



# United States Department of the Interior

FISH AND WILDLIFE SERVICE  
South Florida Ecological Services Office  
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March 16, 2005

Colonel Robert M. Carpenter  
District Engineer  
U.S. Army Corps of Engineers  
701 San Marco Boulevard, Room 372  
Jacksonville, Florida 32207-8175

Service Log No.: 4-1-04-PL-6866

Corps Application No.: SAJ-2003-09416 (NW-MAE)

Date Received: March 24, 2004

Applicant: Barron Collier Investments

County: Collier

Dear Colonel Carpenter:

This document transmits the Fish and Wildlife Service's (Service) revised biological opinion for the above referenced project and its effects on the endangered Florida panther (*Puma concolor coryi*) and threatened Audubon's crested caracara (*Polyborus plancus audubonii*) in accordance with section 7 of the Endangered Species Act of 1973, as amended (ESA) (87 Stat. 884; 16 U.S.C. 1531 *et. seq.*). The original biological opinion was issued on February 22, 2005. This revised biological opinion corrects errors and omissions in literature cited in the text, clarifies references cited in the document, and corrects errors in some of the tables referenced in the text.

This biological opinion is based on information provided in a March 23, 2004, U.S. Army Corps of Engineers' (Corps) notification letter, information provided by WilsonMiller on June 29, 2004, July 13, 2004, August 17, 2004, and August 18, 2004, the Corps' August 18, 2004, letter to the Service which transmitted project information prepared by WilsonMiller, information provided by WilsonMiller, meetings, telephone conversations, email, and other sources of information. A complete administrative record of this consultation is on file at the South Florida Ecological Services Office.

The purpose of the project, as defined in the Corps' notification letter, is to construct six storm water outfall structures in association with the development of Ave Maria University and an associated town center. Construction of these structures will impact less than 0.5 acre of herbaceous wetlands. The project is located on a 683.4-acre parcel that consists of 28.4 acres of wetlands and open water and 655 acres of uplands. This parcel is located south of Immokalee Road, west of Camp Keais Road, north of Oil Well Road, and east of Camp Keais Strand in Sections 31, 32, and 33, Township 47 South, Range 29 East, and in Sections 4, 5, 8, 16, and 17, Township 48 South, Range 29 East, Collier County, Florida. In addition, and for the purposes of this biological opinion, the Service considers the proposed action to also include those lands



surrounding the 683.4-acre project currently being reviewed for potential development under the State of Florida's Development of Regional Impact (DRI) review process. The proposed Town of Ave Maria DRI will include the Ave Maria University and the Town of Ave Maria with a town center, residential components, and mixed-use commercial development. The proposed Town of Ave Maria DRI, including the 683.4-acre parcel, totals 4,995 acres and is located in Sections 1, 12, 13, Township 48 South, Range 28 East; Sections 6, 7, 16, and 18, Township 48 South, Range 29 East; Sections 27, 29, 30, and 31, Township 47 South, Range 29 East; and Section 36, Township 47 South, Range 28 East, Collier County, Florida.

Information provided by the applicant for the total Ave Maria DRI project indicates a maximum of 4,995 acres of wetlands and uplands may be adversely affected under a build-out scenario for the project. Detailed and specific information for all parts of the Ave Maria DRI project is not yet available; therefore, the analysis and conclusions of this biological opinion are valid for the Ave Maria DRI provided the maximum acreage of impacts to wetlands or uplands, beyond those proposed under the current DRI plan, is not significantly exceeded. Under the Clean Water Act, section 404, future permitting through the Corps is anticipated; at which time confirmation of the acreage of wetland and upland impacts (habitat loss) assumed under this biological opinion will occur. For the purposes of this biological opinion, the entire Ave Maria DRI project site (4,995 acres) is assumed to be impacted, in terms of loss of panther habitat.

The Ave Maria DRI project site is comprised primarily of agricultural lands within a larger setting of agricultural lands (Figures 1A and 1B). The primary wetland system in the project vicinity is Camp Keais Strand, a regional north-to-south flowway/wetland system to the immediate west of the project. Clearing for agricultural conversion occurred in the 1960s and 1970s on lands on both sides of Camp Keais Strand, including the project site, with essentially all of the upland lands in the region having been converted to intensive row crop production by the early 1980s. The Ave Maria DRI project site is predominantly within the Secondary Zone (Kautz et al. In Review). Those portions of the Ave Maria DRI (Figure 2) project adjacent to Camp Keais Strand system are within the designated Primary Zone that extends out from the native vegetation communities of the strand (Figures 3A, 3B, and 3C). The maximum acreage of wetland impacts anticipated to occur under the Ave Maria DRI build-out may involve discharge of fill and excavation in approximately 30 acres of federally jurisdictional wetlands and 15 acres of ditches and other surface waters (waters of the United States) and preservation of the balance of 66 acres of federally jurisdictional wetlands. The vast majority of development impacts are proposed for areas that have been previously cleared and are currently being utilized for intensive agriculture activities. As mitigation for wetland impacts, the applicant proposes to enhance and preserve 66 acres of onsite wetlands under Federal wetland jurisdiction and accomplish further wetland mitigation, if necessary, within wetlands that are part of the adjacent Camp Keais Strand system. The specific justification and quantification of wetland mitigation will occur during future Corps 404 permit application reviews.

Two of the land compensation parcels (identified as Stewardship Sending Areas, designated SSA1 and SSA2, totaling approximately 850 acres) are comprised of a mix of native vegetated habitats. Three compensation parcels (identified as SSA3, SSA4, and SSA6, totaling approximately 6,935 acres) are comprised of a mosaic of agricultural fields, hydric and mesic

pine (*Pinus elliottii*) flatwoods, and cypress (*Taxodium distichum*) domes and sloughs, with various levels of infestation of the invasive exotic Brazilian pepper (*Schinus terebinthifolius*). SSA3 and SSA4 compensation lands are situated in a regionally significant wildlife corridor and are part of the Okaloacoochee Slough System. These compensation lands are bisected by County Road (CR) 846, which leads east out of the town of Immokalee. This portion of CR 846 has been the site of five panther deaths due to motor vehicle collisions over the past decade. Placement of the compensation lands under conservation easement is anticipated to facilitate the construction of one or more wildlife underpasses along this important stretch of CR 846. SSA6 compensation lands are adjacent and contiguous to the Florida Panther National Wildlife Refuge (NWR).

In the Nationwide Permit notification letter to the Service dated March 23, 2004, the Corps determined the Ave Maria University project “may affect, but is not likely to adversely affect” the endangered wood stork (*Mycteria americana*), the endangered red-cockaded woodpecker (*Picoides borealis*), the eastern indigo snake (*Drymarchon corias couperi*), and the threatened Audubon’s crested caracara. The Corps provided a “may affect” determination for the endangered Florida panther and requested the Service initiate formal consultation. In a letter to the Corps dated June 23, 2004, the Service indicated further information was needed on the full potential DRI project and the Service would need to consider the entire DRI area as the project area. No statement of concurrence regarding determinations was offered. In a letter to the Service dated August 18, 2004, the Corps transmitted requested information from the applicant regarding the maximum potential DRI project. The Corps indicated determinations of “may affect, but is not likely to adversely affect” for the wood stork, red-cockaded woodpecker, and eastern indigo snake. The Corps revised its determination to “may affect” for Audubon’s crested caracara and restated its determination of “may affect” for the Florida panther and requested initiation of formal consultation. After reviewing information received from the Corps and the applicant’s agent, WilsonMiller, the Service concurs with the Corps’ determination of “may affect, but is not likely to adversely affect” for the wood stork, red-cockaded woodpecker, and eastern indigo snake, and “may affect” for the Audubon’s crested caracara and the Florida panther.

#### Use of Best Scientific and Commercial Information by the Service

The Service will use the most current and up-to-date scientific and commercial information available. The nature of the scientific process dictates that information is constantly changing and improving as new studies are completed. The scientific method is an iterative process that builds on previous information. As the Service becomes aware of new information, we will ensure it is fully considered in our decisions, evaluations, reviews, and analyses as it relates to the base of scientific knowledge and any publications cited in our documents.

Specifically, there is one such document cited in the biological opinion the Service acknowledges has been affected in its cited form by new scientific information. The Service has taken these new sources of information into account when using this document to help guide our analysis and decisions. This document is the Multi-Species Recovery Plan (MSRP) of 1999. In

addition, the Service has examined Kautz et al. (In Review) for its scientific validity, specifically with regards to comments and recommendations by other reviewers as discussed below.

### South Florida Multi-Species Recovery Plan

The MSRP was designed to be a living document and it was designed to be flexible to accommodate the change identified through ongoing and planned research and would be compatible with adaptive management strategies. These principals are set forth in both the transmittal letter from the Secretary of the Interior and in the document itself. As predicted, this is what indeed occurred in the intervening years since the MSRP was published. The Service uses the MSRP in the context it still presents useful information when taken in conjunction with all the new scientific information developed subsequent to its publication.

### Kautz et al. (In Review)

The Florida Panther Subteam was charged with developing a landscape-level strategy for the conservation of the Florida panther population in south Florida. The Subteam produced the Landscape Conservation Strategy for the Florida Panther in South Florida in December 2002 and provided it to the Service. Upon receipt, the Service began to use the information in the Landscape Conservation Strategy in its decision making processes and documents. Since then some portions of the science and findings in the Landscape Conservation Strategy have been challenged. Many, but not all, of the Subteam members have refined the methodology, further analyzed the data, and better defined the results of the Landscape Conservation Strategy into a draft article, referred to here as Kautz et al. (In Review), for submission to a professional peer-reviewed journal, Biological Conservation. To date, the authors have responded to two sets of edits on their draft article and are waiting to hear from the journal editor regarding acceptance of the manuscript for publication. In addition, the authors have considered the comments provided by Beier (2003) on the Landscape Conservation Strategy and the recommendations provided by the Scientific Review Team (SRT) (Beier et al. 2003) as discussed below. Dr. Jane Comiskey, one of the authors of Kautz et al. (In Review) has expressed some concerns about the manuscript and we have addressed her concerns below as well. We have also addressed issues relating to the ESA and the Information Quality Act.

### **Beier (2003) Comments on the Draft Landscape Conservation Strategy**

Beier provided 37 comments on the Subteam's Landscape Conservation Strategy. Kautz et al. (In Review) addressed all of Beier's comments except those discussed below.

1. Include a statement that when analyses using nighttime data are available, this picture probably will change.

*This statement is not in the manuscript, but in this and other biological opinions, the Service acknowledges that nighttime and 24-hour data are generally not readily available at this time. Data from GPS collars will be considered when found to be reliable and available. Availability of nighttime or 24-hour data may possibly change some conclusions about panther habitat in the*

*future. In analyses of puma habitat in California, Beier (2003) found that puma show markedly broader habitat use and selection at night compared to daytime. We expect that when GPS-collar data becomes available, there may be a shift to broader habitat use at night. However, the Service does not solely rely on daytime telemetry in making its decisions regarding panther habitat. The Service considers panther habitat to include all areas required for the panther to live out its full life-cycle, including areas providing food and shelter and supporting characteristic movement such as hunting, breeding, dispersal, and territorial behavior.*

2. Explain the witch's finger jutting eastward from the Primary Zone. No panther is going to have a home range 10 miles long and 400 meters wide. Buffer this so that it is at least 1 mile wide at its narrowest points, and 4 to 5 miles wide in most areas. I support the idea of making this primary habitat, but strongly feel that it does not make sense to make it so narrow.

*This was not addressed. This comment relates to the slender portion of the Primary Zone that protrudes eastward at the border of Palm Beach and Broward Counties and the recommendation by Beier that it be buffered to be more inclusive. While Kautz et al. (In Review) did not make this requested modification, this omission has little bearing in this biological opinion, which is located in Collier County. The Service considers Primary, Dispersal, and Secondary Zones and other panther habitat along with the best available scientific and commercial data in our analyses and evaluations.*

3. Secondary Zone: Overall, the approach is *reasonable*, but not *rigorous*. We will probably never have data to make this a rigorous analysis, so it would be unreasonable to demand that. However, if you ran a cursory sensitivity analysis, you can determine how the map varies under different assumptions about cutoff points and relative weights.

*According to Kautz et al. (In Review), the Secondary Zone is defined as natural and disturbed lands adjacent to the Primary Zone that may have potential to support an expanding panther population, especially if habitat restoration were possible. A preliminary boundary of a Secondary Zone was originally drawn on a hard copy map by the Multi-species Ecosystem Recovery Implementation Team (MERIT) Panther Subteam. The landscape context of the draft Secondary Zone was evaluated by combining a set of 30-meter (m) pixel grids created to measure three habitat-related variables (i.e., proximity to Primary Zone, proximity to a forest plus buffer patch, forest plus buffer patch size) and three land-use variables (i.e., proximity to urban lands, intensity of land use, and road type and density). Pixels in the six data layers were assigned scores of 1 to 10, with 10 representing the best case for panthers. Equal interval or progressively increasing or decreasing increment functions were applied to each data layer as deemed appropriate. The Secondary Zone boundary was finalized by adjusting the preliminary boundary to conform to results of the landscape context analysis and to land use changes as indicated by recent satellite imagery. To our knowledge, a cursory sensitivity analysis varying the scores assigned to the different variables within each data layer was not run. Therefore, we do not know how a map of the Secondary Zone would vary under different assumptions about cutoff points and relative weights. However, as a group, the Subteam reviewed the draft Secondary Zone boundaries in relation to the results of the context analyses and recent satellite imagery, and achieved consensus on the adjusted boundaries that best met the definition of the*

*Secondary Zone. Therefore, the Service does not believe the lack of this cursory sensitivity analysis affects the scientific validity of a Secondary Zone nor the Service's ability to use it in biological opinions.*

4. A density of 1 panther per 11,000 hectare (ha) is a strange inference from this simple descriptive statistic. The 11,000 ha is simply total area divided by the number of panther home ranges in the area. This is not a sound approach toward estimating minimum forest area for use by panthers.

*In the Landscape Conservation Strategy, the MERIT Panther Subteam attempted to identify lands north of the Caloosahatchee River for their capacity to support one or more groups of reproducing panthers. In that process, they assumed that large forest patches, at least 11,000 ha in size, would be needed. This assumption was based on an estimate of population density in optimal habitat given by Maehr et al. (1991a).*

*In conducting a compositional analyses, Kautz et al. (In Review) determined that panther use of forest patches within fixed kernel home ranges south of the Caloosahatchee River differed significantly from random. The smallest forest patch size classes occurred within home ranges in higher proportions relative to their availability than larger forest patch sizes. With this new knowledge, Kautz et al. (In Review) did not repeat the erroneous assumption that forest patches at least 11,000 ha in size are required by panthers. Kautz et al. (In Review) did use 1 panther per 11,000 ha as a rough density estimate along with a density estimate derived from their own analysis (1 panther per 12,919 ha) to provide estimated ranges for the potential number of panthers that could be accommodated by the current configuration of the Primary, Dispersal, and Secondary Zones.*

5. Habitat Capacity, “defined as areas with pixel values >3.” This definition, it seems, would result in a region with Swiss-cheese holes and outlier bubbles of habitat. Was there a step that involved smoothing to create a “smooth” map? If so, describe that step. If not, acknowledge and describe the nature of the resulting map.

*For the purposes of their study, the Subteam developed an estimate of panther population density. Minimum convex polygons of panther home ranges were generated for all Florida panthers by year based on telemetry records through early in 2000 (n=49,889 telemetry locations, 1981 to 2000). Each polygon was converted to a 100 m pixel grid, and the resulting grids were summed. The region of most consistent panther occupancy for the period of record was defined as areas with pixel values  $\geq 3$ . This step excluded areas used only once or twice by transient animals. To estimate population density, the total land area within the resulting region of panther occupancy was divided by 62, the estimated size of the panther population in 2000 (McBride 2000). Using this method, the region of most consistent panther occupancy from 1981 through early 2000 covered 800,951 ha. Based on the estimated panther population of 62 individuals (McBride 2000), population density was one panther per 12,919 ha in 2000. Kautz et al. (In Review) did not address the shape or character of the resulting map, nor whether its creation involved “smoothing.” However, the resulting size of area of occupancy and*

*population density they report are consistent with other published information and are considered the most current and up-to-date scientific information available to the Service.*

6. “Region of panther occupancy was divided by 62, the estimated size of the panther population in 2000.” Need to be specific about whether this refers to resident adults, resident breeding adults, adults plus independent juveniles, or total panthers, including kittens. McBride’s estimate, I believe, was “adults plus independent juveniles” and is thus analogous to the estimated density provided by Maehr et al (1991a).

*This was partially addressed. Kautz et al. (In Review) states that “...estimates place the population at 8-100 adults and subadults (Land and Lacy 2000; McBride 2001, 2002, 2003).” Later, where Kautz et al. (In Review) use the estimate of 62 panthers, McBride is cited. According to Kautz et al. (In Review), “To estimate population density, the total land area within the resulting region of panther occupancy was divided by 62, the estimated size of the panther population in 2000 (McBride 2000).” McBride (2000) clearly indicates that 62 panthers “...includes collared and uncollared, adult and subadult, part-Texas and pure Florida panthers. It does not include kittens at the den site, nor does it include extrapolations.” The Service understands that the panther population of 62 in 2000 included adults plus subadults and not kittens at the den.*

7. “A population of this size would have  $N_e$  of ~ 50 breeding adults.” This statement needs explanation based on published data, otherwise delete it.  $N_e$  is a notoriously difficult parameter to estimate.

*No similar statement is in Kautz et al. (In Review) and  $N_e$  is not mentioned in the text. However,  $N_e$  is in Table 5 of Kautz et al. (In Review). The presence of  $N_e$  in Table 5 does not affect the scientific validity of the document nor the Service’s ability to use it. The effective population size ( $N_e$ ) is the number of adults in a population contributing to offspring in the next generation. Although we understand that  $N_e$  is difficult to estimate, we believe use of it is helpful in the population guidelines given in Kautz et al. (In Review). The Service realizes that the effective population size is generally smaller than the census size and is often much smaller than the census size. Although not specifically discussed in our biological opinions, we factor this into our analyses.*

8. It is hard to believe that we cannot “rank agricultural lands as panther habitat” with data already in hand. Don’t we already know that unimproved pasture > improved pasture > citrus > row crops?

*This has been addressed to some degree. Table 1 of Kautz et al. (In Review) does rank some agriculture lands but not to the level of detail in the comments. The Service has factored the relative value of cover types/habitat types into our analyses and decision-making process during project evaluations and reviews.*

9. Please change “long-term survival of the Florida panther” to “long-term survival of the existing population of the Florida panther.”

