Territory size ranges from about 1,000 acres to about 5,000 acres, likely dependent upon the quality of the habitat.

Breeding pairs of caracaras are monogamous, highly territorial, and exhibit fidelity to both their mate and the site (Morrison 1999). First breeding occurs at 3 years of age (Nemeth and Morrison 2002). The initiation of breeding is marked by several behavioral changes, including the pair perching together near the nesting site, preening and allopreening, and sharing food.

Caracaras are one of the first of Florida's raptors to begin nesting. Although breeding activity can occur from September through June, the primary breeding season is considered to be November through April. Nest initiation and egg-laying peak from December through February. Caracaras construct new nests each nesting season, often in the same tree as the previous year. Both males and females participate in nest building. Nests are well concealed and most often found in the tops of cabbage palms (Morrison and Humphrey 2001), although nests have been found in live oaks (*Quercus virginiana*), cypress (*Taxodium distichum*) (first record, Morrison et al. 1997), Australian pine (*Casuarina* spp.), saw palmetto (*Serenoa repens*), and black gum (*Nyssa sylvatica*). Caracaras usually construct their nests 4 to 18 meters above the ground, and the nest structure primarily consists of stems from herbaceous and woody shrubs, vines, grasses or other plant materials woven together and trampled to form a depression (Bent 1938; Sprunt 1954; Humphrey and Morrison 1997; Smith and Scholer 2013). Caracaras vigorously defend their nesting territory during the breeding season (Morrison 2001). The clutch size is usually two eggs, although at times three eggs are laid. Incubation lasts for about 31 to 33 days (Morrison 1999) and is performed by both sexes. Ordinarily, only one brood is raised per season, but about 10 percent of breeding pairs may raise a second brood. Young fledge at about 7 to 8 weeks of age, and post-fledgling dependency on parental birds lasts approximately 8 weeks.

Foraging typically occurs throughout the territory during both nesting and non-nesting seasons (Morrison 2001). Caracaras are highly opportunistic in their feeding habits. They will capture live prey and eat carrion. The diverse diet consists of insects and other invertebrates, fish, snakes, turtles, birds, and mammals (Layne 1996; Morrison 2001). Recent information from Morrison (2005) indicates wetland-dependent prey species and mammals (primarily in the form of carrion) comprise about 64 percent and 31 percent of the total diet, respectively. Caracaras search for prey while flying, from perches, and when walking or running along the ground (Service 1999).

Foraging behavior also includes regularly patrolling sections of roads for animals killed by collisions with motor vehicles (Palmer 1988); caracaras are known to occasionally chase the larger black vulture (*Coragyps atratus*) and turkey vulture (*Cathartes aura*) away from a carcass (Howell 1932). Scavenging at land-fills has also been observed (Morrison 2001). Tractors plowing fields or mowing pastures and road right-of-ways are often closely followed by individuals who feed opportunistically on the prey that may be flushed or exposed. Agricultural drainage ditches, cattle ponds, roadside ditches, the margins of wetlands and other shallow water features, and recently burned lands also provide good foraging areas for the caracara (Morrison 2001).

Caracaras are strong fliers and highly mobile birds that are capable of moving long distances, including juveniles. Morrison (2005) noted that sub-adult caracaras are nomadic. Individuals may traverse a large portion of the species' range in Florida from the time it leaves its natal territory to the time it establishes a territory. Adults will also occasionally leave their territory and travel great distances, usually outside of the breeding season. The caracara's vagility and nomadic behavior during its sub-adult years may be the reason that caracaras are occasionally recorded far outside their breeding range. Caracaras have been observed in the Florida Keys and into the panhandle of Florida (Bay County) as well as in other states and as far north as Nova Scotia, although some of these individuals may have escaped from captivity (Layne 1996). Currently, there is no evidence to suggest breeding and genetic exchange occurs between the Florida population and other populations of the Northern caracara.

Observations and radio-telemetry monitoring have documented aggregations of caracaras within several "gathering areas" in south-central Florida. Large groups of caracaras (up to 50) have been observed along the Kissimmee River north of State Route (SR) 98; south of Old Eagle Island Road in northern Okeechobee County; south of SR 70 and west of Fort Pierce in St. Lucie County; and south of SR 70 on the Buck Island Ranch in Highlands County. These gathering areas are regularly, but not continually, used by sub-adult and non-breeding caracaras and generally consist of large expanses of improved pasture. Morrison (2001) suggests that gathering areas may be important to caracaras before first breeding during the first 3 years after leaving their natal territory. However, the habitat values of these areas to caracaras have not yet been evaluated.

Habitat

The caracara prefers habitats that contain largely short-stature vegetation with a low density of trees that can be used for nesting. Historically, caracaras inhabited native dry or wet prairies containing scattered cabbage palms, their preferred nesting tree. Scattered saw palmetto, low-growing oaks (*Quercus minima, Q. pumila*), and cypress also occur within these native communities. Over the last century, many of the native prairie vegetation communities in central and south Florida have been converted for cattle ranching, and have been replaced by improved and unimproved pasture dominated by non-native, sod-forming grasses. Caracaras occur within these pastures, presumably because the vegetation structure of this habitat type is similar to that of native prairies. In addition, the scattered cabbage palms that are often present within improved pastures provide nesting sites for caracaras. Morrison and Humphrey (2001) hypothesize that

habitats with short-stature vegetation may be preferred by the caracara, due to its tendency to walk on the ground while foraging. The height and relatively simple structure of the vegetation may directly facilitate foraging by caracaras because it easier to walk through and provides less cover for predators. Consequently, caracaras likely benefit from management actions, such as regular mowing, burning, and high-density grazing in agricultural lands and prescribed burning in native habitat types that maintain vegetation in a low stature and structurally simple condition (Morrison and Humphrey 2001).

Maintaining habitat heterogeneity, including specific land cover types as well as small (less than 2.47 ac [0.99 ha]) freshwater wetlands, is important in maintaining suitable habitat for the caracara in Florida (Morrison et al. 2006). The proportion of six vegetation and land cover types (*i.e.*, cabbage palm-live oak hammock, grassland, improved pasture, unimproved pasture, hardwood hammocks and forest, and cypress/pine/cabbage palm) and two types of aquatic habitats (*i.e.*, lentic and lotic) were determined to be the most important criteria for predicting habitat suitability for caracara. Most known nest locations (72.9 percent) in the study were present on improved pasture although that habitat type only comprised 12.5 percent of the entire study area. Caracara appear to be using pastures, ditches, and impounded wetlands that have replaced the historic land cover as shown by the high occurrence of improved and unimproved pastures and wetlands in caracara home ranges (Morrison et al. 2006).

Distribution

The caracara is a resident, non-migratory species that occurs in Florida as well as the southwestern United States and Central America. Florida's population of caracara is found in the prairie area of the south-central region of the State, from Polk and Osceola Counties southward to Collier and Broward Counties. The caracara is most abundant in a five-county area that includes Glades, DeSoto, Highlands, Okeechobee, and Osceola Counties (Service 1999).

Morrison and Humphrey (2001) characterized caracara distribution, reproductive activity, and land use patterns within a 5,180,000-ac (2,096,000-ha) area in south-central Florida. Comparisons of caracara territories to randomly selected areas of available habitat within the study area indicated that caracara territories contained higher proportions of improved pasture and lower proportions of forest, woodland, oak scrub, and marsh. Territory size was inversely related to the amount of improved pasture within the territory. In addition, breeding-area occupancy rate, breeding rate, and nesting success were consistently higher on private ranch lands during the study.

Population Dynamics

Monitoring the caracara population, determining territory occupancy, and nesting effort and success, is very difficult because most caracara breeding territories occur on private lands in Florida that are not accessible to researchers (Humphrey and Morrison 1997). Consequently, estimates of the caracara population have been based on counts of caracaras along roadsides (Heinzman 1970; Layne 1995). These roadside counts have the potential to be strongly affected by the presence of non-territorial juvenile and sub-adult birds during the period when they are

nomadic. Furthermore, the abundance of non-breeding adults further complicates estimating breeding pairs from roadside counts. Because the occurrence and density of caracaras is not evenly distributed (due to congregations and nomadic individuals) within the region they occupy, roadside surveys are probably unreliable for estimating the overall population.

