To estimate the spatial extent of development across cover classes the wood stork may use for foraging, we use the "Proportional" method described in section 2.1.4, which distributes 39,973 acres of development among all areas (Development and Mining, Base Zoning, and Eligible Lands) that could receive high-density development under the HCP. By this method, we estimate that the proposed Action could convert up to 4,885 acres of wetland habitats to residential, commercial, or mining uses (Table 2-3, sum of column "G" for native wetlands). This 4,885 acres of development represents 60% of the wetlands that occur in the full development envelope. Therefore, we expect development distributed among the use designations of the full envelope would affect the foraging needs equivalent to 60% of 22 wood storks, or about 14 wood storks. Development confined entirely to the Development and Mining designation (*i.e.*, no substitution of Base Zoning or Eligible lands in the development cap), which includes 2,442 acres of wetlands (see Table 2-2), would affect the foraging needs equivalent to 8 wood storks.

We would expect habitat alteration that causes displacement from foraging areas to harm (actually kill or injure) wood stork individuals indirectly through reduced reproductive success if it substantially reduces prey availability within a colony's CFA. In section 13.1.4 under "Habitat Loss and Alteration," we discussed evidence that attributes local stork population declines to a reduced food base. In section 13.2.1, we discussed the substantial decline in numbers of nesting pairs at the Corkscrew colony over the past 50 years, most likely due to a reduced food base. Based on the preceding analysis in this section, we believe that the conversion of wetland foraging habitats to residential/commercial or mining uses would cause, through reduced reproductive success, a long-term reduction of about 8–14 wood storks, collectively, from the three active colonies with CFAs that overlap the Plan Area.

To mitigate for permanent wood stork habitat losses associated with the Covered Activities, the Applicants propose to "preserve, restore, enhance, and/or create suitable wood stork habitat" within the designated Preservation and Very Low Density Use areas (HCP chapter 7.2.1.2). We consider these proposals in the following section.

13.3.2 Preservation Activities

The designated Preservation areas of the HCP contain 49,695 acres of native wetlands (Table 2-2) that we consider as potential wood stork habitat. In Table 13-2, we estimate that these wetlands would support foraging for about 134 wood storks from the three active colonies with CFAs that overlap the Plan Area. The nesting site for one of these colonies, the Collier-Hendry colony, is within an isolated freshwater swamp (see Figure 13-2) on designated Preservation lands.

The Applicants propose a continuation of existing land uses (agriculture, silviculture, *etc.*) in the Preservation areas, which we listed in section 2.3. All of these uses may occur to some extent in native wetlands of the Preservation areas except crop cultivation. Land management activities in the Preservation areas for which the Applicants seek take authorization and that may occur in wetlands include:

- prescribed burning;
- mechanical control of groundcover (*e.g.*, roller chopping, brush-hogging, mowing);

- ditch and canal maintenance;
- mechanical and/or chemical control of exotic vegetation; and
- similar activities that maintain or improve land quality.

In wetlands, prescribed burning is usually applied to control woody encroachment in non-forested wetlands (*e.g.,* wet prairies and bogs), which do not ordinarily support wood stork nesting. Therefore, we do not expect prescribed fire to harm wood stork eggs or flightless chicks. The other activities listed above may temporarily disrupt wood stork foraging activity, but are unlikely to harm birds unless conducted near nesting sites. We believe that trees surrounded by standing water, the typical setting of a colonial wading bird rookery, are unlikely locations for these land management actions.

In Chapter 7.2.1.2 of the HCP, the Applicants propose to preserve and maintain wood stork habitats in the Preservation and Very Low Density use designations (Objective 1), and to restore, enhance, or create such habitat to mitigate for permanent losses associated with the Covered Activities (Objective 2). The HCP notes that the latter activities would typically occur in conjunction with Clean Water Act section 404 permitting processes. Where feasible, the Applicants would focus on "enhancement and/or restoration of suitable short-hydroperiod foraging habitats (shallow open marshes, wet prairies)" to provide wood stork foraging during the pre-nesting and fledging periods. The HCP does not specify performance measures (amount or extent, functional gain) for such restoration and enhancement activities.

We do not expect the management of Preservation areas to reduce the numbers, reproduction, or distribution of the wood stork in the Preservation areas, because these activities would, at minimum, maintain current conditions. Special attention to this species in the long-term management of the Preservation areas under conservation easements could increase wood stork densities and the Plan Area population. However, lacking detailed information about how habitat management under conservation easements may benefit this species, we are unable to estimate the extent of potential benefits.

13.3.3 Very Low Density Development

The Very Low Density (VLD) use areas of the HCP contain 733 acres of native wetlands that we consider as wood stork habitat (Table 2-2). In Table 13-2, we estimate that these wetlands would support the foraging needs equivalent to only 2 wood storks from the three active colonies with CFAs that overlap the Plan Area. The nesting site for one of these colonies, the Barron Collier colony, is on an island within an impoundment on one of the VLD use areas (see Figure 13-2).

Land uses in the VLD areas are similar to the Preservation areas, but may also include isolated residences, lodges, and hunting/fishing camps, at a density of no more than one dwelling unit per 50 acres. The Applicants would continue current ranching/livestock operations and other management activities as described for the Preservation Areas (*e.g.,* exotic species control, prescribed burning). As in the Preservation areas, we do not expect adverse effects resulting from the continuation of the existing land management regimes.

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The HCP does not specify a footprint for the isolated residences, lodges, and hunting/fishing camps, but indicates that their construction could clear up to 10% of the existing native vegetation (see section 2.5). New dwelling development could occur within any of the cover types present besides open water and existing development. We believe it is unlikely that such development would occur on the narrow island that supports the Barron Collier colony. Elsewhere, clearing up to 10% of the native wetland cover types that we consider as wood stork habitat would reduce such habitat by 73 acres (Table 2-7). It is possible that dwelling development in the VLD areas could entirely avoid wetlands, but we conservatively estimate a 73-acre habitat loss, which would support the foraging needs equivalent to less than one of the wood storks associated with the three active colonies.

The general measures for enhancing wood stork habitat in the Preservation areas apply to the VLD areas as well (see previous section 11.3.2). However, the potential to increase wood stork numbers or reproduction is limited due to the small extent of wetlands in the VLD areas.

13.3.4 Tables and Figures

Table 13-2. Native wetlands cover (acres) within three wood stork core foraging areas (CFAs, 18.6-mile radius from nest colony site) that overlap the land use designations of the HCP, and estimated number of wood storks for which wetlands inside and outside the Plan Area would support foraging and roosting, based upon 2018 nesting colony stork counts (Percentage of CFA TOTAL WETLANDS × # storks per colony).

COLONY	DEVELOP-MENT	BASE ZONING	ELIGIBLE FOR INCLUSION	Subtotal for All Potential Development Areas	PRESER-VATION	VERY LOW DENSITY	PLAN AREA TOTAL	CFA WETLANDS OUTSIDE PLAN AREA	CFA TOTAL WETLANDS
Barron Collier	2,361	630	4,853	7,843	49,829	733	58,404	333,728	392,133
Collier - Hendry	2,492	630	4,460	7,581	48,977	733	57,291	251,648	308,939
Corkscrew	2,450	0	3,972	6,422	35,920	418	42,760	175,770	218,530
	Percentage of CFA WETLANDS								
Barron Collier	0.6%	0.2%	1.2%	2.0%	12.7%	0.2%	14.9%	85.1%	
Collier - Hendry	0.8%	0.2%	1.4%	2.5%	15.9%	0.2%	18.5%	81.5%	
Corkscrew	1.1%	0.0%	1.8%	2.9%	16.4%	0.2%	19.6%	80.4%	
	Wood stork numbers equivalent to the "Percentage of CFA TOTAL WETLANI								
Barron Collier (282 storks)	2	0	4	6	36	0	42	240	282
Collier - Hendry (54 storks)	1	0	1	2	8	0	10	44	54
Corkscrew (540 storks)	6	0	10	16	88	2	106	434	540
Total	9	0	15	24	132	2	158	718	876

13.4 Cumulative Effects on Wood Stork

For purposes of consultation under ESA §7, cumulative effects are those caused by future state, tribal, local, or private actions that are reasonably certain to occur in the Action Area. Future Federal actions that are unrelated to the proposed action are not considered, because they require separate consultation under §7 of the ESA.

We identified in section 3 of this BO/CO a projected increase in traffic on public roads as the sole source of effects that are consistent with the definition of cumulative effects for this Action. We have no information that suggests traffic on public roads is a predictable cause of wood stork injury, mortality, or significant behavioral modification.

13.5 Conclusion for Wood Stork

In this section, we summarize and interpret the findings of the previous sections for the wood stork (status, baseline, effects, and cumulative effects) relative to the species-specific purpose of a BO under §7(a)(2) of the ESA, which is to determine whether the proposed action is likely to jeopardize the continued existence of a species.

Status

Following a substantial population decline in the decades before the species' classification as endangered in the U.S. in 1984, the wood stork's breeding range and numbers have gradually increased. In 2014, the Service reclassified the species as threatened and established the U.S. breeding population as a distinct population segment. The current breeding range includes Florida, Georgia, and South Carolina, and since 2005, North Carolina. The average number of nesting pairs in 2013–2015 was about 10,800. A doubling of the U.S. wood stork population in the past 3 decades has occurred through an increasing number of smaller nesting colonies (average about 100 nesting pairs). New colonies are increasingly located in artificial impoundments. Colony productivity (number of chicks fledged per nesting attempt) is highly variable among sites and between years, and a clear increasing or decreasing trend is not apparent.

Primary threats to the species include the degradation or loss of habitat due to development, hydrologic alteration of wetlands, and reductions in prey abundance. Prey availability is an important factor limiting the populations of several wading birds, including the wood stork. The primary conservation needs of the wood stork mirror those of other species of wading birds: maintain and restore wetlands for nesting and foraging, and protect nesting sites from disturbance.

Baseline

The core foraging area (CFA; 18.6-mile radius around the nesting site) of three wood stork nesting colonies active in 2018 overlap the Plan Area. The nesting site for two of these colonies are within the Plan Area, and the third colony (the Corkscrew Swamp colony) is located about 2 miles west of the Plan Area. In 2018, these colonies supported nesting for a total of 876 adult

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wood storks. We expect that the amount of wood stork foraging in the Plan Area during the breeding season is directly proportional to the fraction of wetlands habitat within the Plan Area that is within each colony's CFA. Plan Area wetlands constitute between 14.9% and 19.6% of the total wetlands acreage within each of the three CFAs. We estimate that Plan Area wetlands supply the total foraging needs equivalent to about 158 of the 876 wood storks (18.0%) nesting at the three colonies in 2018. Threats to the wood stork within the Plan Area include habitat loss and degradation. Conservation needs within the Plan Area include the protection and management of existing suitable habitat, and the hydrologic restoration of degraded wetlands.

Effects

The two wood stork nesting colonies active in 2018 that occur within the Plan Area are not within the Development and Mining, Base Zoning, and Eligible Lands designations (the potential development "envelope" of the HCP), but the CFAs of these colonies and the Corkscrew Swamp colony overlap these designations. We estimate that wetlands in the full development envelope of the HCP support the foraging needs of about 22 wood storks from the three colonies, most (16) from the Corkscrew colony. The designated Development areas support the foraging needs of about 8 wood storks. Depending on the distribution of the development cap (39,973 acres) among the Development and Mining, Base Zoning, and Eligible Lands designations, we estimate the development would eliminate 2,442–4,884 acres of wetlands that support the foraging needs equivalent to 8–14 wood storks from the three colonies. We expect that this wetlands loss would cause, through reduced reproductive success in the three colonies, a corresponding long-term reduction in the Plan Area wood stork population.

We estimate that wetlands within the designated Preservation areas support the foraging needs equivalent to about 134 wood storks from the three active colonies with CFAs that overlap the Plan Area. The nesting site for one of these colonies is within an isolated freshwater swamp on designated Preservation lands. We do not expect the management of Preservation areas to reduce the numbers, reproduction, or distribution of the wood stork in the Preservation areas, because these activities will, at minimum, maintain current conditions. Special attention to this species in the long-term management of the Preservation areas under conservation easements could increase wood stork densities and the Plan Area population.

We estimate that wetlands within the designated Very Low Density use areas support the foraging needs equivalent to about 2 wood storks from the three active colonies with CFAs that overlap the Plan Area. The nesting site for one of these colonies is on an island within an impoundment on one of the VLD use areas. We believe it is unlikely that limited development (1 dwelling per 50 acres) would occur on the narrow island that supports this colony. Clearing up to 10% of the native wetlands in the VLD use areas would reduce potential wood stork habitat by 73 acres, which would support the foraging needs equivalent to less than one of the wood storks of the three active colonies.

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Cumulative Effects

We have no information that suggests traffic on public roads, which is the sole source of cumulative effects we have identified for this Action, is a predictable cause of wood stork injury, mortality, or significant behavioral modification.

Opinion

The loss of about 2,442–4,884 acres of wetlands that support wood stork foraging activity and potential nesting activity in the future would add an increment of habitat loss to the species' range. Foraging habitat reductions near nesting colonies may impair reproductive success, and we estimate a reduction that would reduce the Plan Area population by about 8–14 wood storks from current levels of 876 breeding individuals. Range-wide abundance is about 10,800 nesting pairs (21,600 individuals).

Precluding new development and mining activity in the dedicated Preservation areas would protect 49,695 acres of wood stork habitat, which contains 85% of the Plan Area wetlands. As these areas are brought under conservation easements, habitat enhancements that may increase wood stork numbers are likely, but the amount or extent is not predictable at this time. Given the small proportional impact of the Development activities to the Plan Area wood stork population, and a much smaller proportional impact range-wide, we believe the net impact of the Action on the wood stork is within the species' ability to sustain.

After reviewing the current status of the species, the environmental baseline for the Action Area, the effects of the Action and the cumulative effects, it is the Service's biological opinion that the Action is not likely to jeopardize the continued existence of the wood stork.

14 Red-cockaded Woodpecker

This section provides the Service's biological opinion of the Action for the red-cockaded woodpecker.

14.1 Status of Red-cockaded Woodpecker

This section summarizes best available data about the biology and current condition of the red-cockaded woodpecker (*Picoides borealis*) (RCW) throughout its range that are relevant to formulating an opinion about the Action. The Service published its decision to list the RCW as endangered on October 13, 1970 (35 FR 16047–16048). The most recently completed 5-year review of the species' status recommended no change to its endangered classification (USFWS 2006). The Service has not designated critical habitat for the RCW.

For a more detailed discussion of the status of the species in south Florida and throughout its range, please refer to the Service's South Florida Multi-species Recovery Plan (USFWS 1999) and the Revised Recovery Plan (USFWS 2003), respectively.

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14.1.1 Species Description

The RCW measures approximately 7–8 inches in length with a wingspan of 14–15 inches. The RCW is distinguished from other woodpeckers by its conspicuous white cheek patches, black cap and neck, and black-and-white barred back and wings.

14.1.2 Life History

The RCW is a territorial, non-migratory, cooperative breeding species (Lennartz et al. 1987). It is the only North American woodpecker that excavates its roost and nest cavities exclusively in living pines. RCWs live in family social units called groups. A group is comprised of a breeding pair, the current year's offspring, and zero to four helpers (adults, normally male offspring of the breeding pair from previous years) (Walters 1991).

Each group member has its own cavity, although a single tree may support multiple cavities. The area containing a group's cavity trees plus a 200-foot forested buffer is called a cluster (Walters 1991). Cavities within a cluster are either complete or under construction, and either active, inactive, or abandoned. We refer to multiple clusters in relatively close proximity to each other as a colony.

Cooperative breeding behavior, in which a pool of adult helpers is available to replace breeders, makes RCW populations unusually resistant to environmental and demographic variation, but highly sensitive to the spatial arrangement of habitat (USFWS 2003). Helpers readily occupy breeding vacancies as they arise, but do not disperse very far, and typically occupy vacancies on their natal territory or a neighboring one. This limited dispersal ability makes geographically isolated groups much less likely to persist through time. Colonization of unoccupied habitat is exceedingly slow under natural conditions, because cavity excavation in living pines is a lengthy process, and RCWs will not occupy habitat without cavities. Rates of natural cavity excavation and colonization increase as forests age and old pines become more abundant.

RCWs forage almost exclusively on live pine trees, and occasionally on recently killed pines (Franzreb 2004). Their prey consists of wood cockroaches, caterpillars, spiders, woodborer larvae, centipedes, and ants (Hanula and Horn 2004). Although they will use smaller pine trees as foraging substrate, RCWs prefer pines greater than 10 inches in diameter at breast height (dbh) (Hooper and Harlow 1986; Engstrom and Sanders 1997).

The spatial extent of foraging habitat needed to sustain a RCW cluster depends primarily on habitat quality. Home ranges in optimal habitat in the Carolinas average 173–222 acres. Habitat quality in most of Florida and other portions of the species' range is generally lower. Home ranges for RCWs in north Florida average 297–346 acres (Porter and Labisky 1986), and 346–395 acres in central and south Florida (Patterson and Robertson 1981; Nesbitt et al. 1983; DeLotelle and Epting 1992). In Big Cypress National Preserve, where the pinelands are not contiguous, RCWs used areas as large as 741–988 acres (D. Jansen, Big Cypress National Preserve, personal communication 1996). At Avon Park Air Force Range (AFR), home range size varied from 173–890 acres, with an average of 395 acres (P. Ebersbach, Avon Park AFR, personal communication 1996).

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14.1.3 Numbers, Reproduction, and Distribution

The RCW persists in remaining fragmented parcels of suitable pine forest in 11 southeastern States. The species is extirpated from New Jersey, Maryland, Missouri, Tennessee, and Kentucky (Costa 2004). The Service's most recent (2003) range-wide population estimate was 14,500 RCWs in 5,800 known active clusters (average of 2.5 individuals per cluster). This is less than 3% of the estimated abundance at the time of European settlement.

The RCW probably once occurred in all 67 Florida counties, with exception of the Florida Keys in Monroe County (Hovis and Labisky 1996). The southern-most historic record is from the Florida City area in Miami-Dade County (Howell 1921). The species is still widely distributed in the state, but substantial populations now occur only in the Panhandle. Elsewhere, populations are relatively small and disjunct. The estimated breeding population of the RCW in Florida is 1,500 pairs, of which 75% are in the Panhandle (Cox et al. 1995). The population centered in the Apalachicola National Forest (680 active clusters as of 1996) is the largest in Florida (R. Costa, FWS, personal communication 2011).

14.1.4 Conservation Needs and Threats

The primary threat to RCW survival and recovery is an ongoing loss, fragmentation, and degradation of pine habitats. RCW habitat quality depends largely on a fire regime that maintains a plant community structure with a relatively open understory. In Florida, invasive exotic vegetation exacerbates the problem of insufficient fire frequency. In south Florida generally, and especially in southwest Florida, the conversion of pine flatwoods habitat on private lands to urban development is a substantial cause of habitat loss and fragmentation.

The loss of habitat on private lands has demographically isolated RCWs remaining on public lands, which could affect the genetic viability of these populations. As recently as 30 years ago, genetic interchange among RCWs in south Florida was likely. Increasing isolation resulting from habitat loss could lead to inbreeding and genetic depression.

Changes in hydrology in south Florida also have caused the loss and degradation of pineland habitat. Alteration of the hydroperiod caused by residential housing construction killed a large area of pines on the Cecil M. Webb Wildlife Management Area. Without a frequent fire regime, draining hydric slash pine flatwoods, which support most RCW colonies in southwest Florida, allows a dense understory to develop (Beever and Dryden 1992).

The availability of suitable cavity trees is a factor limiting RCW populations. The use of artificial cavities can quickly establish RCW groups in unoccupied habitat that is otherwise suitable (Copeyon 1990; Allen 1991). Significant population expansions following artificial cavity provisioning are well documented (Gaines et al. 1995; Franzreb 1999; Carlile et al. 2004; Doresky et al. 2004; Hagan et al. 2004; Hedman et al. 2004; Marston and Morrow 2004; Stober and Jack 2003).

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14.2 Environmental Baseline for Red-cockaded Woodpecker

This section describes the current condition of the RCW in the Action Area without the consequences to the listed species caused by the proposed Action.

14.2.1 Action Area Numbers, Reproduction, and Distribution

The Applicants did not conduct surveys of the Plan Area designed to detect RCWs, and we have no records of active RCW clusters within the Plan Area. RCWs are known to occur near the Plan Area, and the Plan Area contains 9,932 acres of pine flatwoods habitats (wet, mesic, and scrubby flatwoods, see Table 2-1). We have no data about the condition of these flatwoods relative to RCW habitat requirements (*e.g.,* understory density, availability of large trees for cavities). The Applicants' include the RCW as a Covered Species of the HCP in the event that the species colonizes the Plan Area from adjacent conservation lands during the 50-year ITP period. Figure 14-1 shows the location of RCW clusters documented near the Plan Area.

Southwest Florida currently supports at least 85 active RCW clusters, of which 51% are on Federal lands, 35% are on State lands, and 14% are on private lands. The Cecil M. Webb WMA, located in Charlotte County about 40 miles north of the Plan Area, supports 27 active RCW clusters that appear stable. The National Park Service actively manages 43 clusters in Big Cypress National Preserve (BCNP), which abuts the southeastern edge of the Plan Area, and this population appears to be increasing. The Picayune Strand State Forest (PSSF) and Florida Panther National Wildlife Refuge (FPNWR) support the active RCW clusters that are closest to the Plan Area. We have additional RCW records from private lands near Naples (Figure 14-1). It is likely that RCW numbers have declined on private lands in southwest Florida in recent decades due to habitat loss and degradation (Beever and Dryden 1992).

The RCW colony that is closest to the Plan Area is located approximately 5 miles to the south in the FPNWR. This colony consist of two active RCW clusters that occupy eight artificial nest cavities. The next closest colony is located in the Belle Meade and South Golden Gates Estates tracts of the PSSF. This colony consists of 3 active and 11 inactive clusters. RCWs in this colony may interact with RCWs on private lands near Naples. The PSSF population has been in decline for several decades, due to lack of habitat management prior to acquisition by the State of Florida. Prescribed fire and other actions now underway on the PSSF are likely to reverse this decline.

Colonization of unoccupied habitat is exceedingly slow under natural conditions, and we have no direct evidence that RCWs occupy the Plan Area. The suitability of Plan Area flatwoods as RCW habitat is unknown, but likely poor, consistent with other private lands known to support RCWs in Collier County (Beever and Dryden 1992). The extent of RCW dispersal is typically limited to adjacent territories with unoccupied cavities. RCW territories average about 300–400 acres in south Florida, but some encompass as much as 1,000 acres in areas of non-contiguous pinelands (see section 14.1.2). The diameter of a 400-acre circle is 0.89 miles, and that of a 1,000-acre circle is 1.41 miles. We believe it is unlikely that RCWs from known clusters that are 5 miles or more from the Plan Area have colonized the Plan Area. Although undocumented clusters within

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the Plan Area are possible, we lack sufficient evidence to conclude that RCWs are reasonably certain to occur in the Plan Area.

14.2.2 Action Area Conservation Needs and Threats

Beever and Dryden (1992) summarized data about the substantial conversion of slash pine flatwoods in south Florida to agricultural and urban land uses, and examined the role of hydric (wet) flatwoods as RCW nesting and foraging habitat. By 1970, forest clearing reduced the historic extent of slash pine flatwoods by about 50 percent. By 1989, the acreage of urban areas in southwest Florida exceeded that of slash pine flatwoods. Unlike more northern parts of the species' range, where mesic and xeric (upland) longleaf pine communities most commonly support RCW colonies, hydric (wetland) slash pine flatwoods support the majority of active colonies in southwest Florida. A combination of saturated soils during the wet season and periodic fire during the dry season produce the open understory characteristics that RCWs prefer. Without frequent fire, dryer flatwoods in the climate and soils of southwest Florida develop a dense understory. The drying of hydric flatwoods caused by large drainage canals associated with the Golden Gate development and the Cocohatchee River degraded habitat conditions for RCW colonies located on private lands in Collier County west of FPNWR.

Maintaining the hydrology of wet flatwoods and applying prescribed fire to such areas are the primary conservation needs of the RCW in southwest Florida, including the Plan Area. Conservation lands near the Plan Area that support RCWs (*e.g.,* FPNWR, BCNP) are implementing fire management plans that seek to maintain or restore habitat conditions for RCWs and other listed species that depend on pine forests with a relatively open understory. Installing artificial cavities to expand existing colonies or establish new colonies may also contribute to stabilizing or increasing RCW numbers in areas with otherwise suitable habitat conditions.

14.2.3 Tables and Figures

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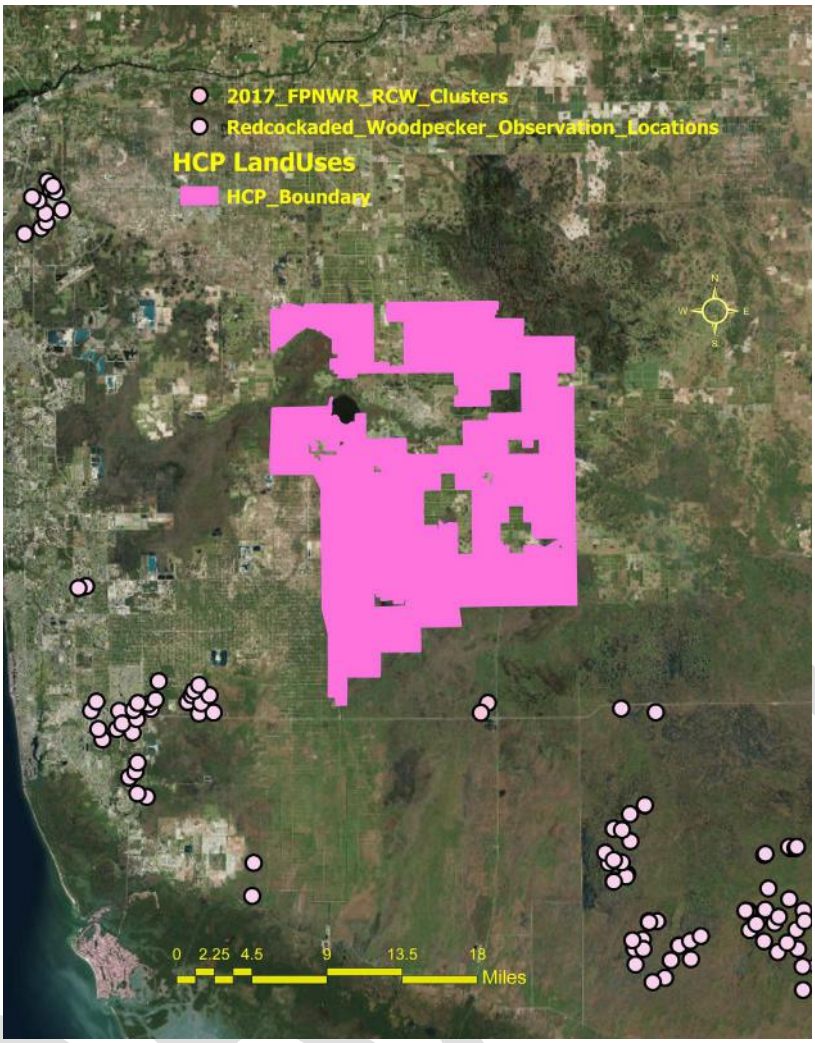

Figure 14-1. Red-cockaded woodpecker locations near the Plan Area.

14.3 Effects of the Action on Red-cockaded Woodpecker

This section describes all reasonably certain consequences to the RCW that we predict the proposed Action would cause, including the consequences of other activities not included in the proposed Action that would not occur but for the proposed Action. Such effects may occur later in time and may occur outside the immediate area involved in the Action.

14.3.1 Development and Mining, Base Zoning, and Eligible Lands

As we explained in section 14.2.1, we do not believe the Plan Area is reasonably certain to support RCWs. Therefore, we do not expect the development of up to 39,973 acres within the designated Development and Mining, Base Zoning, and Eligible Lands of the HCP to affect the RCW.

The three land-use designations of the HCP development envelope contain 1,461 acres of flatwoods habitat (wet, mesic, and scrubby; see Table 2-1) that could possibly support previously undocumented RCW clusters. The Applicants propose to conduct USFWS protocol (USFWS 2003, Appendix 4) RCW surveys in pine flatwoods that are included in development project areas (HCP chapter 7.2.1.3). The survey protocol directs surveyors to report the discovery of cavity trees or other evidence of RCW activity to the USFWS.

14.3.2 Preservation Activities

As we explained in section 14.2.1, we do not believe the Plan Area is reasonably certain to support RCWs. Therefore, we do not expect the preservation of 8,356 acres of pine flatwoods (wet, mesic, and scrubby flatwoods; see Table 2-1) within the designated Preservation Areas to affect the RCW.

The Applicants propose to manage pine flatwoods within the Preservation areas to benefit multiple Covered Species, including the RCW, if RCWs colonize such areas (HCP chapter 7.2.1.3). The Preservation areas contain 84% of the Plan Area flatwoods cover. Specifically, the Applicants propose to maintain an open understory where RCWs are present. If pinelands within the Preservation areas are maintained or restored as suitable RCW habitat, and if RCWs colonize these areas, 8,356 acres of pine flatwoods could support up to 21 RCW clusters with a territory size of about 400 acres.

14.3.3 Very Low Density Development

As we explained in section 14.2.1, we do not believe the Plan Area is reasonably certain to support RCWs. Therefore, we do not expect the Covered Activities within 115 acres of pine flatwoods (112 acres mesic, and 3 acres wet flatwoods; see Table 2-1) within the designated Very Low Density (VLD) areas to affect the RCW.