*This was not addressed in Kautz et al. (In Review). However, the Service realizes that a single Florida panther population exists in south Florida. Our decision in this biological opinion and others are based upon ensuring the survival of the panther population in south Florida while working toward what is needed for recovery throughout the panther's historic range.*

### **Scientific Review Team Report**

1. Beier et al. (2003) states that “Telemetry data have been collected for Florida panthers over a long time period (since 1981), but in some analyses of habitat use, the vegetation maps may not have been updated and ground-truthed to stay current with analyses of telemetry data. The SRT has insufficient information to know to what degree this may be a problem, but recommends attention to this potential problem in future analyses.”

*Kautz et al. (In Review) states that “While researchers have continued to collect telemetry data for radio-collared panthers through the date of this writing, we are reporting the results of the only telemetry data that were available at the time of our collaborative work, and the telemetry data we used were closer in time to the date of the land cover data sets used for habitat analysis.” In relation to how this point was addressed in the Kautz et al. (In Review) manuscript, Randy Kautz (Florida Fish and Wildlife Conservation Commission [FWC], personal communication, 2004) stated that he “spent several hours at one point zooming in on panther telemetry against a backdrop of recent land cover data, and...found very few obvious examples of this being a problem. My own take was that the volume of telemetry data of over 55,000 records was so huge that any currency problems comprised a very small error factor.” The Service concurs with Randy Kautz’s conclusion and believes that currency errors in such a large sample size would not be significant.*

2. Beier et al. (2003) strongly recommends the use of compositional analyses (Aebischer et al. 1993) or another statistically appropriate method to compare the distributions of forest patch sizes available to panthers to those used by panthers.

*Kautz et al. (In Review) used compositional analysis to assess the effect of forest patch size on panther habitat use within the study area south of the Caloosahatchee River. This was accomplished by reclassifying upland and wetland forest types into one forest class, determining patch size, and assigning individual forest patches to size classes according to an equal area increment function. Differences in proportions of forest patches within each home range relative to the entire study area were then tested. Kautz et al. (In Review) found that forest patches of all sizes are important to panthers and that the smallest classes of forest patches are especially important.*

3. Beier et al. (2003) states “The estimate of 84% to 87% kitten survival (Maehr and Caddick 1995) is indefensible for several reasons.”

*Randy Kautz (FWC, personal communication, 2004) stated that “Our Population Viability Analysis (PVA) models used more recent and realistic survival rates of 0.62.”*

4. Beier et al. (2003) states “The SRT recommends that any future PVA models should be built from scratch and explicitly consider parameter uncertainty, variation (demographic, environmental) in parameters, and uncertainty in key functional relationships such as density dependence and the effects of inbreeding.”

*Randy Kautz (FWC, personal communication, 2004) stated that “We used Risk Assessment, Management, and Audit Systems (RAMAS), and I believe we are happy with the results. Our use of RAMAS preceded the SRT report. I personally think that enough PVAs have been done to give us a pretty good picture of the survival potential of the population, but no doubt the next generation of PVA modelers will improve on past work.” The Service concurs with this statement and believes that Kautz et al. (In Review) should be considered among the most current and up-to-date scientific and commercial information available and will use this information in our biological opinions until new, scientifically peer reviewed and verified data are present.*

#### **Dr. Jane Comiskey’s February 2005 Comments on Kautz et al. (In Review)**

Taken as a whole, Dr. Comiskey’s concerns dealt primarily with the addition of text and explanation to Kautz et al. (in review) if it was to be used as a substitute for the Conservation Strategy. The Service agrees that Kautz et al. (In review) is not a stand alone document and must be used in conjunction with the body of scientific literature regarding the panther, including the work of the Panther Subteam.

1. Kautz et al. (In Review) lacks the needed ecological and environmental context to replace the full Landscape Conservation Strategy.

*This may be correct in some instances. However, where the Service has cited this document in place of the Landscape Conservation Strategy we have ensured that the information is indeed included in Kautz et al. (In Review) and not part of the larger, more detailed Landscape Conservation Strategy. We believe that Kautz et al. (In Review) captures the major findings of the Landscape Conservation Strategy. Additional ecological and environmental context that is specific to an individual proposed project and proposed project site is included in this and other biological opinions.*

2. “The best we know given the current science at hand” indicates that some model assumptions are violated in the existing population and that parameter value estimates for reproductive rates and kitten survival are likely too optimistic. We need to acknowledge that in using model results.

*Some parameter value estimates for reproductive rates and kitten survival may be too optimistic. Some estimates of kitten survival have been too high (e.g., 0.80) while others may be too low. It would have been our preference to see a range of kitten survival rates used in the model between the Conservative, Moderate, and Optimistic scenarios as was done with other reproductive parameters used in Kautz et al. (In Review). To our knowledge and that of the authors, the kitten*

*survival rate of 0.62 is the most recent and, as far as we know, most reliable; we do not have a more reliable rate for kitten survival to use.*

*Sensitivity analyses conducted by Karen Root of the Panther Subteam showed that juvenile survival was the most important variable of those used within the PVA (K. Root, Bowling Green State University, personal communication, 2003). Therefore, we are aware that uncertainty within this parameter may have the greatest consequences on the projected population performance or trajectory. We acknowledge that uncertainties exist, and that we are aware of them, however, we consider the 0.62 kitten survival rate the best available at this time. The Service and the FWC along with our partners will continue to monitor the panther population and the south Florida landscape and incorporate any new information and changes into our decision-making process.*

*We recognize that model parameters such as this can have effects on model outcomes. The Service is mindful of the limitations that could exist and when making decisions, we ensure through various means that the well being of the species is accounted for.*

3. Kautz et al. (in Review) does not include a definition of habitat.

*We agree that specifically stating what constitutes panther habitat would be beneficial, however, we do not agree that lack of a definition should prevent use of Kautz et al. (In Review). Most biologists have an understanding of what habitat means. We believe that the Service and our counterparts understand what constitutes panther habitat. However, the Service considers panther habitat to be all areas required for the panther to live out its full life-cycle, including areas providing food and shelter and supporting characteristic movement such as hunting, breeding, dispersal, and territorial behavior.*

4. We agreed on the Florida Panther Subteam on the importance of ranking land use categories on a scale of adverse to beneficial effects on panthers and evaluating proposed land use changes in the context of this scale. Randy Kautz felt that it would be redundant to include an explicit statement about this approach toward evaluating the impact to panthers of intensification of disturbance within zones.

*The Service believes that ranking land use categories on a scale of adverse to beneficial effects on panthers and evaluating proposed land use changes in the context of this scale would be helpful, but is not necessarily needed to be part of Kautz et al. (In Review).*

5. RAMAS PVA Assumptions: we need more discussion of the assumptions associated with the PVA and the degree to which we know these assumptions to be violated in the existing landscape and population.

*We are aware of the assumptions used in the PVA analyses and consider these in our decisions. We will acknowledge the degree to which we believe any assumptions are being violated in our documents.*

*According to Kautz et al (In Review), “All models assumed a 1:1 sex ratio, a stable age distribution, 50 percent of females breeding in any year, and an initial population of 41 females (82 individuals including males), the approximate population size in 2001-2002 (McBride 2001, 2002). The basic version of each model incorporated no catastrophes or epidemics, no change in habitat quality or amount, and a ceiling type of density dependence. The basic versions of the models incorporated a carrying capacity of 45 females (90 individuals) based on estimated population sizes likely to be supported by the Primary and Secondary Zones (see Sections 4.1 and 4.3).”*

*The Service acknowledges that some of these assumptions are violated and tries to factor the degrees to which assumptions may be violated into our decisions. For example, the Service is aware that the Panther Subteam had attempted to address the effects of habitat loss by assuming a 25 percent loss of panther habitat over the first 25 years (i.e., one percent per year) of the 100-year model simulation during their analyses. Although the probability of extinction only increases approximately one percent under this scenario, the mean final abundance of panthers was reduced by 26 percent to 31 to 38 females. The actual likelihood of population declines and extinction can be much higher than the guidelines suggest, depending upon the number of and severity of assumptions violated. The Service realizes that habitat loss is occurring at an estimated 0.8 percent loss of habitat per year (R. Kautz, personal communication, 2003). The Service has tried to account for habitat loss and changes in habitat quality within its regulatory program and specifically through its habitat assessment methodology. For example, we have increased the base ratio used within this methodology to account for unexpected increases in habitat loss. Similarly, we consider changes in habitat quality and encourage habitat restoration wherever appropriate.*

*With regard to the assumption of no catastrophes, the Service has considered the recent outbreak of feline leukemia in the panther population at Okaloacoochee Slough as a potential catastrophe. However, the FWC is carefully monitoring the situation and it appears to be under control at this time due to a successful vaccination program. However, if the outbreak spreads into the population, the Service will consider this as a catastrophe and factor this into our decisions.*

6. All three of the RAMAS PVA model scenarios (conservative, moderate, and optimistic) estimate the first year kitten survival rate at 62 percent, based on the Land/Linda kitten survival analysis from FWC annual panther reports (FWC 2001, repeated in 2002, 2003, 2004). However, the selective Land/Linda analysis omits without explanation many failed litters documented in denning tables in these same annual reports, resulting in estimates of survival rates that are too optimistic, especially for the purebred Florida component of the population where most failed litters occurred. Even when reliable rates are computed, PVA scenarios should incorporate a range of survival rates, since the high survival rate among introgressed litters in part reflects expansion into unoccupied areas of the range where there is less competition for space and prey. As such, rates could decrease as the range becomes saturated and as inbreeding effects may reappear in the population.

*Per Tim O'Meara (FWC, personal communication, 2005), this does include litters that failed. The FWC annual report does include all litters for which FWC was able to get into the den and determine outcome of litters 6 months later; if litters were not included it was because they did not meet those criteria (T. O'Meara, personal communication, 2005). We agree that incorporating a range of kitten survivals into various PVA models would be beneficial in the future. To our knowledge, the kitten survival rate of 0.62 is the most recent and most reliable estimate to use at this time. We will continue to use this estimate until a more reliable estimate is available.*

7. We should include a statement acknowledging that the SRT has found serious errors in panther science and has recommended reanalysis of baseline data for the population. We should acknowledge that, as a result of errors, PVA parameter values may have been overestimated, leading to PVA results that may be too optimistic. In the meantime, decisions should err on the side of the panther.

*The Service agrees that the SRT has found serious errors in the scientific literature related to the panther and that reanalysis of baseline demographic data for the population should be done. The SRT has made numerous recommendations and the FWC and the Service are in the process of prioritizing these based upon need and importance to panther recovery. We realize that PVAs, like any model or analyses, are only as good as the assumptions, parameters, and data used. We believe that Kautz et al. (In Review) used the best available estimates for the parameters within the PVA. We realize that there is a possibility that the PVA results may be too optimistic. We agree that our decisions should err on the side of the panther.*

#### **Endangered Species Act/Information Quality Act**

1. The ESA states that the Service “shall use the best scientific and commercial data available.” However, the vegetation data and land use/land cover maps, as well as the panther telemetry points are several years old.

*Most information must be analyzed before it is of use to us. Due to the time for analysis and the extensive and lengthy peer review and publication process, it is not possible for an article to be published in a professional journal before the data becomes several months to a few years old as is the case in this instance. We believe that Kautz et al. (In Review) constitutes the “best scientific and commercial data available,” however, part of the base data and maps are not necessarily the most current.*

2. The Information Quality Act Challenge states “The estimate of an 80% pre-introgression kitten survival rate in Maehr et al. (1999, 2002) was based on an indefensible estimate Maehr and Caddick (1995) that was unsupported by data (Beier et al. 2003:47, 49, 143-144).”

*Kautz et al. (In Review) used the more current and realistic survival rate of 0.62.*

## Summary

After carefully reviewing Kautz et al. (In Review) and considering the above recommendations and standards, we believe that Kautz et al. (In Review) should be considered among the best scientific and commercial data available. Therefore, Kautz et al. (In Review) and the analyses contained therein, along with all other best scientific and commercial data available, is referred to in this document and will be used in our decision making process until or unless new information suggests revisions are necessary.

### Consultation History

On March 23, 2004, the Corps issued a Nationwide Permit notification letter to the Service consistent with the Florida panther final interim Standard Local Operating Procedures for Endangered Species (SLOPES) (Service 2000) and the Corps' Florida Panther Effects Determination Key, dated July 1, 2003 (Corps 2003). The proposed project, as identified in the Corps' notification letter, involves the construction of six stormwater outfall structures as part of the construction of Ave Maria University and an associated town center. The project site was identified as being on a 683.4-acre parcel comprised of 27.8 acres of wetlands and open water and 655.6 acres of uplands. The Corps also transmitted a biological assessment, prepared by WilsonMiller, to the Service. The Corps provided an initial determination of "may effect, but not likely to adversely affect" for the wood stork, red-cockaded woodpecker, eastern indigo snake, and caracara. The Corps also provided a "may affect" determination for the Florida panther and requested initiation of formal consultation.

In a June 23, 2004, letter to the Corps, the Service indicated further information was needed on the full potential DRI project and the Service would consider the entire DRI area as the project area. The Service requested habitat characterizations, impact analysis for wetlands and other fish and wildlife resources, and effect determinations for threatened and endangered species in and surrounding the total potential planned development.

In a letter to the Service dated August 18, 2004, the Corps transmitted requested information from the applicant regarding the maximum potential DRI project including habitat characterizations and analysis for wetland and other fish and wildlife resources. The Corps provided determinations of "may affect, but is not likely to adversely affect" for the wood stork, red-cockaded woodpecker, and eastern indigo snake. The Corps revised their determination to "may affect" for the Audubon's crested caracara and restated their determination of "may affect" for the Florida panther and requested initiation of formal consultation.

In August 2004, the Service received a copy of a Development of Regional Impact Application for Development Approval for The Town of Ave Maria (the DRI application).

On August 18, 2004, Tom Jones, the applicant's representative, along with Bruce Johnson and Tim Durham of WilsonMiller, as the applicant's consultant, met with the Service at the South Florida Ecological Services Office in Vero Beach to review and present the information previously forwarded to the Service by the Corps.

On September 1, 2004, Service staff conducted a site evaluation to review existing field conditions at the DRI site and the SSA sites.

## BIOLOGICAL OPINION

### DESCRIPTION OF PROPOSED ACTION

The applicant proposes to construct six stormwater outfall structures in association with the construction of Ave Maria University. The structures have been identified by the Corps as occurring on a 683.4-acre parcel involving the construction of the core of a new university and town center. This 683.4-acre parcel, as well as the entire DRI parcel as discussed below, is proposed to occur within a portion of Collier County covered by a Rural Lands Stewardship Area (RLSA) overlay under the county's Comprehensive Plan.

The RLSA provides requirements whereby new development activity must declare the maximum potential size of a given project as part of the initial local approval process. The RLSA program also requires that: (1) environmentally sensitive/valuable lands (SSA) be placed under appropriate conservation easements in order to generate sufficient "credits" to entitle other lands, and (2) development may only occur on lands with low environmental resource value (Stewardship Receiving Areas). The enabling mechanism for the entire project will be the DRI review process involving the State of Florida Department of Community Affairs, the Southwest Florida Regional Planning Council (RPC), and local government. An application for a stand-alone subset of the DRI was submitted to the State/RPC/county and is currently referred to as the Preliminary Development Agreement (PDA) under the DRI process. The PDA process allows a project that may ultimately become a DRI to begin with the understanding that a full DRI application will be submitted within a specified timeframe and that the applicant has no assurances approval will be given for anything beyond the PDA area. The proposed PDA is 960 acres in size and the balance of the potential project acreage (beyond the PDA area) is 4,035 acres for a combined maximum total acreage of 4,995 acres.

The PDA boundaries and acreage of 960 acres were primarily based on zoning/entitlement considerations rather than permit considerations and were declared relatively early as part of the DRI/PDA process. The actual engineering design of the PDA components has resulted in permit boundaries that differ from, but are contained within, the PDA boundaries. Therefore, the construction phase of the PDA and corresponding State Environmental Resource Permit is for a 683.4-acre area within the PDA. The outfall structures, for which authorization is sought under Corps Nationwide Permit 12, are contained within the same 683.4-acre area.

On July 23, 2004, the DRI Application for Development Approval for The Town of Ave Maria was filed with the State/RPC/county. The DRI project land uses will be comprised of 995 acres of university/schools, 2,921 acres of residential, 328 acres of mixed-use, 211 acres of community facilities, 62 acres of wetland preserves, 61 acres of parks, 175 acres of lake parks, and 242 acres of internal roadway.

For the purposes of this biological opinion, the Service has determined the entire potential DRI area be considered as the project area in order to evaluate both the currently proposed 683.4-acre project and the potential future DRI area impacts and associated compensation. The 4,995-acre project site is comprised of 111 acres of jurisdictional wetlands, 15 acres of other surface waters, and 4,884 acres of uplands with isolated wetland inclusions. Out of the 4,995 total acres within the DRI, only 301 acres (6 percent) of the project site possess native land cover, all of which have been historically disturbed, degraded, and fragmented by decades of standard agricultural operations. Current land use and habitat cover types include 588 acres of pasture, 3,357 acres of cropland, 327 acres of sod farm, 162 acres of fallow/open rural lands, 25 acres of agricultural canals/ditches, 173 acres of disturbed native uplands, 201 acres of disturbed native wetlands, 128 acres of exotic vegetation (Brazilian pepper monoculture), and 34 acres of roads.

The DRI project will involve impacts to approximately 30 acres of wetlands and 15 acres of ditches (other Waters of the United States) while approximately 66 acres of wetlands will be enhanced and preserved onsite. The project will also impact an additional 4,884 acres of uplands and isolated wetlands, for a total of 4,995 acres of habitat marginally suitable for utilization by the Florida panther. Wetlands consist primarily of remnant cypress and pine/cypress vegetation with significant levels of infestation by Brazilian pepper. Uplands consist primarily of intensively cultivated, raised-bed agricultural fields and sod farming areas. A 601-acre area of improved pasture exists at the northwest corner of the project site. Portions of this pasture area are utilized for foraging by a pair of Audubon's crested caracaras, currently nesting adjacent to the northwest project boundary. As discussed below, conservation measures in the form of off-site compensation for loss of caracara habitat is proposed by the project.