Morrison and Humphrey (2001) noted the caracara is perceived to be in long-term decline, although adequate data is not available on historic patterns of abundance, or habitat used to accurately assess the status of the species. Heinzman's (1970) 4-year road survey from 1967 to 1970 suggested fewer than 100 individual caracaras at 58 localities remained in Florida. Stevenson (1976) concurred with this estimate in 1974. Layne (1996) monitored caracara distribution and population status in Florida from 1972 to 1991. Observations made by Layne (1996) estimated the adult portion of the population was stable with a minimum of about 300 birds in 150 territories. The immature portion of the population was estimated to be about 100 to 200 individuals, increasing the total statewide population estimate to 400 to 500 birds. However; these population estimates were likely biased because they were based on roadside counts of birds, and roadsides were surveyed more intensively than areas away from roads. Given the challenges associated with accessing all the potential habitat within the caracara's range, conducting a reliable range-wide survey of the population and obtaining an accurate estimate of the caracara's current population size remains difficult.

However, evidence from behavior suggests habitat is limited for the caracara and the species is at or near carrying capacity within the existing habitat (Morrison et al. 2007). Monitoring of caracara breeding areas since the 1990s found that breeding territories tend to remain occupied and that breeding is attempted every year. The fact that territories are not seen regularly coming and going is consistent with the assertion that all possible breeding sites are occupied (Morrison et al. 2007). In addition, Dwyer et al. (2012) tracked individual nonbreeding caracaras in adult plumage for over three years and found these birds never established breeding territories. This information indicates that the tracked caracaras were unable to find suitable breeding sites, again supporting the concept that no suitable breeding habitat is available to the breeding age birds and the existing breeding habitat is at carrying capacity. Furthermore, Dwyer *et al.* 2010 noted that nonbreeding adults (floaters) made up approximately 40 percent of the nonbreeding population.

Critical Habitat

Critical habitat has not been designated for the caracara.

Threats

Present or Threatened Destruction, Modification or Curtailment of its Habitat or Range

The caracara's perceived decline, as described in historic literature, is attributed primarily to habitat loss (Layne 1996). Large areas of native prairie and pasture lands in south-central Florida have been converted to citrus operations, tree farms, other forms of agriculture, and commercial and residential development, and habitat loss has accelerated in the past few decades (Morrison and Humphrey 2001). The perceived population decline and the geographic isolation of the Florida population resulted in the listing of the caracara as threatened in 1987. However,

historical conversion of forested habitats to pasture has not been adequately documented as partially offsetting losses of caracara habitat, so a full accounting of historic habitat changes is lacking. The current threat of habitat loss persists as changes in land use and development of caracara habitat continue, and pastures are converted to residential and commercial development.

The lack of habitat management in some areas has also resulted in degradation or loss of caracara habitat. For example, encroachment of woody shrubs and trees into open dry prairies, pastures and similar habitats have resulted in reduction in habitat suitability. In addition, the large-scale removal of cabbage palms from pastures to sell for commercial and residential landscaping may also reduce the availability of potential nesting sites.

As discussed above, the caracara prefers open habitats with low-stature vegetation for foraging (Morrison and Humphrey 2001). Accordingly, cattle ranching and the creation of extensive pastures appear to be compatible with caracara survival. The number of caracara territories occurring in improved or unimproved pasture can be expected to increase if sufficiently large overgrown pastures are reclaimed and/or new pastures or restored native prairies are created from lands subject to other agricultural land uses. The conversion of pasture to citrus, sugarcane, and residential/commercial development is cause for concern (Morrison 2001). Recognizing the habitat value of cattle ranches and enlisting landowner cooperation in the conservation and management of these lands are essential elements in recovery of the caracara.

Disease or Predation

Currently, disease or Predation does not appear to threaten the continued existence of the caracara.

Other Natural or Manmade Factors Affecting its Continued Existence

Collision with vehicles along roadways may also be a significant form or mortality and contribute to further population level declines. Florida's burgeoning human population has increased the number of motor vehicles and the need for roads. The increase in traffic as well as the caracara's predisposition for feeding on road-killed animals has probably increased the number of caracaras killed or injured as a result of vehicle strikes. Morrison (2003) identifies highway mortalities as a major cause of juvenile mortalities with young birds especially vulnerable within the first six months after fledging.

In addition, direct human persecution continues in parts of the caracara's range (Morrison and Dwyer 2012). Caracara are killed by some ranchers because of the belief that caracara kill and eat newborn livestock. Furthermore, spent lead ammunition from hunting and shooting may have the potential to affect any individuals that feed upon the carrion (Golden *et al*. 2016).

Finally, the Florida population of caracaras is isolated and habitat-specific. Therefore, it may be susceptible to environmental catastrophes and potentially reduced reproductive rates because of demographic accidents such as skewed sex ratios or disproportionate age-related mortality. Low numbers may also reduce the genetic viability in the population through loss of heterozygosity, thereby increasing vulnerability to environmental stresses. The location of many of the

occupied territories on private land, and the inaccessibility of these territories to surveyors, makes it difficult to census the caracara and detect changes in its population size and distribution. This difficulty increases the possibility of not detecting a population decline that could result in extinction.

Climate Change and Sea Level Rise

Our analyses under the Act include consideration of observed or likely environmental effects related to ongoing and projected changes in climate. As defined by the Intergovernmental Panel on Climate Change (IPCC), "climate" refers to average weather, typically measured in terms of the mean and variability of temperature, precipitation, or other relevant properties over time; thus "climate change" refers to a change in such a measure which persists for an extended period, typically decades or longer, due to natural conditions (e.g., solar cycles) or human-caused changes in the composition of the atmosphere or in land use (IPCC 2013, p. 1450). Detailed explanations of global climate change and examples of various observed and projected changes and associated effects and risks at the global level are provided in reports issued by the IPCC (2014 and citations therein). Information for the United States at national and regional levels is summarized in the National Climate Assessment (Melillo et al. 2014 entire and citations therein; see Melillo et al. 2014, pp. 28-45 for an overview). Because observed and projected changes in climate at regional and local levels vary from global average conditions, rather than using global scale projections, we use "downscaled" projections when they are available and have been developed through appropriate scientific procedures, because such projections provide higher resolution information that is more relevant to spatial scales used for analyses of a given species and the conditions influencing it. (See Melillo et al. 2014, Appendix 3, pp. 760-763 for a discussion of climate modeling, including downscaling). In our analysis, we use our expert judgment to weigh the best scientific and commercial data available in our consideration of relevant aspects of climate change and related effects.

Climate change may result in inundation of habitat from sea level rise, and altered weather patterns in south Florida. For example, an increase or decrease in precipitation could affect water levels in wetlands and canals, and this, in turn, could affect prey densities and ultimately affect productivity and survivorship of the caracara. Increased precipitation could increase the availability of prey species, whereas increased periods of drought could reduce prey availability to caracara. The intensity or frequency of thunderstorms or hurricanes is also predicted to increase with climate change. Winds associated with these events could adversely affect the caracara by decreasing nesting trees and therefore nesting opportunities. It is difficult to estimate, with any degree of precision, which species will be affected by climate change or exactly how they will be affected. The Service will use Strategic Habitat Conservation planning, an adaptive science-driven process that begins with explicit trust resource population objectives, as the framework for adjusting our management strategies in response to climate change (Service 2006).