The Applicants propose to manage pine flatwoods within the VLD areas to benefit multiple Covered Species, including the RCW, if RCWs colonize such areas (HCP chapter 7.2.1.3). Specifically, the Applicants propose to maintain an open understory where RCWs are present. Pinelands within the VLD use areas are insufficient to support the habitat requirements of a single RCW cluster, but some adjoin larger tracts of flatwoods in the Preservation areas. If maintained or restored as suitable RCW habitat, and if RCWs colonize these areas, the VLD areas could contribute a fraction of the foraging or roosting/nesting habitat associated with one or more clusters.

14.4 Cumulative Effects on Red-cockaded Woodpecker

For purposes of consultation under ESA §7, cumulative effects are those caused by future state, tribal, local, or private actions that are reasonably certain to occur in the Action Area. Future Federal actions that are unrelated to the proposed action are not considered, because they require separate consultation under §7 of the ESA.

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We identified in section 3 of this BO/CO a projected increase in traffic on public roads as the sole source of effects that are consistent with the definition of cumulative effects for this Action. We have no information that suggests traffic on public roads is a predictable cause of RCW injury, mortality, or significant behavioral modification.

14.5 Conclusion for Red-cockaded Woodpecker

In this section, we summarize and interpret the findings of the previous sections for the red-cockaded woodpecker (status, baseline, effects, and cumulative effects) relative to the species-specific purpose of a BO under §7(a)(2) of the ESA, which is to determine whether the proposed action is likely to jeopardize the continued existence of a species.

Status

The RCW persists in remaining fragmented parcels of suitable pine forest in 11 southeastern States. Our most recent range-wide population estimate was 14,500 RCWs in 5,800 known active clusters. The species is widely distributed in Florida, but substantial populations now occur only in the Panhandle.

The primary threat to RCW survival and recovery is an ongoing loss, fragmentation, and degradation of pine habitats. RCW habitat quality depends largely on a fire regime that maintains a plant community structure with a relatively open understory. The availability of suitable cavity trees is a factor limiting RCW populations. The use of artificial cavities can quickly establish RCW groups in unoccupied habitat that is otherwise suitable

Baseline

The Applicants did not conduct surveys of the Plan Area designed to detect RCWs, and we have no records of active RCW clusters within the Plan Area. RCWs are known to occur near (>= 5 miles) the Plan Area, and the Plan Area contains 9,932 acres of pine flatwoods habitats. We have no data about the condition of these flatwoods relative to RCW habitat requirements (*e.g.,* understory density, availability of large trees for cavities), but they are likely of poor quality, consistent with other private lands that are known to support RCWs in Collier County. The Applicants' include the RCW as a Covered Species of the HCP in the event that the species colonizes the Plan Area from adjacent conservation lands during the 50-year ITP period.

The RCW colony that is closest to the Plan Area is located in a conservation area approximately 5 miles to the south. We believe it is unlikely that RCWs from known clusters that are 5 miles or more from the Plan Area have colonized the Plan Area. Although undocumented clusters within the Plan Area are possible, we lack sufficient evidence to conclude that RCWs are reasonably certain to occur in the Plan Area.

Effects

Because we do not believe the Plan Area is reasonably certain to support RCWs, we do not expect the proposed Action to affect the RCW. The Applicants propose to conduct RCW surveys

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in pine flatwoods that are included in development project areas. The survey protocol directs surveyors to report the discovery of cavity trees or other evidence of RCW activity to the USFWS. The Applicants propose to manage pine flatwoods within the Preservation areas (which contain 84% of the Plan Area flatwoods) to benefit the RCW, if RCWs colonize such areas. Specifically, the Applicants propose to maintain an open understory where RCWs are present. If all pinelands within the Preservation areas (8,306 acres) are maintained or restored as suitable RCW habitat, and if RCWs colonize these areas, the Preservation areas could support up to 21 RCW clusters, each with a territory size of about 400 acres.

Cumulative Effects

We have no information that suggests traffic on public roads, which is the sole source of cumulative effects we have identified for this Action, is a predictable cause of RCW injury, mortality, or significant behavioral modification.

Opinion

Our assessment of the best available data about RCWs and their habitat in southwest Florida is that RCWs are not reasonably certain to occur in the Action Area. Therefore, we expect the Action to have no effect on the RCW. Any findings of adverse or beneficial effects caused by Covered Activities in the HCP would be speculative and contrary to the legal standards that apply to the ESA section 7 compliance process. However, we acknowledge the Applicants': (a) pre-development surveys of development project sites; (b) subsequent coordination with the USFWS upon detecting RCWs; and (c) commitment to maintaining an open understory in pinelands of the Preservation and Very Low Density use areas that RCWs may colonize during the course of the ITPs. The Preservation areas contain 84% of the Plan Area pine flatwoods; therefore, any future colonization of the Plan Area is more likely to occur the Preservation areas than elsewhere.

After reviewing the current status of the species, the environmental baseline for the Action Area, the effects of the Action and the cumulative effects, it is the Service's biological opinion that the Action is not likely to jeopardize the continued existence of the RCW.

15 Roseate Spoonbill

This section provides the Service's conference opinion of the Action for the roseate spoonbill.

15.1 Status of Roseate Spoonbill

This section summarizes best available data about the biology and current condition of the roseate spoonbill (*Platalea ajaja*) (spoonbill) throughout its range that are relevant to formulating an opinion about the Action. At this time, the roseate spoonbill is not protected under the ESA. The Service has not reviewed the species' status relative to the ESA definitions of "endangered" and "threatened." The State of Florida protects the roseate spoonbill as a threatened species under Florida's Endangered and Threatened Species Rule. For purposes of

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this Conference Opinion, we rely upon the Biological Status Review prepared by the Florida Fish and Wildlife Conservation Commission (FWC 2011) and other available data to describe the species' status.

15.1.1 Species Description

The roseate spoonbill is a large wading bird, reaching a length of 30–40 inches with a wingspan of 50–53 inches. It has a long, spoon-shaped bill, pink wings and underparts, a white neck and back, and pinkish legs and feet.

15.1.2 Life History

Dumas (2000) synthesized available data about the biology of the spoonbill, which is the source of information we provide here. The spoonbill is a colonial-nesting wading bird that breeds and forages mostly in coastal wetlands, but also in freshwater wetlands. Nesting is primarily on coastal islands over standing water in trees and shrubs, but may also occur further inland. Birds typically disperse after breeding, sometimes to inland areas, depending on variable hydrologic conditions and prey availability. The spoonbill forages in shallow water, targeting small fish and crustaceans. Foraging occurs in a variety of coastal and inland settings, including bays, estuaries, lagoons, sea grass meadows, marsh, wet prairies, swamps, canals, tidal mudflats, tidal pools, sloughs, lakes, ponds, river drainages, mosquito control impoundments, catfish and crayfish ponds, cattle ponds, roadside ditches, and puddles. The average flight distance from a Florida Bay nest site to foraging areas was about 7.5 miles.

15.1.3 Numbers, Reproduction, and Distribution

The breeding range of the roseate spoonbill includes portions of South America, the Pacific and Gulf coasts of Mexico and Central America, the Caribbean, and the U.S. states of Texas, Louisiana, and Florida (Dumas 2000). FWC (2011) cites various sources that estimate the range-wide population at about 150,000–200,000 individuals, with about 5,500 breeding pairs in the U.S.

The largest breeding colonies in Florida are in Florida Bay, with additional colonies in Tampa Bay and in Brevard County on the Atlantic coast. The Florida population was about 736 individuals statewide in 1965, but has since slowly increased in numbers and range to a total of >= 1,800 individuals in 2011 (FWC 2011). FWC (2011) estimates the extent of wetlands that spoonbills use for foraging in Florida at about 12,500 miles^2 (8 million acres).

15.1.4 Conservation Needs and Threats

In its Biological Status Review Report, FWC (2011) summarized available data about threats to the spoonbill in Florida, which is the source of information we provide here. The plume trade of the late 1800s reduced the Florida spoonbill population to only 15 breeding pairs by the early 1900's, but numbers increased and range expanded following legal protections. Current threats include the degradation or loss of habitat due to coastal development, hydrologic alteration of wetlands, and reductions in prey abundance. Like other wading birds in wetland habitats,

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spoonbills are exposed to persistent contaminants such as heavy metals and pesticides. Breeding sites and some foraging sites are vulnerable to oil spills and disturbance from recreational activity. Raccoons and other predators that gain access to a rookery can seriously impair reproduction and cause the colony to abandon the rookery.

Conservation needs mirror those of other colonial wading birds: management and protection of breeding and foraging habitats (*e.g.,* posting and enforcing no-disturbance buffers around a nesting site), and hydrologic restoration to restore and maintain prey productivity.

15.2 Environmental Baseline for Roseate Spoonbill

This section describes the current condition of the roseate spoonbill in the Action Area without the consequences to the listed species caused by the proposed Action.

15.2.1 Action Area Numbers, Reproduction, and Distribution

The Applicants did not conduct species-specific surveys for the spoonbill within the Plan Area, but note in section 5.5.1.4 of the HCP that the species is routinely observed in the Plan Area. The eBird database contains numerous records of sightings at locations within the Plan Area of up to 12 spoonbills, but typically 1–5 birds (eBird 2019). The FWC Water Bird Locator, a statewide database of known colonial nesting sites since the 1970s for wading birds and other species, does not contain records of spoonbill nesting colonies within the Plan Area or within 30 miles of Plan Area (FWRI 2019). Without any records of nesting activity in the Plan Area, and given the species' more typical use of coastal wetland nesting sites, we believe that the Plan Area supports spoonbill foraging and roosting, but is not reasonably certain to support nesting.

The Plan Area contains 58,543 acres of native freshwater wetlands that are potential spoonbill habitat (Table 2-2). The estimated Florida spoonbill population of about 1,800 individuals that forage in about 8 million acres of wetlands (FWC 2011) represents an overall density of about 1 bird per 4,444 acres. We apply this density to the wetland acreage of the Plan Area to estimate that about 13 roseate spoonbills may forage and roost within the Plan Area.

15.2.2 Action Area Conservation Needs and Threats

Large areas of native wetlands habitat within the Plan Area have been altered via land clearing and drainage for agricultural uses. This loss of habitat has likely reduced prey availability and increased competition with other wading birds. Threats to the spoonbill within the Plan Area include further habitat loss and degradation. Conservation needs within the Plan Area include the protection and management of existing suitable habitat, and the hydrologic restoration of degraded wetlands.

15.3 Effects of the Action on Roseate Spoonbill

This section describes all reasonably certain consequences to the roseate spoonbill that we predict the proposed Action would cause, including the consequences of other activities not

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included in the proposed Action that would not occur but for the proposed Action. Such effects may occur later in time and may occur outside the immediate area involved in the Action.

15.3.1 Development and Mining, Base Zoning, and Eligible Lands

To estimate the spatial extent of development across cover classes the spoonbill may occupy, we use the "Proportional" method described in section 2.1.4, which distributes 39,973 acres of development among all areas (Development and Mining, Base Zoning, and Eligible Lands) that could receive high-density development under the HCP. By this method, we estimate that the proposed Action could convert up to 4,884 acres of wetland habitats to residential, commercial, or mining uses (Table 2-3, sum of column "G" for native wetlands). The designated Development and Mining areas contain 2,442 acres of native wetlands (Table 2-2), which is the maximum loss of wetlands that could occur if development is confined entirely to these areas (*i.e.,* no substitution of Base Zoning or Eligible lands in the development cap). Using a density of one bird per 4,444 acres of habitat (see section 15.2.1), 2,442–4,884 acres of wetlands would support only about one spoonbill.

Development and mining in wetlands would involve various activities (drainage, filling, excavation, paving, building construction, *etc.*) that would permanently eliminate the affected areas as spoonbill habitat. No known spoonbill nesting colonies occur within the Plan Area; therefore, we do not expect development activities to directly kill or injure spoonbill eggs or flightless young. However, development of wetlands used as foraging areas would cause spoonbills that may use these areas to forage elsewhere.

We would expect habitat alteration that causes displacement from foraging areas to harm (actually kill or injure) spoonbill individuals indirectly through reduced reproductive success if it substantially reduces prey availability within the typical foraging distance from colonial nesting sites (about 7.5 miles for birds at a Florida Bay colony; see section 15.1.2). The nearest documented spoonbill nesting colony is over 30 miles from the Plan Area (FWRI 2019). Undetected nesting activity may occur in the Plan Area, but lacking any evidence that indicates where such nesting occurs, we are not reasonably certain that loss of wetlands foraging habitat resulting from the development would impair spoonbill reproductive success. However, we recognize that prey availability is considered an important factor limiting spoonbill and other wading bird populations (FWC 2013).

The Applicants propose to mitigate for permanent losses of habitat for Covered wading bird species through "preservation, and potential restoration, enhancement and/or creation of an equal acreage" of in-kind habitat (HCP chapter 7.5.1.4). In its "Species Conservation Measures and Permitting Guidelines," FWC (2019) considers wetland mitigation through the State's Environmental Resource Permit (ERP) process sufficient to satisfy its permitting requirements for potential take of spoonbill caused by significant modification of foraging habitat. We expect that the developments of the HCP would engage the State's ERP process.

15.3.2 Preservation Activities

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The designated Preservation areas of the HCP contain 49,695 acres of native wetlands (Table 2-2) that we consider spoonbill foraging and roosting habitat. Using a density of one bird per 4,444 acres of habitat (see section 15.2.1), these wetlands would support about 11 spoonbills. We have no records of spoonbill nesting in the Preservation areas, but undetected nesting may occur in wetlands of the Plan Area.

The Applicants propose a continuation of existing land uses (agriculture, silviculture, *etc.*) in the Preservation areas, which we listed in section 2.3. All of these uses may occur to some extent in native wetlands of the Preservation areas except crop cultivation. Land management activities in the Preservation areas for which the Applicants seek take authorization and that may occur in wetlands include:

- prescribed burning;
- mechanical control of groundcover (*e.g.*, roller chopping, brush-hogging, mowing);
- ditch and canal maintenance;
- mechanical and/or chemical control of exotic vegetation; and
- similar activities that maintain or improve land quality.

In wetlands, prescribed burning is usually applied to control woody encroachment in non-forested wetlands (*e.g.,* wet prairies and bogs), which do not ordinarily support spoonbill nesting. Therefore, we do not expect prescribed fire to harm spoonbills. The other activities listed above may temporarily disrupt spoonbill foraging activity, but are unlikely to harm birds unless conducted near nesting sites. We believe that trees surrounded by standing water, the typical setting of a colonial wading bird rookery, are unlikely locations for these land management actions.

We do not expect the management of Preservation areas to reduce the numbers, reproduction, or distribution of the spoonbill in the Preservation areas, because these activities would, at minimum, maintain current conditions. Special attention to this species in the long-term management of the Preservation areas under conservation easements could increase spoonbill densities and the Plan Area population. However, lacking detailed information about the spoonbill in the Plan Area, and about how habitat management under conservation easements may benefit this species, we are unable to estimate the extent of potential benefits.

15.3.3 Very Low Density Development

The Very Low Density (VLD) use areas of the HCP contain 733 acres of native wetlands that we consider as spoonbill habitat (Table 2-2). Using a density of one bird per 4,444 acres of habitat (see section 12.2.1), these wetlands are unlikely to support substantial use by spoonbills. No sites known to support spoonbill nesting activity within the Plan Area are located within the VLD areas.

Land uses in the VLD areas are similar to the Preservation areas, but may also include isolated residences, lodges, and hunting/fishing camps, at a density of no more than one dwelling unit per 50 acres. The Applicants would continue current ranching/livestock operations and other management activities as described for the Preservation Areas (*e.g.,* exotic species control,

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prescribed burning). As in the Preservation areas, we do not expect adverse effects resulting from the continuation of the existing land management regimes.

The HCP does not specify a footprint for the isolated residences, lodges, and hunting/fishing camps, but indicates that their construction could clear up to 10% of the existing native vegetation (see section 2.5). New dwelling development could occur within any of the cover types present besides open water and existing development. Clearing up to 10% of the native cover types that we consider as spoonbill habitat would reduce such habitat by 73 acres (Table 2-7). It is possible that dwelling development in the VLD areas could entirely avoid wetlands, but we conservatively estimate a 73-acre habitat loss. Because the VLD area wetlands do not support known nesting colonies, we do not expect this extent of habitat modification to kill or injure spoonbills.

The general measures for enhancing spoonbill habitat in the Preservation areas apply to the VLD areas as well (see previous section 11.3.2). However, the potential to increase spoonbill numbers or reproduction is limited due to the small extent of wetlands in the VLD areas.

15.4 Cumulative Effects on Roseate Spoonbill

For purposes of consultation under ESA §7, cumulative effects are those caused by future state, tribal, local, or private actions that are reasonably certain to occur in the Action Area. Future Federal actions that are unrelated to the proposed action are not considered, because they require separate consultation under §7 of the ESA.

We identified in section 3 of this BO/CO a projected increase in traffic on public roads as the sole source of effects that are consistent with the definition of cumulative effects for this Action. We have no information that suggests traffic on public roads is a predictable cause of roseate spoonbill injury, mortality, or significant behavioral modification.

15.5 Conclusion for Roseate Spoonbill

In this section, we summarize and interpret the findings of the previous sections for the roseate spoonbill (status, baseline, effects, and cumulative effects) relative to the species-specific purpose of a BO under §7(a)(2) of the ESA, which is to determine whether the proposed action is likely to jeopardize the continued existence of a species.

Status

The spoonbill is widely distributed in the Americas and Caribbean. Range-wide abundance is about 150,000–200,000 individuals, with about 5,500 breeding pairs in the U.S. The Florida population was estimated at >= 1,800 individuals in 2011, with an area of occupancy of about 12,500 miles^2 (8 million acres). Nesting is primarily on coastal islands over standing water in trees and shrubs, but may also occur further inland. Birds typically disperse after breeding, sometimes to inland areas, depending on variable hydrologic conditions and prey availability. Primary threats to the species include the degradation or loss of habitat due to coastal development, hydrologic alteration of wetlands, and reductions in prey abundance. Prey

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availability is an important factor limiting the populations of several wading birds, including the spoonbill. The primary conservation needs of the spoonbill mirror those of other species of wading birds: maintain and restore wetlands for nesting and foraging, and protect nesting sites from disturbance.

Baseline

Spoonbills are known to use the Plan Area, but not for nesting. The Plan Area contains 58,543 acres of native freshwater wetlands that are potential spoonbill habitat. The estimated Florida spoonbill population of about 1,800 individuals that forage in about 8 million acres of wetlands (FWC 2011) represents an overall density of about 1 bird per 4,444 acres. We apply this density to the wetland acreage of the Plan Area to estimate that about 13 roseate spoonbills may forage and roost within the Plan Area. Threats to the spoonbill within the Plan Area include habitat loss and degradation. Conservation needs within the Plan Area include the protection and management of existing suitable habitat, and the hydrologic restoration of degraded wetlands.

Effects

Depending on the distribution of the development cap among the Development and Mining, Base Zoning, and Eligible Lands designations of the HCP, we estimate the development would eliminate 2,442–4,884 acres of wetlands that would support only about one spoonbill. Lacking evidence that indicates spoonbill nesting occurs within or near the Plant Area, we are not reasonably certain that loss of wetlands foraging habitat resulting from the development would impair spoonbill reproductive success.

The designated Preservation areas may support about 11 spoonbills. We do not expect the management of Preservation areas to reduce the numbers, reproduction, or distribution of the spoonbill in the Preservation areas, because these activities will, at minimum, maintain current conditions. Special attention to this species in the long-term management of the Preservation areas under conservation easements could increase spoonbill densities and the Plan Area population.

Native wetlands in the Very Low Density (VLD) use areas are unlikely to support frequent or substantial use by spoonbills. Clearing up to 10% of the native wetlands in the VLD use areas would reduce potential spoonbill habitat by 73 acres. Because the VLD area wetlands do not support known spoonbill nesting colonies, we do not expect this extent of habitat modification to kill or injure spoonbills.

Cumulative Effects

We have no information that suggests traffic on public roads, which is the sole source of cumulative effects we've identified for this Action, is a predictable cause of spoonbill injury, mortality, or significant behavioral modification.

Opinion

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The loss of about 2,442–4,884 acres of wetlands that may support spoonbill foraging activity would add an increment of habitat loss to the species' range in Florida, where numbers have slowly increased to current levels of about 1,800 individuals over the past several decades. Foraging habitat reductions near nesting colonies may impair reproductive success, but no known spoonbill nesting colonies occur within or near the Plan Area. However, prey availability is recognized as a primary factor limiting spoonbill populations. Using the statewide spoonbill density (1 per 4,444 acres of wetland foraging habitats) as a measure of the impact of wetlands loss on spoonbill populations, the development could reduce spoonbill numbers by only one individual. Range-wide abundance is about 150,000–200,000 individuals.

Precluding new development and mining activity in the dedicated Preservation areas would protect 49,695 acres of spoonbill habitat, which contains 85% of the Plan Area wetlands. As these areas are brought under conservation easements, habitat enhancements that may increase spoonbill numbers are likely, but the amount or extent is not predictable at this time. Given the small proportional impact of the Development activities to Florida spoonbill populations, and a much smaller proportional impact range-wide, we believe the net impact of the Action on the spoonbill is within the species' ability to sustain.

After reviewing the current status of the species, the environmental baseline for the Action Area, the effects of the Action and the cumulative effects, it is the Service's conference opinion that the Action is not likely to jeopardize the continued existence of the roseate spoonbill.

16 Audubon's Crested Caracara

This section provides the Service's biological opinion of the Action for the crested caracara.

16.1 Status of Audubon's Crested Caracara

This section summarizes best available data about the biology and current condition of the Audubon's crested caracara (*Polyborus plancus audubonii;* now northern crested caracara*, Caracara cheriway*) (caracara) throughout its range that are relevant to formulating an opinion about the Action. The Service published its decision to list the Florida population of the caracara as threatened on July 6, 1987 (52 *FR* 25229). A more detailed description of the status of the species is available at: https://www.fws.gov/verobeach/StatusoftheSpecies/20170405_SOS_AudubonCrestedCaracara.pdf. The Service has not designated critical habitat for the caracara.

16.1.1 Species Description

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). Adult caracaras are dark brownish-black dorsally and have a white and black barred breast (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).

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16.1.2 Life History

Caracaras are diurnal and non-migratory. Breeding adults establish territories, which average approximately 3,000 acres, where they are typically found year round (Morrison and Humphrey 2001). Territory size ranges from about 1,000 acres to about 5,000 acres, likely dependent upon the quality of the habitat. Breeding pairs are monogamous, territorial, and exhibit fidelity to both their mate and the site (Morrison 1999). Caracaras vigorously defend their nesting territory during the breeding season (Morrison 2001).

Although breeding activity can occur from September through June, the primary breeding season is considered 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. Nests are well concealed and most often found in the tops of cabbage palms (Morrison and Humphrey 2001), although nests have been found in several other tree species.

The clutch size is usually two eggs, although sometimes three. Both parents take turns incubating the eggs for about 31 to 33 days (Morrison 1999). Breeding pairs ordinarily raise one brood per season, but about 10% of pairs may raise a second brood. Young fledge at about 7–8 weeks of age, and post-fledgling dependency on parental birds lasts approximately 8 weeks.

Foraging

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% and 31% of the total diet, respectively.

Foraging behavior includes regularly patrolling sections of roads for animals killed by collisions with motor vehicles (Palmer 1988). Caracaras will occasionally chase the larger black vulture (*Coragyps atratus*) and turkey vulture (*Cathartes aura*) away from a carcass (Howell 1932). Scavenging at landfills occurs (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 may also provide good foraging areas for the caracara (Morrison 2001).

Movements

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. As a result of a three-year study which included 58 tagged birds, Dwyer et al (2013) reported that non-breeding caracaras “ranged five times more widely during breeding seasons than during non-breeding seasons, and ranged >250 times more widely than breeding caracaras which defended territories

year-round." An individual may traverse a large portion of the species' range in Florida from the time it leaves its parents' 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.

Substantial vagility and sub-adult nomadic behavior result in occasional caracara observations recorded far outside the species' breeding range. Caracaras have been observed in the Florida Keys, the panhandle of Florida (Bay County), 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 that breeding and genetic exchange occurs between the ESA-protected Florida population and other populations of the Northern caracara.

Gathering Areas

Observations and radio-telemetry monitoring have documented aggregations of caracaras within several "gathering areas" and communal roosts in south-central Florida. Gathering areas are typically pasture and citrus areas that simultaneously support large groups (*i.e.,* 50+ individuals) of foraging, non-breeding caracaras during the daytime. Gathering areas 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;
- south of SR 70 on the Buck Island Ranch in Highlands County; and
- near the intersection of SR 82 and SR 29 in Collier County.

Morrison (2001) suggests that gathering areas are important to caracaras before first breeding during the first 3 years after leaving their natal territory. Dwyer (2008) indicated that gathering areas "do not appear to be defended by territorial adults and may provide important refuge from territorial adults during the day." Gathering areas vary in size and therefore, likely support different numbers of non-breeders. These areas are regularly, but not continually used, and occur near communal roosts. At dusk, the birds move into communal roosts, which are usually palm-dominated forests, although scattered palms or cypress hammocks are also used. Figure 16-1 shows a large group of caracaras near Fisheating Creek in a pasture and roosting in a dead oak tree.

Dwyer (2010) identified 13 non-breeding communal roosts that are regularly spaced through the species' range in Florida (Figure 16-2). The ratio of geometric mean distance between nearest neighbors to arithmetic mean distance is a measure of regular spacing, with values approaching 1.0 indicating greater regularity. For all 13 communal roosts, Dwyer calculated a spacing ratio of 0.85. Combining roosts #10 and #13 (*i.e.,* two of the three roosts east of the Immokalee roost) gives a ratio of 0.90. Individual nonbreeding caracaras moved regularly among these sites, and 10 of the 13 known communal roosts are within habitat identified as having high or very high probabilities of nesting caracaras (Smith et al. 2013).

Dwyer et al (2013) interpreted the ecological significance of communal roosts to caracaras as "central places from which non-breeders forage not for food, but for territories in a prospecting context." Non-breeding adult birds maintain the numbers and distribution of a breeding

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population by replacing breeding individuals that die. The loss of a communal roost and/or its associated gathering area could reduce non-breeder survival and delay the re-occupation of vacant breeder territories by non-breeders from more distant communal roosts. Without non-breeding adults ("floaters") regularly prospecting for newly unoccupied suitable habitat within the current breeding range, overall population productivity would decline.

The size of a gathering area that is necessary to maintain its ability to replenish the breeding population of the surrounding landscape is not known. Dwyer (2008) noted that approximately 50% of his telemetry locations occurred within 5 km of roosts, but noted that he did not locate all tagged birds on all survey dates. The longest distance traveled by mid-day from the roost of the previous night was 6 km. He also reported that 95% of all telemetry locations occurred within 22 km of roosts, and that 25 km is the average distance between roosts. Because birds appeared to avoid crossing large areas of non-habitat, he suggested that conservation actions should maintain habitat connectivity between communal roosts to maximize survival and recruitment.

Habitat

The caracara prefers habitats with short-stature vegetation and a low density of trees for nesting. Historically, caracaras inhabited native dry or wet prairies containing scattered cabbage palms, their preferred nesting tree. Over the last century, cattle ranching in central and south Florida has largely replaced native prairie vegetation with 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. The scattered cabbage palms that are often present within improved pastures provide nesting sites for caracaras. Morrison and Humphrey (2001) suggested that a preference for habitats with short-stature vegetation derives from the species' tendency to walk on the ground while foraging. Walking is easier in shorter vegetation, and provides less cover for predators. Caracaras likely benefit from regular mowing, burning, and high-density grazing in agricultural lands, and from prescribed burning in native habitat types, which maintain vegetation in a low-stature and structurally simple condition (Morrison and Humphrey 2001).

Morrison et al. (2006) determined that a mix of habitats comprised of six land cover types interspersed with small (less than 2.47 ac [0.99 ha]) freshwater wetlands (lentic and lotic) were the best predictors of caracara distribution in Florida. Landscapes that appear most suitable for caracara contain a contiguous mix of such small wetlands plus:

- cabbage palm-live oak hammock;
- grassland;
- improved pasture;
- unimproved pasture;
- hardwood hammocks and forest; and
- cypress/pine/cabbage palm.

More than 70% of known caracara nests occur within small clumps of trees, usually cabbage palms, in areas classified in land cover data as improved pasture (Barnes 2007).

For non-breeding caracaras, Dwyer et al. (2013) reported, "pasture occupied by cattle was the most used habitat relative to availability and was used more than pasture without cattle." This is

likely due to increased insect prey production associated with cattle (carcasses and dung). Citrus groves were also used during the day, and because pasture and citrus were often adjacent, they suggested that citrus groves function as refugia from socially-dominant breeding caracaras. Row crops, forests, shrubs, scrub, open water, wetlands, and urban areas were the least-used habitats by non-breeders.

16.1.3 Numbers, Reproduction, and Distribution

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 caracaras occupies the south-central region of the State, from Polk and southern Volusia Counties southward to Collier and northern Dade 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-acre (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 measuring nesting effort/success, is difficult because most caracara breeding territories occur on private lands in Florida that are not accessible to researchers (Humphrey and Morrison 1997). Consequently, roadside counts have provided the primary means of estimating caracara population size (Heinzman 1970; Layne 1995). Breeding individuals occupy territories that do not overlap substantially, but non-breeding individuals are nomadic and concentrate in gathering areas. Non-territorial juvenile and nomadic sub-adult birds may represent a disproportionate share of roadside counts.