The Town of Ave Maria site is located south of Immokalee Road, west of Camp Keais Road, north of Oil Well Road, and east of Camp Keais Strand in Sections 1, 12, 13, Township 48 South, Range 28 East; Sections 6, 7, 16, and 18, Township 48 South, Range 29 East; Sections 27, 29, 30, and 31, Township 47 South, Range 29 East; and Section 36, Township 47 South, Range 28 East, Collier County, Florida. The Ave Maria DRI project site is predominately within the Secondary Zone as designated by Kautz et al. (In Review). Those portions of the Ave Maria DRI project that are adjacent to and extend out from the native communities in Camp Keais Strand are within Kautz et al.'s (In Review) designated Primary Zone.

The applicant is proposing conservation measures to minimize the direct and indirect effects of the project to the Florida panther, the caracara, and the wood stork. To compensate for impacts to ditches, other surface waters, and agricultural fields periodically utilized by wood storks, the applicant proposes to enhance and preserve 66 acres of onsite wetlands.

SSA1, SSA2, SSA3, SSA4, and SSA6 are each located within the Primary Zone (Kautz et al. In Review). SSA1 is located in Section 1, Township 48 South, Range 28 East and Section 6, Township 48 South, Range 29 East, Collier County. SSA2 is located in Section 36, Township 47 South, Range 28 East; and Section 31, Township 47 South, Range 29 East, Collier County. SSA3 and SSA4 are part of an important wildlife movement corridor. SSA3 is located in Sections 33, 34, 35, and 36, Township 46 South, Range 30 East; and Sections 1, 2, 3, and 4, Township 47 South, Range 30 East, Collier County. SSA4 is located in Sections 1, 2, 3, and 4,

Township 47 South, Range 30 East, Collier County. SSA6 is located in Sections 2 and 3, Township 49 South, Range 29 East, Collier County.

SSA3, SSA4, and SSA6 are comprised of a mosaic of wetland and upland habitats along with smaller agricultural fields/pastures. Panther telemetry data as well as panther/motor vehicle collision data indicate significant historic and current use of the SSA3, SSA4, and SSA6 areas as home range and movement corridors. SSA3, SSA4, and SSA6 are comprised of a matrix of habitats including pasture and areas of cabbage palms that are potential habitat restoration/enhancement areas for the benefit of caracara.

#### Action Area

##### Florida panther

The consultation area for the Florida panther includes lands in Charlotte, Glades, Hendry, Lee, Collier, Palm Beach, Broward, Miami-Dade, and Monroe Counties, as well as the southern portion of Highlands County (Figure 4). Developed urban coastal areas in eastern Palm Beach, Broward, and Miami-Dade Counties, and in western Charlotte, Lee, and Collier Counties were excluded because they contain little or no panther habitat, and it is unlikely that panthers would use such areas.

For the purposes of this consultation, the action area includes the Corps' project area, the balance of the Ave Maria DRI lands, and surrounding lands used by panthers with home ranges near the Ave Maria DRI project area (Figure 5). Movements of Florida panthers are much larger than the project site; and therefore, the action area is larger than the proposed action identified by the Corps' public notice. The action area, which is a subset of the current panther range, includes those lands the Service believes may experience direct and indirect effects from the proposed development. Maehr et al. (1990a) monitored five solitary panthers continuously for 130-hour periods seasonally from 1986 to 1989, rarely observing measurable shifts in location during the day, but nocturnal shifts in location exceeding 20 kilometers (km) (12.4 miles) were not unusual. Maehr et al. (2002) in a later report documents a "mean maximum dispersal distance" of 42.3 miles (68.4 km) for subadult males and 12.6 miles (20.3 km) for adult females. In the same report, Maehr et al. (2002) documents a "mean dispersal distance" of 37.3 km (23.1 miles) for subadult males. Dispersal patterns tend to be circular and of insufficient length to ameliorate inbreeding. Comiskey et al. (2002) documents a "mean dispersal distance" for subadult male panthers as an average distance of 40.1 km (24.8 miles) from their natal range, which is similar to the dispersal distance referenced by Maehr et al. (2002), and is the basis of the Service's action area determination. Therefore, for both direct and indirect effects, the action area is defined as all lands within a 25-mile radius of the Ave Maria DRI project. This action area does not include urban lands, lands west of Interstate 75 (I-75), and lands outside the Service's panther consultation area. This action area includes those areas anticipated to sustain direct and indirect effects such as roadways experiencing increased traffic (Oil Well Road west of Camp Keais Road), areas with increased human disturbance (project area and periphery of project), and areas in which habitat fragmentation and intraspecific aggression may be felt.

## Audubon's crested caracara

For the purposes of this consultation, the action area for caracara encompasses the project area included in the DRI and surrounding lands within the 196,000-acre Collier County RLSA (Figure 1B). The action area is effectively an extension of the caracara's documented current geographic range and includes those lands the Service believes may experience direct and indirect effects from the proposed development. This action area does not include urban lands, lands outside of the RLSA, or publicly owned lands (e.g., Florida Panther NWR, Big Cypress National Park [BCNP], etc.) adjacent to the RLSA.

This action area definition is supported by several objective facts: (1) the confirmed and probable caracara breeding activity in Collier County occurs within this area; (2) the proposed action occurs near the center of this area; (3) most of the suitable caracara habitat within eastern Collier County occurs within this action area; and (4) the RLSA program provides a mechanism for protecting the agricultural land uses (e.g., cattle ranches, pastures) that serve as the major habitat for caracara.

## STATUS OF THE SPECIES/CRITICAL HABITAT RANGEWIDE – Florida Panther

The State of Florida declared the panther a game species in 1950, gave it complete protection in 1958, although not an official designation, and closed the hunting season. The Federal government listed the panther as endangered in 1967 (32 FR 4001). Heavy hunting and trapping, an inability to adapt to changes in the environment, and land development were cited as reasons for the species decline. Critical habitat has not been designated for the Florida panther; therefore, none will be affected.

## Species Description

The Florida panther was first described by Charles B. Cory in 1896 as *Felis concolor floridana* based on a specimen he collected in Sebastian, Florida (Hall and Kelson 1959). Bangs (1899), however, noted *Felis floridana* had previously been used for a bobcat and, believing the panther was restricted to peninsular Florida and could not breed with any other form, assigned it full specific status as *Felis coryi*. The taxonomic classification of the *Felis concolor* group was revised by Nelson and Goldman (1929), and the panther was assigned subspecific status as *Felis concolor coryi*. This designation also incorporated *Felis arundivaga*, which had been classified by Hollister (1911) from specimens collected in Louisiana. Detailed descriptions of each of the subspecies are provided in Young and Goldman (1946) (30 subspecies) and Hall (1981) (27 Subspecies). The genus *Felis* was recently revised so all mountain lions, including the Florida panther, were placed in the genus *Puma* (Nowell and Jackson 1996).

The Florida panther is a medium-sized mammal described as dark tawny in color, with short, stiff hair (Bangs 1899), and having longer legs and smaller feet (Cory 1896) than other puma subspecies. Adult males reach a length of 2.15 m (7 feet) from their nose to the tip of their tail and may reach or exceed 68 kilograms (kg) (150 pounds) in weight, but typically average around 54.5 kg (120 pounds). They stand approximately 60 to 70 centimeters (cm) (23 to 27 inches) at

the shoulder. Adult females are smaller with an average weight of 34 kg (75 pounds) and length of 1.85 m (6 feet). The skull of the Florida panther has been described as having a broad, flat, frontal region, and broad, high-arched or upward-expanded nasals (Young and Goldman 1946).

The coat of an adult Florida panther is unspotted and typically rusty reddish-brown on the back, tawny on the sides, and pale gray underneath. The long cylindrical tail is slender compared to some of the other subspecies of *Puma concolor* (Belden 1989). Florida panther kittens are gray with dark brown or blackish spots and five bands around the tail. The spots fade as the kittens grow older and are almost unnoticeable by the time they are 6 months old. At this age, their bright blue eyes turn to the light-brown straw color of the adult (Belden 1989).

Three external characteristics are often observed in Florida panthers that are not found in combination with other subspecies of *Puma concolor*. These characteristics are a right angle crook at the terminal end of the tail, a whorl of hair or “cowlick” in the middle of the back, and irregular, light flecking on the head, nape, and shoulders (Belden 1986). The light flecking may be a result of scarring from tick bites (Maehr 1992a; Wilkins 1994). The kinked tail and cowlicks are considered manifestations of inbreeding (Seal et al. 1994).

### Life History

Panthers are essentially solitary. Interactions between adult females and their kittens are most frequent. Interactions between adult male and female panthers are second in frequency, last from 1 to 7 days, and usually result in pregnancy. Conflicts between males are common and often result in serious injury or death to some individuals. Between October 1984 and June 2004, there were 36 known deaths attributed to intraspecific aggression (FWC 2004). While most of those were between males, one-third occurred between male and female panthers resulting in 12 deaths of females (FWC 2004). Overall, the amount of mortality from intraspecific aggression appears to be increasing with a total of 13 mortalities during the first 10 years of study and nearly double that in the second 10 years (FWC 2004). In addition, the extant of mortality in female panthers from intraspecific aggression appears to be increasing. Since 1995, 10 of the 23 known deaths from intraspecific aggression were female panthers, whereas in previous years only 2 of 13 such deaths were females (FWC 2004). Densities of Florida panthers have increased in the last decade. Higher densities may lead to increases in panther interactions and aggressive conflicts between male panthers, and male and female panthers. However, aggressive encounters between females have not been documented (Maehr et al. 1991a).

Panther activity levels peak around sunrise and sunset. The lowest activity levels occur during the middle of the day. Females at natal dens follow a similar pattern with less difference between high and low activity periods. Although some travel occurs during the day, panthers are mostly crepuscular (Maehr et al. 2004). There are no known differences in seasonal movements, wet and dry season habitat use, seasonal variation in diet, or effects of season on road crossings. Responses to fluctuations in water levels are believed to be not significant (Maehr et al. 1989; Maehr et al. 1990b, 1991a).

## Habitat

Maehr (1990a) estimated the occupied range of the panther in 1990 to be 2.2 million acres (880,000 ha) in south Florida. Logan et al. (1993) estimated the range to be 3.1 million acres (1,254,500 ha), which is roughly 5 percent of its historic range. The area of most consistent panther occupancy from 1981 through early 2000 was estimated by Kautz et al. (In Review) to be 2 million acres (800,951 ha). Native landscapes within the Big Cypress Swamp region of south Florida, within occupied panther range, are dominated by slash pine, cypress, and freshwater marshes, interspersed with mixed-swamp forests, hammock forests, and prairies. Private lands represent about 25 percent of the Primary, Secondary, and Dispersal Zones in south Florida (Kautz et al. In Review). The largest contiguous tract of panther habitat is the Big Cypress/Everglades ecosystem in Collier, Monroe, and Miami-Dade Counties. Suitable habitat also extends into Lee, Hendry, Charlotte, Glades, Broward, Palm Beach, Highlands, Sarasota, Polk, Osceola, Hardee, and Desoto Counties. Some researchers are of the belief that the low nutrient, frequently saturated soils prevalent south of I-75 in south Florida do not produce the quality or quantity of forage required to support large herds of white-tailed deer (*Odocoileus virginianus*), which is a dominant prey species for panthers (see below); and believe it is unlikely habitat in BCNP and Everglades National Park (ENP) is as productive as habitat on private lands in northern and western Collier County in terms of panther health, reproduction, and density (Maehr 1992a). However, more recent reports provide contradictory information (McBride 2002, 2003). In addition, according to Beier et al. (2003), the conclusion that ENP and BCNP are poor habitats for panthers is not scientifically supported.

Forests provide important diurnal habitat for panthers. Belden et al. (1988) reported Florida panthers use hardwood forests and mixed swamps more than would be expected based on their occurrence in the landscape. While panthers may seek upland forests for daytime resting, as indicated by telemetry data, Kautz et al. (In Review) confirmed that panthers also utilize non-forest cover types interspersed in landscapes of forest patches, including freshwater marsh, prairie and shrub lands, agricultural lands, and pasture lands.

Telemetry data are the best available information about daytime panther habitat use. However, there are limitations and assumptions that should be stated about any conclusions based on telemetry data. Beier et al. (2003) points out several biases in research by Maehr and Cox (1995) in relating the importance of forests as panther habitat. These biases are stated to result from the use of daytime telemetry locations to describe habitat use, the selective use of telemetry data, and using location of telemetry versus panthers as a sampling unit. First, the panther telemetry data is collected in the morning, which creates a disjuncture between the time of data collection (beginning shortly after 7:00 am) and the times of peak panther activity (dawn and dusk). Habitat selection by panthers may be considerably broader at dawn and dusk (Beyer and Haufler 1994; Rettie and McLoughlin 1999). Second, the majority of panthers that have been radio-collared were on public lands. Telemetry research began in the Fakahatchee Strand State Preserve in 1981 (Belden et al. 1988) and gradually expanded to include BCNP, ENP, Florida Panther NWR, Picayune Strand State Forest, Okaloacoochee Slough State Forest, and Corkscrew Regional Ecosystem Watershed (CREW). It also expanded to include some telemetry data research on private lands in Collier, Hendry, Glades, and Lee Counties. Lastly, tests of the

accuracy of some of the telemetry locations revealed the difference between the actual location of the transmitter and the recorded location averaged 77 m (Dees et al. 2001) and can be as large as 230 m (Belden et al. 1988). These results were obtained by placing test transmitters in known locations in the field, plotting transmitter locations from the air, and then determining the error of actual versus observed locations.

A more recent analysis (Maehr et al. 2004) suggests some likelihood daytime telemetry locations are not dissimilar to areas used by panthers at night. However, 24-hour telemetry has not returned enough data to fully address this question. Maehr et al. (1990b) found panthers were very active around sunrise, a time of day well represented by aerial telemetry data, but that Comiskey et al. (2002) claims is missing from previous analyses of panther habitat use. Although it is not known exactly what behavior each animal was engaged in at the time these data were collected, it likely included a variety of activities, *e.g.*, walking, hunting, feeding, grooming, and resting. However, Maehr et al. (2004) believes daytime telemetry data include periods during which panthers are quite active. Although Maehr et al. (2002) did not compare habitats recorded by observers during periods of activity (as indicated by mercury tip switches or radio-collars) to habitats available to the panther.

The Florida panther SRT, commissioned by the Service and the FWC to do an independent critical review of literature related to ecology and management of the panther, published their findings in Beier et al. 2003. Included in these findings, the SRT: (1) encourages the acquisition and analysis of nighttime telemetry data to provide a more complete picture of Florida panther habitat use; (2) urges researchers to fully disclose and explain reasoning for selective use of data; (3) believes panthers rather than individual panther locations should be the sampling unit for determining habitat use; (4) believes vegetation maps used in habitat analysis be current with the data being analyzed; and (5) recommends to cease using a 90-m distance from forest cover, minimum sizes of forest patches, and the Panther Habitat Evaluation Model in making decisions about habitat mitigation and acquisition.

Maehr and Cox (1995) studied 10 female and 13 male panthers and found the home ranges included 6 percent freshwater marsh, 5 percent grass and agriculture, 3 percent dry prairie, 3 percent shrub swamp, 1 percent barren land, and concluded panthers can remain part of the native fauna in areas where agricultural activities exist. The above cover types, which represent open habitat, totaled 18 percent of the panther's home range. Maehr et al. (1991a) states panthers may travel through agricultural areas at night. Panthers currently in ENP have home ranges less than 10 percent forest cover (Comiskey et al. 2002). Maehr et al. (2002) found three panthers that crossed the Caloosahatchee River all went through areas with limited forest cover, and dispersing males wander widely through unforested and disturbed areas (Maehr 1992a). Beier et al. (2003) reported Comiskey et al. (2002) made a credible case that no significant relationship exists between home range size and percent forest cover.

## Reproduction and Demography

Male panthers are polygynous and maintain large home ranges mutually exclusive of other males but overlapping that of several females. Breeding peaks in fall and winter (Maehr 1992b). Gestation lasts 90 to 96 days. Parturition is distributed throughout the year with the majority of

births occurring between March and July. Prenatal litters range from three to four. Postnatal litters range from one to four kittens (FWC 2001). Litters surviving to 6 months of age average 2.2 kittens. Female panthers losing their litters generally produce replacement litters within the same breeding season. Intervals between litters range from 19 to 22 months (FWC 2004). Den sites are usually located in dense, understory vegetation, typically saw palmetto (Maehr 1990a). Den sites are used for up to 2 months and may be used again in subsequent years.

Historical records of den sites and birth rates for the past 5 years for the Florida panther, based on data provided by the FWC (2004), were: 7 dens, 18 kittens in 2003/2004; 6 dens, 17 kittens in 2002/2003; 12 dens, 26 kittens in 2001/2002; 8 dens, 21 kittens in 2000/2001; and 6 dens, 17 kittens in 1999/2000. Based on 2.5 kittens per den and an understanding a female panther will generally produce kittens every other year, the female population is estimated to include an average of 14 to 16 producing females with 7 to 8 females per year producing 18 to 20 kittens per year.

Early estimates of infant mortality varied and were in conflict. For example, Roelke et al. (1993) characterized infant mortality as relatively high with fewer than half of all births resulting in offspring that survive beyond 6 months of age. Land (1994) estimated the kitten survival rate between age 6 months and 1 year at 0.895, based on a sample of 15 radio-instrumented kittens. More recently, however, the FWC has been visiting den sites of female Florida panthers and Texas puma females since 1992 and has documented the number of kittens that survived to 6 months of age for 38 of these litters (FWC 2004). Florida panther and Texas puma kitten survival to 6 months of age were estimated to be 52 and 72 percent, respectively, but were not significantly different ( $P=0.2776$ ) (FWC 2004). Average kitten survival, therefore, was 62 percent from birth to 6 months of age (FWC 2004). The FWC (2004) determined the survival of kittens greater than 6 months of age by following the fates of 55 radio-collared dependent-aged kittens, including 17 Texas puma descendants from 1985 to 2004. They found only 1 of these 55 kittens died before reaching independence (a 98.2 percent survival rate) (FWC 2004). Twenty-three of 24 female panthers, first captured as kittens, became residents and 18 (78.3 percent) produced litters. One female was too young to determine residency status (FWC 2004). Female panthers were considered as adult residents if they were older than 18 months-of-age, established home ranges, and bred, or if they were older than 3 years of age and established a home range (Maehr et al. 1991b). Twenty-eight of the 31 male panthers became residents; three males were too young to determine residency status (FWC 2004). Male panthers were considered residents if they were older than 3 years of age and established a home range that overlapped with females (FWC 2004).