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Enclosure B

Status of the Species – Florida Panther

STATUS OF THE SPECIES – Florida panther (*Puma concolor coryi*)

Legal Status – On March 11, 1967, the Service listed the panther as endangered (32 FR 4001) throughout its historic range, and they received Federal protection under the passage of the Act in 1973. In addition, the Florida Panther Act (Florida Statute 372.671), a 1978 Florida State law, made killing a panther a felony. The panther is listed as endangered by the States of Florida, Georgia, Louisiana, and Mississippi in addition to its Federal listing. Critical habitat has not been designated for the panther.

Species Description

Appearance/Morphology

An adult panther is unspotted and typically rusty reddish-brown on the back, tawny on the sides, and pale gray underneath. Adult males can reach a length of 7 feet (ft) (2.1 meters [m]) from their nose to the tip of their tail and may exceed 161 pounds (lbs) (73 kg) in weight; but, typically adult males average around 116 lbs (52.6 kg) and stand about 24 to 28 inches (in) (60 to 70 centimeters [cm]) at the shoulder (Roelke 1990). Female panthers are smaller with an average weight of 75 lbs (34 kg) and length of 6 ft (1.8 m) (Roelke 1990). Panther kittens are gray with dark brown or blackish spots and five bands around the tail. The spots gradually fade as the kittens grow older and are almost unnoticeable by the time they are 6 months old. At this age, their bright blue eyes slowly turn to the light-brown straw color of the adult (Belden 1988).

Three external characteristics: a right angle crook at the terminal end of the tail, a whorl of hair or cowlick in the middle of the back, and irregular, white flecking on the head, nape, and shoulders – not found in combination in other subspecies of *Puma* (Belden 1986), were commonly observed in panthers through the mid-1990s. The kinked tail and cowlicks were considered manifestations of inbreeding (Seal 1994); whereas the white flecking was thought to be a result of scarring from tick bites (Maehr 1992). Four other abnormalities prevalent in the panther population prior to the mid-1990s were cryptorchidism (one or two undescended testicles), low sperm quality, atrial septal defects (the opening between two atria in the heart fails to close normally during fetal development), and immune deficiencies; and these were suspected to be the result of low genetic variability (Roelke et al. 1993).

Taxonomy

The panther was first described by Charles B. Cory in 1896 as *Felis concolor floridana* (Cory 1896). The type specimen was collected in Sebastian, Florida. Bangs (1899), however, believed the panther was restricted to peninsular Florida and could not intergrade with other *Felis* sp. Therefore, he assigned it full specific status and named it *Felis coryi* since *Felis floridana* had been used previously for a bobcat (*Lynx rufus*).

Culver et al. (2000) examined genetic diversity within and among the described subspecies of *Puma concolor* using three groups of genetic markers and proposed a revision of the genus to include only six subspecies, one of which encompassed all puma in North America including the panther. They determined the panther was one of several smaller populations that had unique features. Specifically, the number of polymorphic microsatellite loci and amount of variation were lower, and it was highly inbred. The degree to which the scientific community accepted the results of Culver et al. (2000) and the proposed change in taxonomy is not resolved (Service 2008). The panther remains listed as a subspecies, and continues to receive protection pursuant to the Act.

Life History

Male panthers are polygynous, maintaining large, overlapping home ranges containing several adult females and their dependent offspring. Breeding activity peaks from December to March (Shindle et al. 2003). Litters (n = 82) are produced throughout the year, with 56 to 60 percent of births occurring between March and June (Jansen et al. 2005; Lotz et al. 2005). The greatest number of births occurs in May and June (Jansen et al. 2005; Lotz et al. 2005). Average litter size is 2.4 ± 0.91 (standard deviation) kittens. Seventy percent of litters are comprised of either two or three kittens.

Panther dens are usually located closer to upland hardwoods, pinelands, and mixed wet forests and farther from freshwater marsh-wet prairie (Benson et al. 2008). Most den sites are located in dense saw palmetto (*Serenoa repens*), shrubs, or vines (Maehr 1990a; Shindle et al. 2003, Benson et al. 2008). Den sites are used for 6 to 8 weeks by female panthers and their litters from birth to weaning (Benson et al. 2008). Independence and dispersal of young typically occurs at 18 months, but may occur as early as one year (Maehr 1992).

Benson et al. (2009) analyzed survival and cause-specific mortality of subadult and adult panthers. They found that sex and age influenced panther survival, as females survived better than males, and older adults (≥10 years) survived poorly compared with younger adults. Genetic ancestry strongly influenced annual survival of subadults and adults after introgression, as F1 generation admixed panthers survived longer than pre-introgression panthers and non-F1 admixed individuals (Benson et al. 2009).

Mortality records for uncollared panthers have been kept since February 13, 1972, and for radio-collared panthers since February 10, 1981 (FWC 2013, and FWC unpublished data). Through June 25, 2014, 424 mortalities have been documented (FWC 2014). Of the 424 total mortalities, 181 were radio-collared. Intraspecific aggression was the leading cause of mortality for radio-collared panthers, and was more common for males than females (Benson et al. 2009). Older-adult males had significantly higher, and subadult males had marginally higher, mortality due to intraspecific aggression than adult males in their prime (Benson et al. 2009). Most

intraspecific aggression occurs between male panthers; but, aggressive encounters between males and females have occurred, resulting in the death of the female. Defense of kittens or of a kill is suspected in half (five of ten) of the known instances through 2003 (Shindle et al. 2003).

Following intraspecific aggression, the greatest causes of mortality for radio-collared panthers was from unknown causes, vehicles, and other (Benson et al. 2009). From February 13, 1972, through June 30, 2014, 215 panthers (radio-collared and uncollared) were hit by vehicles (FWC 2014). These collisions resulted in 203 panther fatalities and 12 non-fatal injuries. The number of panther/vehicle collisions per year is positively correlated with the annual panther count (McBride et al. 2008).

Female panthers are considered adult residents if they are older than 18 months, have established home ranges, and have bred (Maehr et al. 1991). Land et al. (2004) reported 23 of 24 female panthers first captured as kittens survived to become residents and 18 (78.3 percent) produced litters; 1 female was too young to determine residency. Male panthers are considered adult residents if they are older than 3 years and have established a home range that overlaps with females. Thirty-one (31) male panthers were captured as kittens and 12 (38.7 percent) of these cats survived to become residents (Jansen et al. 2005). "Successful male recruitment may depend on the death or home range shift of a resident adult male" (Maehr et al. 1991). Turnover in the breeding population is low with documented mortality in radio-collared panthers being greatest in subadult and non-resident males (Maehr et al. 1991; Shindle et al. 2003).

Den sites of female panthers have been visited since 1992 and the kittens tagged with passive integrated transponder chips. Annual survival of these kittens has been determined to be 0.328 ± 0.072 (SE) (Hostetler et al. 2009). There was no evidence survival rate differed between male and female kittens or was influenced by litter size. Hostetler et al. (2009) found kitten survival generally increased with degree of admixture with introduced Texas pumas and decreased with panther abundance. Kitten survival is lowest during the first 3 months of their lives (Hostetler et al. 2009).

Panther dispersal begins after a juvenile becomes independent from its mother and continues until it establishes a home range. Dispersal distances are greater for males than females. The maximum dispersal distance recorded for a young male was 139.2 mi (224.1 km) over a 7-month period followed by a secondary dispersal of 145 mi (233 km). Comiskey et al. (2002) found males disperse an average distance of 25 mi (40 km) and females typically remain in or disperse short distances from their natal ranges. Female dispersers establish home ranges less than one average home range width from their natal range (Maehr et al. 2002a). Maehr et al. (2002a) reported all female dispersers ($n = 9$) were successful at establishing a home range whereas only 63 percent of males ($n = 18$) were successful. Dispersing males usually go through a period as transient (non-resident) subadults, moving through the fringes of the resident population and often occupying suboptimal habitat until an established range becomes vacant (Maehr 1997).