Morrison et al. (2007) report that breeding territories monitored since the 1990s tend to remain occupied by birds that attempt breeding every year. Although access to suitable habitat on private lands is limited, they interpret the consistent occupation of known territories as evidence that the caracara population is at or near the carrying capacity of the available habitat. Dwyer et al. (2012) tracked individual non-breeding caracaras in adult plumage that failed to establish breeding territories for over three years, which is consistent with the notion that all available breeding habitat is occupied. Dwyer (2010) reported that nonbreeding adults (floaters) made up approximately 40% of the adult population, which suggests that territories are unavailable for these birds that are likely otherwise capable of breeding.

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Morrison and Humphrey (2001) noted that the published literature on the caracara characterized the species as experiencing a long-term decline in numbers, despite limited data on historic patterns of abundance or habitat availability. Layne (1996) estimated the adult portion of the population was stable with a minimum of about 300 birds in 150 territories, about 100–200 immature birds, and a total statewide population of about 400–500 birds. However, this estimate was informed mostly by roadside counts. A more recently published population estimate is not available.

The Service's South Florida Field Office has a geospatial database of various listed species occurrences in which we have recorded the location of 265 discrete caracara territories from 1994 to 2016. Recent land development may have displaced some of these. At most, these territories represent 530 breeding adults, which is almost double Layne's (1996) estimate of about 300 breeding adults. Using an average of 3,000 acres per territory, 265 breeding pairs would occupy 795,000 acres of breeding habitat, which is substantially less than the 1,835,777 acres of pasture and dry prairie habitats within the general range of the caracara based on land cover data. Because the previously cited research (Morrison et al. 2007; Dwyer et al. 2012; Dwyer 2010) suggests that caracaras occupy nearly all suitable breeding habitat, the additional 1,040,777 acres pasture and dry prairie habitats could support up to 347 additional territories, or 265 + 347 = 612 territories. This total represents the upper end of the range of the potential size of the breeding population, because not all pasture and prairie habitats are in contiguous blocks. This equates to a population estimate of 1,224 breeding adults. Layne's (1996) estimate of about 300 breeding adults, based primarily upon roadside counts, represents the lower end of the range.

16.1.4 Conservation Needs and Threats

Habitat Loss or Degradation

The caracara's perceived decline, as described in the literature, is attributed primarily to habitat loss (Layne 1996). Large areas of native prairie and pasture in south-central Florida were converted to citrus groves, tree farms, or other forms of agricultural, commercial, or residential development. As a result, 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 prompted the listing of the caracara as threatened in 1987. However, while native prairies and pastures were appropriated for other uses, some forested habitats were converted to pastures. The net effect on caracara habitat availability is not documented, so a full accounting of historic habitat changes is lacking. Regardless, the threat of habitat loss persists as changes in land use continue, particularly as pastures are converted to residential and commercial development.

A change in habitat management may result in the degradation or loss of caracara habitat. For example, the reduction in cattle on Allapattah Ranch (Martin County; after acquisition by the State of Florida for a Wetland Reserve Program project) allowed woody shrubs and dog fennel to grow in the pastures, which reduced caracara habitat suitability. However, some years later, fire management re-opened the pastures for caracaras to return. In addition, some large-acreage landowners sell cabbage palms from their properties for landscaping. Cabbage palms are also

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occasionally harvested for local consumption (swamp cabbage or heart of palm). This may reduce the availability of potential nesting sites.

Cattle ranching appears compatible with caracara persistence on the Florida landscape. Reducing tree density on overgrown pastures and/or restoring agricultural lands to native prairies would increase habitat availability and probably increase caracara numbers. The continuing 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 the recovery of the caracara.

Disturbance

The caracara's tolerance of human activities is variable and likely affected by previous experience (Morrison 2001). The greatest risk of nest failure from disturbance occurs during the late incubation and early nestling stages (Morrison 2001). Flushing distance was estimated at approximately 300 meters (1,000 feet) from the nest, but can increase with repeated disturbance (unpublished data, as cited in Morrison 2001). Repeated flushing can increase the likelihood of nest abandonment or make nestlings more susceptible to predation.

The Service recommends a 300-meter primary zone around any active caracara nest to preclude human disturbance. The Service does not have disturbance-distance data for non-breeding caracaras (including at communal roosts). However, if repeated disturbance results in lost roost functionality (see section 1.1.2), then avoiding repeated disturbance of roosts is a conservation need. Birds on a nest are more invested (in eggs or nestlings) compared to birds merely roosting, and therefore, are more likely to exhibit a greater tolerance of disturbance (closer disturbance). However, in the absence of better information, the Service recommends the 300-meter primary zone for the conservation of communal roosts also.

Other Threats

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 by vehicles. Morrison (2003) identifies highway collisions as a major cause of juvenile mortality. Young birds appear especially vulnerable within the first six months after fledging. The Service receives occasional reports of dead caracaras, and if the bird was found on a road or right-of-way, road-kill is the assumed cause. Rural roads with a speed limit greater than 55mph (*e.g.,* SR 710, SR 78, and US 98) seem to account for a disproportionate share of roadkill reports. Dwyer (unpublished data) recorded observations of road-killed bird species from July 13, 2006, to March 25, 2009, while he conducted his research on non-breeding caracaras in Florida. He reported 845 road-killed birds from 36 different species over 650 sample days, including 18 caracaras (about 2% of the total).

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Direct human persecution continues in parts of the caracara's range (Morrison and Dwyer 2012). Caracaras are killed by some ranchers who believe that caracaras kill and eat newborn livestock. Spent lead ammunition from hunting and shooting has the potential to poison animals that feed upon the carrion (Golden *et al*. 2016).

The Florida population of caracaras is relatively small and isolated. Small and isolated populations are vulnerable to environmental catastrophes and to reduced reproductive rates caused by skewed sex ratios or age-specific mortality. Low numbers set the stage for reduced adaptability to environmental changes and stresses through the loss of genetic heterozygosity. Many occupied territories occur on private land that is inaccessible to surveyors, which makes it difficult to monitor and detect changes in the species' population size and distribution. This difficulty increases the possibility of not detecting a population decline that is leading to extinction.

Climate change and rising sea levels may shift human population centers away from the Florida coasts to the interior (see section 3.3), including the range of the caracara. The additional loss and fragmentation of caracara habitat associated with such a shift is another reasonably foreseeable threat to the species' survival and recovery.

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16.1.5 Tables and Figures

Figure 16-1. Photo (8/2/2018, 7:30 am) of about 80 caracaras along US27 in the Fisheating Creek communal roost and gathering area (source: Mike Elfenbein to Dave Shindle, USFWS).

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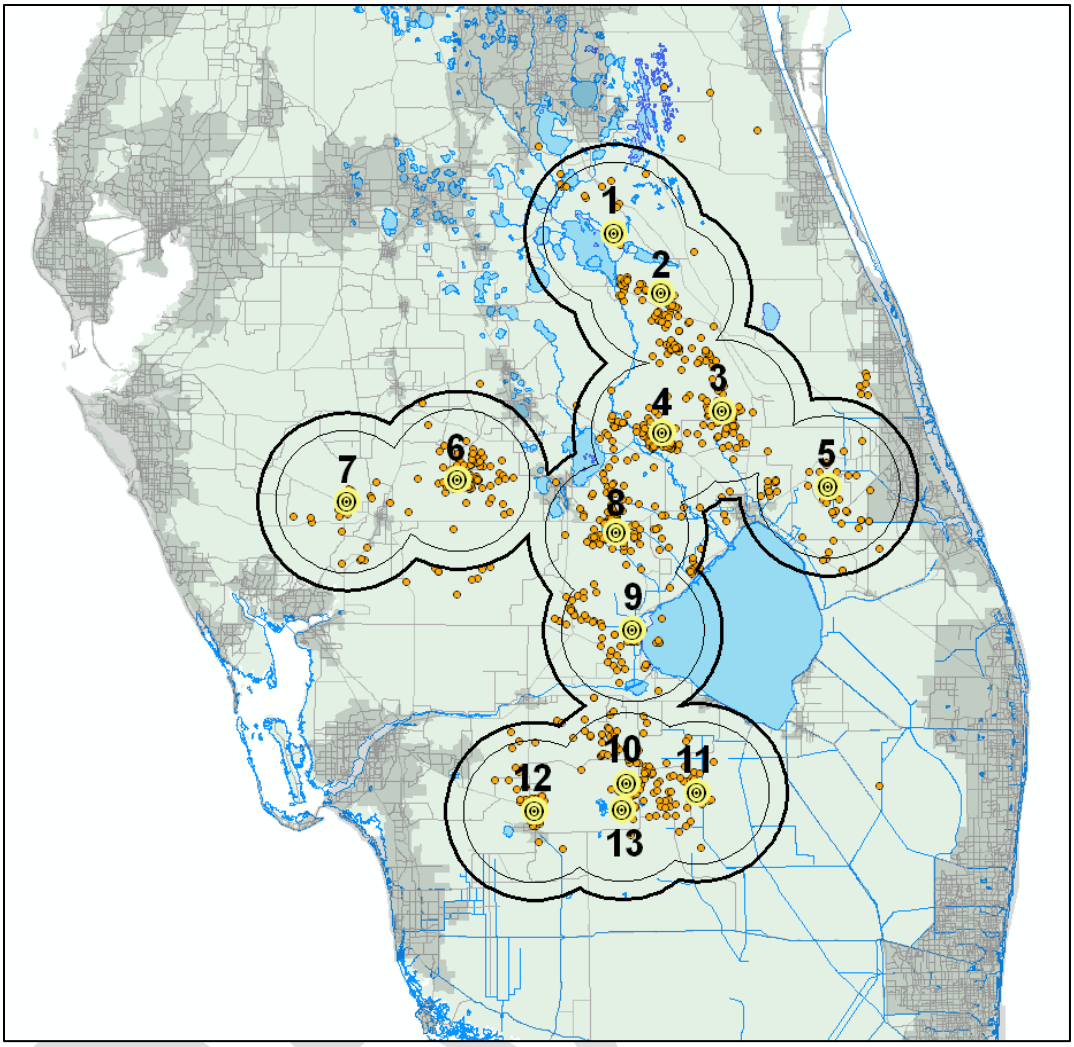

Figure 16-2. Aerial telemetry (orange circles) and communal roost (yellow bull's eyes) locations for crested caracaras tracked from August 2006 through October 2008. Dark polygon outline = 25 km buffer around roosts. Light polygon outline = 20 km buffer around roosts.

16.2 Environmental Baseline for Audubon's Crested Caracara

This section describes the current condition of the caracara in the Action Area without the consequences to the listed species caused by the proposed Action.

16.2.1 Action Area Numbers, Reproduction, and Distribution

Breeders

The e-Bird website (https://ebird.org/explore) documents 566 observations of caracaras from January 2010 to May 2017, mostly along roads, within and around the Plan Area (Figure 16-3).

Figure 16-4 shows the locations of four caracara nests located within the Plan Area during the past 10 years, and of another five nests immediately adjacent to or near the Plan Area boundaries. These nests were documented during studies for various development proposals (Passarella and Associates, Inc. 2017; Inwood Consulting Engineers, Inc. 2016; Turrell, Hall and Associates, Inc. 2017).

One of the five nests located just outside the Plan Area was within the Town of Ave Maria, a development that completed consultation associated with Federal permits several years ago (see section 2.1.1). We believe it is likely that caracaras still occupy breeding territories associated with the other eight nest locations, including the four within the Plan Area, because established territories tend to remain occupied until habitat conditions no longer support a breeding pair (see section 16.1.3, "Population Dynamics").

The Applicants did not conduct surveys for caracara nests in the Plan Area, which contains a substantial acreage of pastures and other cover types that caracaras may use (see section 16.1.2, "Habitat"). The Cooperative Land Cover (CLC) classes listed in Table 2-1 (FWC and FNAI 2016) that breeding caracaras may use include (listed in decreasing order of Plan Area abundance):

1) cropland/pasture (26,902 acres);
2) marshes (16,699 acres);
3) improved pasture (15,122 acres);
4) prairies (wet) and bogs (10,163 acres);
5) rural open lands (6,964 acres);
6) isolated freshwater marsh (1,806 acres);
7) mesic hammock (1,791 acres);
8) hydric hammock (119 acres); and
9) freshwater non-forested wetlands (105 acres).

These nine CLC classes cover 83,733 acres, or 50% of the Plan Area. Pastures, both improved and unimproved, are the primary areas of short-stature vegetation that would support breeding caracaras in the Plan Area, provided that suitable nesting trees, access to water, and prey resources are also available. Isolated or small clumps of trees located within improved pastures support more than 70% of known caracara nests (Barnes 2007). Unimproved pastures are included in the cropland/pasture class in our CLC data for the Plan Area, but row crops are among the least-used cover types by breeding caracaras (Dwyer et al. 2013).

Therefore, we used the land cover data of the South Florida Water Management District (SFWMD 2011), which separates unimproved pastures from various crop types, to estimate the extent of pasture-like conditions within the CLC cropland/pasture type. Within the Plan Area's 26,902 acres of the CLC cropland/pasture cover type, the SFMWD data classifies 2,245 acres as pasture or pasture-like cover types (*e.g.,* herbaceous prairie, unimproved pasture, woodland pasture, *etc.*). Combined with the acreage of the CLC improved pasture cover type, we estimate the Plan Area contains up to 15,122 + 2,245 = 17,367 acres of pastures that caracaras would most likely include in their breeding territories.

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The 17,367 acres of Plan Area pastures could support 3,000-acre territories for about 6 breeding pairs that consisted *entirely* of pastures; however the home range of a breeding caracara also includes surface water features, some amount of hammock cover, and other non-forested lands (see section 16.1.2, "Habitat"). This mix is variable, but in the home ranges of 28 breeding pairs examined by Barnes (2007), the acreage of pastures and native grasslands in each substantially exceeded that of all other cover types combined. Because the acreage of the non-pasture types listed above is more than double that of the pasture types in the Plan Area, the extent of pasture likely controls the Plan Area carrying capacity for breeding caracaras. To estimate the number of breeding territories the Plan Area is likely to support, we consider 2,000 acres of pasture cover (2/3 of the average home range size), along with 1,000 acres of other cover types (*e.g.,* hammocks, non-forested wetlands, ponds, streams/ditches), sufficient to support a breeding pair. We expect that 17,367 acres of pasture, plus adjacent wetlands and hammock cover in the Plan Area, would support 8–9 caracara breeding pairs. Previous studies have documented 4 nesting locations within the Plan Area boundaries (Figure 16-4). Based on habitat availability, and the general observation elsewhere that caracaras are at or near the carrying capacity of available habitat (see section 16.1.3), we estimate that another 5 breeding territories are likely to occur in the Plan Area.

Non-Breeders

The Plan Area also provides habitat for juvenile and non-breeding adult ("floater") caracaras. The southwestern-most of 13 communal roosts and associated gathering areas that Dwyer (2010) identified throughout the Florida range of the species is located in the Plan Area north of Immokalee (the Immokalee roost; roost #12 in Figure 16-2). Dwyer radio tagged non-breeding adult caracara's, seven of which he tracked to the Immokalee roost. He located one or more of these birds in the surrounding area 54 times from 03/20/2007–03/24/2009 (Figure 16-5). Most of the detections occurred in citrus orchards, and the rest in pastures. He detected these seven birds at more distant locations an additional 57 times, including on one occasion as far away as the Lake Placid roost in Glades County (roost #12 in Figure 16-2). Dwyer more often located these seven birds near the Devil's Garden and Clewiston communal roosts (roosts #10 and #13 in Figure 16-2), which are the two roosts closest to the Immokalee roost. In general, the radio-tagged birds moved frequently among the roosts and gathering areas southwest of Lake Okeechobee. Dwyer counted caracaras entering the Immokalee communal roost at dusk on 3 days in September 2008 (12, 28, and 24 caracaras on September 8, 10, and 18, respectively).

We searched recent records (January 2010 – May 2017) from the e-Bird website for locations in or near the Plan Area where six or more caracaras were observed together. Five or fewer birds together (two parents and up to three fledglings) could represent a family unit, whereas six or more are a clear indication of non-breeder activity. Figure 16-6 shows 9 such locations (observation dates between March 2012–January 2017), all within a few miles of the Immokalee roost site. On April 27, 2016, staff from Inwood Consulting reported at least 89 caracaras foraging in a pasture west of SR29 and just north of its intersection with SR82 (Figure 16-7; note the citrus orchard in the background).

These observations and the telemetry data of Dwyer (2010) suggest that the area north of Immokalee adjacent to SR29, SR82, and Church Road, serves as a gathering area for non-

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breeding caracaras. Birds likely use the pastures in this area for foraging when they can, and retreat to adjacent citrus orchards when challenged by the resident and socially dominant occupants of a breeding territory. Two of the four known caracara nesting locations within the Plan Area boundaries are in this same general area (Figure 16-4). We roughly estimate that the size of the area around the Immokalee communal roost site that encompasses the various sightings of >= 6 birds and Dwyer's telemetry locations of birds that roosted at Immokalee is about 25,000 acres, of which about 1/3 is within the Plan Area boundaries.

16.2.2 Action Area Conservation Needs and Threats

Both breeding and non-breeding caracaras occupy the Plan Area. Current threats to the species range-wide (see section 16.1.4), such as loss of habitat and vehicle mortality, are applicable within the Plan Area and the larger Action Area, which includes roads we expect to experience an increase in traffic that would not occur but for the development activity. Maintaining large areas of pasture or pasture-like habitat interspersed with wetlands and cabbage palms for nesting in this area is the primary conservation need to assure long-term persistence of the caracara in the Action Area.

We are aware of only one recent caracara road mortality within the Action Area. It occurred on or about July 27, 2018, on the four-lane section of Oil Well Road near the Arthrex facility (Danaher 2018). Danaher (2018) reported that this section of the road has at times a "…non-stop stream of cars travelling 60-70 mph in both directions…."

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9903 **16.2.3 Tables and Figures**
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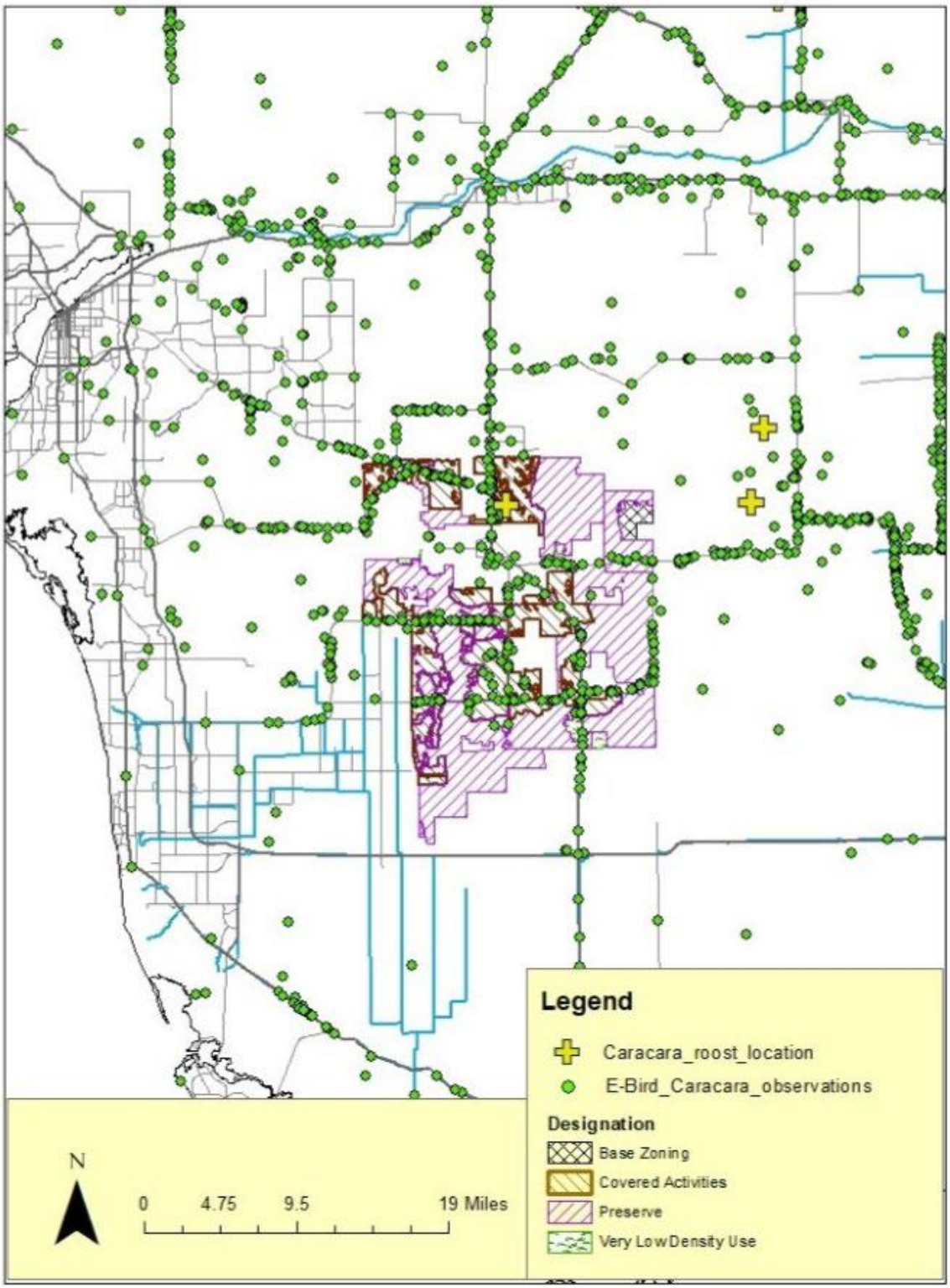

9905
9906
9907 **Figure 16-3**. Caracara locality data in southwest Florida from e-Bird (2010-2017).

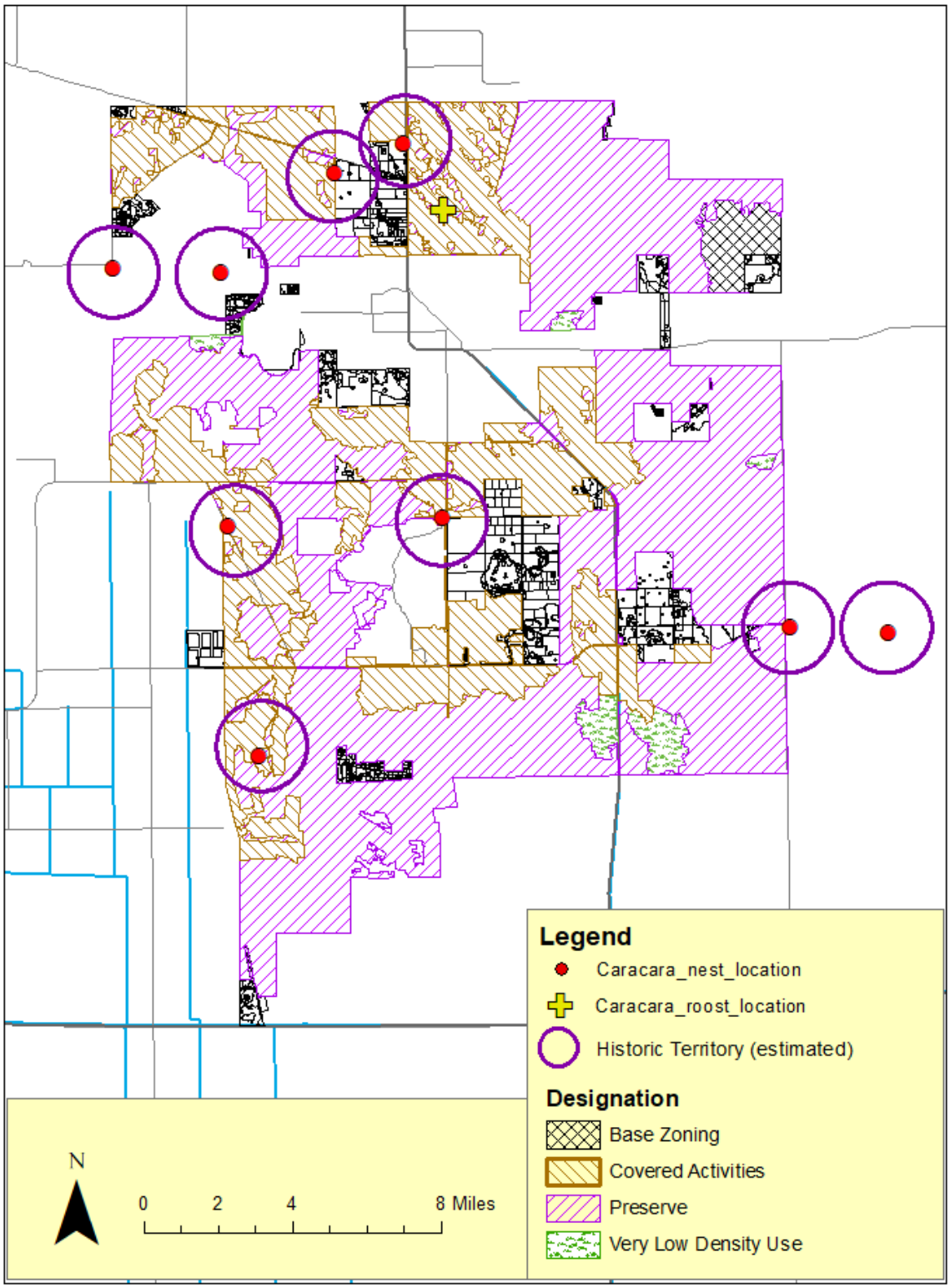

Figure 16-4. Reported caracara nests in and around the East Collier HCP Plan Area (purple circles around nest locations approximate territory size).

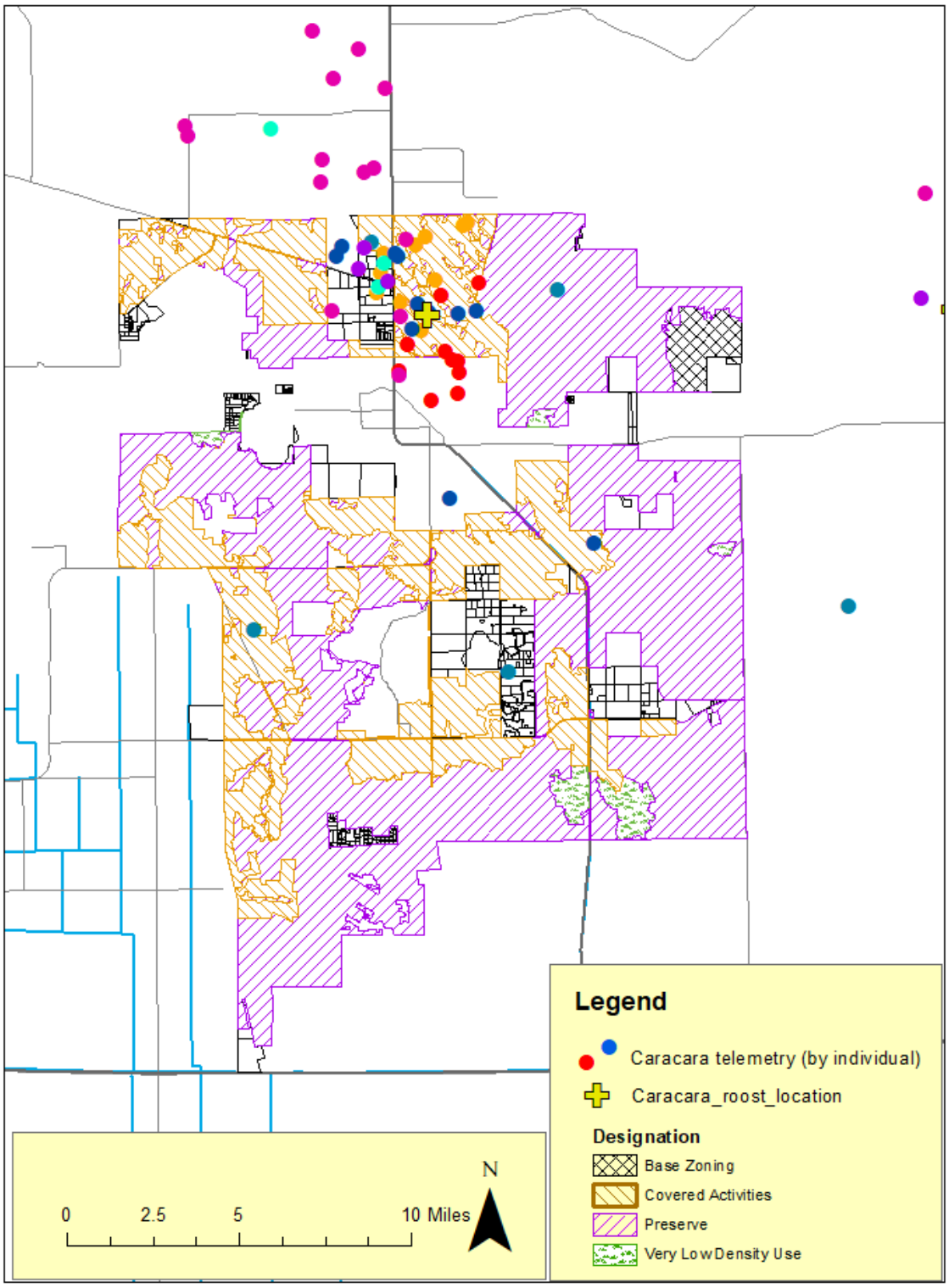

Figure 16-5. Non-breeding caracara telemetry data from Dwyer (2010), color-coded per each of seven tagged birds in and around the Plan Area.