Females are readily recruited into the population as soon as they are able to breed (Maehr et al. 1991a). Age at first reproduction has been documented as early as 18 months for females (Maehr et al. 1989). However, 50 percent of known panther dens were initiated by females aged 2 to 4 years. Females aged 5 to 11 years initiated the remaining 50 percent.

The first sexual encounters for males have occurred at about 3 years of age (Maehr et al. 1991a). Dispersing females are quickly assimilated into the resident population, typically establishing home ranges less than one home range width from their natal ranges (Maehr et al. 2002), while

males usually go through a period as transient (non-resident) subadults, moving through the fringes of the resident population and often occupying suboptimal habitat until an established range becomes vacant (Maehr 1997). Maehr (1990a) believes there is a lack of unoccupied suitable habitat for dispersing subadult Florida panthers, which may increase fighting among males, and successful male recruitment appears to depend on the death or home range shift of a resident adult male (Maehr et al. 1991a). Turnover in the breeding population is low and documented mortality in radio-collared panthers is greatest in subadult and non-resident males (Maehr et al. 1991b).

Natural genetic exchange with other panther populations ceased when the Florida panther became geographically isolated over a century ago (Seal et al. 1994). Isolation, reduced population size, and inbreeding resulted in loss of genetic variability and diminished health. Data on polymorphism and heterozygosity, along with records of multiple physiological abnormalities, suggest the panther population has experienced inbreeding depression (Roelke et al. 1993; Barone et al. 1994). Inbreeding depression has been related to decreased semen quality, lowered fertility, reduced neonatal survival, and congenital heart defects in a variety of domesticated and wild species (Lasley 1978; Ralls and Ballou 1982; Wildt et al. 1982; O'Brien et al. 1985; Roelke 1991). Congenital heart defects have been shown to be related to diminished panther survival and reproduction (Roelke 1991; Dunbar 1993; Barone et al. 1994). The Florida panther exhibits diminished male reproductive characteristics compared to other populations of *Puma concolor* in North and Latin America (Barone et al. 1994). In a comparison of 16 male Florida panthers and 51 males from *Puma concolor* populations in Texas, Colorado, Latin America, and North American zoos, Wildt (1994) found a much higher rate of unilateral cryptorchidism (43.8 versus 3.9 percent), lower testicular and semen volumes, diminished sperm motility, and a greater percentage of morphologically abnormal sperm in the Florida panther samples.

Measured heterozygosity levels indicate the Florida panther has lost 60 to 90 percent of its genetic diversity (Culver et al. 2000). Measured levels of mDNA variation are the lowest reported for any similarly studied feline population, including leopards, cheetahs, and other *Puma concolor* subspecies. Electrophoretic analyses also indicated the Florida panther has less genetic variation than any other *Puma concolor* subspecies. Panther DNA fingerprint variation is nearly as low as in the small, isolated population of Asiatic lions of the Gir Forest Sanctuary in India (Roelke et al. 1993).

A genetic restoration program was initiated for the Florida panther in 1995. FWC (2001, 2003, 2004) indicated representation of Texas cougar genes in the south Florida population is probably close to the goal of 20 percent (Seal et al. 1994), although two of the eight Texas females are over-represented. The occurrence of kinked tails and cowlicks has been reduced in intercross progeny. Information on other morphological traits associated with genetic isolation and inbreeding such as cryptorchidism, sperm deformities, atrial septal heart defects, and skull morphology cannot be collected until the intercross progeny mature or pass away. However, the fecundity of the intercross progeny would seem to indicate sperm deformities have been reduced. For example, one first-generation male captured and examined in the field by Smithsonian Theriogenologist, Dr. Jo Gayle Howard, had a sperm count 3 times that of a Florida panther, a

sperm motility rate twice as high, a percentage of normal sperm 4 times greater, and a sperm concentration 10 times higher (McBride 2001). Since the genetic restoration program was initiated in 1995, the number of panthers monitored annually has increased, highway mortality has increased, and panthers have moved into formerly unoccupied niches on public land in south Florida (McBride 2002). This may indicate a more robust population that varies dramatically from population parameters prior to 1995. However, Maehr and Lacy (2002) recommended caution in claiming success through genetic management. They state it is likely local prey populations cannot support the increased number of panthers over the long term, and as long as the panthers are restricted to south Florida, the problems of inbreeding and genetic variation that led to the genetic restoration program will return. Still, McBride (2002) states panther recovery continues to benefit from genetic restoration and an existing State land acquisition program (for large tracts of land) north of BCNP will provide additional benefits.

### Food Habits

Florida panther food habit studies indicate commonly consumed prey include feral hog (*Sus scrofa*), white-tailed deer, raccoon (*Procyon lotor*), nine-banded armadillo (*Dasypus novemcinctus*), and alligator (*Alligator mississippiensis*) (Maehr et al 1990a; Dalrymple and Bass 1996). Adult panthers generally consume one deer or hog per week, supplemented by opportunistic kills of smaller prey (Maehr 1997). A female with kittens may need the equivalent of two such kills per week. The high caloric intake needed to sustain successful reproduction and rearing of kittens is best achieved when a dependable supply of large prey is available (Roelke 1990). Deer and hogs accounted for 85.7 percent of consumed biomass north of I-75 and 66.1 percent south of I-75 (Maehr et al. 1990a). Differences in prey abundance and availability were indicated by an eight-fold greater deer abundance north of I-75 versus south of I-75, although the estimated number of deer consumed did not differ between the north and south portions of the study area. Hog numbers were lower south of I-75. Hogs dominated the diet of panthers in the north in terms of both estimated biomass and numbers. In the south, deer accounted for the greatest estimated biomass consumed, whereas raccoons were the highest estimated number of prey items consumed. Domestic livestock were found infrequently in scats or kills, although cattle were readily available north of I-75 (Maehr et al. 1990c). However, the number of deer consumed did not differ between the north and south portions of the study. There appears to be a consensus among land managers and Federal biologists that white-tailed deer and wild hogs are the dominant prey for panther, while rabbits, raccoon, and armadillos are of secondary importance (Beier et al. 2003).

### Movements and Dispersal

Adult Florida panthers occupy available habitat in a pattern similar to western cougars (Land 1994). More than 7,000 telemetry locations on 26 radio-collared panthers between 1985 and 1990 indicated home range size varied from 21 to 461 square miles (53 to 1,183 square km), averaging 200 square miles (519 square km) for resident males and 75 square miles (193 square km) for resident females. Beier et al. (2003) found estimates of panther home ranges varying from 74 to 153 square miles (193 to 396 square km or 47,359 to 97,920 acres) for females and 168 to 251 square miles (435 to 650 square km or 107,520 to 160,639 acres) for

males to be reliable. The most current estimate of home-range sizes (minimum convex polygon method) for established, non-dispersing adult panthers, based on radio-collared panthers monitored during the 2003-2004 genetic restoration and management annual monitoring report ( $n = 37$ ), averaged 60.3 square miles (156.1 square km or 38,572 acres) for females ( $n = 22$ ) and 160.6 square miles (416 square km or 102,794 acres) for males ( $n = 10$ ) (FWC 2004). Home ranges of resident adults were stable unless influenced by the death of other residents and home range overlap was extensive among resident females and limited among resident males (Maehr et al. 1991a).

Maehr et al. (1990a) monitored five solitary panthers continuously for 130-hour periods seasonally from 1986 to 1989, rarely observing measurable shifts in location during the day, but nocturnal shifts in location exceeding 20 km (12.4 miles) were not unusual. Maehr et al. (2002) in a later report documents a “mean maximum dispersal distance” of 42.3 miles (68.4 km) for subadult males and 12.6 miles (20.3 km) for subadult females. In the same report Maehr et al. (2002) documents a “mean dispersal distance” of 37.3 km for subadult males. Dispersal patterns tend to be circular and of insufficient length to ameliorate inbreeding. Comiskey et al. (2002) documents a “mean dispersal distance” for subadult male panthers as an average distance of 40.1 km (24.8 miles) from their natal range, which is similar to the dispersal distance reference by Maehr et al. (2002). Subadult dispersal typically occurs around 1.5 to 2 years of age, but may occur as early as 1 year of age. Dispersing males wander widely through unforested and disturbed areas (Maehr 1992a).

#### Status

Of the 27 recognized subspecies of *P. concolor* described by Hall (1981), the Florida panther is the sole remaining subspecies in the eastern United States. Historically, the panther was distributed from eastern Texas or western Louisiana and the lower Mississippi River Valley east through the southeastern states in general, intergrading to the north with *P. c. cougar*, and to the west and northwest with *P. c. stanleyana* and *P. c. hippolestes* (Young and Goldman 1946). The Florida panther had been eliminated from most of the historic range by 1950. Occasional sightings and signs were reported throughout the rural southeast between 1950 and 1980 (Anderson 1983). The only confirmed panther population was found in south Florida (Anderson 1983).

#### Distribution

A variety of human activities contributed to the decline of the Florida panther. The first bounty on Florida panthers was passed in 1831. An 1887 Florida law authorized a payment of \$5 for scalps (Tinsley 1970). Panthers were also shot on sight, hunted, poisoned, and trapped. Agricultural land clearing in the southeastern United States between 1850 and 1909 totaled 31.6 million acres (12.8 million ha). Lumbering reduced the original southern forest nearly 40 percent from 300 million acres (121.4 million ha) to 178 million acres (72.0 million ha) by 1919 (Williams 1990). Meanwhile the white-tailed deer, primary prey of the panther, was reduced from a range-wide population of about 13 million in 1850, to under 1 million by 1900

(Halls 1984). Over a 100-year period, bounty hunting, land clearing, lumbering, and market hunting of deer contributed to the range-wide decline of the panther.

At the beginning of the 20th century, the Florida panther population may have numbered as many as 500 (Seal et al. 1989). The State of Florida declared the panther a game species in 1950 and in 1958 totally protected the animal. In the 1970s, the FWC established a Florida Panther Record Clearinghouse to ascertain the status of the panther. The first field searches were made in 1972. The Florida Panther Act, a State law enacted in 1978, made killing the panther a felony. Telemetry investigations began in 1981, primarily on public lands in southwest Florida. Maehr et al. (1991a) estimated the average density of panthers in southwest Florida between February and July 1990 to be one panther per 42.9 square miles (47 square km or 27,456 acres). When extrapolated over a 1,965.6 square mile (5,040 square km or 1,257,979 acre) area thought to be occupied by radio-collared panthers in southwest Florida, the estimated population of the area was 46 adults (9 resident males, 28 resident females, and 9 transient males) between December 1985 and October 1990. This estimate assumed homogeneous density and similar age and sex composition over time and space. Maehr et al. (1991a) considered the actual population to be higher because the estimation technique excluded panthers in ENP, eastern BCNP, and areas north of the Caloosahatchee River. The Florida Panther Interagency Committee, comprised of the Service, National Park Service, Florida Department of Environmental Protection, and the FWC, estimated the population in 1993 at 30 to 50 adults (Logan et al. 1993). More recent estimates show a panther population (adults and subadults) of 62 in 2000 (McBride 2000), 78 in 2001 (McBride 2001), 80 in 2002 (McBride 2002), and 87 in 2003 (FWC 2003). No documented population number has been provided by FWC for 2004 to date. However, D. Land (FWC, personal communication, November 2004) estimates the population to be between 70 and 100 panthers.

Human persecution over a 100-year period, along with bounty hunting, land clearing, lumbering, and market hunting of deer, resulted in a range-wide decline of the panther, and as a result panthers now occupy just 5 percent of their former range. The remaining breeding population is in south Florida, south of the Caloosahatchee River. Dispersing males occasionally cross the Caloosahatchee River and have been observed in rural habitats of south-central Florida.

In the south Florida breeding population, habitat loss, habitat fragmentation, habitat degradation, and increased human disturbance resulting from agricultural and residential development are now considered among the primary threats to long-term panther persistence. Continued development associated with the expansion of Florida's urbanized east coast, urban development on the west coast, and the spread of agricultural development in the south Florida interior, have placed increasing pressure on panthers and panther habitat (Maehr 1990b; Maehr et al. 1991a; Maehr 1992b). Past land use activity, hydrologic alterations, road construction, and lack of fire management (Dees et al. 1999) have also affected the quality and quantity of panther habitat.

In southwest Florida, agriculture development between 1986 and 1990 resulted in a row crop acreage increase of 8,990 acres (3,640 ha) or 21 percent; a sugarcane increase of 16,000 acres (6,475 ha) or 21 percent; and a citrus increase of 54,000 acres (21,850 ha) or 75 percent. Rangeland, much of it suitable for panther occupation, decreased by 160,000 acres (64,750 ha)

or 10 percent. In a more current analysis, (B. Stys, FWC, unpublished data, 2002) performed a change detection analysis for Collier, Lee, Hendry, Charlotte, and Glades Counties, and found the area of disturbed lands in these five counties increased 31 percent between 1986 and 1996. Most (66 percent) of the land use change over the 10-year period was due to conversion to agricultural. Forest cover types accounted for 42 percent of land use conversions, dry prairies accounted for 37 percent, freshwater marsh accounted for 9 percent, and shrub/brush lands accounted for 8 percent.

Residential, commercial, and industrial development projects may have an adverse direct effect on the Florida panther through: (1) the permanent loss and fragmentation of panther habitat; (2) the permanent loss and fragmentation of habitat that supports panther prey; (3) the loss of available habitat for foraging, breeding, and dispersing panthers; and (4) a reduction in the geographic distribution of the species. Indirect effects may include: (1) an increased risk of roadway mortality to panthers traversing the area due to the increase in vehicular traffic; (2) increased disturbance to panthers in the project vicinity due to human activities; (3) the reduction in panther prey; (4) the reduction in value of panther habitat adjacent to the project due to habitat fragmentation; and (5) a potential increase in intraspecific aggression between panthers (and an increase in mortality of subadult male panthers) due to reduction of the geographic range of the panther.

Panther prey density, especially deer, is an important factor in evaluating panther habitat. The type and number of prey available affects the health and distribution of panthers, as well as their ability to breed and support young. Environmental factors, specifically the availability of high quality forage, affect the prey density and influence the carrying capacity and population dynamics of the prey species, especially deer herds (Fleming et al. 1993). In the Everglades region, deer inhabit a variety of landscape types, including pinelands, high ridges, and adjacent periphery wetlands, which include the mosaic of sawgrass and wet prairie savannahs and sloughs that comprise the interior freshwater marshes and coastal mangrove forest.

Deer are ruminants, with small stomach capacities, and are selective for high quality forage to meet their nutritional needs. To meet these high quality forage needs, deer selectively move through the mosaic of habitat types taking advantage of the seasonal forage that provide the most benefit to the deer. Water management practices have reduced habitat heterogeneity and the sequence of seasonal and successional patterns of plant growth and appear to have affected deer abundance (Fleming et al. 1993).

Other adverse changes in habitat characteristics that affect deer density include the invasion of exotics into native uplands, over drainage of marshes, and the establishment of monotypic stands of unpalatable plant species, generally resulting from nutrient enrichment related to agricultural and urban runoff. The replacement of these native plant communities reduces important habitat heterogeneity and the ability of deer to meet their critical dietary needs. For example, deer densities on over-drained, exotic species infested private lands being developed in northwest Lee County averaged one deer-per 591 acres (Turrell 2001) to one deer-per 534 acres (Passarella 2004). As another example, in monotypic stands of cattail (*Typha* spp.) communities in the Everglades Wildlife Management Areas, historical deer densities in the mid-to-late 1950s

averaged one deer-per 100 acres (40 ha) when the vegetative community was a mosaic of native species, whereas more recent surveys (1993) showed a 67 to 76 percent decrease (one deer per 300 to one deer per 475 acres) of the 1959 population estimate (Fleming et al. 1993).

As a comparison to higher quality habitat communities, deer densities in wildlife management areas in the BCNP's Corn Dance Unit were predicted to be between one deer-per 165 acres and one deer-per 250 acres (Steelman et al. 1999). Predictions of deer density in Fakahatchee Strand were estimated to be higher than one deer per 18.2 acres (McCown 1991). Deer densities in the Mullet Slough area of BCNP yielded an estimated density range of one deer per 93 acres and one deer per 250 acres. The Stairsteps Unit of BCNP support densities of one deer per 190 acres to one deer per 218 acres from track count estimates. Aerial surveys for the same units used after 1982 estimated deer densities between one deer per 60 acres and one deer per 2,643 acres (Steelman et al. 1999). Harlow (1959) predicted deer density in wet prairie habitat in Florida to be one deer per 115 acres.

To counteract the threat of exotic species invasion and monotypic stands of unpalatable plant species, all public land and most private land managers pursue exotic and invasive species management and habitat improvement through fire management and eradication programs. However, these actions are restricted by available funds to implement these programs.

Panthers, because of their wide-ranging movements and extensive spatial requirements are also particularly sensitive to habitat fragmentation (Harris 1985). Habitat fragmentation can result from road construction, urban development, and agricultural land conversions within migratory patterns of panther prey species and affect the ability of panthers to move freely throughout their home ranges. Construction of highways in wildlife habitat typically results in loss and fragmentation of habitat, traffic related mortality, and avoidance of associated human development. Roads can also result in habitat fragmentation, especially for females who are less likely to cross them.

Kautz et al. (In Review) estimated approximately 25 percent of panther habitat within Primary, Secondary, and Dispersal Zones, is on private land. Maehr (1990a) indicated development of private lands may limit panther habitat to landscapes under public stewardship. From March 1984 through February 2004 the Service concluded formal consultation on 49 projects involving the panther. The minimum expected result of these projects is impacts to 84,692 acres of panther habitat and the preservation of 25,748 acres (Table 1). Of the 84,692 acres of impacts, 39,918 are due to agricultural conversion and 44,774 acres to development and mining. The non-agriculture impacts are permanent land losses, whereas the agricultural conversions may continue to provide some habitat functional value to panthers, depending on the type of conversion. However, these land conversions provide less functional value than native habitats. The 44,774 acres of expected impacts from development and mining included a mixture of agricultural fields consisting of row crops and citrus groves and natural lands with varying degrees of exotic vegetation. Management actions on the lands preserved include exotic species removal, fire management, wetland hydrology improvement, improved forest management practices, and recreational benefit improvements.