Most panther dispersal occurs south of the Caloosahatchee River. However, panthers have been documented north of the Caloosahatchee River many times since February 1972 through field signs (*e.g.*, tracks, urine markers, scats), camera-trap photographs, carcasses from vehicle-related mortalities, telemetry from radio-collared animals (Land and Taylor 1998; Land et al. 1999; Shindle et al. 2000; Maehr et al. 2002b; Belden and McBride 2005), captured animals (one of which was radio collared), and one skeleton.

The Caloosahatchee River, a narrow (295-328 ft [90-100 m]), channelized river, is probably not a significant barrier to panther movements. Western subspecies of *Puma* are known to cross wide, swift-flowing rivers up to a mile in width (Seidensticker et al. 1973; Anderson 1983). However, the combination of the river, SR 80, and land uses along the river seems to have somewhat restricted panther dispersal northward (Maehr et al. 2002b). Documented physical evidence of at least 15 uncollared male panthers has been confirmed north of the river since 1972, but neither female panthers nor reproduction have been documented in this area since 1973 (Belden and McBride 2005).

Panthers require large areas to meet their needs. Numerous factors influence panther home range size, including: habitat quality, prey density, and landscape configuration (Belden 1988; Comiskey et al. 2002). Home range sizes of six radio-collared panthers monitored between 1985 and 1990 averaged 128,000 ac (51,800 hectares [ha]) for resident adult males and 48,000 ac (19,425 ha) for resident adult females; transient males had a home range of 153,599 ac (62,160 ha) (Maehr et al. 1991). Comiskey et al. (2002) examined the home range size for 50 adult panthers (residents greater than 1.5 years old) monitored in south Florida from 1981 to 2000 and found resident males had a mean home range of 160,639 ac (65,009 ha) and females had a mean home range of 97,920 ac (39,627 ha). Beier et al. (2003) found home range size estimates for panthers reported by Maehr et al. (1991) and Comiskey et al. (2002) to be reliable.

Annual minimum convex polygon home range sizes of 52 adult radio-collared panthers monitored between 1998 and 2002 ranged from 15,360 to 293,759 ac (6,216 to 118,880 ha), averaging 89,600 ac (36,260 ha) for 20 resident adult males and 44,160 ac (17,871 ha) for 32 resident adult females (Land et al. 1999, 2002; Shindle et al. 2000, 2001). The most current estimate of home-range sizes (minimum convex polygon method) for established, non-dispersing, adult, radio-collared panthers averaged 29,056 ac (11,759 ha) for females (n = 11) and 62,528 ac (25,304 ha) for males (n = 11) (Lotz et al. 2005). The average home range was 35,089 ac (14,200 ha) for resident females (n = 6) and 137,143 ac (55,500 ha) (n = 5) for males located at Big Cypress National Preserve (BICY) (Jansen et al. 2005). Home ranges of resident adults tend to be stable unless influenced by the death of other residents.

Activity levels for panthers are greatest at night with peaks around sunrise and after sunset (Maehr et al. 1990b). The lowest activity levels occur during the middle of the day. Female panthers at natal dens follow a similar pattern with less difference between high and low activity periods.

Telemetry data indicate panthers typically do not return to the same resting site day after day, with the exception of females with dens or panthers remaining near kill sites for several days. The presence of physical evidence such as tracks, scats, and urine markers, confirms panthers move extensively within home ranges, visiting all parts of the range regularly in the course of hunting, breeding, and other activities (Maehr 1997; Comiskey et al. 2002). Males travel widely throughout their home ranges to maintain exclusive breeding rights to females. Females without kittens also move extensively within their ranges (Maehr 1997). Panthers are capable of moving large distances in short periods of time. Nightly panther movements of 12 mi (20 km) are not uncommon (Maehr et al. 1990a).

Adult females and their kittens interact more frequently than any other group of panthers. Interactions between adult male and female panthers last from 1 to 7 days and usually result in pregnancy (Maehr et al. 1991). Aggressive interactions between males often result in serious injury or death. Independent subadult males have been known to associate with each other for several days and these interactions do not appear to be aggressive in nature. Based on radio-collared panthers, aggression between males is the most common cause of male mortality (FWC 2014) and an important determinant of male spatial and recruitment patterns based on (Maehr et al. 1991; Shindle et al. 2003).

Primary panther prey species are white-tailed deer and feral hog (*Sus scrofa*) (Maehr et al. 1990b; Dalrymple and Bass 1996). Generally, feral hogs constitute the greatest biomass consumed by panthers north of the Alligator Alley section of I-75, while white-tailed deer are the greatest biomass consumed to the south (Maehr et al. 1990b). Secondary prey species include raccoons (*Procyon lotor*), nine-banded armadillos (*Dasypus novemcinctus*), marsh rabbits (*Sylvilagus palustris*) (Maehr et al. 1990b), and American alligators (*Alligator mississippiensis*) (Dalrymple and Bass 1996). No seasonal variation in diet has been detected. Maehr et al. (1990b) rarely observed domestic livestock in scats or kills of the panther, although cattle were readily available in the study area. In a study of calf depredation on two ranches in southwest Florida (Main and Jacobs 2014), panthers were determined to be the cause of calf mortality for 0.5 percent of calves on one ranch and 5.3 percent of calves on the other ranch.

Little information on the feeding frequency of the panther is available. However, the feeding frequency of the Puma is likely similar to the feeding frequency of the panther. Ackerman et al. (1986) reported a resident adult male puma generally consumes one deer-sized prey every 8 to 11 days. Moreover, a resident female puma will consume one deer-sized prey item every 14 to 17 days, and one deer-sized prey item every 3.3 days for a female with three 13-month-old kittens.

Habitat

Noss and Cooperrider (1994) considered the landscape implications of maintaining viable panther populations. Assuming a male home range size of 137,599 ac (55,685 ha) (Maehr 1990), an adult sex ratio of 50:50 (Anderson 1983), and some margin of safety, they determined a reserve network as large as 15,625 to 23,438 mi^2 (40,469 to 60,703 km^2) would be needed to

support an effective population size of 50 individuals (equating to an actual adult population of 100 to 200 panthers [Ballou et al. 1989]). However, to provide for long-term persistence based on an effective population size of 500 individuals (equating to 1,000 to 2,000 adult panthers [Ballou et al. 1989]), could require as much as 156,251 to 234,376 mi^2 (404,687 to 607,031 km^2). This latter acreage corresponds to roughly 60 to 70 percent of the panther's historical range. Although it is uncertain whether this much land is needed for panther recovery, it does provide some qualitative insight into the importance of habitat conservation across large landscapes for achieving a viable panther population (Noss and Cooperrider 1994).

Radio-collar data and ground tracking indicate that panthers use the mosaic of habitats available to them as resting and denning sites, hunting grounds, and travel routes. The majority of telemetry locations (Belden 1986; Belden et al. 1988; Maehr 1990; Maehr et al. 1991; Maehr 1992; Smith and Bass 1994; Kerkhoff et al. 2000; Comiskey et al. 2002, Cox et al. 2006, Kautz et al. 2006, Land et al. 2008) and natal den sites (Benson et al. 2008) were within or close to forested cover types, particularly cypress swamp, pinelands, hardwood swamp, and upland hardwood forests. Global Positioning System data has shown panthers (n = 12) use all habitats contained within their home ranges by selecting for forested habitat types and using all others in proportion to availability (Land et al. 2008).

Kautz et al. (2006) found that the smallest class of forest patches (*i.e.*, 9 to 26 ac [3.6 to 10.4 ha]) were the highest ranked forest patch sizes within panther home ranges. The diverse woody flora of forest edges probably provides cover suitable for stalking and ambushing prey (Belden et al. 1988; Cox et al. 2006). Also, dense understory vegetation comprised of saw palmetto provides some of the most important resting and denning cover for panthers (Maehr 1990; Benson et al. 2008). Shindle et al. (2003) estimated 73 percent of panther dens were in saw palmetto thickets.