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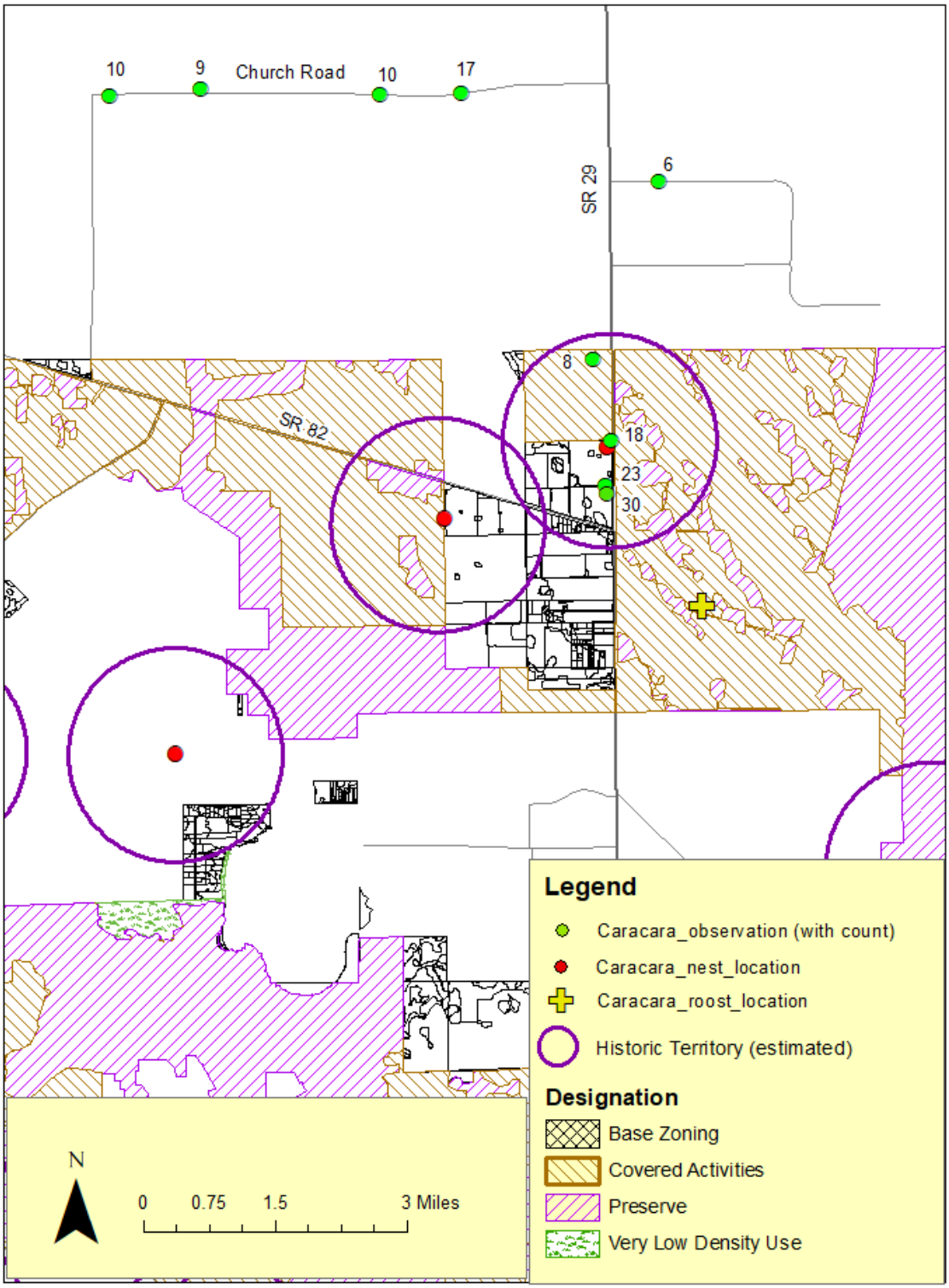

9918
9919
9920 **Figure. 16-6**. Observer locations for greater than five caracaras in the Immokalee gathering area
9921 and HCP Plan Area (data from e-Bird website; March 2012-January 2017).

Figure 16-7. A photograph of approximately 21 of the reported 89 caracaras occupying a pasture within the Immokalee gathering area on April 27, 2016 (west of SR29 just north of intersection with SR82; Inwood Consulting, Inc. 2016). Cattle egrets, ibises and vultures also appear in the photograph.

16.3 Effects of the Action on Audubon's Crested Caracara

This section describes all reasonably certain consequences to the caracara that we predict the proposed Action would cause, including the consequences of other activities not included in the proposed Action that would not occur but for the proposed Action. Such effects may occur later in time and may occur outside the immediate area involved in the Action.

16.3.1 Development and Mining, Base Zoning, and Lands Eligible for Inclusion

Effects to Breeding Caracaras

The designated Development and Mining, Base Zoning, and Lands Eligible for inclusion (collectively, the development envelope of the HCP) encompass 66,245 acres (Table 2-1);

however, the HCP proposes a development cap of 39,973 acres. Table 16-1 lists by HCP land use designation the acreage of cover types that breeding caracaras are known to include in their home range (see sections 16.1.2 under "Habitat" and 16.2.1 under "Breeders"). Pastures, which constitute the majority of a breeding territory, are more likely to receive development activity than wetlands, hammocks, or water features. The total acreage of pastures in the potential development envelope is 8,340 acres, which is substantially less than the 39,973-acre development cap. Therefore, we apply the "reasonable maximum impact" method (section 2.1.4) for estimating the extent of habitat changes caracaras are likely to experience.

Using a 2:1 ratio of pasture to other caracara breeding habitat types, we estimated in section 16.2.1 that the Plan Area supports 8–9 caracara breeding territories averaging 3,000 acres in size. Pastures in the development envelope, plus adjacent wetlands, hammocks, and water features, would likely support about 4 of these territories (8,340 ÷ 2,000). The Development and Mining land-use designation, which includes 5,516 acres of pastures, would likely support 2–3 of the 4 territories in the development envelope.

The Applicants propose to avoid and minimize impacts to caracara nesting where breeding caracara pairs are present (HCP Chapter 7.2.1.1). To accomplish this objective, the Applicants propose to conduct caracara nest surveys before construction activities begin, and to preclude construction activity within 300 meters (984 feet) of a nest from November through April. These conservation measures should avoid causing reproductive failure of nests that occur in development areas during the initial year of construction activity that encompasses a nest site. However, the conversion of pasture and adjacent land cover to mining and/or commercial/residential uses within breeding territories would eventually displace the activity of resident breeders, wholly or partially, into other areas. Such displacement is likely to cause aggression with resident caracaras and/or other raptors in these areas leading to death or injury, or to reduced fitness caused by competition for food resources and reproductive failure during subsequent years. We expect such consequences for 2–4 breeding pairs, depending on the specific pattern of overlap between development activity within the development envelope and territory boundaries.

Effects to Non-Breeding Caracaras Using the Gathering Area and Communal Roost

In section 16.2.1, we roughly estimated the size of the Immokalee gathering area, based on sightings of multiple (6–89) caracaras, at about 25,000 acres. The development envelope overlaps about 40% of this area. The communal roost near Immokalee that serves as the anchor for this gathering area is a palm hammock within a narrow band (< ½ mile wide) of wetlands designated as a Preservation area under the HCP. These wetlands are surrounded by a citrus grove that is part of a designated Development and Mining area. Clearing the citrus grove and its subsequent development would likely cause caracaras to abandon the communal roost, due to the proximity (< ¼ mile) of a substantial increase in human activity. Such activity would begin with the use of heavy equipment to clear and grade the grove, followed by months/years of additional activity to either convert the former grove to commercial/residential or mining uses. We believe it is unlikely that caracaras would tolerate nearly continuous disturbance so close to a roost site.

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Non-breeders displaced from the Immokalee roost and gathering area would need to relocate, possibly to the Devil's Garden or Clewiston roosts and gathering areas, or possibly establish a new communal roost. Dwyer (2010) observed frequent movements of tagged individuals among the roosts and gathering areas southwest of Lake Okeechoobee. We would expect the displacement of some or all non-breeders the Immokalee area caused by the development activity to increase competition for and pressure on limited feeding and sheltering resources at other gathering areas and roosts; however, any population-level consequences of such displacement are unclear. These "floaters" are not part yet part of the breeding population, but serve as a reservoir of adults that replace breeders when territories become available. We are unable to predict the degree to which impacts to the Immokalee gathering area may reduce the survival of the individuals affected or reduce the productivity of breeding caracaras in the surrounding areas.

Effects of Increased Traffic

The Action will contribute to an increase in traffic on public roads of the Action Area (see section 3.2). The main traffic arteries into the Plan Area are SR 29 (55 mph), SR 82 (45 mph), Immokalee Road (CR 846; 45 and 55 mph), and Oil Well Road (CR 858; 45 mph). We anticipate that the population and employment growth associated with the developments will increase the number of vehicles on these and other roads. If roads are widened to accommodate increased traffic in the future, speed limits may also increase. Caracaras frequently feed on road-killed animals, which puts them at risk of becoming roadkill themselves. We do not have reliable data from which to predict caracara road mortality as a function of traffic volume. However, it is a logical inference that the mortality risk increases with traffic volume and with the speed of vehicles, especially at speeds greater than 45 mph.

16.3.2 Preservation Activities

Using a 2:1 ratio of pasture to other caracara breeding habitat types, we estimated in section 16.2.1 that the Plan Area supports 8–9 caracara breeding territories averaging 3,000 acres in size. The designated Preservation areas contain 8,525 acres of pastures and 29,094 acres of other cover classes that support caracara breeding territories (Table 16-1). Pastures are the limiting habitat component for caracaras in the Preservation areas, and we estimate that they likely support 4–5 (8,525 ÷ 2,000) of the 9 predicted Plan Area breeding territories.

The Applicants propose a continuation of existing land uses (agriculture, silviculture, *etc.*) in the Preservation areas, which we listed in section 2.3. All of these uses may occur to some extent in habitats that support caracaras. Land management activities in the Preservation areas for which the Applicants seek take authorization and that may occur in caracara habitats include:

- prescribed burning;
- mechanical control of groundcover (*e.g.*, roller chopping, brush-hogging, mowing);
- ditch and canal maintenance;
- mechanical and/or chemical control of exotic vegetation; and
- similar activities that maintain or improve land quality.

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We have no evidence of prescribed burning causing harm to caracaras. A fire burning too hot beneath a cabbage palm or other tree containing a nest could conceivably kill eggs or flightless chicks. However, we have no data about the timing or location of burning relative to caracara nesting that would allow us to predict the amount or extent of such harm. The other activities listed above may temporarily disrupt caracara foraging activity, but are unlikely to harm eggs or chicks within a nest.

In Chapter 7.2.1.1 of the HCP, the Applicants propose to preserve and maintain caracara habitats in the Preservation and Very Low Density use designations (Objective 1), and to "restore, as needed, suitable caracara core habitat areas to mitigate for permanent caracara habitat losses associated with the Covered Activities" (Objective 2). Habitat restoration would involve replacing vegetation >12 inches tall with short-stature grasses in overgrown pastures (*e.g.,* reducing shrub encroachment using fire).

The Applicants propose to conduct such restoration to an extent that offsets permanent losses of caracara habitat caused by the Covered Activities and results in no-net loss of caracara habitat in the Plan Area. The HCP does not identify areas or estimate the total extent within the Preservation areas on which caracaras would benefit from the restoration activity. The extent of pastures within the Preservation areas (8,525 acres) is only slightly greater than within the full development envelope (8,340 acres), and 3,009 acres (55%) greater than within the designated Development and Mining areas. Lacking specific plans or performance measures for the restoration activities, we are unable to estimate potential benefits to caracaras. However, we do not expect the management of Preservation areas to reduce the numbers, reproduction, or distribution of the caracara in the Preservation areas, because these activities would, at minimum, maintain current conditions.

16.3.3 Very Low Density Development

The Very Low Density (VLD) use areas of the HCP do not contain pastures that would provide the core foraging habitat of a caracara breeding territory (Table 16-1). Although 16 acres of mesic hammock and cabbage palms that may occur in isolated patches in the VLD use areas could provide trees for nesting, any associated territory for foraging activity would necessarily encompass about 2,000 acres of pasture in adjacent land-use designations. We have no records of caracara nesting within the VLD use areas.

The Applicants' proposals to survey for caracara nesting activity before any construction activity, and to preclude activity within 300 meters of an active nest from November through April (see section 16.3.1), would apply to the construction of isolated residences, lodges, and hunting/fishing camps in the VLD use areas. These conservation measures should avoid causing reproductive failure of nests that may occur in the VLD use areas. Removal of an unoccupied nest tree would cause the breeding pair to seek an alternative nest tree the following nesting season. We have no data that suggests the availability of trees for nesting is limiting in the Plan Area. Because the majority of a breeding territory associated with a nest in the VLD use areas would necessarily occur outside the VLD use areas, we do not expect significant adverse effects resulting from the possible loss of an unoccupied nest tree in these areas.

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16.3.4 Tables and Figures

Table 16-1. Acreage of cover classes that occur in the Plan Area, by HCP land use designation, that breeding caracaras are known to include in their home range.

COOPERATIVE LAND COVER CLASS	A. DEVELOP-MENT	B. BASE ZONING	C. ELIGIBLE FOR INCLUSION	D. POTENTIAL DEVELOPMENT ENVELOPE (A+B+C)	E. VERY LOW DENSITY	F. PRESER-VATION	TOTAL (D+E+F)
Improved Pasture	4,393	1,082	1,546		502	7,599	
Unimproved Pasture (within the CLC Cropland/Pasture Class)[1]	1,123	143	53		0	926	
Pasture Subtotal	**5,516**	**1,225**	**1,599**	**8,340**	**502**	**8,525**	**17,367**
Mesic Hammock	417	16	167		61	1,129	
Rural (Rural Open Lands)	1,415	0	1,153		241	4,155	
Freshwater non-Forested Wetlands	6	0	0		0	99	
Prairies and Bogs	708	0	1,152		98	8,205	
Marshes	1,007	0	1,335		124	14,233	
Isolated Freshwater Marsh	9	536	102		2	1,156	
Hydric Hammock	0	2	0		0	117	
Non-Psture Subtotal	**3,562**	**554**	**3,909**	**8,025**	**526**	**29,094**	**37,645**
Total	**9,078**	**1,779**	**5,508**	**16,365**	**1,028**	**37,619**	**55,012**

[1]Based on South Florida Water Management District (SFWMD 2011) land cover data within the extent of the "Cropland/Pasture" CLC class.

16.4 Cumulative Effects on Audubon's Crested Caracara

For purposes of consultation under ESA §7, cumulative effects are those caused by future state, tribal, local, or private actions that are reasonably certain to occur in the Action Area. Future Federal actions that are unrelated to the proposed action are not considered, because they require separate consultation under §7 of the ESA.

We identified in section 3 of this BO/CO a projected increase in traffic on public roads as the sole source of effects that are consistent with the definition of cumulative effects for this Action. Increased vehicle traffic (especially at speeds greater than 45 mph) unrelated to the Action is a stressor that may adversely affect breeding and non-breeding caracaras in the Action Area. Road mortality is documented for caracaras (see section 16.1.4). As the population of southwest Florida increases, we expect more vehicle use in the Action Area, and a concomitant increase in road mortality of animals in general. This will increase the risk of injury or mortality to caracaras that forage on these road killed animals. However, the available data on caracara road mortality is not sufficient to formulate a clear relationship between traffic volume, speed limits, caracara distribution, and other relevant factors from which we could predict with reasonable certainty an expected increase in mortality.

16.5 Conclusion for Audubon's Crested Caracara

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In this section, we summarize and interpret the findings of the previous sections for the caracara (status, baseline, effects, and cumulative effects) relative to the species-specific purpose of a BO under §7(a)(2) of the ESA, which is to determine whether the proposed action is likely to jeopardize the continued existence of a species.

Status

Florida's population of caracaras (the entity protected under the ESA) occupies primarily pastures and native prairie habitats of the south-central region of the State. Although about 1.8 million acres of such habitats remain in this region, available evidence suggests that the species is at or near carrying capacity, due in part to the relatively large size (average 3,000 acres) of a breeding territory. We estimate that the range-wide population consists of 150–612 breeding pairs (300–1,224 adults), the current year's offspring, plus non-breeding adults ("floaters") that number about 40% of the breeding population. Habitat loss caused by conversion of pasture and native prairies to other uses (*e.g.,* residential and commercial development) is the primary threat to the species' survival and recovery. Road mortality is another recognized threat of uncertain significance.

Baseline

Caracaras are present and reproduce in the Plan Area, which is near the southwestern edge of the species' range in Florida. Forest clearing and drainage activities to facilitate agricultural uses have likely increased, relative to historic conditions, the amount of short-stature vegetation in the Plan Area that caracaras prefer as habitat. The Plan Area has supported at least 4 caracara nests since the mid-1990s. Based on inferences from habitat availability, we expect the Plan Area to support as many as 9 breeding territories. A communal roost and associated gathering area located north of Immokalee near the northern edge of the Plan Area supports relatively high numbers of non-breeding caracaras (89 observed on one occasion).

Effects

The development activity of the HCP would cause a loss of habitats that support both breeding and non-breeding caracaras. We expect caracara displacement from the developed areas to other already-occupied habitats, which would lead to the subsequent harm of 2–4 breeding pairs, depending on the specific pattern of overlap between development activity and breeding territories. Although an increase in traffic associated with the new developments would increase the risk of caracara road mortality, we do not have reliable data from which to predict such mortality as a function of traffic volume.

We expect that development activity would likely cause non-breeding caracaras to abandon the communal roost near Immokalee, due to the proximity (< ¼ mile) of a substantial increase in human activity. We are unable to predict the degree to which impacts to the Immokalee gathering area may reduce the survival of the individuals affected or reduce the productivity of the breeding population.

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The Covered Activities in the Preservation Areas would maintain conditions for 4–5 breeding pairs. We are unable to determine the extent to which habitat restoration (*e.g.,* reducing shrub encroachment in pastures) in the Preservation Areas, which is intended to offset losses caused by development, would benefit caracaras. The HCP does not identify areas in need of, or specify the total extent of, such restoration. The Very Low Density use areas do not contain pastures that would provide the core foraging habitat of breeding territories, and we expect that Covered Activities in these areas are not likely to adversely affect the species.

Cumulative Effects

The available data on caracara road mortality is not sufficient to formulate a clear relationship between traffic volume, speed limits, caracara distribution, and other relevant factors from which we could predict an increase in mortality.

Opinion

The best available data indicates that the caracara population in Florida is breeding habitat limited. The loss of pasture (up to 8,340 acres) and other habitats caused by the development activity, which we estimate support 2–4 breeding pairs, would add an increment of habitat loss to the species' range. Because we do not expect displaced pairs to continue to reproduce, we expect an eventual 0.3–2.7% reduction relative to the species' range-wide abundance of 150–612 breeding pairs (4/150=2.7%; 2/612=0.3%). The habitat loss is not likely to alter the species' overall range, as other areas that should continue to support caracaras are present in the Plan Area.

The consequences of likely impacts to the non-breeding communal roost (one of 13 range wide) and associated gathering area are unclear. Three other communal roosts in adjacent Hendry County may serve floaters prospecting for vacant breeding territories in east Collier County, or non-breeders could establish a new communal roost and gathering area closer to, or even within, the Plan Area. The change to non-breeder habitats caused by the Action is not beneficial, but neither is it reasonably certain to cause a reduction in the species' numbers or reproduction.

Precluding new development and mining activity in the dedicated Preservation areas would protect 8,525 acres of pastures, and 29,094 acres of other caracara habitats, which we estimate support 4–5 breeding pairs. As these areas are brought under conservation easements, habitat restoration should benefit the caracara, but the amount or extent of an increase in numbers or reproduction is not predictable at this time. Given the small proportional impact of the development activities to the range-wide population and habitat availability, and the prospect of habitat enhancements that could offset this impact to some degree, we believe the net impact of the Action on the caracara is within the species' ability to sustain.

After reviewing the current status of the species, the environmental baseline for the Action Area, the effects of the Action and the cumulative effects, it is the Service's biological opinion that the Action is not likely to jeopardize the continued existence of the Audubon's crested caracara.

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17 Everglade Snail Kite

This section provides the Service's biological opinion of the Action for the Everglade snail kite.

17.1 Status of Everglade Snail Kite

This section summarizes best available data about the biology and current condition of the Everglade snail kite (*Rostrhamus sociabilis plumbeus*) (snail kite) throughout its range that are relevant to formulating an opinion about the Action. The Service published its decision to list the snail kite, Florida population, as endangered on March 11, 1967 (32 FR 4001), and designated critical habitat for the species on August 11, 1977 (42 FR 40685–40690). Snail kite critical habitat does not occur in the Action Area, and we do not discuss it further in this BO.

The following Service documents, cited in this section as necessary, provide additional details about the status of the snail kite:

- South Florida multi-species recovery plan (USFWS 1999)
- Everglade Snail Kite 5-Year Review (USFWS 2007)
- Recovery Plan for the Endangered Everglade Snail Kite; Draft Amendment 1 (USFWS 2019)

The finding of our most recent 5-year review (USFWS 2007) was to retain the species' current classification as an endangered species.

17.1.1 Species Description

The snail kite is a medium-sized hawk with a wingspan of about 45 inches. Its beak is slender and hooked. Adult males are slate gray with black head and wing tips, have a white patch at the base of a square tail, and red legs. Females are brown and heavily streaked with dark lines, have a white line above the eye, a white patch at the base of a square tail, and yellow legs. Immatures resemble females, but are darker.

17.1.2 Life History

Snail kites are dietary specialists that feed almost exclusively on apple snail species (*Pomacea spp.*) (Kitchens et al. 2002; Cattau et al. 2010). Both predator and prey rely on freshwater wetland habitats for all aspects of their life history. Snail kites locate snails visually from perches or while flying about 5–33 feet above the water surface (Sykes 1987c; Sykes et al. 1995). Using its talons, a kite takes a snail from wetland vegetation as far as 6 inches below the water surface, and using its greatly curved beak, extracts the snail from its shell. Snail kites concentrate hunting activity in areas of high snail abundance and aerial detectability, returning to the same areas as long as foraging conditions remain favorable (Cary 1985).

The breeding season varies widely from year to year depending on rainfall and water levels. Nearly all (98%) nesting attempts are initiated December–July, and 89% are initiated January–June (Sykes 1987, Beissinger 1988, Snyder et al. 1989). Snail kites often nest again following both failed and successful initial attempts (Beissinger 1986, Snyder et al. 1989).

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During the breeding season, adult snail kites remain close to their nest sites until the young fledge or the nest fails. Adults forage no more than 6 km (3.7 miles) from the nest (Beissinger and Snyder 1987), and generally less than a few hundred meters. Following fledging, adults may remain near the nest for several weeks until the young are fully independent.

Snail kites are gregarious outside of the breeding season and may roost in groups of up to 400 or more individuals (Bennetts et al. 1994). Roosting sites are usually located over water. In Florida, communal roosts are primarily in willow stands, and in some cases melaleuca and pond cypress.

Snail kites are not migratory (*i.e.,* undertaking predictable movements between traditional seasonal habitats), but are nomadic within their range, which is probably an adaptation to variable hydrologic conditions (Sykes 1979). Outside of the breeding season, snail kites may travel long distances (> 150 miles in some cases) within and among the major wetland systems of the species' range in Florida (Bennetts and Kitchens 1997). Most movements are probably searches for better foraging sites, but some movements occur when conditions appear favorable. Currently, there is no evidence suggesting that snail kites undertake trans-oceanic movements (*e.g.,* Florida to Cuba) or interbreed with snail kites located in other countries (Sykes 1979; Beissinger et al. 1983).

Adult snail kites have relatively high annual survival rates ranging from 85–98% (Nichols et al. 1980; Bennetts et al. 1999; Martin et al. 2006), with higher mortality in drought years (Takekawa and Beissinger 1989; Martin et al. 2006). Adult longevity records indicate that snail kites may frequently live longer than 13 years in the wild (Sykes et al. 1995).

Habitat

Our South Florida Multi-Species Recovery Plan (USFWS 1999) provides a description of snail kite habitat characteristics, from which we summarize information that is relevant to this consultation in this section. Snail kite habitat consists of freshwater marshes and the shallow vegetated edges of lakes, both natural and man-made, that support apple snails. Areas that most often support snail kite foraging have emergent vegetation less than < 3 m tall interspersed with shallow (0.2-1.3 m deep) open water, which may contain relatively sparse patches of submergent vegetation. Apple snails require emergent vegetation to climb near the water surface to feed, breathe, and lay eggs. Because snail kites hunt for apple snails visually, dense herbaceous or woody vegetation precludes efficient foraging. Trees and shrubs (*e.g.,* willow and dahoon holly) interspersed with the marsh and open water provide hunting perches and roosts.

Roosting sites are nearly always located over water. In Florida, 91.6% are located in willows, 5.6% in *Melaleuca*, and 2.8% in pond cypress. Snail kites tend to roost in willows at a height of 1.8–6.1 m, in stands of 0.02–5 ha. Roosting in *Melaleuca* or pond cypress occurs in stands with tree heights of 4–12 m.

17.1.3 Numbers, Reproduction, and Distribution

In the U.S., the range of the snail kite is limited to Florida. Our South Florida Multi-Species Recovery Plan (USFWS 1999) provides a history of the species' abundance and distribution in

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Florida. The current range includes portions of 20 Florida counties, between Marion and Volusia counties in the north, and Miami-Dade and Monroe counties in the south. Six regional freshwater systems support most of the species' breeding activity: marshes in the upper St. Johns River basin, the Kissimmee River valley, Lake Okeechobee, Loxahatchee Slough, the Everglades (*i.e.,* areas south of Lake Okeechobee), and the Big Cypress basin.

Reproductive success is highly variable among years, locations, and local nest environments (Sykes 1979, 1987c; Beissinger 1986; Bennetts et al. 1988; Snyder et al. 1989). Drought reduces nesting success by depressing native apple snail populations (Beissinger and Takekawa 1983) and by increasing terrestrial predators' access to nests (Beissinger 1986).

Beginning in 1997, researchers began using a mark-recapture method that accounts for detection probabilities to estimate snail kite numbers (Drietz et al. 2002). Population estimates based on this method ranged from about 3,000 birds in 1997–1999 (Dreitz et al. 2002), to a low of 662 birds in 2009 (Cattau et al. 2009), and 2,585 birds in 2017 (Fletcher et al. 2018). The most recent (2018) population estimate is 2,347 birds (Fletcher 2019).

17.1.4 Conservation Needs and Threats

The principal threats to the snail kite are (USFWS 1999):

(a) the loss, fragmentation, and degradation of wetlands caused by residential, commercial, and agricultural development, and;
(b) the alteration of wetland hydrology caused by ditches, canals, levees, water control structures, pump stations, impoundments, and the associated manipulation of water levels using this infrastructure.

The species' principal conservation needs are to maintain, restore, and enhance the capacity of wetlands to produce apple snails that are accessible to snail kite foraging.

Nearly half of the Everglades have been drained for agriculture and residential/commercial development (Davis and Ogden 1994), and other areas have been impounded. The drainage of Florida's interior wetlands has reduced the extent and quality of habitat for both the apple snail and the snail kite (Sykes 1983a). The extensive network of ditches and canals has permanently lowered the water table and facilitated development in many areas that were once snail kite habitat. Management of this network and associated impoundments influences regional water levels and recession rates, which affects apple snails (Darby et al. 2006), and often adversely affects snail kite nesting and foraging (Sykes 1983b; Beissinger and Takekawa 1983; Beissinger 1986; Dreitz et al. 2002; Martin et al. 2007; Cattau et al. 2008).

The discharge of domestic waste water and the runoff of nutrient-laden water from agricultural lands to surface waters in Florida promotes the growth of invasive exotic and native plants, particularly cattail (*Typha* spp.), water lettuce (*Pistia stratiotes*), water hyacinth (*Eichhornia crassipes*), and hydrilla (*Hydrilla verticillata*). High densities of these aquatic plants make apple snails inaccessible to snail kites (USFWS 2007). Controlling these plants is difficult, and some attempts involving mechanical removal and herbicides have actually destroyed snail kite nests (Rodgers and Schwikert 2001).

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The native apple snail, *Pomacea paludosa*, was the almost exclusive prey of the snail kite in Florida, but in the last two decades, a non-native apple snail, *P. maculata*, has become established the northern half of the snail kite's range, where snail kites are preying upon the introduced species. Cattau et al. (2016) examined the potential demographic consequences of this change in the prey base of the snail kite. The highly invasive *P. maculata* is larger, more fecund, grows faster, has a longer life span, and is more tolerant of drought than *P. paludosa*. Where the non-native snail is established, its densities are often 2–100 times higher than the native species. Kite movements and distribution of breeding individuals have tracked the spread of *P. maculata* populations. Since 2005, a substantial fraction of snail kite breeding has shifted to the northern portions of the species' range. In 2013, the Kissimmee River Valley and Lake Okeechobee supported about 80% of the observed nests, but adult survival rates are lower in the more northern breeding areas. Despite the change to this key vital rate, population monitoring and modeling suggests that changes to other demographic parameters, such as apparent juvenile survival, have had a positive influence on the rate of population growth.

Exposure to contaminants that accumulate in apple snails is another recognized threat to the snail kite. Apple snails absorb and ingest copper from sediments and their diet (Frakes et al. 2008; Hoang et al. 2008). Elevated copper levels are commonly detected in disturbed Everglades wetlands, where it accumulates in apple snails and may cause birth defects in snail kites (Frakes et al. 2008).

17.2 Environmental Baseline for Everglade Snail Kite

This section describes the current condition of the Everglade snail kite in the Action Area without the consequences to the listed species caused by the proposed Action.