## Habitat Management

Prescribed burning is probably the single most important habitat management tool available to public land stewards. Dees et al. (1999, 2001) examined panther use of habitat in response to prescribed burning at Florida Panther NWR and BCNP between 1989 and 1998. The greatest temporal response by panthers to burning in pine was within 1 year followed by a decline in subsequent years and is likely due to the rapid regrowth of vegetation, which attracted prey (Dees et al. 2001). Temporal analysis demonstrated notable selection only for pine stands that had been burned within 1 year relative to older burns. Compositional analysis showed that panthers were more likely to position their home ranges in areas that contained pine. Dees et al. (2001) suggest that panthers were attracted to less than 1 year old burns because of white-tailed deer and other prey responses to vegetation and structural changes caused by prescribed fire. According to Dees et al. (2001), it was the effect of burning in pine, rather than the pine per se, which most influenced habitat selection by panthers. However, they caution that the effects of shorter burning intervals on vegetation composition and landscape-level changes be determined before burning rotations are reduced.

## Land Conservation Trends

The 1.4 million-acre ENP was established in 1947 more than 2 decades before the Florida panther was listed as endangered. The 577,000-acre BCNP was established in 1974, just 1 year after passage of the ESA. Additional State and Federal acquisitions since the establishment of ENP and BCNP include Fakahatchee Strand Preserve State Park (58,373 acres), Florida Panther NWR (26,400 acres), Picayune Strand State Forest (55,200 acres), Collier-Seminole State Park (7,271 acres), Okaloacoochee Slough State Forest (34,962 acres), and CREW (24,028 acres). As of April 2001, non-profit organizations, local governments, State and Federal agencies, and Tribes have protected approximately 2.21 million acres of panther habitat south of the Caloosahatchee River within the Primary, Secondary, and Dispersal Zones (Kautz et al. In Review). These protected lands are the cornerstones for the Service's continuing effort to work in tandem with the private sector and State and county government, to preserve and manage panther habitat. These lands are protected by conservation easements or transferred by title to public entities to manage.

## Mortality, Trauma, and Disturbance

Records of mortality on uncollared panthers have been kept since February 13, 1972, and records of mortality on radio-collared panthers have been kept since February 10, 1981. A total of 143 panther mortalities have been documented through June 2004, with 59 (41 percent) known deaths occurring in the past 4 years (FWC 2001, 2002, 2003, 2004). Overall, documented mortality ( $n = 99$ ) of radio-collared and uncollared panthers averaged 3.4 per year through June 2001. However, from July 2001 through June 2004, documented mortality ( $n = 48$ ) increased with an average of 16.0 per year during these years (FWC 2002, 2003, 2004). Eighty-four free roaming, radio-collared panthers have died since 1981, and intraspecific aggression was the leading cause accounting for 41 percent of these mortalities (FWC 2004).

Unknown causes and collisions with vehicles accounted for 24 percent and 19 percent of mortalities, respectively. Other factors (7 percent), infections (5 percent), and diseases (4 percent) caused the remaining mortalities (FWC 2004). The causes of mortality were found to be independent of gender (FWC 2004). It is likely some causes, such as road mortality, are more likely to be found, and therefore, are over represented in the above total.

Between February 13, 1972, and June 30, 2004, Florida panther vehicular trauma ( $n = 73$ ), averaged 2.3 panthers per year (FWC 2004). Thirty-four incidents of trauma (47 percent) have occurred in the past 5 years (average 6.8 panthers per year during 2001 to 2004). From June 30, 2003, through October 2004, we are aware of seven additional vehicular mortalities, including several near CREW, one on Interstate 4 near Tampa, one just east of the intersection of I-75 and Alligator Alley, one on I-75 at mile marker 93, one on I-75 near mile marker 98, and one several miles north of CR 858 on State Road (SR) 29. Although the relative significance of vehicular trauma to other sources of mortality is not entirely known, it has been the most often documented source of mortality (Maehr 1989; Maehr et al. 1991b) because the death of uncollared panthers, due to other causes (e.g., intraspecific aggression, old age, disease, etc.) often goes undetected.

There are presently 34 wildlife underpasses with associated fencing suitable for panther use along I-75 and to date, no panthers have been killed by vehicles in areas protected with wildlife underpasses (FWC 2003). There are two underpasses suitable for panther use currently existing, and two additional underpasses presently proposed by the Florida Department of Transportation (FDOT) along U.S. Highway 29 (US 29) (Department of the Army Public Notice SAJ-2004-778). However, vehicular trauma still occurs on outlying rural roads and the FWC is conducting a study to determine the impacts of vehicular collisions to panthers and studying ways to minimize panther vehicle collisions. Several additional panther/wildlife crossings are proposed along roadways in rural Lee and Collier Counties in addition to the proposals along US 29 (FWC 2001). In addition, Collier County, in cooperation with the National Wildlife Federation and the Florida Wildlife Federation, is coordinating a study of the segment of CR 846 east of Immokalee by Dr. Reed Noss and Dr. Daniel Smith to determine the optimum location for wildlife crossing construction (WilsonMiller, electronic mail, 2005).

Florida panthers were hunted for bounty during the 1800s and for sport up until the 1950s (Tinsley 1970). Seven panther shootings, six fatal and one non-fatal, were documented between 1978 and 1986. A female Texas puma introduced for genetic restoration was shot in 1998 (FWC 1999). Education, self-policing among hunters, and regulation are the tools by which shootings are minimized. All free-ranging pumas in Florida are protected by a “similarity of appearance” provision in the ESA (56 FR 40265-40267; August 14, 1991).

Janis and Clark (1999) compared the behavior of panthers before, during, and after the recreational deer and hog-hunting season (October through December) in areas opened (BCNP) and closed (Florida Panther NWR, Fakahatchee Strand State Preserve) to hunting. The variables examined were: (1) morning activity rates; (2) movement rates; (3) predation success; (4) home range size; (5) home range shifts; (6) habitat selection; (7) distance from panther locations to trails; and (8) frequency of panther use in the Bear Island Unit of BCNP. The authors failed to

detect any relationship between hunting and the first six variables. Of the last two variables they determined the distance of panther locations from trails increased an average of 0.31 mile (180 m) and the frequency of panther use in the Bear Island Unit decreased from 30 up to 40 percent during the hunting season. An analysis of movement rates, a measure of energy expenditure, predation success, and energy intake do not indicate any direct, negative energetic responses to increased human activity during the hunting season. However, the increase in average distance from trails and decrease in panther use of the Bear Island Unit are indicative of a behavioral change. Janis and Clark (1999) surmise the increase in the distance of panther locations from trails is “biologically minor” and probably related to prey behavior (*i.e.*, white-tailed deer moving deeper into the forest to avoid hunters). The decrease in panther use of the Bear Island Unit is balanced by an increase in use of private lands north of BCNP as “refugia.” However, Beier et al. (2003) finds this and other studies of hunting impacts to panthers to be inconclusive.

### Population Dynamics

PVAs have emerged as key components of endangered species conservation. This process is designed to incorporate demographic information into models that predict if a population is likely to persist in the future. PVA incorporates deterministic and stochastic events including demographic and environmental variation, and natural catastrophes. PVA has also been criticized as being overly optimistic about future population levels (Brook et al. 1997) and should be viewed with caution; however, they are and have been shown to be surprisingly accurate for managing endangered taxa and evaluating different management practices (Brook 2000). They are also useful in conducting sensitivity analyses to determine where more precise information is needed (Hamilton and Moller 1995; Beissinger and Westphal 1998; Reed et al. 1998; Fieberg and Ellner 2000).

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

We believe the spatially explicit model, based on probability of persistence for 100 years, developed by Kautz et al. (In Review) represents the best insight into population viability for the panther at this time. Kautz et al. (In Review) built their own spatially explicit or habitat-based models using RAMAS Geographic Information System (GIS) software. The basic versions of these models assumed no catastrophes or epidemics, no change in habitat quality or amount, and a ceiling type of density dependence (Kautz et al. In Review). Variations of these models had different density dependence, various levels of habitat loss, or intermittent catastrophes or epidemics (Kautz et al. In Review).

Kautz et al. (In Review) suggested a set of population guidelines for use in management and recovery of the Florida panther based upon results of PVAs: (1) populations of less than 50 individuals are likely to become extinct in less than 100 years; (2) populations of 60 to 70 are barely viable and expected to decline by 25 percent over 100 years; (3) populations of 80 to 100 are likely stable but would still be subject to genetic problems (*i.e.*, heterozygosity would slowly decline); and (4) populations greater than 240 have a high probability of persistence for 100 years and are demographically stable and large enough to retain 90 percent of original genetic diversity.

Population guidelines for populations of panthers between 50 and 60 individuals and between 70 and 80 individuals were not specifically provided in Kautz et al. (In Review). However, the Service views the guidelines in Kautz et al. (In Review) as a continuum. Therefore, we consider populations of 50 to 60 individuals to be less than barely viable or not viable with declines in population and heterozygosity. Similarly, we consider populations of 70 to 80 to be more than barely viable or somewhat viable with some declines in population and heterozygosity. Like other population guidelines presented in Kautz et al. (In Review), these assume no habitat loss or catastrophes.

In September 2003, the documented south Florida panther population was 87 adults and subadults, not including kittens at the den (FWC 2003). The south Florida panther population has shown an increase in the survivability of young and juveniles (McBride 2003) and an increase in the population estimates from 62 in 2000 (McBride 2000) to 78 in 2001 (McBride 2001) to 80 in 2002 (FWC 2002) to 87 in 2003 (FWC 2003). No documented population number has been provided by FWC for 2004; however, D. Land (FWC, personal communication, November 2004) estimates the population to be between 70 and 100 panthers. McBride (Livestock Protection Company, personal communication, November 2004) plans to provide a verified population count in early 2005 and expects, due to the extent of mortalities this year, the population estimate may be lower than last year. However, minor fluctuations in the number of panthers within any given year are expected and are not the determining factors in the jeopardy analysis for biological opinions in which all take would be due to habitat loss.

Based on the PVA of Kautz et al. (In Review), a population of 80 to 100 panthers is needed for stability over a 100-year period and is the basis of the Service's goal to identify and protect sufficient lands for this size population. However, according to Kautz et al (In Review), "All models assumed a 1:1 sex ratio, a stable age distribution, 50 percent of females breeding in any year, and an initial population of 41 females (82 individuals including males), the approximate population size in 2001-2002 (McBride 2001, 2002). The basic version of each model incorporated no catastrophes or epidemics, no change in habitat quality or amount, and a ceiling type of density dependence. The basic versions of the models incorporated a carrying capacity of 45 females (90 individuals) based on estimated population sizes likely to be supported by the Primary and Secondary Zones."

The Service acknowledges that some of these assumptions are violated and tries to factor the degrees to which assumptions may be violated into our decisions. For example, the Service is aware that the Panther Subteam had attempted to address the effects of habitat loss by assuming

a 25 percent loss of panther habitat over the first 25 years (*i.e.*, one percent per year) of the 100-year model simulation during their analyses. Although the probability of extinction only increases approximately one percent under this scenario, the mean final abundance of panthers was reduced by 26 percent to 31 to 38 females. The actual likelihood of population declines and extinction can be much higher than the guidelines suggest, depending upon the number of and severity of assumptions violated. The Service realizes that habitat loss is occurring at an estimated 0.8 percent loss of habitat per year (R. Kautz, FWC, personal communication, 2003). The Service has tried to account for habitat loss and changes in habitat quality within its regulatory program and specifically through its habitat assessment methodology (discussed below). For example, we have increased the base ratio used within this methodology to account for unexpected increases in habitat loss. Similarly, we consider changes in habitat quality and encourage habitat restoration wherever possible.

With regard to the assumption of no catastrophes, the Service has considered the recent outbreak of feline leukemia in the panther population at Okaloacoochee Slough as a potential catastrophe. However, the FWC is carefully monitoring the situation and it appears to be under control at this time due to a successful vaccination program. However, if the outbreak spreads into the population, the Service will consider this as a catastrophe and factor this into our decisions.

We acknowledge that uncertainties exist, assumptions can be violated, and catastrophes can occur. However, the Service and the FWC along with our partners will continue to monitor the panther population and the south Florida landscape and incorporate any new information and changes into our decision-making process.

#### Panther Conservation Efforts

Previous recovery plans for the Florida panther have called for the establishment of additional populations within the historic range of the Florida panther (Service 1987, 1995). The PVA models discussed in the previous section and in detail in Kautz et al. (In Review) support this goal and predict a population of 80 to 100 individuals is needed for stability over a 100-year period and a population greater than 240 is needed to retain 90 percent of original genetic diversity. Kautz et al. (In Review) assessed the available habitat south of the Caloosahatchee River and determined that Primary, Secondary, and Dispersal Zone lands were not sufficient to sustain a population of 240 individuals south of the Caloosahatchee River. However, Kautz et al. (In Review) determined sufficient lands were available south of the Caloosahatchee River to support a population of 79 to 94 individuals (although all lands are not protected). A high priority for recovery and conservation of the Florida panther is to ensure the survival of the existing breeding population south of the Caloosahatchee River. The Service's goal is to achieve this priority and concurrently identify lands north of the Caloosahatchee River that can be the recipient area for the expansion of the South Florida panther population from south of the Caloosahatchee River to other parts of its historic range. We believe sufficient lands may be found north of the Caloosahatchee River and possibly elsewhere throughout the southeast (Thacher et al. 2003) to, in conjunction with the lands conserved south of the river, support a population of greater than 240 individuals.

In the early 1990s, two plans for the protection of Florida panther habitat in south Florida were developed (Logan et al. 1993; Cox et al. 1994). Both of these plans identified privately owned lands that contained habitats important to the long-term conservation of the Florida panther. Logan et al. (1993) identified specific parcels of land by section, township, and range as Priority 1 and 2 preservation areas. However, this plan has been criticized as being too general (*i.e.*, targeted lands perceived as including too many areas not truly panther habitat [active rock and sand mines]) and for not having been available for public review and comment prior to publication. Cox et al. (1994) identified specific lands based on their habitat features and the likelihood they could support a minimally viable population of panthers for the next 200 years.

The lands identified in each of these planning studies, although referred to in the studies as essential to the survival and recovery of the Florida panther, were intended to be guides for land acquisition planning purposes, because of their inclusion of lands containing urban developments and other lands not considered truly panther habitat (*i.e.*, active rock and sand mines). These land preservation recommendations have been used by Federal, State, and county resource agencies as guides for public land acquisition programs, local land-use planning, and, in a few cases, compensation for land-use conversion projects proposed for lands identified by the plans.

Figure 6 provides a representative view of the land preservation efforts within the southwest Florida landscape that not only benefits the Florida panther, but also provides benefits to the mosaic of other species important to the south Florida ecosystem. Table 2 provides a summary of the targeted and acquired acreages of the Conservation Lands in southwest Florida. Based on the table, total lands targeted for acquisition to date are 3,588,749 acres.

To further refine the land preservation needs of the Florida panther and to specifically develop a landscape-level strategy for the conservation of the Florida panther population in south Florida, the Service, in February 2000, appointed a Florida Panther Subteam. This subteam is part of the overarching MERIT. MERIT includes more than 30 members representing Federal, State and local governmental agencies, the Seminole Tribe of Florida, the Miccosukee Tribe of Indians of Florida, academia, industry, and the private sector, and was created with the purpose of overseeing the implementation of the recovery and restoration tasks identified in the MSRP.

The Florida Panther Subteam was charged with developing a landscape-level strategy for the conservation of the Florida panther population in south Florida. The results of this collaborative effort are partially presented in Kautz et al. (In Review). One of the primary goals of this effort was to identify a strategically located set of lands containing sufficient area and appropriate land cover types to ensure the long-term survival of the Florida panther (Figure 7). Kautz et al. (In Review) focused their efforts on the area south of the Caloosahatchee River, where the reproducing panther population currently exists.

Kautz et al. (In Review) created an updated Florida panther potential habitat model based on the following criteria: (1) forest patches greater than 4.95 acres (2 ha); (2) non-urban cover types within 656 feet (200 m) of forest patches; and (3) exclusion of lands within 984 feet (300 m) of urban areas. The potential habitat map was reviewed in relation to telemetry data, recent satellite imagery (where available), and panther home range polygons. Boundaries were drawn around

lands defined as the Primary Zone (Figure 7), defined as the most important area needed to support a self-sustaining panther population.

Kautz et al. (In Review) referred to these lands as essential; however, as observed in the two previous plans (Logan et al. 1993; Cox et al. 1994), lands within the boundaries of the Primary Zone included some urban areas and other lands not considered to be truly panther habitat (*i.e.*, active rock and sand mines).

The landscape context of areas surrounding the Primary Zone was modeled and results were used to draw boundaries of the Secondary Zone (Figure 7), defined as the area capable of supporting the panther population in the Primary Zone, but where habitat restoration may be needed (Kautz et al. In Review).

Kautz et al. (In Review) also identified, through a least cost path model, the route most likely to be used by panthers dispersing out of south Florida, crossing the Caloosahatchee River, and dispersing into south-central Florida. The lands within the boundaries of the least cost model prediction were defined as the Dispersal Zone (Figure 7). The preservation of lands within this zone is important for the survival and recovery of the Florida panther, as these lands are the dispersal pathways for expansion of the south Florida panther population.

The Primary Zone covers 2,270,590 acres (918,895 ha); the Secondary Zone covers 812,104 acres (328,654 ha); and the Dispersal Zone covers 27,883 acres (11,284 ha); providing a total of 3,110,578 acres (1,258,833 ha) (Kautz et al. In Review). Kautz et al. (In Review) also estimated the present average density, based on telemetry and other occurrence data, to average one panther per 31,923 acres (12,919 ha). Based on this average density, the Primary Zone could support 71 to 84 panthers; the Secondary Zone 8 to 10 panthers without habitat restoration and 25 to 30 panthers with habitat restoration; and the Dispersal Zone 0 panthers. Taken together, the three zones in their current condition apparently have the capacity to support approximately 79 to 94 Florida panthers (Kautz et al. In Review). Kautz et al.'s (In Review) PVA model suggest that a population of 80 to 100 individuals is likely to be stable and, although subject to genetic problems, is likely to survive through 100 years provided the model assumptions are met.