Between 1981 and 2010, more than 90,000 locations were collected from more than 180 radio-collared panthers. Belden et al. (1988); Maehr et al. (1991); Maehr and Cox (1995); Maehr (1997); Kerkoff et al. (2000); Comiskey et al. (2002); Cox et al. (2006); and Kautz et al. (2006) provide information on habitat use based on various subsets of these data. Land et al. (2008), investigated habitat selection of 12 panthers in the northern portion of the breeding range using Global Positioning System (GPS) telemetry data collected during nocturnal and diurnal periods, as well as VHF telemetry data collected only during diurnal periods, and found analysis of both types of telemetry data yielded similar results.

Even though some suitable panther habitat remains in south-central Florida, it is widely scattered and fragmented (Belden and McBride 2005). Thatcher et al. (2006) used a statistical model in combination with a geographic information system (GIS) to develop a multivariate landscape-scale habitat model based on the Mahalanobis distance statistic (D^2) to evaluate habitats in south central Florida for potential expansion of the panther population. They identified four potential habitat patches: the Avon Park Bombing Range area, Fisheating Creek/Babcock-Webb Wildlife Management Area (WMA), eastern Fisheating Creek, and the Duette Park/ Manatee County area. These habitat patches are smaller and more isolated compared with the current panther

range, and the landscape matrix where these habitat patches exist provides relatively poor habitat connectivity among the patches (Thatcher et al. 2006, 2009). Major highways and urban or agricultural development isolate these habitat patches, and they are rapidly being lost to the same development that threatens southern Florida (Belden and McBride 2005).

Travel and dispersal corridors

In the absence of direct field observations/measurements, Harrison (1992) suggested landscape corridors for wide-ranging predators should be half the width of an average home range size. Following Harrison's (1992) suggestion, corridor widths for panthers would range from 6.1 to 10.9 mi (9.8 to17.6 km) depending on whether the target animal was an adult female or a transient male. Beier (1995) suggested that corridor widths for transient male puma in California could be as small as 30 percent of the average home range size of an adult panther; however, topography in California is dramatically different from that in Florida. Without supporting empirical evidence, Noss (1992) suggests regional corridors connecting larger hubs of habitat should be at least 1.0 mi (1.6 km) wide. Beier (1995) makes specific recommendations for very narrow corridor widths based on short corridor lengths in a California setting of wild lands completely surrounded by urban areas; he recommended corridors with a length less than 0.5 mi (0.8 km) should be more than 328 ft (100 m) wide, and corridors extending 0.6 to 4 mi (1 to 7 km) should be more than 1,312 ft (400 m) wide. The Dispersal Zone, which connects lands between the Panther Focus Area south of the Caloosahatchee River and the Panther Focus Area north of the Caloosahatchee River, encompasses 44 mi^2 (113 km^2) with a mean width of 3.4 mi (5.4 km) (Figure 5). Although it is not adequate to support a single panther, the Dispersal Zone is strategically located and expected to function as an important landscape linkage to south-central Florida (Kautz et al. 2006). Transient male panthers currently use this zone as they disperse northward into south-central Florida.

Distribution

The panther is the last subspecies of *Puma* (also known as mountain lion, cougar, panther, or catamount) still surviving in the eastern United States. Historically occurring throughout the southeastern United States (Young and Goldman 1946), today the panther is restricted to less than 5 percent of its historic range located in south Florida.

When Europeans first came to this country, pumas roamed most all of North, Central, and South America. Early settlers attempted to eradicate pumas by every means possible. By 1899, it was believed panthers had been restricted to peninsular Florida (Bangs 1899). By the late 1920s to mid-1930s, it was thought by many the panther had been completely extirpated (Tinsley 1970). In 1935, Dave Newell, a Florida sportsman, hired Vince and Ernest Lee, Arizona houndsmen, to hunt for panthers in Florida. They killed eight in the Big Cypress Swamp (Newell 1935). Every survey conducted since then confirmed a breeding panther population in southern Florida south of the Caloosahatchee River, and no survey since then has been able to confirm a reproducing panther population outside of southern Florida.

Although generally considered unreliable, sightings of panthers regularly occur throughout the southeast. Nonetheless, a reproducing population of panthers has not been documented to occur outside of south Florida for at least 30 years despite an extensive search effort (Belden et al. 1991; McBride et al. 1993; Clark et al. 2002). Survey reports and more than 70,000 locations of radio-collared panthers recorded between 1981 and 2004 clearly define the panther's current breeding range. Reproduction is known only in the Big Cypress Swamp and Everglades physiographic region in Collier, Lee, Hendry, Miami-Dade, and Monroe Counties, south of the Caloosahatchee River (Belden et al. 1991). As discussed previously, panthers occasionally disperse north of the Caloosahatchee River. However, these animals are likely all males searching to establish new territories. There is no evidence of female panthers or successful panther reproduction currently occurring north of the Caloosahatchee River (Nowak and McBride 1974; Belden et al. 1991; Land and Taylor 1998; Land et al. 1999; Shindle et al. 2000; McBride 2002; Belden and McBride 2005). In 1973, McBride captured one female in Glades County (Nowak and McBride 1974). This was the last time a female panther was identified north of the Caloosahatchee River.

Population Dynamics

McBride et al. (2008) and McBride (2010) reported minimum population counts (*i.e.*, number known alive) based on physical evidence (*e.g.*, tracks, urine markers, panther treed with hounds, trail-camera photos). They counted adult and subadult panthers, but not kittens at the den. Three rules were used to distinguish individuals: (1) gender was determined by track size or stride length; (2) time (freshness) was determined by known events within the past 24 hours, such as wind or rain; and (3) distance between individual track sets. These rules were used as an exclusionary tool to avoid over-counting (McBride et al. 2008). The number of panthers detected and verified by physical evidence from 1981 to 1994 fluctuated between a high of 30 and a low of 19 adult and juvenile panthers, with the lowest point occurring in 1991 following the removal of seven juveniles and three kittens to initiate a captive breeding program (McBride et al. 2008). In 1995, eight female pumas from Texas were released to address suspected deleterious effects of inbreeding. From 1996 to 2003, the panther population increased at a rate of 14 percent per year with 26.6 kittens being produced annually (Johnson et al. 2010). The effective population size (N_e) rose from 16.4 in 1995 to 32.1 in 2007, with corresponding census populations (N) of 26 and 102, respectively. The population tripled since 1995 (McBride et al. 2008, Johnson et al. 2010), reaching a high of 117 by 2007 (mortalities not subtracted). Data reported in McBride (2000, 2001, 2002, 2003, 2004, 2006, 2007,2008, and 2009), McBride et al. (2010, 2011, 2012, and 2013), and Johnson et al. (2010) noted minimum population counts of 62 panthers in 2000, 78 in 2001, 80 in 2002, 87 in 2003, 78 in 2004, 82 in 2005, 97 in 2006, 117 in 2007, 104 in 2008, 113 in 2009, 115 in 2010, 111 in 2011, 123 in 2012, and 133 in 2013.

Maehr et al. (1991) provide an estimate of population density of 1 panther per 27,520 ac, based on 17 radio-collared and 4 uncollared panthers. They extrapolated this density to the area occupied by radio-collared panthers (1,245,435 ac) during the period 1985 to 1990 to achieve a

population estimate of 46 adult panthers for southwest Florida (excluding Everglades National Park [ENP], eastern BICY, and Glades and Highlands Counties). Beier et al. (2003), however, argued this estimate of density, although "reasonably rigorous," could not be extrapolated to other areas because it was not known whether densities were comparable in those areas. Kautz et al. (2006) provided a density estimate of 1 panther per 31,923 ac by dividing the panther count at that time (67) by the area within the Primary Zone. This estimate does not take into account the variability in panther densities across the landscape. Using an average of the 2007 to 2009 panther counts in the eight survey units covered by McBride et al. (2008) and Kautz et al. (2006), the density estimates range from a low of one panther per 81,479 ac to a high of one panther per 7,850 ac for the Primary Zone lands within these survey units.