17.2.1 Action Area Numbers, Reproduction, and Distribution

The Plan Area is near the southwestern edge of the species' range in Florida. The eBird website (https://ebird.org/explore; accessed 10/31/19) has numerous records of snail kite observations within the Plan Area in the past 10 years, generally of a single bird, but occasionally of as many as six at a single location. Meyer et al. (2017) provided the Service with data from a study tracking the movements of telemetered snail kites, including two adult birds located within the Plan Area in 2013 and 2014 (Figure 17-1) that did not nest in the Plan Area. In 2018, a Service biologist observed three immature snail kites foraging in "peripheral wetlands" (see section 17.1.2, "Habitat") of the Plan Area during a Christmas bird count (Danaher 2019).

We have no records of snail kite nesting in the Plan Area. Recorded snail kite nesting activity closest to the Plan Area is about 9 miles north on private lands in Hendry County, about 12 miles northwest on private lands in Lee County, and more than 16 miles to the east and southeast on public conservation lands (see HCP Figure 5-5). While nesting, adult birds forage less than 4 miles from the nest (see section 17.1.2, "Life History"). Therefore, we believe that snail kite observations within the Plan Area represent nomadic and opportunistic use of available foraging habitats by birds that are not breeding in the Plan Area, such as the telemetered birds tracked to the Plan Area (Figure 17-1).

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Wetland types that are most likely to support snail kite foraging and roosting in the Plan Area include (from Table 2-1):

- freshwater non-forested wetlands (105 acres);
- prairies and bogs (10,163 acres);
- marshes (16,699 acres);
- isolated freshwater marsh (1,806 acres);
- isolated freshwater swamp (4,063 acres);
- cultural - lacustrine (1,184 acres);
- cultural - riverine (160 acres);
- lacustrine (133 acres); and
- natural lakes and ponds (28 acres).

Collectively, these types cover 34,340 acres (21.5%) of the 159,489-acre Plan Area. We have no data that would support a meaningful estimate of the numbers of snail kites that likely use the Plan Area annually during nomadic wanderings and dispersal from natal territories located elsewhere. We believe that relatively low numbers probably spend a few weeks or months of the year foraging and roosting in the Plan Area.

17.2.2 Action Area Conservation Needs and Threats

Snail kite use of the Plan Area appears limited to foraging and roosting for small numbers of birds for brief periods. However, the species' primary conservation needs in this context are essentially the same as those within portions of the range that support breeding activity, *i.e.,* maintain, restore, and enhance wetlands that provide abundant populations of apple snails that are available to snail kites. The loss or degradation of such habitats caused by drainage, development activity, and/or eutrophication would correspondingly reduce the ability of the Plan Area to support snail kites.

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17.2.3 Tables and Figures

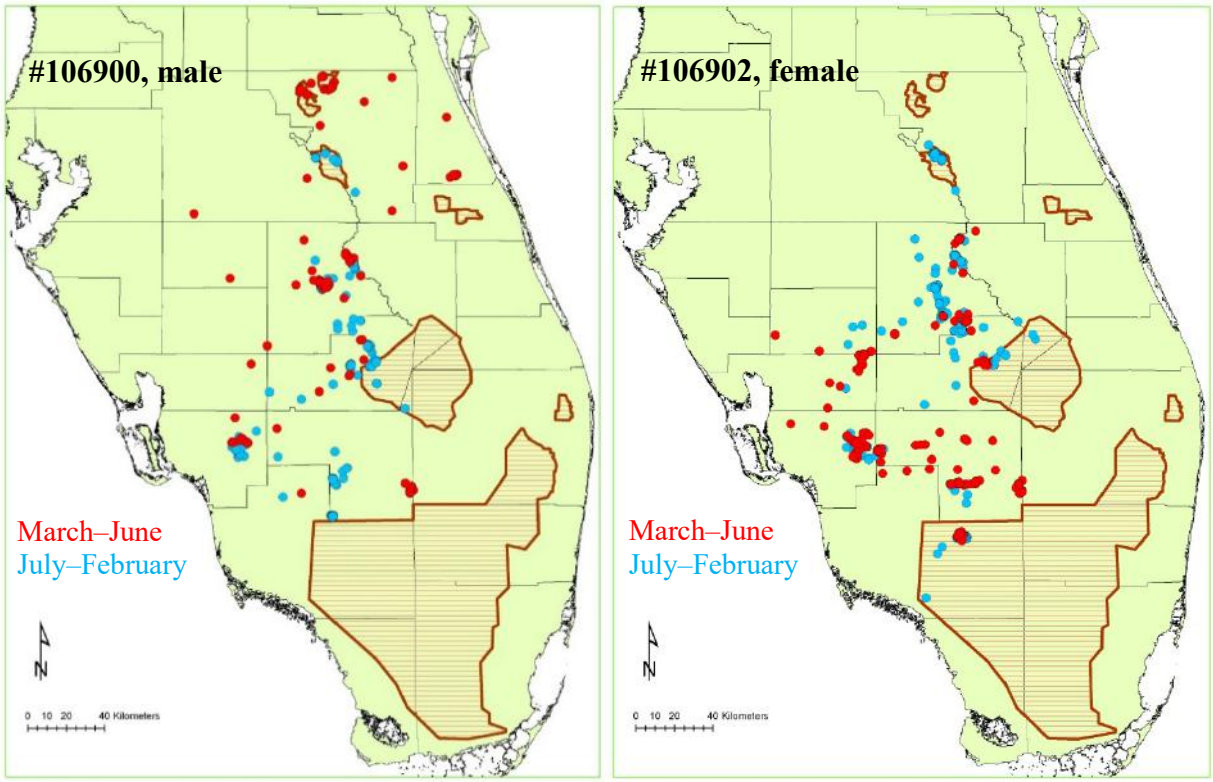

Figure 17-2. Telemetry data for two adult snail kites tracked 2013–2014 that Meyer et al. (2017) located within the Plan Area.

17.3 Effects of the Action on Everglade Snail Kite

This section describes all reasonably certain consequences to the Everglade snail kite that we predict the proposed Action would cause, including the consequences of other activities not included in the proposed Action that would not occur but for the proposed Action. Such effects may occur later in time and may occur outside the immediate area involved in the Action.

17.3.1 Development and Mining, Base Zoning, and Eligible Lands

The designated Development and Mining, Base Zoning, and Lands Eligible for inclusion (collectively, the development envelope of the HCP) encompass 66,245 acres (Table 2-1); however, the HCP proposes a development cap of 39,973 acres. Open water cover classes are unlikely to receive development activity, and other wetlands are unlikely to receive a disproportionately large share of it, but some wetlands loss is likely. We apply the "proportional method" described in section 2.1.4 to estimate the extent of wetlands loss that development of up to 39,973 acres would cause.

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Table 17-1 shows the results of our calculations, taken from Table 2-3, for those cover classes that snail kites are likely to use. We estimate that the proposed Action could convert up to 3,133 acres of wetland habitats to residential, commercial, or mining uses. The designated Development and Mining areas contain 1,969 acres of wetland types associated with snail kites, which is the maximum loss of wetlands that could occur if development is confined entirely to these areas (*i.e.,* no substitution of Base Zoning or Eligible lands in the development cap).

Development and mining in wetlands would involve various activities (drainage, filling, excavation, paving, building construction, *etc.*) that would permanently eliminate 1,969–3,133 acres of wetlands as snail kite habitat. We do not believe the Plan Area supports snail kite nesting; therefore, we do not expect development activities to directly kill or injure snail kite eggs or flightless young. Development of wetlands used for foraging would cause a small number of snail kites that use these areas during nomadic wanderings and dispersal to forage elsewhere. Because these kites are mobile and seeking foraging opportunities (*i.e.,* not provisioning young in a nest), we do not expect significant adverse consequences to individuals resulting from such displacement.

To mitigate for permanent snail kite habitat losses associated with the Covered Activities, the Applicants propose to "Preserve, and potentially restore, enhance, and/or create suitable snail kite foraging and/or nesting habitat" within the designated Preservation and Very Low Density Use areas (HCP chapter 7.2.1.5). We consider the effects of these proposals in the following section.

17.3.2 Preservation Activities

The designated Preservation areas of the HCP contain 27,600 acres, or 80.4% (Table 17-1), of the wetland types in the Plan Area that we consider as potential snail kite habitat. The Applicants propose a continuation of existing land uses (agriculture, silviculture, *etc.*) in the Preservation areas, which we listed in section 2.3. All of these uses may occur to some extent in native wetlands of the Preservation areas except crop cultivation. Land management activities in the Preservation areas for which the Applicants seek take authorization and that may occur in wetlands include:

- prescribed burning;
- mechanical control of groundcover (*e.g.*, roller chopping, brush-hogging, mowing);
- ditch and canal maintenance;
- mechanical and/or chemical control of exotic vegetation; and
- similar activities that maintain or improve land quality.

These activities may temporarily disrupt snail kite foraging activity, but are unlikely to harm birds that are not nesting. We believe that willow stands surrounded by standing water, the typical setting for snail kite roosting, are unlikely locations for these land management actions.

In Chapter 7.2.1.5 of the HCP, the Applicants propose to maintain snail kite habitats in the Preservation and Very Low Density use designations (Objective 1), and to potentially restore, enhance, or create such habitats to mitigate for permanent losses associated with the Covered Activities (Objective 2). The HCP notes that restoration/enhancement activities would typically

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occur in conjunction with Clean Water Act section 404 permitting processes. The HCP indicates that management would "focus on maintaining apple snail populations in wetlands, controlling exotic/nuisance wetland and aquatic plant species, and buffering nest areas from human activities" in coordination with the Service and USACE permitting. The HCP does not specify performance measures (amount or extent, functional gain) for such restoration and enhancement activities.

We do not expect the management of Preservation areas to reduce the numbers, reproduction, or distribution of the snail kite in the Preservation areas, because these activities would, at minimum, maintain current conditions. Special attention to this species in the long-term management of the Preservation areas under conservation easements could increase the number of snail kites that the Plan Area supports, and possibly even promote nesting activity. However, lacking detailed information about how habitat management under conservation easements may benefit this species, we are unable to estimate the extent of potential benefits.

17.3.3 Very Low Density Development

The Very Low Density (VLD) use areas of the HCP contain 264 acres of native wetlands, and 667 acres of lakes and ponds with peripheral wetlands (total 931 acres), that could support snail kite foraging and roosting (Table 17-1). Land uses in the VLD areas are similar to the Preservation areas, but may also include isolated residences, lodges, and hunting/fishing camps, at a density of no more than one dwelling unit per 50 acres. The Applicants would continue current ranching/livestock operations and other management activities as described for the Preservation Areas (*e.g.,* exotic species control, prescribed burning). As in the Preservation areas, we do not expect adverse effects resulting from the continuation of the existing land management regimes.

The HCP does not specify a footprint for the isolated residences, lodges, and hunting/fishing camps, but indicates that their construction could clear up to 10% of the existing native vegetation (see section 2.5). New dwelling development could occur within any of the cover types present besides open water and existing development. It is possible that dwelling development in the VLD areas could entirely avoid wetlands, but we conservatively estimate a 26-acre habitat loss (10% of the 264 acres of native wetlands). Development of wetlands used as foraging areas would cause a small number of snail kites that may use the VLD areas during nomadic wanderings and dispersal to forage elsewhere. We do not expect significant adverse consequences to individuals resulting from such displacement.

The general measures for enhancing snail kite habitat in the Preservation areas apply to the VLD areas as well (see previous section 17.3.2). However, the potential to increase or enhance snail kite foraging habitat is limited due to the small extent of wetlands in the VLD areas.

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17.3.4 Tables and Figures

Table 17-1. Acreage of cover classes that occur in the Plan Area, by HCP land use designation, that snail kites are likely to use for foraging and roosting.

COOPERATIVE LAND COVER CLASS	A. DEVELOP-MENT	B. BASE ZONING	C. ELIGIBLE FOR INCLUSION	D. VERY LOW DENSITY	E. PRESER-VATION	PLAN AREA TOTAL	Development Envelope (A+B+C)	Estimated Extent of Development[1]
Marshes	1,007	0	1,335	124	14,233	16,699	2,342	1,411
Prairies and Bogs	708	0	1,152	98	8,205	10,163	1,860	1,127
Isolated Freshwater Swamp	168	0	173	40	3,681	4,063	341	208
Isolated Freshwater Marsh	9	536	102	2	1,156	1,806	648	384
Freshwater non-Forested Wetlands	6	0	0	0	99	105	6	3
Cultural - Lacustrine	45	0	419	657	63	1,184	464	0
Cultural - Riverine	25	0	42	0	92	160	67	0
Lacustrine	0	0	75	9	48	133	75	0
Natural Lakes and Ponds	0	0	6	1	21	28	6	0
COLUMN TOTAL	**1,969**	**536**	**3,304**	**931**	**27,600**	**34,340**	**5,809**	**3,133**
COLUMN PERCENT	**5.7%**	**1.6%**	**9.6%**	**2.7%**	**80.4%**	**100.0%**	**16.9%**	**9.1%**

[1] From column "G" of Table 2-3, which prorates the development cap among the three HCP land-use designations of the HCP development envelope.

17.4 Cumulative Effects on Everglade Snail Kite

For purposes of consultation under ESA §7, cumulative effects are those caused by future state, tribal, local, or private actions that are reasonably certain to occur in the Action Area. Future Federal actions that are unrelated to the proposed action are not considered, because they require separate consultation under §7 of the ESA.

We identified in section 3 of this BO/CO a projected increase in traffic on public roads as the sole source of effects that are consistent with the definition of cumulative effects for this Action. We have no information that suggests traffic on public roads is a predictable cause of snail kite injury, mortality, or significant behavioral modification.

17.5 Conclusion for Everglade Snail Kite

In this section, we summarize and interpret the findings of the previous sections for the snail kite (status, baseline, effects, and cumulative effects) relative to the species-specific purpose of a BO under §7(a)(2) of the ESA, which is to determine whether the proposed action is likely to jeopardize the continued existence of a species.

Status

Snail kites are dietary specialists that feed almost exclusively on apple snails. Both predator and prey rely on freshwater wetland habitats for all aspects of their life history. Snail kites are

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nomadic, probably as an adaptation to variable hydrologic conditions. Outside of the breeding season, snail kites may travel long distances within and among the major wetland systems of the species' range in Florida. The most recent (2018) population estimate is 2,347 birds. The principal threats to the snail kite are:

(a) the loss, fragmentation, and degradation of wetlands caused by residential, commercial, and agricultural development, and;
(b) the alteration of wetland hydrology caused by ditches, canals, levees, water control structures, pump stations, impoundments, and the associated manipulation of water levels using this infrastructure.

The species' principal conservation needs are to maintain, restore, and enhance the capacity of wetlands to produce apple snails that are accessible to snail kite foraging.

Kite movements and distribution of breeding individuals have tracked the spread of non-native apple snail (*P. maculata*) populations. Since 2005, a substantial fraction (about 80%) of snail kite breeding has shifted to the northern portions of the species' range (Kissimmee River Valley, Lake Okeechobee).

Baseline

Snail kites are known to use the Plan Area, but we have no records of snail kite nesting within 9 miles the Plan Area, which lies on the southwestern edge of the species' range in Florida. Snail kite observations within the Plan Area most likely represent nomadic and opportunistic use of available foraging habitats by birds that do not nest in the Plan Area. The Plan Area contains 34,340 acres of freshwater wetland and open water cover classes that could support foraging and roosting. We believe that relatively low numbers of snail kites probably spend a few weeks or months each year in the Plan Area. Conservation needs and threats in the Plan Area parallel the range-wide needs and threats.

Effects

The development and mining in the Plan Area would involve various activities (drainage, filling, excavation, paving, building construction, *etc.*) that would permanently eliminate 1,969–3,133 acres of wetlands as snail kite foraging and roosting habitat, depending on its distribution within the potential development envelope. This loss would cause a small number of snail kites that use these areas during nomadic wanderings and dispersal to forage elsewhere. We do not expect significant adverse consequences (death or injury) to individuals resulting from such displacement.

The designated Preservation areas of the HCP contain 27,600 acres, or 80.4%, of the wetland types in the Plan Area that we consider as potential snail kite habitat. The Applicants propose to preserve existing habitats, and to potentially restore, enhance, or create such habitats to mitigate for permanent losses associated with the Covered Activities. The HCP does not specify performance measures (amount or extent, functional gain) for such restoration and enhancement activities. We do not expect the management of Preservation areas to reduce the numbers, reproduction, or distribution of the snail kite in the Preservation areas, because these activities would, at minimum, maintain current conditions. Special attention to this species in the long-

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term management of the Preservation areas under conservation easements could increase the number of snail kites that the Plan Area supports, and possibly even promote nesting activity.

The Very Low Density use areas of the HCP contain 931 acres of native wetlands and open water that could support apple snails and foraging for a few snail kites. Development of some portions of these for residences, lodges, hunting/fishing camps could reduce such habitat by up to 26 acres, but we do not expect significant adverse consequences to snail kites resulting from such displacement.

Cumulative Effects

We have no information that suggests traffic on public roads, which is the sole source of cumulative effects we have identified for this Action, is a predictable cause of snail kite injury, mortality, or significant behavioral modification.

Opinion

The loss of about 2,000–3,000 acres of wetlands that likely support nomadic snail kite foraging activity would add an increment of habitat loss to the species' range. Because it does not appear that the Plan Area supports snail kite nesting, we do not expect this habitat loss to actually kill or injure snail kites. Another approximately 27,000 acres of freshwater wetlands and open water areas would remain in the Preservation areas, where future management as mitigation for habitat losses may increase snail kite carrying capacity, but such enhancement is not predictable with available data.

Situated on the southwestern edge of the species' range in Florida, the Plan Area does not provide a vital corridor for movement among the primary breeding regions. In recent years, most kite breeding activity is concentrated in regions to the north (Kissimmee River Valley, Lake Okeechobee). In this context, the loss of nomadic foraging habitat in the development areas, potentially offset to some degree with habitat enhancements in an acreage of preservation areas nine times larger than the loss, does not represent an appreciable reduction in the species' distribution. We expect no significant reductions to the species' reproduction or numbers caused by the proposed Action.

After reviewing the current status of the species, the environmental baseline for the Action Area, the effects of the Action and the cumulative effects, it is the Service's biological opinion that the Action is not likely to jeopardize the continued existence of the snail kite.

18 Eastern Diamondback Rattlesnake

This section provides the Service's conference opinion of the Action for the eastern diamondback rattlesnake.

18.1 Status of Eastern Diamondback Rattlesnake

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This section summarizes best available data about the biology and current condition of the eastern diamondback rattlesnake (*Crotalus adamanteus*) (EDR) throughout its range that are relevant to formulating an opinion about the Action. At this time, the EDR is not protected under the ESA, but its status relative to the ESA definitions of "endangered" and "threatened" is under review (77 FR 27403, May 10, 2012, 90-Day Finding).

18.1.1 Species Description

The EDR is the largest venomous snake in the U.S. The Florida Museum (2018) provides the following description:

> "Average adult size is 36–72 inches (91–183 cm), record is 96 inches (244 cm). A large, heavy-bodied snake with a row of large dark diamonds with brown centers and cream borders down its back. The ground color of the body is brownish. The tail is usually a different shade, brownish or gray, and toward the end of the tail the diamonds fade out or break into bands. The tail ends in a rattle. The scales are keeled. The large and thick head has a light bordered dark stripe running diagonally through the eye and there are vertical light stripes on the snout. The pupil is vertical (cat-like) and there is a deep facial pit between the nostril and the eye. The young are similar to the adults in color pattern. The tip of the tail of new born Eastern Diamondback Rattlesnake ends in a "button," which is the first segment of the future rattle."

18.1.2 Life History

The EDR is a solitary ambush predator that feeds on a variety of rodents and rabbits (Means 2017), Although it uses the burrows of other animals for shelter, the EDR hunts only above ground (Timmerman and Martin 2003). Individuals do not defend a territory or den communally, and interact with others only for mating (Means 2009). Females reach sexual maturity between 2–6 years (Timmerman and Martin 2003). EDRs bear live young, with a gestation period lasting from April–May through August–September (Martin and Means 2000). The natural lifespan of an EDR is probably 15–20 years, but field evidence suggests that few individuals live beyond 10 years, most likely due to anthropogenic mortality (Timmerman and Martin 2003).

Martin and Means (2000) described the primary habitats of the EDR as open-canopy, pyro-climax (conditions maintained by a frequent fire regime) pinelands and savannas, including longleaf pine/wire grass sandhills, clayhills, and flatwoods. The species also occurs in coastal strand forest, palmetto prairie, temperate hardwood forest, tropical hardwood hammocks, and sand pine or oak scrub, especially where these are adjacent to pine-dominated habitats. Present-day habitats include various ruderal (disturbed) situations such as berms along canals, citrus groves, spoil islands, and old-field successional habitats. The EDR may occur in agricultural areas that have patches of native or early-successional habitat nearby. Old fields and abandoned citrus groves may support relatively high densities. Planted pines are suitable habitats for 10–15 years until the canopy closes.

EDRs require shelter during cold weather and during fires. Gopher tortoise burrows, armadillo burrows, and stumps are typical shelter for the species (Hoss 2017; Timmerman and Martin

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2003). In the mild winters of south Florida, EDRs often use patches of saw palmetto as cover (Martin and Means 2000).

Martin and Means (2000) summarized available home range studies, which report substantial differences in different portions of the species' range and by sex. Males have a larger home range. In a northeast Florida study area, average male and female home range was 208 and 115 acres, respectively. In a northwest Florida study area, average male and female home range was 494 and 198 acres, respectively. In a south Florida (Everglades) study area, the minimum home range (sexes not reported) was 297 acres and the maximum was 642 acres.

18.1.3 Numbers, Reproduction, and Distribution

The historical (pre-European settlement) range of the EDR most likely encompassed most of the Coastal Plain of the southeastern U.S. from North Carolina to South Florida, and west to Mississippi and Louisiana, generally coinciding with the historical distribution of the longleaf pine savanna ecosystem (Martin and Means 2000). Means (2017) estimated historical range wide abundance at about 3.08 million snakes, and current range wide abundance at less than 100,000. The species is currently most abundant in south Georgia and north Florida (Martin and Means 2000).

Citrus groves, improved pastures, and urban development have replaced a substantial fraction of EDR native uplands habitat in peninsular Florida (Martin and Means 2000). The species has become rare or extirpated from many locations in Florida, including many barrier islands and the Florida Keys. However, with the species' extirpation from many northern areas within the historical range, Florida now constitutes about half of the species' current range (Timmerman and Martin 2003). Habitat availability for gopher tortoises in Florida, a species with similar habitat associations, is estimated at about 3.3 million acres (see section 20.1.3 in "Status of Gopher Tortoise"). Due to this large amount of remaining potential habitat, the EDR is more likely to persist in Florida than in other states (Martin and Means 2000).

18.1.4 Conservation Needs and Threats

The species' abundance has likely been declining since the 1930s, and more rapidly since the 1970s, coinciding with substantial growth of the human population in the southeastern U.S. (Timmerman and Martin 2003). Conversion of native upland cover to agricultural, intensive silvicultural, and urban uses have caused habitat loss and fragmentation, and plant community succession resulting from fire suppression has caused habitat degradation (Timmerman and Martin 2003).

Ware et al (1993) estimated that only 2% remains of the historical extent of longleaf pine savannas, the primary EDR habitat. Habitat fragmentation increases the likelihood of interactions with people who may kill or injure rattlesnakes, intentionally or inadvertently. Eastern EDRs are capable of moving 0.8–1.6 km (0.5–1.0 mi) in a day (Means 2017). In fragmented habitats, these movements make them highly susceptible to road mortality. Means (2017) concluded that "road kills have a serious negative effect on EDR populations, particularly where habitat is fragmented and reduced to small patches by roads."

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Since the 1930s, EDRs and EDR parts have been sold for meat, skins for clothing, rattles and heads for the curio trade, and venom for medical applications (*e.g.*, antivenin to treat snake bite). Timmerman and Martin (2003) estimated that thousands were killed annually for these various commercial purposes. Today, only North Carolina classifies and protects the EDR as an endangered species under state law, which prohibits killing or disturbing the species (N.C. Wildlife Resource Commission 2017). Killing EDRs is legal without a hunting license in Alabama, Florida, Georgia, and South Carolina (but not on public lands in South Carolina), and requires a hunting license in Mississippi. Reliable estimates of numbers intentionally killed for sport or for a real or perceived human safety purpose are not available.

EDR "roundups" began in the 1950s. The most common roundup technique flushes snakes from a gopher tortoise burrow by blowing gasoline fumes into it. At the height of its popularity, 23 towns throughout the species' range organized an annual roundup event. All but two of these towns have discontinued the events or converted them to non-lethal snake education events (Means 2009). Only Cairo, Georgia, and Opp, Alabama, continue lethal EDR roundups (Center for Biological Diversity 2019). The roundups likely contributed to substantial local population declines. Records from the various roundups indicate a decline over time in both capture rates and snake size (Means 2009, Timmerman and Martin 2003).

Although protection from exploitation and killing is generally a necessary step in conserving a declining species, the EDRs primary conservation need is to maintain, restore, and enhance native upland habitats, especially longleaf pine savannas. The range and habitat preferences of the EDR substantially overlap with those of the eastern indigo snake (see section 19) and gopher tortoise (see section 20). Conservation actions intended for these and other species associated with native upland habitats of the southeast U.S. coastal plain benefit the EDR.

18.2 Environmental Baseline for Eastern Diamondback Rattlesnake

This section describes the current condition of the EDR in the Action Area without the consequences to the listed species caused by the proposed Action.

18.2.1 Action Area Numbers, Reproduction, and Distribution

The Applicants did not conduct surveys to map EDR distribution or estimate EDR abundance in the Plan Area. As evidence that the species occurs in the Plan Area, the HCP (Chapter 5.4.1.3) cites Krysko et al. (2011), which includes three records (collection sites for museum specimens) from the Plan Area, and Martin and Means (2000), which includes two additional records (also collection sites for museum specimens) from the Plan Area. These records, and the availability of native upland habitats associated with the species, support a finding that the species is reasonably certain to occur in the Plan Area.

Land cover classes listed in Table 2-1 that align with the habitat descriptions of Martin and Means (2000) (see section 18.1.2; Life History) include all seven of the native upland classes that occur in the Plan Area. Martin and Means (2000) report that old fields and abandoned citrus groves can support high populations when relatively natural habitat is also available. Similarly,

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Hoss (2007) concluded that EDRs persist in agricultural areas only if sufficient natural habitat is nearby. Nearly half (48.3%; Table 2-2) of the Plan Area is in active agriculture (orchards, crops, pastures); however, most of this acreage is represented by large tracts that border natural habitats along the margins only. Although the home ranges of EDRs in the Plan Area probably include some extent of agricultural and wetlands cover, native uplands are most likely to support the species. Native uplands constitute 13,221 acres (8.3%) of the Plan Area.

Researchers report average home range sizes of 208–494 acres for males, and 115–198 acres for females (see section 18.1.2). Means (1986) estimated a density of about 1 adult EDR per 8 ha (19.8 acres) in high-quality habitat (longleaf pine savanna), which implies substantial overlap between individual home ranges. EDRs are not territorial, do not den communally, and interact with other EDRs only for mating (see section 18.1.2, Life History). The home ranges of individuals probably overlap to a degree that corresponds with prey abundance, cover availability, and other habitat factors.

The Plan Area does not contain high-quality longleaf pine savanna habitats, but does contain a substantial acreage of orchards, pastures, and other ruderal habitats interspersed with flatwoods and other types of native upland cover. Therefore, to estimate EDR numbers in the Plan Area, we apply the density of 1 snake per 19.8 acres in high-quality habitat to the acreage of native upland cover classes only (*i.e.,* not to the acreage of agricultural cover classes). We expect the 13,221 acres of native uplands in the Plan Area, and the adjacent margins of other cover types, to support about 668 adult EDRs.

18.2.2 Action Area Conservation Needs and Threats

Threats to EDRs in the Action Area parallel the threats at the range wide scale: habitat loss, fragmentation, and degradation through fire suppression; and road mortality and other lethal encounters with humans. Protecting and managing large tracts of native uplands is the species' primary conservation need.

18.3 Effects of the Action on Eastern Diamondback Rattlesnake

This section describes all reasonably certain consequences to the EDR that we predict the proposed Action would cause, including the consequences of other activities not included in the proposed Action that would not occur but for the proposed Action. Such effects may occur later in time and may occur outside the immediate area involved in the Action.

18.3.1 Development and Mining, Base Zoning, and Eligible Lands

Because EDRs rely primarily on native upland cover types, and it is plausible that development would occur disproportionately in these non-wetland cover types, we use the RMI method described in section 2.1.4 to estimate the extent of development in EDR habitats. Native uplands cover 1,804, 16, and 734 acres of the Development and Mining, Base Zoning, and Eligible Lands designations, respectively (Table 2-2). These 2,554 native upland acres amount to less than the development cap of 39,973 acres that may occur within the 66,245-acre development envelope. Development confined entirely to the Development areas, or implemented with the maximum

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possible substitution of Base Zoning and/or Eligible lands in the accounting for the cap, could replace all of the native uplands habitats in one or more of these HCP land use designations. Using a density of 1 snake per 19.8 (see section 18.2.1), the native uplands in the Development and Mining, Base Zoning, and Eligible Lands designations would support about 91, 1, and 37 EDRs, respectively (total 129).

The development would involve vegetation clearing, grading, excavation and piling, the use heavy equipment and other vehicles at project sites, and the construction of buildings and associated infrastructure. Such substantial alterations of habitats that support EDR feeding, breeding, and sheltering behaviors would disturb, displace, injure, or kill snakes that are present at the time of those activities, depending on site- and project-specific circumstances. An increase in human habitation of the developed areas would increase the likelihood of encounters in which people intentionally kill EDRs.