To evaluate the effects of a project such as this one, which involves habitat loss rather than direct taking through killing, on the Florida panther, the Service considers the contribution the project lands provide to the Florida panther, recognizing not all habitats provide the same functional value. Kautz et al. (In Review) also recognized not all habitats provide the same functional value to the Florida panther and developed cost surface values for various habitat types, based on use by dispersing panthers. Habitat types were assigned a cost surface value from 0 to 10, with lower values indicating higher likely use by dispersing Florida panthers. In Kautz et al. (In Review), these values were used in a least-cost base analysis to determine panther usage. The Service chose to evaluate project effects to the Florida panther through a similar process. However, our analysis is the reverse and evaluates habitats from 0 to 10 with low values reflecting low habitat value to the Florida panther. We incorporated many of the same habitat types chosen by Kautz et al. (In Review) with several adjustments to the assigned habitat values reflecting consolidation of similar types of habitats and the inclusion of Everglades Restoration

water treatment and retention areas, as the basis for habitat evaluations and the recommended compensation values to minimize project effects to the Florida panther (Table 3).

In August 2000, the Service, to assist the Corps in assessing project effects to the Florida panther, developed the Florida panther final interim SLOPES (Service 2000). The Florida panther SLOPES provide guidance to the Corps in assessing project effects to the Florida panther, and recommends actions to minimize these effects. The Florida panther SLOPES also include a consultation area map (Figure 4) that identifies an action area where the Service believes land alteration projects may affect the Florida panther. The acreage in the consultation area map (Figure 4) (4,717,152 acres [1,909,031 ha]) includes lands north of the Caloosahatchee, lands within the three zones and “other” lands. The lands in the “other” zone include a mixture of lands, both north and south of the Caloosahatchee River (1,606,640 acres [650,198 ha]), including urban lands.

As stated previously, the Service’s goal for south Florida is to locate and preserve sets of lands containing sufficient area and appropriate land cover types to ensure the long-term survival of a population of 80 to 100 individuals (adults and subadults) south of the Caloosahatchee River. The Service proposes to achieve this goal through land management partnerships with private landowners, through coordination with private landowners during review of development proposals, and through sensitive land management and acquisition programs with Federal, State, local, private, and Tribal partners. The acreages of lands necessary to achieve this goal, based on the average density of 31,923 acres (12,919 ha) per panther is 2,551,851 acres (1,032,720 ha) for 80 panthers or 3,189,813 acres (1,290,900 ha) for 100 panthers.

The acreage of lands within the panther consultation area as defined in the Florida panther SLOPES (Service 2000) (Figure 4) is 4,717,152 acres (1,909,031 ha), understanding that all these lands do not provide the same value to the Florida panther. The combined acreage of lands within the Primary, Dispersal, and Secondary Zones is 3,110,577 acres (1,258,833 ha) (Kautz et al. In Review). With the premise the Service’s goal is to focus habitat conservation in the Primary, Secondary, and Dispersal Zones, the Service believes lands are available within the consultation area to meet the Service’s goal for the Florida panther in south Florida, provided panther habitat fragmentation is discouraged.

Both the 1995 and 1999 recovery objectives for the panther were to achieve three viable, self-sustaining populations within the historic range of the animal. In 2001, a new Florida Panther Recovery Team was appointed to revise the recovery plan. Although preliminary, the revised recovery objectives established in 2004 continue to be to achieve at least three self-sustaining, viable populations of panthers within the historic range. The Panther Subteam recommended that a population of 80 to 100 panthers be maintained since this is the minimum number needed to serve as a stable base for conservation of the panther in south Florida. The Service believes a population of 80 to 100 panthers in south Florida will serve as the founder population for the recovery of the Florida panther throughout its historic range. The panthers in south Florida will be used to further overall recovery goals.

## STATUS OF SPECIES/CRITICAL HABITAT RANGEWIDE – Audubon’s crested caracara

The northern crested caracara (*Caracara cheriway*) (referenced as Audubon’s crested caracara under ESA and Service documents), is a large, boldly patterned raptor in the Falconidae family (Dove and Banks 1999). It is a resident, diurnal, and non-migratory species that occurs in Florida as well as the southwestern United States and Central America. Florida’s population of the crested caracara is found in the prairie area of the south-central region of the State.

Only the Florida population, which is isolated from other populations of the species in the southwestern United States and Central America, is listed under the ESA. Although no management activities have been undertaken for the United States population of this species, draft habitat management guidelines have been developed (subject to revision) that should aid in the caracara’s recovery (Service 2002).

The following sections draw heavily from the species account provided in the MSRP (Service 1999), augmented with more recent updates from Morrison (1999, 2001, 2003), Morrison and Humphrey (2001), and Nemeth and Morrison (2002).

### Species Description

The crested caracara is a large raptor with a crest, naked face, heavy bill, elongate neck, and unusually long legs. It is about 50 to 64 cm long and has a wingspan of 120 cm. The adult is dark brownish black on the crown, wings, back, and lower abdomen. The lower part of the head, throat, upper abdomen, and under tail coverts are white, the breast and upper back are whitish, heavily barred with black. The tail is white with narrow, dark crossbars and a broad, dark terminal band. Prominent white patches are visible near the tips of the wings in flight. The large, white patches in the primaries and the white tail, broadly tipped with black, are both very conspicuous in flight and can be recognized at a long distance (Bent 1961).

Juveniles have a similar color pattern but are brownish and buffy with the breast and upper back streaked instead of barred. Subadults resemble adults but are more brownish in color. Adults have yellow-orange facial skin and yellow legs. Facial skin of juveniles is pinkish in color, and the legs are gray (Layne 1978). Full adult plumage is obtained sometime after 2 years of age (J. Morrison, University of Florida, personal communication, 1997). There is no evidence of sexual dimorphism, the sexes being similar in color and size; however, gender can be determined surgically or through blood analysis (Morrison and Maltbie 1999).

A caracara’s feet and flight behavior are also notable. Their feet are clearly those of a raptor; however, their talons are flatter, enabling caracaras to run and walk more easily than other raptors. Caracaras are terrestrial and often forage by walking for extended periods on the ground (Morrison and Humphrey 2001). Bent (1938) noted the caracara’s flight pattern resembles that of a northern harrier (*Circus cyaneus*), but caracaras fly faster and more gracefully. Caracaras are strong fliers and may reach speeds of 40 miles per hour. They have also been observed soaring in large circles at great heights (Howell 1932).

The crested caracara is a member of the Class Aves, Order Falconiformes, Family Falconidae. It was originally described by John James Audubon (1834), who discovered the caracara on November 21, 1831, and published an account under the name *Polyborus vulgaris*. John Cassin renamed it in 1865 to *Polyborus audubonii*. In 1999, Dove and Banks definitively renamed the species *Caracara cheriway* and eliminated all subspecies classifications. The MSRP (Service 1999) incorrectly refers to the subspecies as *Polyborus plancus audubonii*, having been completed before the article by Dove and Banks (1999) came out. This account employs “the Florida population of *Caracara cheriway*” as the taxonomic identification.

### Life History

Caracaras are resident, diurnal, and non-migratory. Adult caracaras may be found in their home range year-round. Home ranges average approximately 1,200 ha (approximately 3,000 acres), corresponding to a radius of 2 to 3 km (1.2 to 1.9 miles) surrounding the nest site (Morrison and Humphrey 2001). Foraging typically occurs throughout the home range during nesting and non-nesting seasons.

### Habitat

The Florida caracara population historically inhabited native dry or wet prairie areas containing scattered cabbage palms (*Sabal palmetto*), their preferred nesting tree. Scattered saw palmetto, scrub oaks (*Quercus geminata*, *Q. minima*, *Q. pumila*), and cypress also occur within these native communities. Morrison and Humphrey (2001) hypothesize the vegetation structure of open grasslands (short-stature vegetation, scattered shrub cover, and nest trees) may be preferred by caracara, due to its tendency to walk on the ground during foraging activities. The short vegetation structure may directly facilitate foraging by caracara and provide less cover for predators.

Over the last century, many of the native prairie vegetation communities in central and south Florida have been converted to agricultural land uses, and frequently replaced by improved pasture. Morrison and Humphrey (2001) characterized caracara distribution, reproductive activity, and land use patterns within a 21,000-km<sup>2</sup> area in south-central Florida. Comparisons of randomly selected areas and available habitat within the study area revealed caracara home ranges contained higher proportions of improved pasture and lower proportions of forest, woodland, oak scrub, and marsh. Home range size was inversely related to the proportion of improved pasture within the home range. In addition, breeding-area occupancy rate, breeding rates, and nesting success were consistently higher on private ranch lands during the study. Although it is unclear exactly which management activities best promote habitat utilization by caracara, the mowing, burning, and grazing activities associated with improved pastures serve to maintain the short vegetation structure they appear to favor, and scattered cabbage palms are often present to serve as shade for cattle.

Routine observation and radio-telemetry monitoring suggest there are several “gathering areas” in south-central Florida that may be important to caracaras during the first 3 years after leaving their natal territory, before first breeding (Morrison 2001). Relatively large numbers (up to 50)

of caracaras have been observed along the Kissimmee River north of SR 98; south of Old Eagle Island Road in northern Okeechobee County; south of SR 70, west of Fort Pierce; and south of SR 70 in Highlands County, on the Buck Island Ranch, for example. These gathering areas are regularly but not continually used by subadult and non-breeding caracaras and consist of large expanses of improved pasture; however, the particular habitat values of these areas have not yet been evaluated.

### Reproduction

Morrison (1999) reported breeding pairs of caracaras are apparently monogamous, highly territorial, and exhibit fidelity to both their mate and the site. The age at first breeding has been documented as 3 years of age (Nemeth and Morrison 2002).

Details of breeding behavior in the crested caracara have been documented by Morrison (1998, 1999). The initiation of breeding is marked by several behavioral changes, including the pair perching together near the nesting site, preening and allopreening, and sharing food. Caracaras are one of the first of Florida's raptors to begin nesting. Although breeding activity can occur from September through June, the primary breeding season is considered to be November through April. Nest initiation and egg-laying peak from December through February.

Caracaras construct new nests each nesting season, often in the same tree as the previous year. Both males and females participate in nest building. Nests are well concealed and most often found in the tops of cabbage palms (Morrison and Humphrey 2001) although nests have been found in live oaks (*Q. virginiana*), cypress (first record, 1996), Australian pine (*Casuarina* spp.), saw palmetto, and black gum (*Nyssa sylvatica*). Caracaras usually construct their nests 4 to 18 m above the ground; their nests primarily consist of haphazardly woven vines trampled to form a depression (Bent 1938; Sprunt 1954; Humphrey and Morrison 1996). Caracaras vigorously defend their nesting territory during the breeding season (Morrison 2001).

Clutch size is two or three eggs, but most often two. Incubation lasts for about 31 to 33 days (Morrison 1999) and is shared by both sexes. Ordinarily only one brood is raised in a season, but around 10 percent of the population (annually) may raise a second brood. The young fledge at about 7 to 8 weeks of age, and post-fledgling dependency lasts approximately 8 weeks.

### Food Habits

Caracaras are highly opportunistic in their feeding habits, eating carrion and capturing live prey. Their diets include insects and other invertebrates, fish, snakes, turtles, birds, and mammals (Layne 1978). Live prey also include rabbits, young opossums (*Didelphis marsupialis*), rats (*Rattus* spp.), mice, squirrels, frogs, lizards, young alligators, crabs, crayfish, fish, young birds, cattle egrets (*Bubulcus ibis*), beetles, grasshoppers, maggots, and worms (Bent 1961; Layne et al. 1977; Morrison 2001). Scavenging at urban dumps has also been observed (Morrison 2001).

The birds also closely follow mowers in pastures, tractors plowing fields, etc., in order to capitalize on prey that may be exposed. Agricultural drainage ditches, cattle ponds, roadside ditches and other shallow water features also provide good feeding conditions for caracaras (Morrison 2001).

These raptors hunt on the wing, from perches, and on the ground (Service 1989). They will also regularly patrol sections of highway in search of carrion (Palmer 1988). They may be seen feeding on road kills with vultures. However, caracaras are dominant over vultures and may occasionally chase the larger raptor from the road kill (Howell 1932).

#### Localized Movements

Caracaras are resident, diurnal, and non-migratory. Adult caracaras may be found in their home range year-round. Home ranges average approximately 1,200 ha (approximately 3,000 acres), corresponding to a radius of 2 to 3 km (1.2 to 1.9 miles) surrounding the nest site (Morrison and Humphrey 2001). Foraging typically occurs throughout the home range during nesting and non-nesting seasons.

Occasionally large groups of individual caracaras are encountered (Layne 1978). Oberholser (1974) attributes this to the birds' carrion-feeding habit, although Morrison (University of Florida, personal communication, 1996a) has noted that juvenile caracaras are nomadic. This may account for the number of sightings far outside the core area in Glades, Hendry, Okeechobee, Osceola, and Highlands Counties. Occasional sightings have been reported in Polk, Orange, Indian River, St. Lucie, Martin, Palm Beach, Monroe, and Charlotte Counties. Subadult caracaras also use pasture and grassland habitats and gathering areas where relatively large numbers can regularly be seen and are comprised of similar habitats to those found in the natal territory.

#### Relationship to Other Species

There appears to be no migration or genetic exchange between the Florida population and other populations of the northern caracara. Detailed studies on natural predators are lacking; however, crows (*Corvus* spp.) and raccoons have been documented as nest predators (J. Layne, Archbold Biological Station, personal communication, 1996a; J. Morrison, University of Florida, personal communication, 1996b).

#### Status and Distribution

Morrison and Humphrey (2001) stated no data are available on historic abundance, habitat use, or nest distribution by caracara in Florida. The size of Florida's caracara population remains in question. Accurate counts become difficult because of limited access to areas of suitable habitat and because of the bird's behavior and detectability (Humphrey and Morrison 1997). In 1970, Heinzman (1967-1970) published the results of a 4-year road survey, which indicated fewer than 100 individual caracaras at 58 localities remained in Florida. Stevenson (1976) concurred with this estimate in 1974. Layne (1995) monitored caracara distribution and population status in

Florida from 1972 to 1989. Based on roadside surveys, he estimated the population was stable with a minimum of about 300 adults in 150 territories. The immature population was estimated to be between 100 and 200 individuals, bringing the total statewide population to between 400 and 500 birds. However, given continued landscape change in areas where caracaras have been known to occur, and the fact that not all the probable breeding range has been adequately surveyed for breeding pairs, estimating this population's size remains difficult.

### Habitat Threats

The caracara's perceived decline, as described in historic literature, is attributed primarily due to habitat loss (Layne 1996b). This perceived decline and the geographic isolation of the Florida population eventually resulted in the caracara's listing as threatened in 1987 (52 FR 25232). In particular, the caracara was listed as threatened because its primary habitat, dry prairie, had been destroyed or modified for agriculture and residential development. It was also listed because existing regulatory mechanisms did not adequately prevent the destruction or modification of the caracara's habitat, which is mainly located on private land.

The only known Federal property that supports caracaras is Avon Park Air Force Range (AFR) in Polk and Highlands Counties. In recent years, nesting on Avon Park AFR has been limited to only one nesting pair (J. Morrison, University of Florida, personal communication, 1996a). As emphasized by Morrison and Humphrey (2001), private lands dedicated to cattle ranching possess high conservation value for caracara in Florida.

### Habitat Management

To date, no active conservation measures have been undertaken for this species in Florida. Management activities are also lacking throughout its range. Avon Park AFR has conducted caracara surveys in the past. This contract allowed a biologist to perform research activities both on the AFR and in the surrounding region. In biological opinions and informal consultations over the last decade, the Service has endeavored to better address effects to the caracara through recommendations to: set aside home ranges, allow research and monitoring, perform surveys, avoid work during the nesting season, and formulate a management plan for protection of the resident pair. Proposed development projects evaluated by the Service for their effect on the caracara have included the conversion of pasture to citrus, an FDOT road improvement project, and the construction of a juvenile detention center.

Caracaras appear to benefit from prescribed burning, plowing, and mowing. These activities reduce available cover and may facilitate the observation and capture of prey. In addition, regular mowing, burning, and high-density grazing maintain low vegetative structure, an important habitat characteristic of the caracara's nest stand area (Morrison and Humphrey 2001). These field observations are consistent with the home range compositional analyses that indicate non-random selection of improved and semi-improved pasture land use. Draft habitat management guidelines similar to those in place for the bald eagle (*Haliaeetus leucocephalus*) have been developed for State and Federal agencies (Morrison 2001, Service 2002). The Draft Habitat Management Guidelines for the Bald Eagle in the Southeastern Region (Service 1987)

has been useful in providing guidance for preserving bald eagle nest sites in areas subject to development pressure.

### Mortality, Trauma, and Disturbance

In addition to presumed population declines related to habitat loss, direct human-caused mortality may also be a factor to be considered in the recovery of the species. In the past, large numbers of caracaras were killed in vulture traps (Service 1989). Individuals may also be caught in leg-hold traps used to control mammalian predators (Morrison 1996c). Road mortalities are a significant cause of caracara decline; Morrison (2003) identifies highway mortalities as a major cause of juvenile mortalities with young birds especially vulnerable within the first 6 months of fledging.

The Florida population of caracaras is isolated and habitat-specific. Therefore, it may be susceptible to environmental catastrophes and potentially reduced reproductive rates because of demographic accidents such as skewed sex ratios or disproportionate age-related mortality. Low numbers may also reduce the genetic viability through loss of heterozygosity, thereby increasing vulnerability to environmental stresses. The location of many of the occupied territories on private land, and the inaccessibility of these territories to surveyors, makes it difficult to census the caracara and detect changes in its population size and distribution. This difficulty increases the possibility of not detecting a population decline that could result in extinction.

The major threat to this population remains habitat loss. Large areas of native prairie and pasture lands have been lost in south-central Florida to citrus operations, tree farms, other forms of agriculture, and real estate development and this loss has accelerated in the past few decades (Morrison and Humphrey 2001). However, it is also true that historical conversion of forested habitats to pasture have not been adequately documented as partially offsetting losses to caracara habitat, so a full accounting of historic habitat changes is lacking. The current threat of habitat loss persists as changes in land use continue. Florida's burgeoning human population has also 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 this type of mortality.

Cattle ranching and extensive pastures appear to be compatible with, and may promote, caracara survival. The number of territories occurring in improved or unimproved pasture can be expected to increase if sufficiently large overgrown pastures are reclaimed and/or new pastures are created from other agricultural land uses. The conversion of pasture to citrus (Cox et al. 1994), sugarcane, and residential development is cause for concern. Morrison and Humphrey (2001) found improved pasture constitutes the highest percentage of habitat cover type found within the home ranges of breeding caracaras. Recognizing the conservation value of cattle ranches and enlisting landowner cooperation in the preservation and management of these lands are critical elements in recovery of Florida's caracara population.