The FWC (2010) provided an upper bound population estimate of 0.0177 panthers per square-kilometer (km^2) or one panther per 13,929 ac. Applying this density estimate to the Primary Zone (9,189 km^2) (2,270,652 ac) yields an upper estimate of 163 adult panthers. The FWC's lower estimate is 100 panthers (1.09 panthers per 100 km^2 or 1 panther per 22,707 ac) and is based on annual verified panther sign data (McBride et al. 2008) and minimum number of panthers known to be alive (FWC 2010). Applying the four densities to the Primary Zone would yield a population based on Kautz et al.'s (2006) density estimate of 71 panthers (1 panther per 31,923 ac). Maehr et al.'s (1991) estimate would yield a population of 83 panthers (1 panther per 27,520 ac) and the FWC's (2010) estimate would yield a low of 100 panthers (1 panther per 22,707 ac) and a high of 163 panthers (1 panther per 13,929 ac). For our evaluations however, the Service is continuing to use the average densities provided by Kautz et al. (2006) of one panther per 31,923 ac (12,919 ha) or one panther per 129 km^2.

Population Viability Analysis (PVA) has emerged as a key component of endangered species conservation. This process is designed to incorporate demographic information into models that predict if a population is likely to persist in the future. PVAs incorporate deterministic and stochastic events including demographic and environmental variation, and natural catastrophes. PVAs have been criticized as being overly optimistic about future population levels (Brook et al. 1997) and should be viewed with caution; however, they are and have been shown to be surprisingly accurate for managing endangered taxa and evaluating different management practices (Brook 2000).

Shaffer (1981) originally defined a viable population as follows: "a minimum viable population for any given species in any given habitat is the smallest isolated population having a 99 percent chance of remaining extant for 1,000 years despite the foreseeable effects of demographic, environmental and genetic stochasticity, and natural catastrophes." However, the goal of 95 percent probability of persistence for 100 years is the standard recommended by population biologists and is used in management strategies and conservation planning, particularly for situations where it is difficult to accurately predict the future (Shaffer 1978, 1981, 1987).

From 1981 through 2010, 182 panthers were been radio-collared and monitored on public and private lands throughout south Florida (FWC 2010). Radio-collar data were used by researchers to estimate survival rates and fecundity and were incorporated into PVA models previously developed for the panther (Seal and Lacy 1989, 1992; Cox et al. 1994; Maehr et al. 2002b). These models incorporated a range of different model parameters such as sex ratios, kitten survival rates, age distributions, and various levels of habitat loss, density dependence, and intermittent catastrophes or epidemics. The outputs of these models predicted a variety of survival scenarios for the panther and predicted population levels needed to ensure the survival of the species.

Root (2004) developed an updated set of PVA models for the panther based on RAMAS GIS software (Akçakaya 2002). These models were used to perform a set of spatially explicit PVAs. Three single-sex (*i.e.*, females only) models were constructed using demographic variables from Maehr et al. (2002b) and other sources. A conservative model was based on Seal and Lacy (1989), a moderate model was based on Seal and Lacy (1992), and an optimistic model was based on the 1999 consensus model of Maehr et al. (2002b). In each model, first-year kitten survival was set at 62 percent based on information from panther population monitoring (Shindle et al. 2001). All of the models assumed a 1:1 sex ratio, a stable age distribution, 50 percent of females breeding in any year, and an initial population of 41 females (82 individuals), which was the approximate population size in 2001 and 2002 (McBride 2001, 2002).

The basic versions of each model incorporated no catastrophes or epidemics, no change in habitat quality or amount, and a ceiling type of density dependence. The basic versions of the models incorporated a carrying capacity of 53 females (106 panthers with a 50:50 sex ratio). The models were run with differing values for density dependence, various levels of habitat loss, and intermittent catastrophes or epidemics. Each simulation was run with 10,000 replications for a 100-year period. The minimum number of panthers needed to ensure a 95 percent probability of persistence for 100 years was estimated in a series of simulations in which initial abundance was increased until probability of extinction at 100 years was no greater than 5 percent. More detailed information concerning the PVA model parameters appears in Root (2004).

The results of an earlier, conservative PVA model run done by Seal and Lacy (1989) predicted a probability of extinction of 78.5 percent in 100 years with a mean final total abundance of 3.5 females. Also, the probability of a large decline in abundance (50 percent) was 94.1 percent. Later work based on improved panther modeling and a larger sample of monitored panthers produced both a moderate and optimistic scenario (Root 2004). The moderate model resulted in a 5 percent probability of extinction and a mean final abundance of 42.3 females in 100 years. The probability of panther abundance declining by half the initial amount was 20 percent in 100 years under the moderate model. The optimistic model resulted in a 2 percent probability of extinction and mean final abundance of 51.2 females in 100 years. The probability of panther abundance declining by half the initial amount was only 9 percent in 100 years under the

optimistic model. These models also provide a probability of persistence (100 percent minus probability of extinction) over a 100-year period of 95 percent for the moderate model and 98 percent for the optimistic model.

Model results were also provided by Root (2004) for probability of extinctions for 1 percent loss of habitat per year, within the first 25 years of the model run, based on both the moderate and optimistic scenarios. The 1 percent loss of habitat equates to essentially all remaining non-urban privately owned lands in the Primary Zone and corresponds to the estimated rate of habitat loss from 1986 to 1996 for the five southwest counties based on land use changes (Root 2004). For the moderate model, the model runs predict a probability of extinction increase of about 1 percent to 6 percent with 1.0 percent habitat loss per year for the first 25 years. For the optimistic model, probability of extinction increased from about 2 percent with no loss of habitat to 3 percent with 1.0 percent habitat loss per year, for the first 25 years. These models also predicted the mean final abundance of females would decrease from 41 to 31 females, a 24.3 percent reduction for the moderate model and from 41 to 38 females, a 7.3 percent reduction for the optimistic model.

The probability of persistence over a 100-year period with a 1 percent loss of habitat changed to approximately 94 percent for the moderate model and 97 percent for the optimistic model. The model runs also predicted a mean final abundance of 62 individuals (31 females and 31 males) for the moderate model and 76 individuals (38 females and 38 males) for the optimistic model.

The results of the PVA lead to the development of population guidelines for the panther. Kautz et al. (2006) developed recommendations for panther population size as it relates to persistence following review of the output of Root's PVA models (2004) and those of other previous PVAs for the panther. These recommendations are: (1) populations of less than 50 individuals are likely to become extinct in less than 100 years; (2) populations of 60 to 70 are barely viable and expected to decline by 25 percent over 100 years; (3) populations of 80 to 100 are likely stable but would still be subject to genetic problems (*i.e.*, heterozygosity would slowly decline); and (4) populations greater than 240 have a high probability of persistence for 100 years and are demographically stable and large enough to retain 90 percent of original genetic diversity. Kautz et al.'s (2006) population recommendations, when applied to the populations predicted by Root's (2004) moderate models, describe the "with habitat loss" population (62 panthers) as barely viable and expected to decline by 25 percent over a 100-year period. The "without habitat loss" population (84 panthers) is likely stable but would still be subject to genetic problems.

The Service believes McBride's verified population of 97 panthers in 2006, 117 panthers in 2007, 104 in 2008, 113 in 2009, 115 in 2010, and 111 in 2011, 123 in 2012, and 133 in 2013 is within Kautz et al.'s (2006) population recommendations representing a population that is likely stable but still may be subject to genetic problems.

The Service also believes the model runs show lands in the Primary Zone are important to the survival and recovery of the panther, and sufficient lands need to be managed and protected in south Florida to provide for a population of 80 to 100 panthers, the population range defined as likely stable over 100 years, but subject to genetic problems.

Critical Habitat

Critical habitat has not been designated for the panther.