Displacement by habitat loss could cause EDRs to cross roads seeking alternative habitats, and increased vehicle traffic on public roads during and after construction would increase the risk of roadkill. However, lacking records of EDR roadkill numbers or locations in the Action Area, we have insufficient data to predict with reasonable certainty an expected increase in roadkill. Although some individuals may survive displacement from developed areas, conservatively, we estimate the number of adult individuals harmed by development activities as the total number (129) that we expect to use 2,554 acres of upland habitats in the development envelope.

18.3.2 Preservation Activities

The designated Preservation areas contain 10,221 acres, or 77% (Table 2-2), of the native uplands cover in the Plan Area considered primary EDR habitat. We estimate Plan Area EDR numbers at about 668 adults (see section 18.2.1), and expect the Preservation areas to support about $0.77 \times 668 = 514$ EDRs.

The Applicants propose a continuation of existing land uses (agriculture, silviculture, *etc.*) in the Preservation areas, which we listed in section 2.3. Land management activities in the Preservation areas for which the Applicants seek take authorization include:

- prescribed burning;
- mechanical control of groundcover (*e.g.*, roller chopping, brush-hogging, mowing);
- ditch and canal maintenance;
- mechanical and/or chemical control of exotic vegetation;
- soil tillage; and
- similar activities that maintain or improve land quality.

Prescribed burning maintains habitat quality in the native uplands that EDRs prefer (see section 18.1.2). EDRs may readily avoid a slowly advancing prescribed fire by seeking refuge in burrows or other shelters. Likewise, EDRs may readily avoid slowly advancing heavy equipment engaged in vegetation management or soil tillage, and soil tillage would not occur in native uplands. Controlling exotic vegetation also maintains EDR habitat quality, and we have no data that suggests that herbicides applied according to label instructions may harm EDRs. In general,

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these land management practices may temporarily disrupt EDR foraging activity, but we do not expect them to kill or injure individuals.

The Applicants do not specifically propose to restore, enhance or create EDR habitats in the Preservations areas, but propose to maintain pine flatwoods and other upland forest types with prescribed fire and exotic plant removal. We do not expect the management of Preservation areas to reduce the numbers, reproduction, or distribution of the EDR in the Preservation areas, because these activities would, at minimum, maintain current conditions. Long-term management of the Preservation areas with prescribed fire could increase EDR densities and local abundance, which we expect are currently at low levels.

18.3.3 Very Low Density Development

The Very Low Density (VLD) use areas contain 447 acres, or 3.4% of the native uplands cover in the Plan Area. Using a density of 1 snake per 19.8 acres, we estimate Plan Area EDR numbers at about 668 individuals (see section 18.2.1), and expect the Preservation areas support about $0.034 \times 668 = 23$ EDRs.

Land uses in the VLD areas are similar to the Preservation areas, but may also include isolated residences, lodges, and hunting/fishing camps, at a density of no more than one dwelling unit per 50 acres. The Applicants would continue current ranching/livestock operations and other management activities as described for the Preservation areas (*e.g.,* exotic species control, prescribed burning). As in the Preservation areas, we do not expect continuing the existing land management regimes to harm EDRs.

The HCP does not specify a footprint for the isolated residences, lodges, and hunting/fishing camps, but indicates that their construction could clear up to 10% of the existing native vegetation (see section 2.5). New dwelling development could occur within any of the cover types present besides open water and existing development. It is possible that dwelling development in the VLD areas could entirely avoid native uplands, but we conservatively estimate a 45-acre habitat loss (10% of these types) affecting about $45 \div 19.8 = 2$ EDRs. Development within a portion of the home range of an EDR would cause the individual to shift its activity accordingly. However, the scale of this potential habitat loss (45 acres), which is the total for three widely separated VLD use areas, is less than half the home range size of a female and less than a quarter of the home range size of a male (see section 18.1.3). Therefore, we do not expect significant adverse consequences to individuals resulting from displacement at this scale.

18.4 Cumulative Effects on Eastern Diamondback Rattlesnake

For purposes of consultation under ESA §7, cumulative effects are those caused by future state, tribal, local, or private actions that are reasonably certain to occur in the Action Area. Future Federal actions that are unrelated to the proposed action are not considered, because they require separate consultation under §7 of the ESA.

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We identified in section 3 of this BO/CO a projected increase in traffic on public roads as the sole source of effects that are consistent with the definition of cumulative effects for this Action. Roadkill is a documented cause of EDR mortality (see section 18.1.4). Increased vehicle traffic unrelated to the Action is a stressor that may adversely affect EDRs in the Action Area. As the population of southwest Florida increases, we expect more vehicle use in the Action Area and a concomitant increase in road mortality of animals in general. However, lacking data about EDR roadkill numbers and locations in the Action Area, we cannot predict with reasonable certainty an increase in roadkill caused by sources unrelated to the Action.

18.5 Conclusion for Eastern Diamondback Rattlesnake

In this section, we summarize and interpret the findings of the previous sections for the EDR (status, baseline, effects, and cumulative effects) relative to the species-specific purpose of a BO under §7(a)(2) of the ESA, which is to determine whether the proposed action is likely to jeopardize the continued existence of a species.

Status

The pre-European settlement range of the EDR probably encompassed most of the Coastal Plain of the southeastern U.S., generally coinciding with the historical distribution of the longleaf pine savanna ecosystem. The species has declined from an estimated historical range wide abundance of about 3.08 million to less than 100,000. The species remains most abundant in south Georgia and north Florida. Conversion of native upland cover to agricultural, intensive silvicultural, and urban uses have caused habitat loss and fragmentation, and plant community succession resulting from fire suppression has caused habitat degradation. In Florida, about 3.3 million acres of native upland habitats (based on analyses supporting gopher tortoise abundance estimates) remain. The EDR is exploited for commercial purposes, intentionally killed for sport or as a threat (real or perceived) to human safety, and incidentally killed on roads. Conserving the EDR would likely require some legal prohibitions against intentional take, which are currently in effect only in North Carolina and on public lands in South Carolina. The species' primary conservation need is to maintain, restore, and enhance native upland habitats, especially longleaf pine savannas.

Baseline

Previous collection records and current habitat availability support a finding that the species is reasonably certain to occur in the Plan Area. Although the home ranges of EDRs in the Plan Area probably include some extent of agricultural and wetlands cover, native uplands are most likely to support the species. We expect the 13,221 acres of native uplands in the Plan Area, and the adjacent margins of other cover types, to support about 668 adult EDRs. Threats to EDRs in the Action Area parallel the threats at the range wide scale: habitat loss, fragmentation, and degradation through fire suppression; and road mortality and other lethal encounters with humans. Protecting and managing large tracts of native uplands is the species' primary conservation need in the Plan Area.

Effects

We estimate that 2,554 acres of native uplands in the Development and Mining, Base Zoning, and Eligible Lands designations (and the adjacent margins of other cover types) support about 91, 1, and 37 EDRs, respectively (total 129). Activities associated with development would substantially alter EDR habitats, which would disturb, displace, injure, or kill snakes that are present at the time of those activities, depending on site- and project-specific circumstances. An increase in human habitation of the developed areas following construction would increase the likelihood of encounters in which people intentionally or incidentally kill EDRs. Although some individuals may survive displacement from developed areas, we conservatively estimate the numbers harmed by development activities as all 129 adult EDRs that we expect to occupy upland habitats in the HCP development envelope.

The designated Preservation areas contain the majority (77%) of native upland cover types in the Plan Area, which we expect to support 77% of the EDRs present (about 514 adults). We do not expect the management of Preservation areas to reduce the numbers, reproduction, or distribution of the EDR in the Preservation areas, because these activities would, at minimum, maintain current conditions. We do not expect the small scale of potential development within the Very Low Density (VLD) use areas to cause predictable harm to EDRs. Long-term management of native uplands in the Preservation and VLD areas with prescribed fire could increase EDR densities and local abundance.

Cumulative Effects

Increased vehicle traffic unrelated to the Action is a stressor that may adversely affect EDRs in the Action Area. However, lacking data about tortoise roadkill locations or numbers in the Action Area, we cannot predict with reasonable certainty an increase in roadkill caused by sources unrelated to the Action.

Opinion

Developing up to 2,554 acres of native upland habitats would add an increment of habitat loss within the extant range of the EDR, which likely encompasses several million acres in multiple states. We expect this loss to reduce EDR abundance in the Plan Area by about 129 adult individuals, which represents a 0.13% percent reduction relative to range wide abundance of about 100,000. The extent of habitat enhancement that may occur in the Preservation and VLD use areas is not predictable at this time, but long-term management and protection of over 10,000 acres of native upland cover classes is likely to create some benefits for EDRs. Such management and protection in the Preservation areas would eliminate in these areas the primary threat to the species, which is habitat degradation, loss, and fragmentation. Given the small proportional impact of the Action to range-wide abundance and habitat availability, and the prospect of future habitat improvements, we believe the impact of the Action on the EDR does not represent an appreciable reduction in the species' numbers, reproduction, or distribution.

After reviewing the current status of the species, the environmental baseline for the Action Area, the effects of the Action and the cumulative effects, it is the Service's conference opinion that the Action is not likely to jeopardize the continued existence of the EDR.

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19 Eastern Indigo Snake

This section provides the Service's biological opinion of the Action for the eastern indigo snake (EIS).

19.1 Status of Eastern Indigo Snake

This section summarizes best available data about the biology and current condition of the eastern indigo snake (*Drymarchon corais couperi*) throughout its range that are relevant to formulating an opinion about the Action. The Service published its decision to classify the EIS as threatened on March 3, 1978 (43 FR 4026–4029). The Service has not proposed or designated critical habitat for the EIS. Our description of the species' status in this section relies primarily upon the more comprehensive and detailed "Species Status Assessment Report for the Eastern Indigo Snake" (USFWS 2018), and other sources, as cited.

Although our 1978 listing decision identified the EIS as a subspecies, the scientific community currently recognizes the EIS as the distinct species *Drymarchon couperi*. The Service acknowledges this taxonomic change, which does not affect how the protections of the ESA apply to the EIS. Our most recent 5-year status review (USFWS 2019a) recommended no change to the classification of the EIS. In September 2019, the Service published a revised recovery plan for the EIS (USFWS 2019b).

19.1.1 Species Description

EISs are moderately heavy-bodied and iridescent bluish-black in color, including the belly. The pigment of the chin and sides of the head is reddish, orange-brown, or cream (Conant and Collins 1998; Stevenson et al. 2008). The extent and intensity of head pigmentation is highly variable, lacking on many specimens, and typically most extensive on juveniles and adult males (Layne and Steiner 1996).

The EIS is the longest snake native to the U.S., reaching lengths of up to 8.6 feet (Conant and Collins 1998; Stevenson et al. 2008). Mature adult EIS weigh from 2 pounds to over 10 pounds. Adult males commonly attain a total length of 6.5–7.0 feet (Layne and Steiner 1996; Stevenson et al. 2009), whereas adult females reach a total length of 4.0–6.0 feet (Layne and Steiner 1996; Stevenson et al. 2009; Knafo et al. 2016).

19.1.2 Life History

The EIS exhibits ecological and genetic diversity across its geographic distribution, influencing many aspects of the species' behavior. Based on these differences, the Service partitions EIS populations among four regions: the Panhandle (which includes the counties of the Florida Panhandle, a few contiguous counties in Alabama and Mississippi, and Decatur County, Georgia), Southeast Georgia, North Florida, and Peninsular (south) Florida (USFWS 2018). In this section, we focus on the species' biology in Peninsular Florida.

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The Peninsular Florida populations of the EIS use a wide variety of habitat types, including mesic and scrubby flatwoods, scrub, dry prairie, hardwood hammock, pine sandhill, freshwater and saltwater wetlands, and various human-altered habitats (USFWS 2018). A combination of native uplands (primary habitat) and lowlands (secondary habitat) appears to support the most resilient EIS populations. Most of the native upland cover types that EIS use depend on periodic fire to maintain good habitat quality. EIS generally avoid urbanized areas, but use of improved pastures, citrus groves, sugar cane fields, and canal banks (tertiary habitat) is common in south Florida (Bauder et al. 2018). However, across its range, EIS exhibit a strong preference year-round for native upland habitat types (Bauder et al. 2018; Hyslop et al. 2014).

Although the EIS is active during the day, its frequent use of underground refugia for shelter, breeding, feeding, and nesting activities makes it exceedingly difficult to detect in surveys (USFWS 2018). Shelter sites in south Florida include armadillo and gopher tortoise burrows, natural holes in the ground, leaf litter, and the crevices of rock-lined ditch walls (Layne and Steiner 1996). Reflecting the diversity of habitats the species uses, the EIS feeds on a variety of prey. Rodents, snakes, and other small reptiles represent the majority forage items (Stevenson et al. 2010).

Annual home range size varies by sex and region. Males have larger home ranges than females (up to 3,776 acres *vs*. up to 875 acres), and both sexes have larger home ranges in the northern regions than in Peninsular Florida (USFWS 2018; Appendix A). EISs typically avoid territory overlap between same-sex individuals, but male and female home ranges frequently intersect (Bauder et al. 2016a). EISs in Peninsular Florida do not exhibit seasonal movement between upland and lowland habitats (Hyslop et al. 2014), which partly accounts for smaller annual home range size compared to the northern regions. Movements spanning a linear distance of about 2.4 miles in Peninsular Florida are common (Bauder et al. 2018), with one documented movement of 4.3 miles (USFWS 2018).

The EIS mating season occurs from October through February. Females lay clutches of 4–12 eggs in April and June, which hatch in August and September (USFWS 2018). Although not well understood, EIS longevity is generally 8–12 years (Stevenson et al 2009).

Three studies of hatchlings/juveniles (Moulis 1976, Steiner et al. 1983, Godwin et al. 2011) reported male/female ratios of about 1:1. However, sex ratios become more male-biased in adult snakes. Layne and Steiner (1996) reported an adult male/female ratio of 1.54:1 for EISs in south Florida. Stevenson et al. (2009) reported a ratio of 2.1:1 in a study at Fort Stewart, Georgia.

19.1.3 Numbers, Reproduction, and Distribution

The source of information in this section is our most Species Status Assessment (SSA) for the EIS (USFWS 2018), unless otherwise indicated. Recent EIS occurrence records are scattered throughout three of the four regions identified in section 19.1.2 (North Florida, Peninsular Florida, and Southeast Georgia), but are rare in the Panhandle region. The EIS is likely extirpated from the Mississippi portions of the Panhandle region.

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Based on a spatial analysis of EIS occurrence records (two or more records with overlapping 5-mile buffers), the SSA delineated 51 historical EIS populations (1936–2017 records) and 53 current (2001–2017 records) populations across the full range of the species (Table 19-1). Although the total number of historic and current populations is about the same, the spatial extent of the current populations represents a 48% decline from the distribution of historical populations. The analysis revealed a fragmentation of the historically larger populations into 83 multiple, smaller populations, of which the SSA considers 30 extirpated (83–30=53 current populations).

The SSA does not estimate range-wide EIS abundance or productivity associated with the 12.5 million acres delineated as supporting 53 current populations (Table 19-1), but estimates that these areas contain about 6.4 million acres of suitable habitat. The numbers and density of EIS in these areas are largely unknown, due to the large size of the species' range and its cryptic behaviors. However, a rough estimate of maximum range wide abundance (*i.e.,* carrying capacity of suitable habitat within the extent of current populations) is possible based on male home range size, observed sex ratios, and the extent of suitable habitat within the delineated population areas. The home range of adult males does not substantially overlap with other adult males, is larger than and overlaps the home range of adult females, and adult males outnumber adult females (see section 19.1.2).

Appendix A of the SSA reports EIS annual home range size from telemetry studies conducted in Southeast Georgia (2 studies), North Florida (2 studies), and Peninsular Florida (12 studies). The average size of a male's home range, weighted by the number of males in each of these studies, is 1,260 acres for Southeast Georgia, 367 acres for North Florida, and 343 acres for Peninsular Florida (Table 19-2). The SSA does not report a breakdown of suitable habitat by region to which we could apply these home ranges to estimate carrying capacity. Weighting these average home range sizes by the percentage of the current spatial extent of populations in each region (27%, 10%, and 63%, respectively; Table 19-1), yields a home range of 595 acres. Dividing 6.4 million acres of suitable habitat by 595 acres suggests that the 53 population areas could support up to about 10,800 male EISs. Male/female sex ratios of 1.54–2.1:1 (see section 19.1.2) applied to this estimate yields coextensive adult female abundance ranging from about 5,000–7,000, and a total carrying capacity of about 15,800–17,800 adults.

It is unlikely that the home ranges of EIS encompass all portions of the 6.4 million acres of suitable habitat. Actual abundance would correspond to the fraction of available habitat that EISs occupy, which is unknown. Bauder (2018) suggests that an area of suitable habitat of less than 2,500 acres is insufficient to support a single pair of EISs. If so, the carrying capacity estimated above based upon a 595-acre male home range is at least 4 times too high. Dividing 6.4 million acres by 2,500 acres yields 2,560 males, with about 1,200–1,700 females based on sex ratios (total carrying capacity of about 3,760–4,260 adults).

Appendix B of the SSA reports the methods used for describing current conditions for the 53 EIS population areas identified, including methods for measuring the relative resilience of each population (ability to withstand disturbance). The factors evaluated for each population included:

- extent (size of the overlapping 5-mile buffers around occurrence records);
- connectivity with other population areas;

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- habitat quantity;
- habitat fragmentation;
- tertiary road density;
- % urban area;
- shelter availability (gopher tortoise burrows); and
- habitat type (classified as primary, secondary, and tertiary).

Using weighted scores for each of these factors, the SSA classified the resiliency of the 53 EIS populations as follows: 4 High, 13 Medium, 28 Low, and 8 Very Low. Among these eight factors, the SSA assigned greatest weight to habitat fragmentation. Population areas containing > 75% of habitat in patches > 10,000 acres received the highest score for fragmentation (least fragmented), and those containing >50% of habitat in patches < 5,000 acres received the lowest score.

19.1.4 Conservation Needs and Threats

Habitat loss, fragmentation, and degradation caused by the conversion of native habitats to urban and agricultural uses are the primary threats to this species, because EIS populations require relatively large areas of sufficient connectivity and habitat quality to persist (USFWS 2018). Range wide, the extent of EIS populations has declined from 24.0 to 12.5 million acres (Table 19-1).

Accompanying the loss and fragmentation of EIS habitats caused by urbanization is the risk of mortality on roads that cross EIS territories. EISs generally avoid crossing primary and secondary roads, which contributes to the isolation and fragmentation of populations (USFWS 2018). However, EISs readily cross tertiary roads (paved, non-arterial 2-lane roads). Our SSA (USFWS 2018) cites unpublished data from Georgia and Florida that documents over 100 instances of EIS roadkill since 2000 (the majority of about 200 sightings, dead or alive, on roads). Godley and Moler (2013) reported a 95% decline in EIS catch-per-unit effort within a Florida study area from 1981–2009, identifying roadkill as a primary factor. Minimizing road density within large tracts of suitable habitats is critical to the design of conservation areas for the EIS.

Our SSA (USFWS 2018) also identifies climate change, disease, collection, deliberate killing, pesticide use, and invasive species as additional threats to the species' survival and recovery than habitat loss. However, the species' primary conservation needs are preserving, restoring, and enhancing large tracts of suitable habitat that support extant populations, and repatriating the species to such habitats where the species appears extirpated.

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19.1.5 Tables and Figures

Table 19-1. Historical (A) and current (B) number and extent (acres) of EIS populations by region. Note: only 6.4 million acres of the 12.5 million acres delineated within the extent of current populations is considered potential EIS habitat. (Source: USFWS 2018; Table 6).

(A) Historical: 1936-2017				
Region	Region Area (ac)	Historical Population Extent (ac)	Number of Populations	% of Region Occupied
Southeast Georgia	16,395,372	4,963,121	10	30
North Florida	9,556,835	2,824,993	6	30
Panhandle	20,330,428	2,889,894	13	14
Peninsular Florida	27,805,400	13,382,652	22	48
Total	74,088,035	24,060,660	51	32

(B) Current: 2001-2017					
Region	Current Population Extent (ac)	Number of Extant Populations	Number of Populations in High (H) to Medium (M) Resiliency	% of Region Occupied	% Population Extent Decline
Southeast Georgia	3,384,099	13	1 H; 4 M	21	32
North Florida	1,251,686	5	0 H; 2 M	13	56
Panhandle	84,042	1 (2R)*	0 H; 0 M	0	97
Peninsular Florida	7,780,784	32	3 H; 7 M	28	42
Total	12,500,611	53	4 H; 13 M	17	**48**

* The spatial extent of two repatriation populations (2R) in the Panhandle are not included in the total Current Population Extent, because these populations are not yet considered viable.

Table 19-2. EIS average home range size (acres) from telemetry studies, weighted by the number of snakes tracked in each study (source of study-specific data: USFWS 2018; Appendix A).

	Males		Females	
Region	# Snakes Tracked	Weighted Average Home Range (acres)	# Snakes Tracked	Weighted Average Home Range (acres)
Southeast GA	19	1,260	13	252
North FL	6	367		
Peninsular FL	100	343	71	115
Combined	125	483	84	136

19.2 Environmental Baseline for Eastern Indigo Snake

This section describes the current condition of the EIS in the Action Area without the consequences to the listed species caused by the proposed Action.

19.2.1 Action Area Numbers, Reproduction, and Distribution

The Applicants did not conduct EIS surveys within the Plan Area, but cite sources for several verified observations on various lands immediately adjacent to (within 0.1 mile) and near (within 6 miles) the Plan Area (HCP Chapter 5.2.2.1.3; HCP Figure 5-6). Our SSA includes the records located on conservation lands straddling the northwest corner of the Plan Area (Corkscrew Swamp) as points representing current population "CF1-3" (USFWS 2018). The 5-mile buffers around occurrence records used to delineate the spatial extent of this population overlap the Plan Area. The SSA characterized the resiliency of CF1-3 as Medium Low, with the lowest possible score for population connectivity, due to its isolation from other population areas, but with intermediate scores for the seven other resiliency factors (see section 19.1.3).

In south Florida, the EIS is a habitat generalist, typically found in pine flatwoods, pine rocklands, tropical hardwood hammocks, and in most other undeveloped areas (Kuntz 1977; Enge et al. 2013). EIS use the burrows of gopher tortoise and burrowing owl as refugia (Lawler 1977; Moler 1985; Layne and Steiner 1996), which are species that occur within the Plan Area (see sections 9 and 20 of this BO). Based on recent EIS records within 0.1 mile of the Plan Area, the species' ability to make movements of up to about 5 miles, the presence of potential EIS habitats throughout the Plan Area, and the availability of tortoise and owl burrows, we believe the EIS is reasonably certain to occur in the Plan Area.

EIS use various native wetlands, but generally exhibit a preference year-round and across the species' range for native upland habitat types (Bauder et al. 2018; Hyslop et al. 2014). The acreage of native wetland types in the Plan Area far exceeds that of native upland types (58,543 acres *vs*. 13,221 acres, Table 2-2). The extent of upland habitats likely controls and limits EIS distribution and abundance in the Plan Area. The FWC developed an EIS probability of

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occurrence model for south Florida (FWC unpublished) using the Maxent software (https://biodiversityinformatics.amnh.org/open_source/maxent/), which assigned probabilities of 67–100% to native uplands in the Plan Area, and 0–35% to the interior portions of large wetlands and agricultural areas. Therefore, we estimate EIS abundance in the Plan Area based upon the extent of native upland types.

Metcalf (2017) conducted a telemetry study of EISs in Collier County (Rookery Bay Reserve; east of the Plan Area) that tracked the movements of one female and three male snakes. Average home range size for the three males was 546 acres, which is larger than the Peninsular Florida regional average of 343 acres (see section 19.1.2) (note: the Peninsular Florida average includes data from Metcalf (2017)). Upland habitat types comprised an average of 46% of the home range of the four individuals (range 34–59%). Although the majority of habitats within three of the four home ranges were wetlands, all four individuals spent significantly more time in the uplands (78% of all tracked points). Due to its proximity to the Plan Area (the only EIS home range study conducted in Collier County), we apply the home range size and percentage of uplands habitats in this study to our habitat-based estimation of EIS abundance in the Plan Area.

Considering 13,221 acres of Plan Area native uplands as 46% of EIS home ranges, the full extent of EIS territories is 13,221 ÷ 0.46 = 28,741 acres. These territories would include native wetlands and agricultural lands adjacent to the uplands. Using the 546-acre average male home range size from Metcalf (2017), 28,741 acres would support up to 53 adult males. We would expect the territories of these males to overlap with the home range of about 53 ÷ 1.54 = 34 females (sex ratio in Peninsular Florida), for a Plan Area population of about 87 EISs. More conservatively, Bauder (2018) suggests that more than 2,500 acres of suitable habitat is necessary to support both a male EIS and coextensive female. Using 2,500 acres as the denominator, the Plan Area habitats could support 28,741 ÷ 2,500 = 11 EIS males and 11 ÷ 1.54 = 7 females, for a Plan Area population of about 18 EIS.

19.2.2 Action Area Conservation Needs and Threats

Current threats to the species range-wide (see section 19.1.4), such as habitat loss, fragmentation, and roadkill, are applicable within the Plan Area and the larger Action Area, which includes roads we expect to experience an increase in traffic that would not occur but for the development activity. Numerous roads cross the Plan Area, but we have no records of EIS road mortality within the Plan Area or on roads within the larger Action Area. Primary and secondary roads likely present barriers to EIS movement that fragment the Plan Area into islands of habitat that may not sustain viable populations. As in many other portions of the EIS range, maintaining large contiguous areas of native uplands and native wetlands that support EIS prey species and species that create EIS shelter (*e.g.,* gopher tortoises, burrowing owls) is the primary conservation need of the EIS in the Action Area.

19.3 Effects of the Action on Eastern Indigo Snake

This section describes all reasonably certain consequences to the EIS that we predict the proposed Action would cause, including the consequences of other activities not included in the

proposed Action that would not occur but for the proposed Action. Such effects may occur later in time and may occur outside the immediate area involved in the Action.

19.3.1 Development and Mining, Base Zoning, and Eligible Lands

Because EIS activity is concentrated in native upland cover types, and it is plausible that development would occur disproportionately in these non-wetland cover types, we use the RMI method described in section 2.1.4 to estimate the extent of development in EIS habitats. Native uplands cover 1,804, 16, and 734 acres of the Development and Mining, Base Zoning, and Eligible Lands designations, respectively (Table 2-2). These 2,554 native upland acres amount to less than the development cap of 39,973 acres that may occur within the 66,245-acre development envelope. Development confined entirely to the Development areas, or implemented with the maximum possible substitution of Base Zoning and/or Eligible lands in the accounting for the cap, could replace all of the native uplands habitats in one or more of these HCP land use designations.

The development would involve vegetation clearing, grading, excavation and piling, the use heavy equipment and other vehicles at project sites, and the construction of buildings and associated infrastructure. Such substantial alterations of habitats that support EIS feeding, breeding, and sheltering behaviors would disturb, displace, injure, or kill snakes that are present at the time of those activities, depending on timing and other site- and project-specific circumstances. Site preparation activities conducted from April–September (earliest egg laying through latest hatching) would likely destroy any EIS nests present at a project site.

Displacement by habitat loss could cause EISs to cross roads seeking alternative habitats, and increased vehicle traffic on public roads during and after construction would increase the risk of roadkill. Because EIS generally avoid primary and secondary roads, traffic on public tertiary roads (paved, non-arterial 2-lane roads) poses the greatest risk. However, lacking records of EIS locations or roadkill incidents in the Action Area, we have insufficient data to predict with reasonable certainty an expected increase in roadkill.

The Applicants propose (HCP Chapter 6.2.2.1) to implement the Standard Protection Measures for the Eastern Indigo Snake (USFWS 2013). These measures involve posting information about EISs at construction sites and steps to take in the event that personnel observe live or dead EIS during construction activities. These measures may avoid killing or injuring EISs detected during construction, but such detection is difficult, due to the species cryptic behaviors (spending much time in burrows, crevices, *etc.*). EIS generally avoid urban areas, and individuals displaced from development sites that are adjacent to suitable habitats within other land use designations could survive. However, an undeterminable number would die crossing roads or experience reduced reproductive success or other injury in alternative habitats, which or may not be available nearby, depending on the location of development sites within the Plan Area. Conservatively, we estimate the number of adult individuals harmed by development activities as the total number that could use 2,609 acres of upland habitats in the development envelope.

In a Collier County study area (Metcalf 2017), EIS adult male home ranges averaged 546 acres and included an average of 46% upland cover types (251 acres) (see section 19.1.3). The 2,554

acres of native upland cover in the development envelope could support up to 2,554 ÷ 251 = 10 EIS male territories. Each territory of this average size would include an additional 546 – 251 = 295 acres of adjacent wetlands/agricultural. Using a male/female sex ratio of 1.54:1, these 10 male territories could support about 6 females (a total of up to 16 adult EIS).

Bauder (2018) suggests that more than 2,500 acres of suitable habitat is necessary to support both a male EIS and coextensive female. If this habitat is 46% native uplands, as in the Collier County study cited above, the uplands component amounts to 1,150 acres. Using 1,150 acres as the denominator, the native uplands of the development envelope could support 2,554 ÷ 1,150 = 2 EIS males and 2 ÷ 1.54 = 1 female. Upland cover types occur in patches of variable size throughout the development envelope interspersed with wetlands and agricultural cover types. If 2,500 acres is a more accurate basis for estimating EIS carrying capacity than a male home range size of 546 acres, it is unlikely that the widely dispersed native uplands (many patches > 5 miles apart) within the development envelope would wholly support 2 EIS male territories. It is more likely that native uplands within the development envelope would contribute a portion of the uplands to male territories that substantially overlap with other HCP land uses. We estimate the Plan Area would support 11 EIS male territories of 2,500 acres and 7 females (see section 19.1.3). The development activity would alter these territories such that the total area remaining would support 9 males and 6 females.