## Recovery Plan Objectives

Several recovery plan objectives outlined for the crested caracara in the MSRP (Service 1999) can be addressed in part by activities related to the proposed action. The action occurs within the Collier County RLSA, an innovative comprehensive planning program whereby lands are scored on natural resource factors such as land cover, listed species occurrences, major flow-ways, etc. Lands scoring above a specified threshold value cannot be developed, while lands scoring below that specified threshold may be potentially utilized for future development. Development activities can be entitled only by the voluntary surrender of specified land use rights on any lands within the RLSA (“SSA”), and such lands tend to be areas where the natural resource scores are higher than average. Large contiguous areas of eastern Collier County have been designated as Flowway Stewardship Areas and Habitat Stewardship Areas to protect hydrologic and biological resources.

The net effect of the Collier County RLSA program is that development occurs where the natural resource scores are below a certain threshold, and environmental protection tends to occur in areas with overall natural resource scores that are above the threshold value. These SSA typically contain a variety of resources, thereby benefiting a variety of species. Because landowners receive development credits for finding listed species on lands that they dedicate for protection, the program has already resulted in the identification of several confirmed and probable caracara home ranges in eastern Collier County. Notably, the program creates incentives for the retention of agricultural land uses, which are often overlooked in other planning and conservation programs. Incentives to retain agricultural land uses (especially cattle ranching) facilitate the major element in caracara conservation, which is habitat preservation (Morrison and Humphrey 2001).

Under the heading “species-level recovery actions” (MSRP, page 4-229), item S.1 describes the determination of caracara distribution, status, and abundance. Item S.1.2 describes Collier County as a “formerly inhabited area” for caracara. The Breeding Bird Atlas maintained by the FWC reported one confirmed instance of caracara breeding on the eastern Collier County boundary, one probable breeding, and one possible breeding in the period 1986 to 1991. No other data had been available since 1991. However, the recent confirmation of two breeding pairs in Collier County and other scattered sightings may simply indicate that better distributional information is now becoming available.

The applicant thoroughly surveyed for caracara in and around the proposed action area, and in February 2004 identified a caracara nest tree, an adult pair, and two caracara fledglings just east of the project boundary. Since that time, the applicant has sought verifiable information on caracaras from other landowners and land managers within the Collier County RLSA. To date, another confirmed breeding pair and two juveniles have been identified 1 to 2 miles northwest of Lake Trafford, one or more caracaras have been observed at SR 29 just north of BCNP, and caracaras have been observed west of the Florida Panther NWR. More efforts are needed to determine if the latter two observations constitute breeding pairs or if they represent nomadic individuals.

The confirmed breeding observations extend the known caracara breeding range over 10 miles in eastern Collier County, and individual caracara observations suggest that the extent of occupied areas may be larger. These observations also confirm the promise of the RLSA program, where landowners are actively reporting the presence of listed species like caracara because it enhances, not diminishes, their land value for being good stewards. The RLSA specifically facilitates species-level recovery action 2.1.2 (MSRP page 4-230), encouraging landowners to protect caracara nest sites by providing incentives in the form of development credits that can be applied elsewhere within the RLSA. Other action items regarding caracara colonization and reintroduction in eastern Collier County may or may not be necessary depending upon territory occupancy and available habitats.

Under the MSRP habitat-level recovery actions, the RLSA program facilitates action item 1.1.2, which encourages “use of conservation easements and other non fee-title ownership options to maintain habitat” (MSRP page 4-233). The RLSA program requires legally binding Stewardship Easements that permanently restrict specified land uses on the subject property. Perpetual maintenance of suitable pasture, dry prairie, and/or wet prairie habitats can be added as special conditions that qualify the landowners for additional program credits, addressing recovery action item H.1.1.4 for maintaining and enhancing caracara habitats (MSRP page 4-233). The potential also exists within the RLSA program to advance recovery action item H2, the creation, restoration, or expansion of occupied habitat wherever possible (MSRP page 4-234). The program provides strong incentives (in the form of development credits) for landowners to consider habitat creation and/or restoration activities in support of listed species conservation, while directing development to more environmentally suitable areas within the RLSA.

#### ENVIRONMENTAL BASELINE – Florida Panther

The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions, which occur simultaneously with the consultation in progress.

#### Status of the Species within the Action Area

As stated previously, for the purposes of this consultation, the action area includes the Corps’ project area, the maximum potential DRI footprint, and surrounding lands frequently visited by panthers. The action area is a subset of the current geographic range of the panther and includes those lands the Service believes may experience direct and indirect effects from the proposed DRI development. Therefore, for both direct and indirect effects, the action area is defined as all lands within a 25-mile radius of the project. This action area does not include urban lands, lands west of I-75, and lands outside of the Service’s panther consultation area. The proposed action may have direct and indirect effects on the ability of panthers to breed, feed, find shelter, and disperse within the population.

The Service used current and historical radio-telemetry data, information on habitat quality, prey base, and evidence of uncollared panthers to evaluate panther use in the action area. Panther telemetry data are collected 3 days per week from fixed-wing aircraft, usually in early to midmorning. However, researchers have shown panthers are most active between dusk and dawn (Maehr et al. 1999a; Beier 1995) and are typically at rest in dense ground cover during daytime monitoring flights (Land 1994). Therefore, telemetry locations may present an incomplete picture of panther activity patterns and habitat use (Comiskey et al. 2002). In addition, telemetry data alone may be misleading since less than half the panther population is currently monitored.

Although telemetry data may not provide a complete picture of panther activity patterns, telemetry locations are a good indicator, due to the extensive data set, of the approximate boundaries of home ranges, and the range of Florida panthers south of the Caloosahatchee River. The FWC also uses telemetry data to assess the yearly breeding activity of radio-collared panthers. Female panthers accompanied by kittens or male panthers within close proximity of an adult female were assumed to have engaged in breeding activity during that year. Documentation by McBride (FWC 2003) shows between July 2002 and June 2003, 12 collared panthers, 4 uncollared females, and 3 uncollared males had home ranges in or home ranges that overlapped the same survey unit as the Ave Maria DRI project. In addition, eight other panthers that used this survey unit previously died during this time period (FWC 2003). This unit, designated as Unit 5, includes the Florida Panther NWR, Corkscrew Swamp Sanctuary, and CREW.

Within the action area, the 25-mile radius, 15 radio-collared panthers have overlapping known home ranges (Figure 8). These panthers are FP 59 (male), FP 60 (male), FP 65 (male), FP 71 (female), FP 75 (female), FP 79 (male), FP 70 (female), FP 83 (female), FP 93 (female), FP 100 (male), FP 101 (female), FP 117 (male), FP 127 (male), FP 132 (male), and FP 131 (male). In addition, McBride (2003) notes previous use of the action area by other panthers prior to their mortality. According to telemetry data, no radio-collared panthers have been recorded within 1 mile of the site within the past 12 years. The occurrence of uncollared panthers onsite is unknown.

The project site is located within the geographic range of the panther in Florida. There have been numerous panthers recorded within 5 miles of the project site from 1989 through 2004. The large number of panthers is primarily attributable to lands with native habitats south of the project site and south of Oil Well Road that are contiguous with the Florida Panther NWR. The Service believes the project site may occasionally be used by panthers because it contains habitat types deemed capable of use by panthers and their prey and the project vicinity has been used historically by panthers as indicated by telemetry locations over a 14-year period.

Past and ongoing Federal and State actions affecting panther habitat in the action area include the issuance of Corps permits and State of Florida Environmental Resource Permits authorizing the filling of wetlands for development projects and other purposes. Since 1982, the Corps and the State have had a joint wetland permit application process, where all permit applications submitted to the State are copied to the Corps and vice versa. Within the 25-mile action area, the

Service, since January 14, 1992, has formally consulted on 26 projects regarding the panther that were a result of Federal actions (database entries for formal consultations prior to 1992 are incomplete for projects in the action area). These projects have impacted or are expected to impact approximately 25,575 acres of panther habitat. These projects have also incorporated a total of 15,249 acres of preservation and restoration of panther habitat. The impacted lands generally are: (1) on the western fringe of occupied panther habitat; (2) vegetated with dense stands of exotic species, which may adversely affect the density of the panther prey base; and/or (3) support agricultural enterprises, *i.e.*, row crops, citrus, etc., which provide a lower quality habitat value to the Florida panther. The preserved lands, which are generally proximate to larger tracts of Federal, State, and other preserves, provide a higher quality habitat value for the Florida panther. The Service has determined in the biological opinions issued for these Federal actions, that individually and cumulatively these projects do not jeopardize the survival and recovery of the Florida panther.

From July 2000 through September 2004, the Service also engaged in informal consultation within the Florida panther consultation area with the Corps for approximately 314 projects affecting approximately 420 acres in Collier County (primarily Northern Golden Gate Estates [Figure 9]) and 26 acres in Lee County (primarily Lehigh Acres [Figure 10]) (database entries for informal consultations prior to 1992 are incomplete for projects in the consultation area). Almost all of these projects involved the construction of single-family residences in partially developed areas, each involving less than an acre of direct impact. Although panthers have been known to cross these areas to other parts of their range, prey base and denning utilization of these areas have been affected by the level of development and the additions of these residences is not expected to significantly further impact these habitat functions. For these actions, the Service concurred with the Corps' determination of "may affect, but is not likely to adversely affect" for these individual projects. These projects have been incorporated into the Service's environmental baseline for the Florida panther and the Service has determined that individually and cumulatively these projects do not jeopardize the survival and recovery of the Florida panther.

We have received information that within the action area, the Corps has, between April 1, 2004, and September 30, 2004, issued non-jurisdictional wetland determinations (isolated wetlands) for three projects, totaling 1,039.6 acres in Collier County, and for four projects, totaling 226 acres in Lee County. These additional determinations were issued per jurisdictional guidance provided recently in the Supreme Court decision, Solid Waste Agency of Northern Cook County vs. U.S. Army Corps of Engineers, 531 U.S. 159 (2001); and therefore, they will require no Federal Clean Water Act 404 wetland permit. These projects have been incorporated in the Service's environmental baseline for the Florida panther in this biological opinion and the Service has determined, based on the location of these projects (generally in the western fringe of the panther's geographic range), the quality of the habitat present on these project sites, and the overall status of the Florida panther that these projects individually and cumulatively do not jeopardize the survival and recovery of the Florida panther. However, since loss of panther foraging habitat may occur from construction of these projects and no Corps wetland permit is required, the Service is requesting the applicant pursue Habitat Conservation Plans in cooperation with the Service.

Panther mortality related to traffic within the 25-mile action area from 1979 through August 2004 totals 38 documented panther-vehicle mortalities (see Table 4 and Figure 11). Two recent road mortalities are east of the project area on CR 846, the location of which is being evaluated for construction of a panther crossing (FWC 2003) and proposed as SSA3/SSA4 compensation lands by this project. In addition, Collier County, in cooperation with the National Wildlife Federation and the Florida Wildlife Federation, is coordinating a study of the segment of CR 846 east of Immokalee by Dr. Reed Noss and Dr. Daniel Smith to determine the optimum location for wildlife crossing construction (WilsonMiller, electronic mail, 2005).

Activities within the action area have also benefited panthers. The issuance of Corps and State of Florida Environmental Resource Permits has preserved 15,141 acres of high quality panther habitat for permitted impacts to 25,575 acres of poor quality panther habitat. Additional benefits have resulted from the acquisition of high quality habitat through acquisition programs by the other Federal, State, and county resource agencies. Table 5 provides a summary of the State and county acquisitions within the last 5 years.

Moreover, the management of public lands, including prescribed fire and eradication of exotic vegetation in the Picayune Strand State Forest, Fakahatchee Strand State Preserve, Florida Panther NWR, ENP, and other conservation areas, is intended to improve habitat for panther prey species, which benefits panthers within these areas. Installation of several wildlife crossings under SR 29 within the action area has also benefited the panther by protecting habitat connectivity and eliminating panther-vehicle collision mortalities.

#### Factors Affecting Species Environment within the Action Area

Factors that affect the species environment (positive and negative) within the action area include, but are not limited to, highway, urban, agriculture, resource extraction, public lands management (prescribed fire, public use, exotic eradication, etc.), hydrological restoration projects, public and private land protection efforts, effects of genetic inbreeding, and genetic restoration. Development activities may result in avoidance or limited use of remaining suitable habitat by panthers as well as habitat loss, habitat fragmentation, habitat degradation, and also an increase in risk of vehicular collision (*e.g.*, injury or death).

Public and private land management practices can have a positive, neutral, or negative effect depending on the management goals. Land protection efforts will help to stabilize the extant population. Hunting of the panther is no longer sanctioned, although there still may be instances of intentional or unintentional shooting of individuals for various reasons.

#### ENVIRONMENTAL BASELINE – Audubon’s Crested Caracara

The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7

consultation, and the impact of State or private actions, which occur simultaneously with the consultation in progress.

#### Status of the Species within the Action Area

Until early 2004, the status of the crested caracara within Collier County was exemplified by the MSRP species account (Service 1999), which considered Collier County to be formerly occupied range. Published maps of the caracara breeding range (Figure 12) depicted the southern terminus of the range at the county boundary (*e.g.*, Morrison 2001). However, as a direct result of implementing of the RLSA program, caracara breeding has been confirmed at two distinct sites within the county, and reliable anecdotal reports of sustained caracara presence within the RLSA have been noted.

For the purposes of this consultation, the action area for caracara encompasses the project area included in the DRI and surrounding lands within the 196,000-acre Collier County (RLSA) (Figure 1B). The action area is effectively an extension of the caracara's documented current geographic range, and includes those lands the Service believes may experience direct and indirect effects from the proposed development. This action area does not include urban lands, lands outside the RLSA, or publicly owned lands (*e.g.*, Florida Panther NWR, BCNP, etc.) adjacent to the RLSA.

This action area definition is supported by several objective facts: (1) the confirmed and probable caracara breeding activity in Collier County occurs within this area; (2) the proposed action occurs near the center of this area; (3) most of the suitable caracara habitat within eastern Collier County occurs within this area; and (4) the RLSA program provides a mechanism for protecting the agricultural land uses (cattle ranches, pastures) that serve as the major habitat for caracara.

Data on the current status of caracara in Collier County are limited. As noted previously, a nest tree was documented adjacent to the project site during the 2003-2004 nesting season, and an adult pair and one juvenile were still observed there as of November 2004. The adult pair moved to a new nest tree just within the project boundary as of January 2005 and displayed breeding behaviors, while the juvenile has apparently left the adults. Another breeding pair and two juveniles have been documented 1 to 2 miles northwest of Lake Trafford. At least one caracara has been observed repeatedly at SR 29 just north of BCNP, and caracaras have been observed west of the Florida Panther NWR. Although sightings of additional individual caracaras are not proof of breeding or inhabited territory, they are encouraging for caracara recovery and warrant further study.

#### Factors Affecting Species Environment within the Action Area

Past and ongoing Federal and State actions potentially affecting caracara in the action area include the limited issuance of Corps 404 Individual Permits, the use of Corps Nationwide Permits, and State of Florida Environmental Resource Permits authorizing the filling of wetlands for agricultural projects and other purposes. Historically, most of the environmental changes

within the action area resulted from the conversion of native vegetation to agricultural land uses from the 1940s through the 1980s. Since the mid-1980s, activities authorized through State and Federal permitting have predominantly been associated with the construction and modification of agricultural infrastructure such as canals, berms, farm roads, agricultural stormwater retention areas, etc.

#### EFFECTS OF THE ACTION – Florida Panther

This section analyzes the direct and indirect effects of the DRI project and interrelated and independent actions on the Florida panther and Florida panther habitat.

##### Factors to be Considered

Residential, commercial, and industrial development projects may have a number of direct and indirect effects on the Florida panther and panther habitat. Direct impacts which are primarily habitat based may include: (1) the permanent loss and fragmentation of panther habitat; (2) the permanent loss and fragmentation of habitat that supports panther prey; (3) the loss of available habitat for foraging, breeding, and dispersing panthers; and (4) a reduction in the geographic distribution of the species. Indirect effects may include: (1) an increased risk of roadway mortality to panthers traversing the area due to the increase in vehicular traffic; (2) increased disturbance to panthers in the project vicinity due to human activities; (3) the reduction in panther prey; (4) the reduction in value of panther habitat adjacent to the project due to habitat fragmentation; and (5) a potential increase in intraspecific aggression between panthers (and an increase in mortality of subadult male panthers) due to reduction of the geographic range of the panther. These indirect effects are habitat based, with the exception of vehicular mortality, which could result in lethal “take.” Intraspecific aggression, though habitat based, could also result in lethal “take.” However, based on our analysis (see below), neither vehicular mortality nor mortality through intraspecific aggression are likely to occur as a result of this project.

This project site is adjacent to vegetated panther habitat along its western perimeter (Camp Keais Strand system) and is located within the geographic range of the Florida panther. The vegetation of Camp Keais Strand is comprised mainly of flowway wetlands with limited native vegetation uplands within or adjacent to the project site. Marginal panther habitat, primarily in the form of large-scale agricultural fields and sod farm areas, comprises the majority of the DRI project site. Panthers may be found on and adjacent to the proposed construction footprint year-round. The project will be constructed in a series of potentially disruptive events, and result in permanent loss and alteration of agricultural field and sod farm habitats on the project site. The project site is currently in active agricultural use and only minor additional land clearing is proposed by the project. The time required to complete construction of the project is not specifically known, but is anticipated to occur over a several-year period. The disturbance associated with the project will be permanent and result in a direct loss of marginal, low quality habitat currently available to the panther.

## Analyses for Effects of the Action

Approximately 2,125 acres of the Town of Ave Maria DRI project are agricultural lands located within the Primary Zone (Kautz et al. In Review), and is located inside the panther consultation area as defined by the Service (2000). The Primary Zone designation in this area was designed to capture the native vegetation of Camp Keais Strand plus a generally prescribed offset of 200 m from forested patches > 2 ha. The 200-m offset was used in deriving the Primary Zone principally based in recognition of spatial errors of up to 200 m between recorded and tested telemetry data. The balance, or 2,870 acres, of the project site is generally included within the Secondary Zone (Kautz et al. In Review).