Threats

Present or Threatened Destruction, Modification or Curtailment of its Habitat or Range

Panthers, because of their wide-ranging movements and extensive spatial requirements, are particularly sensitive to habitat fragmentation (Harris 1984). Mac et al. (1998) defines habitat fragmentation as: "The breaking up of a habitat into unconnected patches interspersed with other habitat which may not be inhabitable by species occupying the habitat that was broken up. The breaking up is usually by human action, as, for example, the clearing of forest or grassland for agriculture, residential development, or overland electrical lines." The reference to "unconnected patches" is a central underpinning of the definition. For panther conservation, this definition underscores the need to maintain contiguous habitat and protected habitat corridors in key locations in south Florida and throughout the panther's historic range. Habitat fragmentation can result from road construction, urban development, and agricultural land conversions.

Roads and highways facilitate the movement of people and goods by cars and trucks, and may adversely affect the panther. The construction of new roads and the widening of existing roads can result in the direct loss of wildlife habitat (Forman et al. 2003). In addition, disturbance resulting from motorized vehicles may cause panthers to avoid busy roads. Maher (1990) reported that female panthers are less likely to cross busy highways. Consequently, roads may act as barriers affecting panther movement and fragmenting panther habitat. Panthers can also be injured or killed due to collisions with motorized vehicles when attempting to cross highways, and the potential for collisions increases as traffic increases. Adverse effects resulting from roads and highways represent a potential threat to the existing panther population.

Collisions with motor vehicles on highways are a significant source of mortality for the panther. The FWC documented 165 vehicle-related panther mortalities and 8 vehicle-related panther injuries from 1972 to the present on highways in south Florida. In portions of the panther's range, the rate of panther vehicle-related mortalities may be increasing. Smith et al. (2006) found that vehicle-related panther mortalities in Collier

County increased by a factor of four from 2000 to 2005, compared to previous decades. This increase in panther mortality is likely related to the increase in traffic from Collier County's population growth. Unfortunately, the effect of vehicle-related mortality on the existing panther population is largely unknown.

Wildlife underpasses, or crossings, can be constructed within highway corridors to reduce the potential for panther injuries and mortalities resulting from vehicle collisions. Underpasses allow panthers and other wildlife to safely cross under busy roadways, and maintain connectivity and gene flow within the panther population. Underpasses usually consist of a bridge, prefabricated concrete box, or culvert (Forman et al. 2003). Effective crossing structures are large enough to allow the passage of panthers and include adequate wing fencing to funnel panthers to the crossing site. Crossings should be designed so panthers have an unobstructed view of habitat on the opposite side of the underpass (Foster and Humphrey 1995). The status of lands adjacent to the crossing site should also be considered when determining the location of a crossing. Unprotected private lands adjacent to the crossing could be developed and render the crossing unviable. Accordingly, lands adjacent to crossings should be acquired or placed under a conservation easement or other protective covenant to ensure the crossing will function in perpetuity. A number of wildlife crossings with associated fencing have already been constructed on major roadways in southwest Florida to benefit the panther and other wildlife species. In 1991, the FDOT finished the construction of 28 wildlife crossings within the I-75 corridor from U.S. Highway 27 to just west of Everglades Boulevard.

The FDOT also constructed six wildlife crossings on SR 29 between Oil Well Road and US 41. Crossings A, B, C, and D are located north of I-75 and Crossings E and F are located south of I-75. Crossings A and B were constructed in 2007, Crossings C and D were constructed in 1995, Crossing E was constructed in 1997, and Crossing F was constructed in 1999. Prior to construction of the SR 29 Crossings, a total of 10 vehicle-related panther mortalities were recorded near the locations of Crossings A and B from 1980 through 2004, and 2 vehicle-related panther mortalities were recorded near the location of Crossings C and D from 1979 through 1990. Vehicle-related panther mortalities have not been recorded in the vicinity of Crossings A, B, C, or D following their installation. A total of two vehicle-related panther mortalities were documented within 3.5 mi of the location of Crossing E prior to construction, and vehicle-related panther mortalities were not observed within 2.5 mi of the location of Crossing F prior to construction. Following construction of Crossings E and F, a total of four vehicle-related panther mortalities have been reported within 3 mi of Crossing E, and two vehicle-related panther mortalities have been documented within 1 mi of Crossing F.

Lee County, Collier County, and other entities have been working with the Service to construct additional needed crossings for the panther. For example, the Collier County Road Department recently constructed two wildlife underpasses and barrier fencing

within the Oil Well Road (CR 858) corridor at Camp Keais Strand, in association with the Oil Well Road widening project. Lee County constructed a wildlife underpass and barrier fencing on Corkscrew Road in 2004. Moreover, in 2011, a wildlife underpass and barrier fencing was installed east of Immokalee on County Road (CR) 846 in Collier County, as part of a Habitat Conservation Plan. A wildlife underpass has also been installed on Immokalee Road near CR 951.

Although these wildlife crossings have contributed to minimization of panther-vehicle interactions, more crossings are needed within the major roadways of south Florida to further reduce this threat to the panther and other wildlife species (Smith et al. 2006). Recent studies have been conducted to identify locations for wildlife crossings in south Florida. Swanson et al. (2005) used a Least Cost Pathway (LCP) modeling approach to identify the most likely travel routes for panthers among six major use areas in southwest Florida. LCP modeling takes into consideration elements in the landscape that permit or impede panther movement when traveling. Swanson et al. (2005) identified 20 key highway segments where LCPs intersected improved roadways. Smith et al. (2006) studied the movements of the panther, the Florida black bear, and other wildlife species along SR 29, CR 846 and CR 858 in Collier County, Florida. Data analyzed in the study were obtained from roadkill and track surveys, infra-red camera monitoring stations, existing data provided by the FWC (panther radio telemetry and vehicle mortality reports), and other studies. Smith et al. (2006) recommended new wildlife crossings be considered at various sites along these roadways to reduce vehicle-related mortality of panthers and other wildlife species, and to increase connectivity among wildlife populations. The Service continues to work with the FDOT, county road departments, and other entities to ensure wildlife crossings are installed as needed to promote safe passage of panthers and other wildlife across roadways.

Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Prior to 1949, panthers could be killed in Florida at any time of the year. In 1950, the Florida Game and Fresh Water Fish Commission (now Florida Fish and Wildlife Conservation Commission [FWC]) declared the panther a regulated game species due to concerns over declining numbers. The FWC removed panthers from the game animal list in 1958 and gave them complete legal protection. On March 11, 1967, the Service listed the panther as endangered (32 FR 4001) throughout its historic range, and these animals received Federal protection under the passage of the Act in 1973. In addition, the Florida Panther Act (Florida Statute 372.671), a 1978 Florida State law, made killing a panther a felony. The panther is listed as endangered by the States of Florida, Georgia, Louisiana, and Mississippi in addition to its Federal listing.

Restricted Range

Historically occurring throughout the southeastern United States (Young and Goldman 1946), today the panther is restricted to south Florida in an area that is less than 5 percent of its historic range.

Ongoing Conservation Efforts

Habitat protection has been identified as being one of the most important elements to achieving panther recovery. While efforts have been made to secure habitat, continued action is needed to obtain additions to and inholdings for public lands, assure linkages are maintained, restore degraded and fragmented habitat, and obtain the support of private landowners for maintaining property in a manner that is compatible with panther use. Conservation lands used by panthers are held and managed by a variety of entities including the Service, NPS, Seminole Tribe of Florida, Miccosukee Tribe of Indians of Florida, FWC, Florida Department of Environmental Protection (DEP), Florida Division of Forestry (FDOF), Water Management Districts, non-governmental organizations, counties, and private landowners.

To further refine the land preservation needs of the panther, and to specifically develop a landscape-level program for the conservation of the panther population in south Florida, the Service appointed a Florida Panther Subteam in February 2000. The Subteam was charged with developing a landscape-level strategy for the conservation of the panther population in south Florida. The results of this collaborative effort are partially presented in Kautz et al. (2006). One of the tasks for this subteam was to identify a strategically located set of lands containing sufficient area and appropriate land cover types to ensure the long-term survival of the south Florida population of the panther. Kautz et al. (2006) focused their efforts on the area south of the Caloosahatchee River, where the reproducing panther population currently exists.