19.3.2 Preservation Activities

The designated Preservation areas contain 10,221 acres, or 77% (Table 2-2), of the native upland cover in the Plan Area considered primary EIS habitat. Native uplands cover about 11% of the Preservation areas. We expect native uplands to constitute about 46% of EIS territories in the Plan Area (see section 19.2.1), and adjacent wetlands (secondary habitat) and agricultural lands (tertiary habitat) to constitute the remainder. Therefore, we estimate that EISs inhabit 10,221 ÷ 0.46 = 22,220 acres, or about 25% of the 90,092 acres designated for Preservation.

Containing 77% of the Plan Area native uplands, we expect the Preservation areas to support about 77% of the Plan Area EIS population that we estimated in section 19.2.1:

- 0.77 × 87 = 67 adults, by methods using average home range size; or
- 0.77 × 18 = 14 adults, considering 2,500 acres of suitable habitat as necessary to support an adult male and a coextensive female.

The Applicants propose a continuation of existing land uses (agriculture, silviculture, *etc.*) in the Preservation areas, which we listed in section 2.3. Land management activities in the Preservation areas for which the Applicants seek take authorization include:

- prescribed burning;
- mechanical control of groundcover (*e.g.*, roller chopping, brush-hogging, mowing);
- ditch and canal maintenance;
- mechanical and/or chemical control of exotic vegetation;
- soil tillage; and
- similar activities that maintain or improve land quality.

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Prescribed burning maintains habitat quality in the native uplands that EIS prefer (see section 19.1.2). EIS may readily avoid a slowly advancing prescribed fire by moving to adjacent areas (*e.g.,* wetlands) or seeking refuge in burrows. Likewise, EIS may readily avoid slowly advancing heavy equipment engaged in vegetation management or soil tillage, and soil tillage would not occur in native uplands. Controlling exotic vegetation also maintains EIS habitat quality, and we have no data that suggests that herbicides applied according to label instructions may harm EISs. In general, these land management practices may temporarily disrupt EIS foraging activity, but we do not expect them to kill or injure individuals.

The Applicants do not specifically propose to restore, enhance or create EIS habitats in the Preservations areas, but propose to maintain pine flatwoods and other upland forest types with prescribed fire and exotic plant removal. We do not expect the management of Preservation areas to reduce the numbers, reproduction, or distribution of the EIS in the Preservation areas, because these activities would, at minimum, maintain current conditions. Long-term management of the Preservation areas with prescribed fire could increase EIS densities and local abundance, which we expect are currently at low levels.

19.3.3 Very Low Density Development

The Very Low Density (VLD) use areas contain 447 acres of native uplands considered primary EIS habitat (Table 2-2). These uplands, along with adjacent wetlands (733 acres) and agricultural areas (502 acres), figure into our estimation of EIS abundance in the Plan Area (section 19.2.1), but it is unlikely that any one of three VLD use areas themselves provide sufficient habitat to support a complete territory for one or more EISs.

Land uses in the VLD areas are similar to the Preservation areas, but may also include isolated residences, lodges, and hunting/fishing camps, at a density of no more than one dwelling unit per 50 acres. The Applicants would continue current ranching/livestock operations and other management activities as described for the Preservation Areas (*e.g.,* exotic species control, prescribed burning). As in the Preservation areas, we do not expect continuing the existing land management regimes to harm EISs.

The HCP does not specify a footprint for the isolated residences, lodges, and hunting/fishing camps, but indicates that their construction could clear up to 10% of the existing native vegetation (see section 2.5). New dwelling development could occur within any of the cover types present besides open water and existing development. It is possible that dwelling development in the VLD areas could entirely avoid native uplands and native wetlands, but we conservatively estimate a 45-acre habitat loss of uplands and a 73-acre loss of native wetlands (10% of these types). Development within a portion of the home range of an EIS would cause the individual to shift its activity accordingly. However, the scale of this potential habitat loss (118 acres) is about 22% of the average male home range of 546 acres, spread across three widely separated VLD use areas. Therefore, we do not expect significant adverse consequences to individuals resulting from such displacement.

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19.4 Cumulative Effects on Eastern Indigo Snake

For purposes of consultation under ESA §7, cumulative effects are those caused by future state, tribal, local, or private actions that are reasonably certain to occur in the Action Area. Future Federal actions that are unrelated to the proposed action are not considered, because they require separate consultation under §7 of the ESA.

We identified in section 3 of this BO/CO a projected increase in traffic on public roads as the sole source of effects that are consistent with the definition of cumulative effects for this Action. Road mortality is documented for EISs (see section 19.1.4). Increased vehicle traffic unrelated to the Action is a stressor that may adversely affect EISs in the Action Area. As the population of southwest Florida increases, we expect more vehicle use in the Action Area and a concomitant increase in road mortality of animals in general. Most of the predicted increase in traffic will occur on primary and secondary roads (State and Federal arterial highways that connect major population centers), which EISs generally avoid crossing. Traffic attributed to sources besides the developments within the Plan Area account for a minor share of the predicted increase on tertiary roads (paved, non-arterial 2-lane roads) affected by the Action. However, lacking records of EIS roadkill numbers or locations in the Action Area, we have insufficient data to predict with reasonable certainty an expected increase in roadkill caused by sources unrelated to the Action.

19.5 Conclusion for Eastern Indigo Snake

In this section, we summarize and interpret the findings of the previous sections for the EIS (status, baseline, effects, and cumulative effects) relative to the species-specific purpose of a BO under §7(a)(2) of the ESA, which is to determine whether the proposed action is likely to jeopardize the continued existence of a species.

Status

Based on verified occurrence records, our Species Status Assessment (SSA) for the EIS identified the locations of 53 populations in the current range of the EIS (USFWS 2018). The spatial extent of the current populations represents a 48% decline from the distribution of historical populations. The numbers and density of EIS in these areas are largely unknown, due to the large size of the species' range and its cryptic behaviors. Using the extent of suitable habitat within the 53 locations (6.4 million acres), average male home range size, and male/female sex ratios, we roughly estimate range wide abundance of about 15,800–17,800 adults. Using more conservative assumptions about the extent of habitat necessary to support EIS individuals, we estimate range wide abundance of about 3,760–4,260 adults.

Habitat loss, fragmentation, and degradation caused by the conversion of native habitats to urban and agricultural uses are the primary threats to this species, because EIS populations require relatively large areas of sufficient connectivity and habitat quality to persist.

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Baseline

We have no EIS occurrence records from within the Plan Area boundaries, but the Plan Area overlaps a small portion of one of the 53 extant populations identified in our 2018 SSA (population CF1-3). Based on recent EIS records within 0.1 mile of the Plan Area, the species' ability to make movements of up to about 5 miles, the presence of potential EIS habitats throughout the Plan Area, and the availability of tortoise and owl burrows, we believe the EIS is reasonably certain to occur in suitable habitats throughout the Plan Area. EIS are habitat generalists in Peninsular Florida, but native upland cover types are essential components of the EIS habitat matrix. We use the extent of native upland cover types in the Plan Area, and the same methods we applied to estimating range wide abundance (substituting data for home range characteristics from a Collier County EIS study for range wide averages) to estimate Plan Area EIS abundance of about 87 adults. Using more conservative assumptions about the extent of habitat necessary to support EIS individuals, we estimate Plan Area abundance of about 18 adults.

Current threats to the species range-wide, such as habitat loss, fragmentation, and roadkill, are applicable within the Plan Area and the larger Action Area, which includes roads we expect to experience an increase in traffic that would not occur but for the development activity. Maintaining large contiguous areas of native uplands and native wetlands that support EIS prey species and species that create EIS shelter (*e.g.,* gopher tortoises, burrowing owls) is the primary conservation need of the EIS in the Action Area.

Effects

The development would replace up to 2,554 acres of native uplands that serve as primary habitats within the home range of EIS individuals present in the Plan Area. We expect this habitat alteration, and alterations in adjacent secondary (wetlands) and tertiary (agricultural areas) habitats to disturb, displace, injure, or kill snakes that are present during site preparation, depending on timing and other site- and project-specific circumstances. Site preparation activities conducted from April–September would likely destroy any EIS nests present at a project site. Because the proportions of this range of potential responses are undeterminable, we estimate the number of adult individuals harmed by development activities as the total number that could use 2,554 acres of upland habitats in the development envelope. Using home range size, we estimate the harm of up to 16 adult EISs. Using more conservative assumptions about the extent of habitat necessary to support EIS individuals, we estimate the harm of 3 adult EISs.

The designated Preservation areas contain the majority (77%) of native upland cover types in the Plan Area, which we expect to support 77% of the EISs present (67 adults using home range size; 14 adults using more conservative habitat assumptions). We do not expect the management of Preservation areas to reduce the numbers, reproduction, or distribution of the EIS in the Preservation areas, because these activities would, at minimum, maintain current conditions. We do not expect the small scale of potential development within the Very Low Density Use areas to cause predictable harm to EISs. Long-term management of native uplands in the Preservation and VLD areas with prescribed fire could increase EIS densities and local abundance.

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Cumulative Effects

Lacking records of EIS locations or roadkill in the Action Area, we have insufficient data to predict with reasonable certainty an expected increase in roadkill caused by sources unrelated to the Action. However, most of the predicted increase in traffic will occur on primary and secondary roads (State and Federal arterial highways that connect major population centers), which EISs generally avoid.

Opinion

Our finding in the Baseline section that EISs are reasonably certain to occur in suitable habitats of the entire Plan Area effectively extends the range of population CF1-3 beyond the 5-mile radius of EIS occurrence records that defined the extent of this population in the SSA. Our analyses of the effects of the Action are predicated on the inferences supporting this finding.

The development of up to 2,554 acres of native upland habitats and adjacent EIS secondary and tertiary habitats would add a small increment of habitat loss to the estimated 6.4 million acres of suitable habitat available to the 53 range wide populations identified in the SSA. We predict the loss of 3–16 EIS adults (based on a conservative estimation of habitat requirements and a home-range-size estimation of habitat requirements, respectively) caused by this habitat loss. This loss would represent a population reduction of less than 0.1% relative to our range wide abundance estimates under both the conservative (3,760–4,260 adults) and home-range-size (15,800–17,800 adults) approaches. We are unable to predict additional losses caused by an increase in traffic on public roads, attributed to developments within the Plan Area or to other sources. Because most of the increase in traffic would occur on primary and secondary roads, which EIS avoid, we believe that an increase in EIS roadkill within the Action Area would represent a lesser impact than the impact associated with the action-caused habitat losses.

We have no information that suggests the Plan Area serves a unique or significant role in connectivity between EIS populations or in the species' recovery. Population CF1-3 is one of 53 populations range wide, is isolated from other populations delineated in the SSA, and most of its extent lies to the east of the Plan Area. Most of the impacts we predict would occur in areas beyond the boundaries of population CF1-3, based on our inference of the species' presence in Plan Area habitats. Based on this same inference, 77% of native upland habitats in the Plan Area would continue to support EIS in the Preservation areas, where the proposed Action would remove the primary threat to the species' survival and recovery (habitat loss and fragmentation). Given the small proportional impact of the Action to range-wide abundance and habitat availability, we believe the impact of the Action on the EIS does not represent an appreciable reduction in the species' numbers, reproduction, or distribution.

After reviewing the current status of the species, the environmental baseline for the Action Area, the effects of the Action and the cumulative effects, it is the Service's biological opinion that the Action is not likely to jeopardize the continued existence of the EIS.

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20 Gopher Tortoise

This section provides the Service's conference opinion of the Action for the gopher tortoise.

20.1 Status of Gopher Tortoise

This section summarizes best available data about the biology and current condition of the gopher tortoise (*Gopherus polyphemus*) that are relevant to formulating an opinion about the Action. The species is classified under the ESA as a threatened species in the western portion of its range, and as a candidate species (listing is warranted, but precluded by higher listing priorities) in the eastern portion of its range.

The Service listed the gopher tortoise in 1987 as a threatened species in the western part of its range, from the Tombigbee and Mobile Rivers in Alabama west to southeastern Louisiana on the lower Gulf Coastal Plain (52 FR 25376–25380). The Service has not designated or proposed CH for the western portion of the species' range.

The Service published on July 27, 2011, a 12-month positive finding in response to a petition to protect the eastern populations under the ESA (76 FR 45130–45162). We determined that the species' classification as threatened in the western portion of its range was appropriate, and that listing the species in the eastern portion of its range was warranted, but precluded by higher-priority listing actions. Based on information current as of 8/30/2018, the Service continues to find that listing the gopher tortoise in the eastern portion of its range is warranted, but still precluded by higher-priority listing actions (Service 2019).

For purposes of this Conference Opinion, we summarize information from the gopher tortoise 12-month finding, the *Gopher Tortoise Management Plan* (FWC 2012), and other available data to describe the species' status.

20.1.1 Species Description

The gopher tortoise is the only tortoise in the U.S. that occurs east of the Mississippi River, and is the largest terrestrial turtle of this region. It has a domed, dark-brown to grayish-black shell (carapace) up to 14.6 inches long, and weighs up to 13 pounds. The lower shell (plastron) is yellowish and hingeless. Tortoises cannot completely retract their limbs within the shell. The hind feet are stumpy, and the forelimbs are shovel-like, with claws used for digging. Males are smaller than females; usually have a larger gland under the chin, a longer throat projection, and a more concave plastron. Hatchlings are up to 2 inches long, with a somewhat soft, yellow-orange shell.

20.1.2 Life History

The gopher tortoise typically inhabits uplands, especially those with relatively well-drained, sandy soils. The gopher tortoise is generally associated with longleaf pine (*Pinus palustris*) and xeric oak (*Quercus* spp.) sandhills, but also occurs in scrub, xeric hammock, pine flatwoods, dry prairie, coastal grasslands and dunes, mixed hardwood-pine communities, and a variety of

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disturbed habitats. The burrows of a gopher tortoise are the center of its activity. Gopher tortoises can excavate many burrows over their lifetime, and often use several each year. Burrows typically extend 15–25 feet and up to 12 feet deep below the surface. These burrows, which provide protection from temperature extremes, moisture loss, and predators, serve as a refuge for 350-400 other species, including listed commensal species such as the gopher frog (*Lithobates capito*), eastern indigo snake (*Drymarchon couperi*), Florida pine snake (*Pituophis melanoleucus mugitus*), and Florida mouse (*Podomys floridanus*).

Gopher tortoises spend most of their time within burrows and emerge during the day to bask in sunlight, feed, and mate. The gopher tortoise is slow to reach sexual maturity, has low fecundity and a long life span. Females reach sexual maturity at 9–21 years of age. Gopher tortoises breed from March–October, but females do not reproduce every year. Females excavate a shallow nest to lay and bury eggs, typically between early May and late June, and usually in the apron of soil at the mouth of the burrow. Range-wide, average clutch size varies from about 4–10 eggs per clutch, and incubation lasts 85–100 days. (FWC 2012)

Gopher tortoises have a well-defined activity range where all feeding and reproduction occur. Tortoises are herbivores eating mainly grasses, plants, fallen flowers, fruits, and leaves. Generally, feeding activity is confined to within 50 meters (164 feet) of the burrow, but a gopher tortoise may travel more than 100 meters (328 feet) from its burrow for specific foraging needs. Home ranges vary from 1.2–4.7 acres for males and 0.2–1.6 acres for females (FWC 2012).

20.1.3 Numbers, Reproduction, and Distribution

The current range for the eastern (candidate) population of the gopher tortoise spans from southeastern South Carolina to eastern Alabama and to south Florida. The core of the current distribution of the gopher tortoise in the eastern portion of its range includes central and north Florida and southern Georgia.

Our most recent status assessment (USFWS 2019) reports the most recent gopher tortoise abundance estimates from each state in the species' range as follows:

Florida (adult tortoises)	785,000
Georgia	350,000
Alabama	30,000–130,000
South Carolina	1,500–2,000

These statewide estimates, each based on habitat availability data combined with existing survey-based population data, add up to a range wide total of about 1.2 million tortoises.

The Florida abundance estimate (Enge *et al.* 2006) is based on the availability of about 3.3 million acres of suitable habitat, a density of 0.59 tortoises/acre (adults and immatures) (McCoy *et al.* 2002), and adults representing 40% of the population (the minimum of an observed range of 40–62%; Diemer 1992). The Florida habitat availability data do not include agricultural lands, disturbed lands, and wetlands, all of which tortoises may use to some extent, especially where native upland habitats are highly fragmented or degraded. The Florida density data (McCoy *et al.* 2002) are taken from 44 tracts of public lands (National Forests, National Wildlife Refuges, State Parks), which likely support higher densities than most private lands. Further, the authors of the

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Florida estimate note that tortoises do not occupy all lands with suitable habitat, and suggest that the number of adult tortoises in Florida is probably lower than 785,000.

The relatively large habitat-based statewide abundance estimates listed above are a somewhat misleading indicator of the species' status, because many small and isolated populations are likely not sustainable. Our status assessment (USFWS 2019, citing an unpublished report by the Gopher Tortoise Council 2014) described the following characteristics of a minimum viable population (MVP):

- # adults >= 250;
- density >= 0.4 tortoises/hectare (about 0.16/acre);
- well-managed suitable habitat >= 100 ha (about 250 ac);
- sex ratio approaching 1:1; and
- evidence of active burrows representing all age classes.

The state wildlife agencies report the following numbers of populations that meet the MVP criteria (USFWS 2019):

Florida	38
Georgia	122
Alabama	1–2
South Carolina	2
Total	163–164

Three of the largest populations are on State lands within Florida: Withlacoochee State Forest (8,221); Kissimmee Prairie Preserve State Park (4,778); and Jennings State Forest (3,828).

20.1.4 Conservation Needs and Threats

Gopher tortoises require well-drained, sandy soils for burrowing and nest construction, and an abundance of herbaceous ground cover for food. A relatively open forest canopy and relatively open (litter-free) ground surface is necessary for both feeding and nesting. The primary threats to the gopher tortoise are the loss, fragmentation, and degradation of such habitats. The conversion of native upland habitats to densely stocked pine plantations with a closed canopy eliminates herbaceous ground cover. The conversion of native uplands habitats to agricultural, urban, and mining uses destroys and fragments gopher tortoise habitats.

The availability of herbaceous ground cover along roadsides, especially in areas with highly fragmented or degraded habitats, attracts gopher tortoise foraging activity, which exposes individuals to vehicle strikes. Roadkill is a known source of tortoise mortality, but its effects on populations are not well understood. Reports cited in Enge *et al*. (2006) identified roadkill as the leading cause of tortoise mortality in one rural Georgia study area, and identified tortoises as the third-most frequently killed species on a highway north of Orlando.

The *Gopher Tortoise Management Plan* (FWC 2012) notes that the regular application of prescribed burning is critical for the maintenance of gopher tortoise habitat. Prescribed burning controls the density of woody species, stimulates the growth of herbaceous plants that tortoises eat, and creates conditions necessary for tortoise egg incubation.

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Enge et al. (2006) summarize the available data about predation on gopher tortoises. Various mammals, birds, and snakes eat gopher tortoise eggs and hatchlings. About 80–90% of nests are depredated, primarily by mammalian predators (raccoon, striped skunk, gray fox and opossum), and more than 90% of hatchlings do not survive their first year. Populations of some egg and hatchling predators, such as raccoons and crows, are artificially elevated at the urban/rural interface. Non-native predators of eggs or hatchlings include the armadillo, monitor lizards, and fire ants. Dogs and coyotes sometimes kill adults, but generally, the rate of adult mortality from predation is very low.

The species' primary conservation needs address the primary threats: protect and manage upland habitats that can sustain viable populations. The *Gopher Tortoise Management Plan* (FWC 2012) provides objectives and strategies for conserving the species in Florida.

20.2 Environmental Baseline for Gopher Tortoise

This section describes the current condition of the gopher tortoise in the Action Area without the consequences to the listed species caused by the proposed Action.

20.2.1 Action Area Numbers, Reproduction, and Distribution

The Applicants did not conduct gopher tortoise surveys of the Plan Area during the development of the HCP. The HCP reports available occurrence data from two locations in the northwest corner of the Plan Area, three within the town of Immokalee, and four within three miles of the Plan Area's outer boundary (HCP, Figure 5-7, based on data from FWC). The gopher tortoise typically inhabits areas with relatively well-drained sandy soils (Enge et al. 2006), and the soils of eastern Collier County are generally poorly to very poorly drained (HCP Chapter 3.5). Sandy deposits are thicker (20–40 feet) in the northern half of the Plan Area near Immokalee, and are thinner or absent in the southern half. All of the gopher tortoise observations within the outer boundary of the Plan Area are in the northern half.

Surveys in 2004-2005 supporting State and Federal permitting associated with development of the Town of Ave Maria failed to detect gopher tortoises (B. Layman, Barron Collier Companies, personal communication). Ave Maria encompasses about 5,000 acres within the Plan Area's outer boundary, but is excluded from the Plan Area for purposes of the BO/CO (see section 2.1.1). The species' apparent absence in Ave Maria, located near the geographic center of the Plan Area, suggests that large portions of the Plan Area may not support gopher tortoises, and that its distribution in the Plan Area is likely patchy.

Several different native upland cover classes considered suitable habitat for gopher tortoises occur in the Plan Area, including scrubby flatwoods, mesic flatwoods, scrub, palmetto prairie, mixed hardwood-coniferous, mesic hammock, shrub and brushland (total 13,221 acres; Table 2-1). In south Florida, tortoises are also known to forage on the margins of wetlands, and to dig burrows in man-made berms, but use of such non-typical habitats is poorly understood (FWC 2012). Non-native cover classes in the Plan Area that also are not considered typical habitats (*e.g.*, for the habitat-based population estimates cited in section 20.1.3), but that gopher tortoises are known to use, include rural open land, improved pasture, orchards/groves, and fallow

orchards (total 57,265 acres; Table 2-1). The ratio in the Plan Area of these non-native cover classes to the native cover classes considered typical gopher tortoise habitat exceeds 4:1. We do not expect these non-native cover classes to contain the majority, or even a substantial fraction, of the home range of a gopher tortoise. Consistent with the methods used for estimating statewide gopher tortoise numbers cited in section 20.1.3, we base our estimation of gopher tortoise numbers in the Plan Area on the 13,221 acres of native upland cover classes present.

The Plan Area is located on the southern fringe of the species' range and consists entirely of private lands managed primarily for agricultural purposes. We expect the native upland cover classes of the Plan Area to support a lower density of tortoises than most public conservation lands in the species' range, including those that provided the density data for the FWC statewide habitat-based population estimate (0.59 tortoises/acre; McCoy *et al.* 2002; see section 20.1.3). The results of pre-construction surveys for a spoil disposal site located adjacent to the Plan Area on the northeast side of Lake Trafford are likely more representative of tortoise abundance in the Plan Area. The Conservancy of Southwest Florida (2004) detected 75 active gopher tortoise burrows within 352 acres consisting of disturbed scrub, abandoned citrus, disturbed flatwoods, disturbed marsh, disturbed wet prairie, abandoned fields, and ditches and berms. The surveyors examined 31 of the burrows and found 10 live tortoises (a burrow/tortoise ratio of 3:1). Applying this ratio to all 75 burrows suggests that the site supported 25 tortoises, or a density of 25 ÷ 352 acres = 0.07 tortoises/acre.

Due to its proximity to the Plan Area and its similar mix of cover classes, we consider the 0.07 tortoises/acre density observed at the Lake Trafford site an appropriate proxy for the Plan Area. We estimate that the 13,221 acres of native upland habitats in the Plan Area, and some extent of adjacent non-native and wetlands cover classes, to support about 925 gopher tortoises.

20.2.2 Action Area Conservation Needs and Threats

Threats to the gopher tortoise in the Action Area are similar to those occurring elsewhere the species' range: habitat loss and fragmentation, predation by native and exotic species, vehicle strikes, and insufficient fire regimes. Protecting and managing habitats that can sustain viable populations is the primary conservation need.

20.3 Effects of the Action on Gopher Tortoise

This section describes all reasonably certain consequences to the gopher tortoise that we predict the proposed Action would cause, including the consequences of other activities not included in the proposed Action that would not occur but for the proposed Action. Such effects may occur later in time and may occur outside the immediate area involved in the Action.

20.3.1 Development and Mining

Because gopher tortoises rely primarily on native upland cover types, and it is plausible that development would occur disproportionately in these non-wetland cover types, we use the RMI method described in section 2.1.4 to estimate the extent of development in gopher tortoise habitats. Native uplands cover 1,804, 16, and 734 acres of the Development and Mining, Base

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Zoning, and Eligible Lands designations, respectively (Table 2-2). These 2,554 native upland acres amount to less than the development cap of 39,973 acres that may occur within the 66,245-acre development envelope. Development confined entirely to the Development areas, or implemented with the maximum possible substitution of Base Zoning and/or Eligible lands in the accounting for the cap, could replace all of the native uplands habitats in one or more of these HCP land use designations. Using a density of 0.07 tortoises/acre (see section 20.2.1), the native uplands in the Development and Mining, Base Zoning, and Eligible Lands designations would support about 126, 1, and 51 tortoises, respectively (total 178).

Gopher tortoises use their burrows year-round, and conduct most breeding and feeding activities within 164 feet of their burrows (see section 20.1.2). Construction activities near burrows would disrupt these activities. Collapsing or blocking a burrow during construction activities would kill or injure adults, juveniles, or eggs that are present. The State of Florida classifies the gopher tortoise as a threatened species, and protects gopher tortoises by requiring permits before conducting construction activities within 25 feet of an active burrow. FWC's *Gopher Tortoise Permitting Guidelines* (2017) would apply to the development activity under the HCP, which the Applicants propose to follow (HCP Chapter 7.4.2).

The *Permitting Guidelines* prescribe thorough pre-construction surveys and relocating all tortoises from construction areas to a suitable undisturbed habitat onsite or offsite. The rate of injury and mortality caused by the capture and relocation process is low (0.28% according to E. Seckinger, personal communication). We would expect the death of no more than 1 gopher tortoise (0.28% of 182 tortoises in the development envelope) caused by these intentional measures intended to avoid incidental take that would otherwise occur in the construction areas. The Applicants propose to identify suitable recipient sites within the designated Preservation and Very Low Density use areas for tortoises relocated from the Development areas (HCP Chapter 7.4.2).

Adhering to the FWC *Guidelines* would avoid or minimize direct harm to gopher tortoises caused by the development activity. However, the development of up to 2,554 acres of native upland cover and adjacent areas that tortoises may occupy would permanently reduce the species' distribution in the Plan Area accordingly.

Increased vehicle traffic during and after construction could increase mortality and injury caused by collisions with vehicles outside the footprint of actual construction activity. Increased human population density in the developments could increase predation by both native and non-native predators that increase in local abundance at urban/rural interface. Increased numbers of dogs could increase the injury rate of adult tortoises and the destruction/disturbance of burrows located near this interface. We have no data from which we could reasonably estimate numbers of gopher tortoises located outside construction footprints that these changes associated with the developments would affect. However, we believe that the scale of any such impacts is substantially less than the impact of the habitat loss caused by development, because these changes would affect primarily tortoises that occupy the margins of remaining habitat blocks.

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20.3.2 Preservation Activities

The designated Preservation areas contain 10,221 acres, or 77% (Table 2-2), of the native uplands cover in the Plan Area considered primary gopher tortoise habitat. We estimate Plan Area tortoise numbers at about 925 individuals (see section 20.2.1), and expect the Preservation areas to support about 0.77 × 925 = 712 tortoises.

The Applicants propose a continuation of existing land uses (agriculture, silviculture, *etc.*) in the Preservation areas, which we listed in section 2.3. Land management activities in the Preservation areas for which the Applicants seek take authorization include:

- prescribed burning;
- mechanical control of groundcover (*e.g.*, roller chopping, brush-hogging, mowing);
- ditch and canal maintenance;
- mechanical and/or chemical control of exotic vegetation;
- soil tillage; and
- similar activities that maintain or improve land quality.

Prescribed burning maintains habitat quality in the native uplands that gopher tortoise prefer (see section 20.1.4). Tortoises may avoid a slowly advancing prescribed fire by seeking refuge in their burrows, from which they do not wander very far. Gopher tortoises are relatively less likely to avoid heavy equipment operating within their home ranges, but the scientific literature does not identify the use of heavy equipment as a significant threat (apart from its role in habitat loss and fragmentation) or source of mortality. Accordingly, FWC (2017) specifically exempts agricultural, silvicultural, and wildlife habitat management activities from the requirements for gopher tortoise permits, including tilling, planting, harvesting, prescribed burning, mowing, disking, roller chopping, and tree cutting.

We expect gopher tortoises to persist in the Preservation areas, because the preservation and management activities will, at minimum, maintain current conditions. Long-term management of the Preservation areas with prescribed fire could increase tortoise densities and the local population, which we expect are currently at low levels. However, lacking detailed information about gopher tortoises in the Plan Area, and the extent to which habitat management may specifically benefit this species, we are unable to estimate the extent of potential benefits. Relocating up to about 182 tortoises from the Development areas to the Preservation areas would increase tortoise numbers in the latter. The FWC permitting process involves identifying suitable recipient sites for relocated animals, which we expect will place tortoises in habitats that can sustain them, including recipient sites located in the Preservation areas.