Kautz et al. (2006) created an updated panther potential habitat model. The potential habitat map was reviewed in relation to telemetry data, recent satellite imagery (where available), and panther home range polygons. Boundaries were drawn around lands defined as the Primary Zone, the most important area needed to support a self-sustaining panther population. Kautz et al. (2006) referred to these lands as essential; however, as observed in the two previous plans (Logan et al. 1993; Cox et al. 1994), lands within the boundaries of the Primary Zone included some urban areas and other lands not considered to be panther habitat (*i.e.*, active rock and sand mines). The landscape context of areas surrounding the Primary Zone was modeled and results were used to draw boundaries of the Secondary Zone (Figure 5), the area capable of supporting the panther population in the Primary Zone, but where habitat restoration may be needed (Kautz et al. 2006).

Kautz et al. (2006) also identified, through a LCP model, the route most likely to be used by panthers crossing the Caloosahatchee River and dispersing out of south Florida into south-central Florida. Kautz et al. (2006) used GIS-based analysis to construct the LCP models and identify

optimum panther dispersal corridor(s). The LCP models operated on a cost surface that ranked suitability of the landscape for use by dispersing panthers with lower scores indicating higher likelihood of use by dispersing panthers. Those dispersal routes connecting lands between the Panther Focus Area south of the Caloosahatchee River and the Panther Focus Area north of the Caloosahatchee River were defined as the Dispersal Zone (Kautz et al. 2006). The preservation of lands within this zone is important for the survival and recovery of the panther, as these lands are the dispersal pathways for expansion of the panther population.

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Enclosure C

Panther Compensation Calculator

PANTHER COMPENSATION CALCULATOR

About

Development size		(hectares)
primary/d	secondary	other
498.05633	2895.5472	0

Compensation		(hectares)
primary/d	secondary	other
1520.3723	1773.5273	0

(PHUs)	Suggested Required	Comp. Proposed
primary/d	4484.6	9842.3
secondary	17743.3	8547.0
other	0.0	0.0

Acreage Comp. Ratio	1.0
Primary Equiv. Comp Ratio	1.6

Primary/d impacts fully compensated?	YES
Secondary impacts fully compensated?	NO
"Other" impacts fully compensated?	

No. of Panthers:	90
Base Ratio:	1.98

Relative values	
primary/d	1.000
secondary	0.690
other	0.333

DEVELOPMENT	
Habitat Value before Project	11226
Habitat Value after Project	0
Habitat Value Lost	11226
Base Ratio	1.98
Suggested Compensation	22228

Select Units
- (•) Acres
- ( ) Hectares

New Project

Clear All

COMPENSATION	
Habitat Value of Compensation	13031
Habitat Value after Restoration	22964
Restoration Lift Factor*	0.5
Final Value of Compensation	18389
Additional Compensation Needed	3839

***When converting Ag lands to non-forested native systems applicant gets full credit of lift**

PROJECT PLANNING INFO FOR PANTHER TABLE

Habitat Impact Acreage and Panther Units						Compensation Acreage and Panther Units.					
primary/d		secondary		other		primary/d		secondary		other	
Acres	PHU	Acres	PHU	Acres	PHU	Acres	PHU	Acres	PHU	Acres	PHU
498.1	2264.9	2895.5	8961.3	0.0	0.0	1520.4	9842.3	1773.5	8547.0	0.0	0.0

PROJECT WORKSHEET

Habitat Type	*Assigned value*	Habitat types of land to be developed: Primary/d Zone	Secondary Zone	Other Zone	Primary Equivalent Habitat Units	Habitat types of land after development: Primary/d Zone	Secondary Zone	Other Zone	Primary Equivalent Habitat Units
Pine forest	9.5	0.57	0.66		10				0
Hardwood-Pine	9.3	0.00	0.65		4				0
Cypress swamp	9.2	1.15	0.14		11				0
Hardwood swamp	9.2				0				0
Hardwood Forest	9	0.03			0				0
Dry prairie	6.3		0.07		0				0
Unimproved pasture	5.7				0				0
Shrub swamp/brush	5.5				0				0
Improved pasture	5.2		0.08		0				0
Cropland	4.8	10.79	396.13		1364				0
Orchards/groves	4.7	464.28	2342.52		9779				0
Marsh/ wet prairie	4.7	0.75			4				0
Xeric scrub	4.5				0				0
Exotic/Nuisance plants	3	3.42	1.51		13				0
Coastal wetlands	3				0				0
Barren/Disturbed lands	3	0.28	19.02		40				0
Water	0	12.89	116.33		0				0
Urban	0	3.87	18.44		0	498.06	2895.55		0
Reservoirs*					0				0
STA*					0				0
TOTAL		498.06	2895.55	0.00	11226.20	498.06	2895.55	0.00	0.00

CONTINUE

CLEAR SHEET

COMPENSATION TO OFF-SET

22228

Habitat Units

***NOTE: The assigned value for Reservoirs and STAs varies by size, proposed future management, and their position in the landscape. See the associated methodology document for guidance on starting values and considerations.**

COMPENSATION

Habitat Type	*Assigned value*	Habitat types of land being offered as compensation: Primary/d Zone	Secondary Zone	Other Zone	Equivalent Habitat Units	Habitat types of compensation land after restoration: Primary/d Zone	Secondary Zone	Other Zone	Equivalent Habitat Units
Pine forest	9.5	14.84	28.83		330	686.57	919.68		12551
Hardwood-Pine	9.3	16.51	74.16		629	27.78	101.88		912
Cypress swamp	9.2	196.96	273.28		3547	260.34	363.39		4702
Hardwood swamp	9.2	13.53	3.24		145	21.03	5.29		227
Hardwood Forest	9	2	0.46		21	4.94	0.53		48
Dry prairie	6.3	6.39	1.67		48	9.29	2.51		69
Unimproved pasture	5.7				0				0
Shrub swamp/brush	5.5	10.95	2.28		69	39.05	5.61		236
Improved pasture	5.2	15.99	10.16		120				0
Cropland	4.8	10.33	106.39		402				0
Orchards/groves	4.7	484.85	554.14		4076				0
Marsh/ wet prairie	4.7	104.62	21.64		562	305.26	118.59		1819
Xeric scrub	4.5				0				0
Exotic/Nuisance plants	3	302.33	168.08		1255				0
Coastal wetlands	3				0				0
Barren/Disturbed lands	3	25.85	65.09		212				0
Water	0	80.88	117.46		0				0
Urban	0	68.24	90.60		0				0
Reservoirs*					0				0
STA*					0				0
SubTotal		1354.26	1517.48	0.00	11414.96	1354.26	1517.48	0.00	20564.58

CONTINUE

CLEAR SHEET

COMPENSATION PROPOSED

18389

Habitat Units

15990 Subtotal PHU with time lag factor

USE SECTION BELOW ONLY IF A NATIVE HABITAT IS BEING CREATED FROM AG LANDS

Unimproved pasture	5.7				0				
Improved pasture	5.2				0				
Cropland	4.8	15	49		235				
Orchards/groves	4.7	151	207		1381				
Shrub swamp/brush	7								0
Marsh/ wet prairie	7					166	256		2399
Xeric scrub	7								0
Coastal wetlands	7								0
SubTotal		166.11	256.05	0.00	1615.98	166.11	256.05	0.00	2399.49

Values in green are only used when ag lands are restored to non-forested native habitat. Full restoration value is immediate in this instance only.

2399 Subtotal PHU from Ag Restoration

***NOTE: The assigned value for Reservoirs and STAs varies by size, proposed future management, and their position in the landscape. See the associated methodology document for guidance on starting values and considerations.**