20.3.3 Very Low Density Development

The Very Low Density (VLD) use areas contain 447 acres, or 3.4% (Table 2-2) of the native uplands cover in the Plan Area. We estimate Plan Area tortoise numbers at about 925 individuals (see section 20.2.1), and expect the VLD use areas to support about 0.034 × 925 = 31 tortoises.

Land uses in the VLD areas are similar to the Preservation areas, but may also include isolated residences, lodges, and hunting/fishing camps, at a density of no more than one dwelling unit per

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50 acres. The Applicants would continue current ranching/livestock operations and other management activities as described for the Preservation Areas (*e.g.*, exotic species control, prescribed burning). As in the Preservation areas, we do not expect such management activities to reduce the numbers, reproduction, or distribution of the gopher tortoise in the VLD use areas, because these activities would, at minimum, maintain current conditions.

The HCP does not specify a footprint for the isolated residences, lodges, and hunting/fishing camps, but indicates that their construction could clear up to 10% of the existing native vegetation (see section 2.5). New dwelling development could occur within any of the cover types present besides open water and existing development. It is possible that dwelling development in the VLD areas could entirely avoid native uplands, but we conservatively estimate a 45-acre habitat loss (10% of these types), affecting about 3 tortoises (about 10% of the total numbers).

Development activity in VLD use areas would be subject to the FWC *Gopher Tortoise Permitting Guidelines* (2017), which require pre-construction surveys and subsequent relocation of tortoises from the construction footprint. As in the designated Development areas, implementing the FWC *Guidelines* would avoid or minimize direct harm to gopher tortoises caused by construction activities. Developing up to 45 acres would permanently reduce the species' distribution in the Plan Area accordingly. The HCP indicates that possible recipient sites for tortoises moved away from VLD development sites include suitable habitats within either the VLD use areas or the Preservation Areas.

20.4 Cumulative Effects on Gopher Tortoise

For purposes of consultation under ESA §7, cumulative effects are those caused by future state, tribal, local, or private actions that are reasonably certain to occur in the Action Area. Future Federal actions that are unrelated to the proposed action are not considered, because they require separate consultation under §7 of the ESA.

We identified in section 3 of this BO/CO a projected increase in traffic on public roads as the sole source of effects that are consistent with the definition of cumulative effects for this Action. Roadkill is a documented cause of gopher tortoise mortality (see section 19.1.4). Increased vehicle traffic unrelated to the Action is a stressor that may adversely affect gopher tortoises in the Action Area. As the population of southwest Florida increases, we expect more vehicle use in the Action Area and a concomitant increase in road mortality of animals in general. However, lacking data about tortoise roadkill numbers and locations in the Action Area, we cannot predict with reasonable certainty an increase in roadkill caused by sources unrelated to the Action.

20.5 Conclusion for Gopher Tortoise

In this section, we summarize and interpret the findings of the previous sections for the gopher tortoise (status, baseline, effects, and cumulative effects) relative to the species-specific purpose of a CO under §7(a)(2) of the ESA, which is to determine whether the proposed action is likely to jeopardize the continued existence of a species.

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Status

The current range for the eastern (candidate) population of the gopher tortoise spans from southeastern South Carolina to eastern Alabama and to south Florida. The species is most abundant in central and north Florida, and in southern Georgia. Based on the availability of preferred native upland habitats combined with existing survey-based population data, range wide abundance is at about 1.2 million adult tortoises. The extent of native upland habitats in Florida alone is about 3.3 million acres; however, many of these areas probably do not support tortoises. Range wide, only 164 areas support populations that are known to exceed the criteria for a minimum viable population (# adults >=250, density >= 0.4 tortoises/acre; suitable habitat >= 250 acres). The largest of these viable populations are on public lands, supporting a few thousand individuals. Recognized threats to the species include habitat loss and fragmentation, insufficient fire regimes to maintain habitat quality, predation by native and exotic species, and roadkill. Protecting and managing habitats that can sustain viable populations is the species' primary conservation need.

Baseline

Gopher tortoises are known to occur in the Plan Area, but soil characteristics and the species' apparent absence in some areas suggest that distribution in the Plan Area is likely patchy. Gopher tortoises in south Florida are known to make greater use of some non-native and wetlands cover classes than elsewhere in the species' range. However, some extent of native upland cover classes are necessary to sustain the species, and the extent of native upland cover classes is the basis for regional and range wide population estimates. The Plan Area contains 13,221 acres of native upland cover classes. Using density data from a site adjacent to the Plan Area, we estimate the Plan Area supports about 925 gopher tortoises. Threats to the species in the Plan Area are similar to those elsewhere in the range: habitat loss and fragmentation, insufficient fire regimes to maintain habitat quality, predation by native and exotic species, and roadkill. Likewise, protecting and managing habitats that can sustain viable populations is the species' primary conservation need.

Effects

Development in the Plan Area would eliminate up to 2,554 acres of native upland habitats that we estimate support about 178 gopher tortoises. Implementing the FWC *Gopher Tortoise Permitting Guidelines* would relocate these tortoises from construction footprints to recipient habitats in the designated Preservation or Very Low Density (VLD) use areas. We recognize the potential for increased traffic, predators attracted to the rural/urban interface, and pet populations caused by the new developments to harm tortoises in remaining habitats, but are unable to estimate the numbers affected. We believe the full scale of such effects would be less than the impact of the habitat loss caused by development.

The designated Preservation and VLD areas contain 10,221 and 447 acres, respectively, of native upland habitats that we estimate support about 743 gopher tortoises. We do not expect the management of the Preservation and VLD areas to reduce the numbers, reproduction, or distribution of the gopher tortoise in these areas, because these activities would, at minimum,

maintain current conditions. We estimate that residential/recreational construction that could remove up to 10% of the native upland cover in the VLD areas would prompt the relocation of about 3 tortoises.

Long-term management of the Preservation areas with prescribed fire could increase tortoise densities and local abundance, which we expect are currently low. Relocating up to about 178 tortoises from the Development areas to the Preservation areas would increase tortoise numbers in the latter. The FWC permitting process involves identifying suitable recipient sites for relocated animals, which we expect will place tortoises in habitats that can sustain them, including recipient sites located in the Preservation areas.

Cumulative Effects

Increased vehicle traffic unrelated to the Action is a stressor that may adversely affect gopher tortoises in the Action Area. However, lacking data about tortoise roadkill locations or numbers in the Action Area, we cannot predict with reasonable certainty an increase in roadkill caused by sources unrelated to the Action.

Opinion

Developing up to 2,554 acres of native upland habitats would add an increment of habitat loss to the species' range, which encompasses about 3.3 million acres of native upland habitats in Florida. Relocating up to 178 tortoises from developed areas (and up to 3 tortoises from construction sites within the VLD use areas) to the Preservation areas would affect less than 0.02% of the range wide population of about 1.2 million tortoises. The extent of habitat enhancement that may occur in the Preservation and VLD use areas is uncertain, but long-term management and protection of over 10,000 acres of native upland cover classes is likely to create some benefits for gopher tortoises. Such management and protection in the Preservation areas would eliminate in these areas the primary threat to the species, which is habitat degradation, loss, and fragmentation.

After reviewing the current status of the species, the environmental baseline for the Action Area, the effects of the Action and the cumulative effects, it is the Service's conference opinion that the Action is not likely to jeopardize the continued existence of the gopher tortoise.

21 INCIDENTAL TAKE STATEMENT

ESA §9(a)(1) and regulations issued under §4(d) prohibit the take of endangered and threatened fish and wildlife species without special exemption. The term "take" in the ESA means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" (ESA §3(19)). In regulations, the Service further defines:

- "harm" as "an act which actually kills or injures wildlife. Such act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering;" (50 CFR §17.3) and

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- "incidental take" as "takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant" (50 CFR §402.02).

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

Under ESA §10(a)(1)(B), the Service may authorize incidental take caused by otherwise lawful non-federal actions through an Incidental Take Permit (ITP), provided that such authorization complies with ESA §7(a)(2) and satisfies other permit issuance criteria. We determined that the proposed Action as described in the Applicants' HCP includes activities that are reasonably certain to cause incidental take of 14 of the 20 Covered Species we identified in section 1.1 of the BO/CO.

The proposed Action would also cause other activities (*e.g.*, an increase in traffic associated with residents of the developments) that are reasonably certain to cause incidental take of listed species, but over which the Applicants or their agents would have no involvement or control, and which this ITS does not address. We estimated the amount or extent of taking caused by such activities, and caused by future non-Federal activities unrelated to the Action (cumulative effects) in the BO/CO. We accounted for all three sources of effects (the Applicants' Covered Activities, activities that would not occur but for the Applicants' activities, and unrelated future non-Federal activities in the Action Area) in explaining our findings under ESA §7(a)(2). From these analyses, we collate our estimates of the amount or extent of taking over which the Applicants have involvement or control in section 21.1 below.

A proposed ESA §10 permit differs from other Federal actions that must comply with §7(a)(2) in that the anticipated incidental taking of wildlife is authorized by the ITP, rather than exempted from the applicable prohibitions through an ITS. ESA §10(a)(2) provides criteria that a HCP and an ITP must satisfy, including a specification of the steps that the applicant will take to minimize and mitigate the impacts of incidental taking to the maximum extent practicable. The Service's direct authority under §10(a)(1)(B) to permit incidental taking caused by non-Federal actions supersedes the Service's indirect authority under §7(b)(4) and §7(o)(2) to exempt incidental taking caused by Federal actions. Therefore, the ITS attached to the BO/CO for a proposed HCP and ITP does not need to provide:

- reasonable and prudent measures that are necessary or appropriate to minimize the impacts of incidental taking;
- terms and conditions for implementing such measures; or
- take monitoring and reporting requirements.

However, to fulfill the specific requirements for an ITS under 50 CFR §402.14(i), and to comply with policy in the Services' 1998 Consultation Handbook (p. 4-55–56) and the 2016 HCP Handbook (p. 14–28), we hereby incorporate by reference from any §10(a)(1)(B) permit(s) issued with respect to the proposed HCP all required (non-discretionary):

- conservation measures;
- terms and conditions;

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- monitoring and reporting requirements; and
- provisions for the disposition of dead or injured animals.

This ITS does not address the three Covered Species we dismissed from further analysis in section 1.1.1 of the BO/CO: gopher frog, Southeastern American kestrel, and Everglades mink. We lack sufficient evidence to find that these species are reasonably certain to occur in the Action Area; therefore, we do not anticipate any incidental take of these species. Similarly, we lack sufficient evidence to find that the red-cockaded woodpecker is reasonably certain to occur in the Action Area; therefore, we do not anticipate any incidental take of this species.

This ITS also does not address two of the Covered species that are reasonably certain to occur in the Action Area, but for which our effects analyses indicate the Action is not likely to cause incidental take: the red knot, and the Everglade snail kite. The Applicants did not request take authorization for the red knot, and based on our findings in the BO/CO, none is required. The amount or extent of take we anticipate for the snail kite is none.

21.1 Amount or Extent of Take

This section specifies the amount or extent of take wildlife species caused by activities over which the Applicants would have involvement or control, which we estimated in the "Effects of the Action" section(s) of this BO/CO. We reference, but do not repeat, these analyses here. All instances of incidental take we predict are in the form of harm, *i.e.*, actual death or injury caused by significant habitat modification or degradation, associated with the development activities (operation of equipment, vegetation clearing, grading, drainage, construction, *etc.*).

For each Covered Species that the Action is likely to harm, Table 21-1 identifies the life stage(s) and estimated number of individuals, and the section of the BO/CO that contains the supporting analysis. In all instances, the amount of harm specified is the total we estimate for the duration of the Action, not an annual recurring level of harm. Once the habitat modification that we expect to cause take has occurred, it would not occur again.

For all Covered Species identified in Table 21-1 except the Florida scrub jay and gopher tortoise, the detection of take that occurs incidental to the Action is unlikely or impractical for various reasons (*e.g.*, individuals are small, cryptic, hidden in burrows, or displaced from the development footprint to other areas where death or injury occurs). For all species except the Florida scrub jay, we used estimates of the extent of habitat modification or degradation to estimate the number of individuals exposed to such changes and to predict the subsequent consequences. Therefore, we will use the estimated acreage of habitat modifications, which is where exposure to changes would occur that we expect to directly or indirectly kill or injure individuals, as surrogate measures for monitoring the extent of take (*i.e.,* a measure besides number of individuals). These measures will set a clear standard for determining when the level of anticipated take is exceeded. We report these surrogate measures, by species and by land cover class, in Table 21-2.

Table 21-2 notes also the method we used to estimate the acreage of exposure (see section 2.1.4), because species are associated with different cover classes, the full extent of development

activity (39,973 acres) may occur within a larger portion of the Plan Area, and the cover class-specific likelihood of development is variable. The level of species-specific taking we predict depends on the collective change in those cover classes where we expect the species' exposure to changes caused by development. Causing habitat modification that exceeds the total acres listed in Table 21-2 for the set of cover classes listed for a species is the standard for determining when the level of anticipated take of that species is exceeded.

Table 21-1. Estimates of the amount of take (# of individuals) caused by activities over which the Applicants would have involvement or control, by species and life stage, collated from the cited BO/CO effects analyses.

COMMON NAME	Life Stage	Anticipated # Individuals Harmed	BO/CO Effects Analysis Section
Florida bonneted bat	**adult**	**10**	**4.3.1**
Florida bonneted bat	pup	9	4.3.1
Florida panther	**adult**	**12[c]**	**5.3.1**
Big Cypress fox squirrel	all	39	6.3.1
Florida sandhill crane	**adult**	**12**	**7.3.1**
Florida scrub jay	all	4-10[a]	8.3.1
Burrowing owl	**all**	**67**	**9.3.1**
Little blue heron	adult	2-8	11.3.1
Tricolored heron	**adult**	**3-5**	**12.3.1**
Wood stork	adult	4-7	13.3.1
Roseate spoonbill	**adult**	**1**	**15.3.1**
Audubon's crested caracara	adult	4-8	16.3.1
Eastern diamondback rattlesnake	**adult**	**132**	**18.3.1**
Eastern indigo snake	adult	3-16	19.3.1
Gopher tortoise	**adult**	**180[b]**	**20.3.1**

[a] The Applicants propose to conduct pre-construction surveys and to coordinate with the USFWS for relocating scrub jays found within construction areas. The applicable ITP(s) would authorize such relocation. The estimate here of 4–10 individuals is the total number we expect to occur in such areas, which, if not relocated, construction activities would harm.

[b] The Applicants propose to follow FWC requirements for pre-construction surveys and obtaining State permits that authorize the relocation of gopher tortoises found within construction areas. The estimate here of 180 adults is the total number we expect to occur in such areas, which, if not relocated, construction activities would harm.

[c] Panther take is calculated in panthers/year at full build-out. The Service will utilize its authorities to ensure the action will not take more than 10 adult panthers (or 4 adult female panthers)/year unless growth of the range-wide population allows higher levels of take without jeopardizing the survival and recovery of the species, or decreases to levels that a lesser threshold is warranted.

Table 21-2. Surrogate measures for monitoring the extent of take (acres of habitat modification or degradation), by species and cooperative land cover (CLC) class, collated from the BO/CO effects analyses. "n/a" (not applicable) indicates a cover class in which we do not anticipate exposure to changes that would cause take of the species.

		Species (see acronym list below) and acreage estimation method applied in effects analysis (P= Proportional; R = Reasonable Maximum Impact)												
CLC Code	Land Cover Class Name	FBB (P)	FP (P)	BCFS (P)	FSC (P)	FBO (R)	LBH (P)	TCH (P)	WS (P)	RS (P)	ACC (R)	EDR (R)	EIS (R)	GT (R)
1120	Mesic Hammock	356	601	356	n/a	n/a	n/a	n/a	n/a	n/a	n/a	601	601	601
1210	Scrub	n/a	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0	0	0
1311	Mesic Flatwoods	756	1,252	756	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1,252	1,252	1,252
1312	Scrubby Flatwoods	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0	0	0
1340	Palmetto Prairie	n/a	1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1	1	1
1400	Mixed Hardwood-Coniferous	240	405	240	n/a	n/a	n/a	n/a	n/a	n/a	n/a	405	405	405
1500	Shrub and Brushland	n/a	140	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	285	285	285
1800	Cultural - Terrestrial	n/a	6	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1821	Low Intensity Urban	n/a	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1822	High Intensity Urban	n/a	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1830	Rural (Rural Open Lands)	n/a	1,073	1,571	1,571	2,568	n/a	n/a	n/a	n/a	2,568	n/a	n/a	n/a
1833.1	Cropland/Pasture	n/a	7,945	n/a	11,697	17,743	n/a	n/a	n/a	n/a	17,743	n/a	n/a	n/a
1833.13	Improved Pasture	n/a	2,987	4,401	4,401	7,021	n/a	n/a	n/a	n/a	7,021	n/a	n/a	n/a
1833.2	Orchards/Groves	n/a	10,677	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1833.4	Fallow Orchards	n/a	41	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1833.5	Other Agriculture	n/a	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a
1840	Transportation	n/a	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1850	Communication	n/a	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1860	Utilities	n/a	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1870	Extractive	n/a	14	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1880	Bare Soil/Clear Cut	n/a	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2100	Freshwater non-Forested Wetlands	n/a	2	n/a	3	n/a	3	3	3	3	6	n/a	n/a	n/a
2110	Prairies and Bogs	n/a	776	n/a	1,127	n/a	1,127	1,127	1,127	1,127	1,860	n/a	n/a	n/a
2120	Marshes	n/a	966	n/a	1,411	n/a	1,411	1,411	1,411	1,411	2,342	n/a	n/a	n/a
2121	Isolated Freshwater Marsh	n/a	260	n/a	384	n/a	384	384	384	384	648	n/a	n/a	n/a
2200	Freshwater Forested Wetlands	460	772	460	n/a	n/a	460	460	460	460	n/a	n/a	n/a	n/a
2210	Cypress/Tupelo	248	404	248	n/a	n/a	248	248	248	248	n/a	n/a	n/a	n/a
2211	Cypress	844	1,411	844	n/a	n/a	844	844	844	844	n/a	n/a	n/a	n/a
2213	Isolated Freshwater Swamp	208	341	208	n/a	n/a	208	208	208	208	n/a	n/a	n/a	n/a
2213.1	Dome Swamp	22	37	22	n/a	n/a	22	22	22	22	n/a	n/a	n/a	n/a
2214	Strand Swamp	9	15	9	n/a	n/a	9	9	9	9	n/a	n/a	n/a	n/a
2220	Other Coniferous Wetlands	6	11	6	n/a	n/a	6	6	6	6	n/a	n/a	n/a	n/a
2221	Wet Flatwoods	127	217	127	n/a	n/a	127	127	127	127	n/a	n/a	n/a	n/a
2230	Other Hardwood Wetlands	34	57	34	n/a	n/a	34	34	34	34	n/a	n/a	n/a	n/a
2232	Hydric Hammock	1	2	1	n/a	n/a	1	1	1	1	2	n/a	n/a	n/a
3000	Lacustrine	n/a	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
3100	Natural Lakes and Ponds	n/a	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
3200	Cultural - Lacustrine	n/a	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
4200	Cultural - Riverine	n/a	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
7000	Exotic Plants	n/a	161	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Total Acres	3,311	30,574	9,283	20,594	27,332	4,884	4,884	4,884	4,884	32,189	2,545	2,545	2,545

Acronym -	Common Name
FBB -	Florida bonneted bat
FP -	Florida panther
BCFS -	Big Cypress fox squirrel
FSC -	Florida sandhill crane
FBO -	Florida Burrowing owl
LBH -	Little blue heron
TCH -	Tricolored heron
WS -	Wood stork
RS -	Roseate spoonbill
ACC -	Audubon's crested caracara
EDR -	Eastern diamondback rattlesnake
EIS -	Eastern indigo snake
GT -	Gopher tortoise

21.2 Effect of the Take

In the accompanying BO/CO, the Service determined that the levels of incidental take reported in section 21.1 are/are not likely to jeopardize the continued existence of each Covered Species.

21.3 Reasonable and Prudent Measures, Terms and Conditions, and Monitoring and Reporting

If issued, the ITPs will require the permittees to implement the HCP as proposed. The ITPs will prescribe any additional or modified measures, with non-discretionary terms and conditions, that are necessary to minimize and mitigate incidental take of the Covered Species to the maximum extent practicable. The ITPs will also prescribe any additional or modified procedures to monitor and report such take. No reasonable and prudent measures, terms and conditions, or take monitoring and reporting procedures in this ITS are necessary, because the ITP will specify all such requirements in authorizing the take under ESA §10(a)(1)(B).

22 CONSERVATION RECOMMENDATIONS

ESA §7(a)(1) directs Federal agencies to use their authorities to further the purposes of the ESA by conducting conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary activities that an action agency may undertake to avoid or minimize the adverse effects of a proposed action, implement recovery plans, or develop information that is useful for the conservation of species addressed in the BO/CO. The Florida State Office (FSO) offers the following recommendations that are relevant to the Covered Species of the HCP and that we believe are consistent with the authorities of the Service's Regional Office (RO) through its permits issuance decision.

The HCP provides a framework to facilitate cooperation among the Service, County building authorities, highway construction agencies, and other regional conservation stakeholders to address conservation needs for the covered species throughout the region. The Service should seek formal cooperation with local and state road planning agencies in order to coordinate with and complement HCP implementation. This can take the form of entering cooperative agreements with applicable agencies for highway planning and mitigation. The Service should also invite the participation of panther conservation stakeholders for their input into the periodic HCP check-ins as described above.

As the Service evaluates project proposals for their consistency with the HCP, including whether they satisfy the HCP's objectives for the best management practices, we will consider the following conservation concerns for the covered species.

Florida bonneted bat

a) Maintaining native wetland and upland forested habitats to provide roost sites, as well as vegetated and open water areas to provide foraging opportunities, is the species' primary conservation need in the Plan Area.

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b) Finding additional roost sites is a key component to better understanding the species' habitat needs, which will greatly contribute to conservation of the species. Knowing where roosts occur and determining better methods to detect them will enhance endeavors to learn more about life history and help focus habitat protection efforts on specific locations, especially if roost sites may be a limited resource for the species.

Panther

a) Avoid or Minimize new road construction in the preserve areas.
b) Establish low speed limits (less than 45 mph daytime, 35 mph twilight hours and nighttime) on new roadways within the Plan Area.
c) Maintain internal trip capture of each development at or above 50 percent.
d) Prioritize the construction of wildlife crossings and fencing on road segments within 300m of forest cover.
e) Install at least ½ mile of fencing on either side of new and existing wildlife crossings. Span driveways with gating to maintain continuity of winged fencing as a barrier.
f) Concentrate development more than 300m away from existing forest edge.
g) Use fencing or water barrier to separate new development from forest edges where construction can't be conducted further than 300m away.
h) Regularly prune dense vegetation so that edges and opportunities for concealment are unavailable to panthers near residences, paths, and recreational facilities.
i) Educate residents regarding safe coexistence with panthers and other wildlife.
j) Prohibit residents from keeping domestic animals (chickens, goats, etc.) that attract panthers and other predators.
k) Require full vaccination of all pets in new developments from diseases that can be acquired by panthers.
l) Require pets be kept indoors, leashed, or maintained in fenced enclosures at all times. Encourage residents to feed pets indoors and to not leave pet food dishes outside.
m) Require scavenger/wildlife proof trash containers to prevent wildlife from consuming garbage.
n) Encourage residents to clean grills and store them indoors when not in use.
o) Minimize the use of bird feeders and supplemental feeding stations for deer and other game species.
p) Require residents to deer proof gardens.
q) Encourage residents to wash recycling and trash receptacles regularly to reduce odors that attract panthers and their prey.
r) Encourage residents to install motion activated lighting systems.
s) Ban the use of anticoagulant and neuroactive rodenticides within the Plan Area.
t) Report sightings, encounters, or evidence of panthers in or near developments to neighbors, the HOA, and FWC.

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u) Restore agricultural lands to native habitats that are more beneficial to the panther, especially forested habitats, and maintain in perpetuity.
v) Restore agricultural lands to native habitats that are more beneficial to the panther, especially forested habitats, and maintain in perpetuity.
w) Widen forested corridors near wildlife crossings.
x) Coordinate Preservation and VLD area monitoring and management with the Florida Panther National Wildlife Refuge, the U.S. Fish and Wildlife Service Ecological Services Program, and Florida Fish and Wildlife Conservation Commission.
y) Maximize habitat suitability for panthers and prey in non-developed areas by utilizing habitat management techniques and restoration goals employed by the Florida Panther National Wildlife Refuge (https://www.fws.gov/refuge/Florida_Panther/).
z) Provide information to residents regarding safe coexistence with panthers.

Big Cypress fox squirrel

a) The designated Preservation areas of the HCP contain the majority (47,811 acres, or 74.9 percent) of land cover that we consider as BCFS habitat within the Plan Area. We expect BCFS to persist in the Preservation areas, because the proposed preservation and management activities will, at minimum, maintain current conditions.
b) Attention to this species in the long-term management of the Preservation areas under conservation easements could increase BCFS densities and the Plan Area population.
c) The species' primary conservation need is the protection and management of open understory woodlands. FWC (2018) provides recommendations to address this need and others in its *Species Conservation Measures and Permitting Guidelines for the Big Cypress Fox Squirrel*.

Florida sandhill crane

a) The designated Preservation areas may support up to 51 breeding pairs of cranes. We do not expect the proposed management of Preservation areas to reduce the numbers, reproduction, or distribution of the Florida sandhill crane to in the Preservation areas, because these activities will, at minimum, maintain current conditions.
b) Attention to this species in the long-term management of the Preservation areas under conservation easements could increase crane densities and the Plan Area population.

Florida scrub-jay

a) Precluding new development and mining activity in the dedicated Preservation areas would protect the habitat that may still support another two scrub-jay family groups.

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b) Maintaining current conditions in the Preservation areas could maintain the resident scrub-jay groups for some time.

Florida burrowing owl

a) The likely survival of displaced birds and possible increases in habitat quality in the Preservation areas would reduce the overall impact of the Action to the Florida-wide population to a level substantially below the worst-case scenario of a 1.6 percent loss.

Little blue heron

a) The designated Preservation areas may support 25–75 LBH. We do not expect the proposed management of Preservation areas to reduce the numbers, reproduction, or distribution of the LBH in the Preservation areas, because these activities will, at minimum, maintain current conditions.
b) Attention to this species in the long-term management of the Preservation areas under conservation easements could increase LBH densities and the Plan Area population.

Tricolored heron

a) The designated Preservation areas may support about 50 TCH. We do not expect the proposed management of Preservation areas to reduce the numbers, reproduction, or distribution of the TCH in the Preservation areas, because these activities will, at minimum, maintain current conditions. Special attention to this species in the long-term management of the Preservation areas under conservation easements could increase TCH densities and the Plan Area population.
b) Native wetlands in the Very Low Density (VLD) use areas may support one TCH. Clearing up to 10 percent of the native wetlands in the VLD use areas would reduce TCH habitat by 73 acres. Because the VLD area wetlands do not support known nesting colonies, we do not expect this extent of habitat modification to kill or injure TCH.

Wood stork

a) Special attention to this species in the long-term management of the Preservation areas under conservation easements could increase wood stork densities and the Plan Area population.

Red-cockaded woodpecker

a) The Applicants propose to manage pine flatwoods within the Preservation areas to benefit multiple Covered Species, including the RCW, if RCWs colonize such areas.

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Roseate spoonbill

a) Special attention to this species in the long-term management of the Preservation areas under conservation easements could increase spoonbill densities and the Plan Area population.
a) Special attention to this species in the long-term management of the Preservation areas under conservation easements could increase the number of snail kites that the Plan Area supports, and possibly even promote nesting activity.

Eastern diamondback rattlesnake

a) Long-term management of native uplands in the Preservation and VLD areas with prescribed fire could increase EDR densities and local abundance.

Eastern indigo snake

a) Long-term management of native uplands in the Preservation and VLD areas with prescribed fire could increase EIS densities and local abundance.

Gopher tortoise

a) Development activity in VLD use areas would be subject to the FWC *Gopher Tortoise Permitting Guidelines* (2017), which require pre-construction surveys and subsequent relocation of tortoises from the construction footprint. As in the designated Development areas, implementing the FWC *Guidelines* would avoid or minimize direct harm to gopher tortoises caused by construction activities.
b) The extent of habitat enhancement that may occur in the Preservation and VLD use areas is uncertain, but long-term management and protection of over 10,000 acres of native upland cover classes is likely to create some benefits for gopher tortoises. Such management and protection in the Preservation areas would eliminate in these areas the primary threat to the species, which is habitat degradation, loss, and fragmentation.

23 REINITIATION NOTICE

Formal consultation for the Action considered in this BO relative to the nine ESA-listed Covered Species identified in section 1.1 is concluded. Reinitiating consultation with the Florida State Office (FSO) is required under 50 CFR §402.16 if the Service's Regional Office (RO) retains discretionary involvement or control over the Action (or is authorized by law) when:

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

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Formal conference for the Action considered in this CO relative to the 11 non-listed Covered Species identified in section 1.1 is concluded. When the Service issues a final rule classifying any of these species as endangered or threatened, the RO may submit a written request to the FSO to confirm the CO as a BO issued through formal consultation, if the RO retains discretionary involvement or control over the Action at that time.

This request should advise the FSO of any new data about the Action or its effects on such species that are relevant to adopting the CO as a BO, including the amount or extent of any taking of species that the Action has caused before the effective date of a listing decision. The FSO will review the Action and new information to determine whether modifying the opinion is appropriate. If the FSO finds no significant changes in the Action as proposed or in the information used during the conference, the FSO will confirm the CO as a BO for the Action, which shall conclude formal consultation for the newly listed species. Thereafter, the RO shall request to reinitiate formal consultation under the same circumstances listed above.

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