The minor onsite native vegetation areas are currently permitted and utilized as water retention areas by the existing agricultural operations. The project may result in a maximum conversion of approximately 234 acres (5 percent of the project site) of native vegetation and approximately 1,891 acres of agricultural lands in the Primary Zone onsite into development and university use. The project may also result in a maximum conversion of approximately 2,727 acres of agricultural areas and approximately 143 acres (3 percent of the project site) of native vegetation in the Secondary Zone into development and university use. Compensation for the loss of 4,995 acres of this marginal panther habitat will be through the preservation of 7,285 acres (SSA1, SSA2, SSA3, SSA4, and SSA6 compensation lands) of high quality panther habitat in the Primary Zone (Kautz et al. In Review), within the action area defined by a 25-mile radius from the project. The SSA1 and SSA2 compensation lands are part of the Camp Keais Strand system that could be restored as a regional wildlife corridor. The SSA3 and SSA4 compensation lands are part of the Okaloacoochee Slough system and were part of the home range of two radio-collared panthers during the 2002-2003 reporting period. The SSA6 compensation lands are adjacent and contiguous to the existing Florida Panther NWR and were part of the documented home range of two radio-collared panthers during the same report period. Preservation will be accomplished through a Federal conservation easement in perpetuity.

Habitat Assessment: The Service, in coordination with the applicant, agreed to evaluate the project's effects to the Florida panther through a habitat assessment methodology similar to the process referenced in Kautz et al. (In Review). However, our analysis is the reverse and evaluates habitats from 0 to 10 with low scores reflecting low habitat value to the Florida panther (Table 3). The habitat suitability scores as developed by the Service incorporate a direct calculation per acre with a base ratio (2.5) multiplier to compensate for unavoidable project effects to the Florida panther.

The base ratio is determined from the habitat acreage needs of a population of 90 panthers, which is the mid-point in Kautz et al.'s (In Review) PVA model predictions that a population of 80 to 100 panthers is likely to be stable, although subject to genetic problems, through 100 years. The Service, based on the average panther home range size of 31,923 acres, (Kautz et al. In Review), determined 2,871,894 acres of Primary Zone equivalent lands need to be protected and managed. The available non-urban Primary Zone equivalent lands in the core area (Figure 13) are estimated at 3,272,493 acres (actual acreage is 4,486,364 acres), with 2,094,988 acres of Primary Zone equivalent lands (actual acreage is 2,605,046 acres) of

non-urban lands preserved. The remaining non-urban private lands are estimated at 1,177,506 acres of Primary Zone equivalent lands (actual acreage is 1,881,318 acres). To meet the protected and managed lands goal, an additional 776,906 acres of Primary Zone equivalent lands need to be secured, leaving approximately 400,600 acres of Primary Zone equivalent non-urban lands at risk (1,177,506 minus 776,906 equals 400,600). A base ratio of 1.94 (rounded to 2) is necessary to achieve this goal. However, not all lands provide the same functional value to the Florida panther and not all lands will be subject to Service consultation reviews. Therefore, to provide a margin of conservatism in the Service's assessment goal to protect and manage lands for the Florida panther, an additional 0.5 was added to the ratio of 2.0, providing a base ratio of 2.5. The Service intends to reevaluate this base ratio periodically (every 2 to 3 years) and adjust as needed to achieve the Service's conservation goal for the Florida panther.

The Service also believes a landscape multiplier is necessary to compensate for landscape location and importance of project lands in the consultation area to the Florida panther. For example, as discussed previously, lands in the Other Zone provide less functional value to the Florida panther than lands in the Primary Zone. The Service is applying landscape multipliers of 0.33 where the loss of Other Zone lands is being compensated for in the Primary Zone, 0.5 for loss in Other Zone lands when compensation is in the Secondary Zone, 0.67 for loss of Secondary Zone lands when compensation is in the Primary Zone, and 1.5 for loss of Primary Zone lands when compensation is in the Secondary Zone.

For the Ave Maria DRI project, which is in both Secondary and Primary Zones, with compensation in the Primary Zone, the habitat functional value for the project site is 22,632 panther habitats units (PHU) (13,872 in Secondary and 8,760 in Primary), which is based on the acres of each type of habitat multiplied by the habitat value (Tables 6a, 6b, 6c, and 6d) and assumes all of the 4,995 acres of the project lands are lost. To determine the compensation needs for the project, the habitat value is multiplied by the base ratio of 2.5, then by the landscape multipliers of 0.667 for that area within the Secondary Zone and 1.0 for that area within the Primary Zone. The resulting sum indicates a compensation need of 45,136 PHUs [(13,872 x 2.5 x 0.667) + (8,760 x 2.5 x 1.0)]. The functional value of the compensation site is determined in the same manner, *i.e.*, the acres of each type of habitat multiplied by the habitat value. In this instance, the acres of habitat types for SSA1, SSA2, SSA3, SSA4, and SSA6 compensation lands are multiplied by the existing habitat value (Tables 6b, 6c, and 6d). The resultants are then summed to indicate a total compensation sites value of 58,134 PHUs (7,614 + 32,772 + 17,748) from the 7,285 acres of compensation lands.

Based on these functional comparisons, the Service believes the habitat values lost by the proposed development will be more than offset by the preservation and compensation actions proposed by the applicant. Although the lands proposed for development fall within the Primary and Secondary Zones, these lands: (1) have not had a telemetry point occurrence within 1 mile of the site in 12 years; (2) are primarily comprised of cropland; and (3) are bordered on the north by cropland, on the south by cropland and Oil Well Road, and on the east by Camp Keais Road and extensive citrus lands. The lands proposed for preservation include lands within a regional wetland system (SSA1 and SSA2) identified by the State for special consideration (CREW) and

could become part of future efforts to reestablish the Camp Keais Strand system as a wildlife corridor. Proposed compensation lands within the Okaloacoochee Slough system (SSA3 and SSA4) are within a recognized area of existing panther activity and corridor travel. Protection of the SSA3 and SSA4 lands will facilitate the State support of wildlife crossing construction on a portion of SR 846 where panther collisions have been an ongoing problem. In addition, compensation is proposed (SSA6 compensation lands) on lands abutting the existing Florida Panther NWR. All compensation lands proposed for preservation provide high value habitat for the panther, are in the Primary Zone, and are consistent with the Service's panther conservation goal to strategically locate and preserve sets of lands containing sufficient area and appropriate land cover types to ensure the long-term survival of the Florida panther population south of the Caloosahatchee River.

Wildlife Assessment: As discussed previously, white-tailed deer densities and other prey species are influenced by the quality of the foraging habitat present in an area. Monotypic stands of poor quality foraging plant species and the invasion of a site by exotic plants provide lower habitat foraging values and affect the utilization by and density of foraging species. The habitats in the project area have experienced similar vegetation changes. Historical vegetation on the property included a mosaic of upland and wetland habitats that provided a seasonal pattern of plant growth. However, past and current agricultural practices have resulted in loss of quality forage for resident deer populations. The agricultural practices at the project site involve raised-bed agriculture and sod farming. The climate, soil, and hydrologic conditions at the site allow multiple crops to be planted and harvested through 9 months of the year. The rapid and multiple cycles of leveling fields, adjusting beds, planting and staking plants, and harvesting each year occur over a several square-mile area in the general region of the project site. As a result, forage for deer, either low or high quality, is not available outside the adjacent Camp Keais Strand system. This fact is borne out by the relatively low occurrence of either deer or feral hog sign on the project site. A series of protected species surveys were conducted on the proposed DRI project site by WilsonMiller in 2003 and 2004. Opportunistic foraging by wading birds in various ditches was noted and a nesting pair of caracara was identified approximately 150 linear feet outside the project's northeast boundary. Subsequent observations of the caracara indicate the pair relocated their nesting site approximately 500 feet to the north, along the project sites northeast boundary, at the beginning of the 2004-2005 nesting season. Minimal evidence of feral hog or deer usage of the agricultural areas was observed on the project site, while some deer and feral hog sign was observed further off-site into the adjacent Camp Keais Strand system.

The proposed compensation sites, and SSA3, SSA4, and SSA6 in particular, with their existing mosaic of uplands, pastures, and wetlands, provide a diverse combination of plant species capable of supporting deer foraging as well as feral hog use.

Conservation Measures: The beneficial effects of the project include the preservation of 7,285 acres of Primary Zone panther habitat within the action area. Although the project will result in a net loss in the number of acres of habitat, the value of lost habitat is limited for the panther and the habitat quality provided to the Florida panther through preservation of SSA1, SSA2, SSA3, SSA4, and SSA6 compensation lands is superior to that of the areas to be impacted. The preservation of SSA3 and SSA4 lands is anticipated to facilitate the siting and

construction of needed wildlife crossings and directional fencing along a portion of SR 846 where numerous panther collisions have been documented. SSA6 compensation lands will effectively extend panther preservation lands northward from the existing Florida Panther NWR by 2,000 acres. The SSA3 and SSA4 compensation lands are part of the documented home range of Florida panthers FP 132 and FP 65. The SSA6 compensation lands are part of the documented home range of Florida panthers FP 59 and FP 131. Lands preserved will be protected by conservation easement granted to the Federal government in perpetuity. The compensation sites, SSA3, SSA4, and SSA6 compensation lands in particular, are valuable areas for breeding, foraging, and dispersal habitat important to panthers. In comparison, no radio-collared panthers have been recorded within 1 mile of the project site in over 12 years and the project site data do not indicate use as a movement corridor. Although the occurrence of uncollared panthers is unknown.

### Direct Effects

Direct effects are those effects caused by the proposed action at the time of construction, are primarily habitat based, are reasonably certain to occur, and include: (1) the permanent loss and fragmentation of panther habitat; (2) the permanent loss and fragmentation of habitat that supports panther prey; (3) the loss of available habitat for foraging, breeding, and dispersing panthers; and (4) a reduction in the geographic distribution of the species. Panthers may also be subject to harassment by construction activities. The direct effects this project will have on the Florida panther within the action area are discussed below.

Permanent Loss of Habitat: The project will result in the loss of 4,995 acres of panther habitat located within the Primary and Secondary Zones. The land will be converted to support a university, a defined town center, and residential community. Habitat quality is generally poor, as it is primarily cropland and sod farm. Prey surveys did not document significant site usage by white-tailed deer or feral hog, primary panther prey species. Therefore, we believe the loss of the habitat associated with the project is not significant and this action is not expected to result in jeopardy to or a significant reduction in the geographic distribution of the Florida panther.

Fragmentation of Habitat: The project site, as well as the adjacent Camp Keais Strand wetland system, has not been documented to serve as a panther connection or dispersal corridor, most likely due to the extent and intensity of agricultural operations on both sides of Camp Keais Strand and the significant absence of native upland vegetation in the area. Therefore, fragmentation of panther habitat is not expected to result from project implementation. The project site is also bordered on the north, east, and south by intensively utilized agricultural lands which provide marginal quality foraging habitat for prey species; therefore fragmentation of panther prey species habitat is not expected.

Construction: The construction for this project is anticipated to occur in phases and over several years. There are no known den sites within the project boundaries and the quality and quantity of the foraging prey base is low. Therefore, we believe panther usage of the property is limited and we do not believe project construction will result in direct panther mortality.

Compensation: The Service believes the habitat values lost by the development will be offset by the preservation and compensation actions proposed by the applicant. The lands proposed for development are primarily improved cropland and sod farms with significantly reduced opportunity for use by panther for denning, prey support, or stalking. The 7,285 acres of lands proposed for preservation are consistent with the Service's panther conservation goal to locate and preserve sets of lands containing sufficient area and appropriate cover types to ensure the long-term survival of the Florida panther south of the Caloosahatchee River.

#### Interrelated and Interdependent Actions

An interrelated activity is an activity that is part of the proposed action and depends on the proposed action for its justification. An interdependent activity is an activity that has no independent utility apart from the action under consultation. This biological opinion is based on the maximum potential footprint of the proposed Town of Ave Maria DRI as proposed in the project's July 2004 DRI Application to the State/RPC/local government and dictated by the applicable portions of Collier County's Comprehensive Plan for the Rural Lands Stewardship Overlay. No further interrelated or interdependent actions are expected to result from the project.

#### Indirect Effects

Indirect effects are those effects that result from the proposed action and are reasonably certain to occur. The indirect effects this project will have on the Florida panther within the action area are discussed below and in the assessment of functional habitat values previously discussed. They include: (1) an increased risk of roadway mortality to panthers traversing the area due to the increase in vehicular traffic; (2) increased disturbance to panthers in the project vicinity due to human activities; (3) the reduction in panther prey; (4) the reduction in value of panther habitat adjacent to the project due to habitat fragmentation; and (5) a potential increase of intraspecific aggression between panthers due to reduction of the geographic range of the panther.

Roadway Mortality: The project will result in increased vehicular traffic in the project vicinity during construction and following development. According to traffic studies provided as part of the Town Of Ave Maria DRI application document, long-term, vehicular traffic on the 11-mile segment of CR 858/Oil Well Road between the project and Naples, to the west, is projected to increase. Of the 11 miles of affected Oil Well Road, 6 miles are within the North Golden Gate Estates area evaluated below under the Cumulative Affects-Florida Panther section (also see Figure 9). Where Oil Well Road connects to Immokalee Road and westward towards Naples, significant background traffic volumes exist and the project is not anticipated to significantly impact existing traffic levels on a percentage basis. Vehicular mortality data (see Table 4 and Figure 11) provided by the FWC indicate collisions with motor vehicles have not been documented along the affected segment of roadway (Oil Well Road west of Camp Keais Road). Sufficient data do not exist to determine with certainty if the lack of vehicular/panther collisions along the relevant portion of Oil Well Road to date is due to levels of existing traffic volumes, low utilization of the area by panther, or a combination of both. Lands south of Oil Well Road

contain a mosaic of higher quality panther habitat and support consistent usage by panthers as evidenced by sustained high numbers of panther telemetry points recorded there. South of Oil Well Road, however, the telemetry point data suggest significantly less panther utilization in the areas of extensive agricultural activity and open sod farms. As such, panther crossing of Oil Well Road in the effected area appears not to be significant.

Collier County Transportation Department is currently working with Drs. Reed Noss and Dan Smith to contract a study of optimum wildlife corridor locations for Collier County. The Eastern Collier County Highway and Greenways Plan study is being supported by Collier County in cooperation with the National Wildlife Federation and the Florida Wildlife Federation through a grant to the National Wildlife Federation through Jane's Trust. The study is intended to identify areas of wildlife crossing at the intersection existing/proposed greenways (SSA lands) and existing roadways. The project's SSA3/SSA4 lands are specifically targeted for study based on the project's commitment to SSA designation and panther compensation commitment. The results of the study will be used to specifically site the wildlife crossing locations. The area of Oil Well Road/Camp Keais Strand will also be part of the study in order to evaluate the potential for future restoration of Camp Keais Strand and installation of corresponding wildlife crossings as part of any future improvements to Oil Well Road by Collier County. Should traffic volumes on Oil Well Road increase significantly and/or habitat restoration efforts for the general Camp Keais Strand area be initiated, Collier County is anticipated to initiate roadway improvements to Oil Well Road including a wildlife crossing and directional fencing in the area of Camp Keais Strand and/or west of Camp Keais Strand.

While panther/vehicular collisions have not been documented in the project vicinity, several vehicular mortalities have occurred within the overall project action area (Table 4 and Figure 11). In particular, east of the community of Immokalee on CR 846, 11 panther deaths have been attributed to vehicular collisions since 1997. Other areas of past significant occurrence of vehicular panther mortality within the action area (SR 29 and I-75) have benefited from the installation of wildlife crossings and a corresponding elimination of vehicular panther mortality in those areas. The primary obstacle to the siting and construction of wildlife crossings in the area of CR 846 has been reluctance by the State of Florida to locate crossings where unencumbered private lands exist on either side of a specific crossing location. The applicant is proposing to encumber the lands (SSA3 and SSA4) on both sides of CR 846 as part of the panther compensation for the project. This encumbrance will facilitate the siting of wildlife crossing(s) and directional fencing to the clear benefit of Florida panther.

Habitat Fragmentation: The project site, as well as the adjacent Camp Keais Strand wetland system, has not been documented to serve as a panther connection or dispersal corridor, most likely due to the extent and intensity of agricultural operations on both sides of Camp Keais Strand and the significant absence of native upland vegetation in the area. The project site is also bordered on the north, east, and south by intensively utilized agricultural lands which provide marginal quality foraging habitat for prey species; therefore, fragmentation of panther prey species habitat is not expected.

Panther and Prey Disturbance and Intraspecific Aggression: Potential increase in intraspecific aggression and disturbance to the Florida panther was evaluated. However, the Service believes, as previously discussed, the habitats on the property provide marginal value foraging for prey species which directly affects the frequency and duration of use of the property by panthers. Also, the project site and adjacent Camp Keais Strand are not part of a documented panther movement or dispersal corridor. Therefore, the Service believes it is unlikely the loss of the limited use of the site by panthers will significantly increase the risk of mortality from intraspecific aggression between panthers and increase disturbance to panthers in the project action area due to human activities, or result in a reduction of panther prey.

#### EFFECTS OF THE ACTION – Audubon’s Crested Caracara

This section analyzes the direct and indirect effects of the DRI project on the crested caracara and crested caracara habitat.

##### Factors to be Considered

Residential, commercial, and industrial development projects may have a number of direct and indirect effects on the caracara and caracara habitat. Direct impacts, which are primarily habitat-based, may include: (1) the permanent loss of foraging habitat; (2) the permanent loss of nest tree availability; and (3) a reduction in the geographic distribution of the species. Indirect effects may include: (1) an increased risk of roadway mortality to fledglings due to the increase in vehicular traffic; and (2) increased disturbance to nesting caracara in the project vicinity due to human activities. These indirect effects are habitat based with the exception of vehicular mortality, which could result in lethal “take.”

##### Analysis for Effects of the Action

As noted previously, an adult pair of caracara occupied a nest tree approximately 150 feet east of the project boundary during the 2003-2004 breeding season. Successful breeding was confirmed, and two juvenile caracaras were observed with the adults throughout 2004. The home range of these birds includes  $601\pm$  acres of improved pastures within the project area. Approximately  $480\pm$  acres of the improved pasture areas are dominated by bahia grass (*Paspalum notatum*) groundcover, while  $121\pm$  acres of the pastures at slightly lower elevations are dominated by knot grass (*Paspalum distichum*).

##### Direct Effects

The direct effect of the action will be the conversion of the pasture acreage to development, and the associated loss of caracara pasture habitat and nest site. Morrison (2001) and Morrison and Humphrey (2001) have cited habitat loss as the major threat to caracara conservation. The applicant is currently working with Dr. Joan Morrison, an acknowledged expert on caracara, to develop appropriate compensation plans. The direct impacts are considered as an incidental taking due to the loss of habitat and probable dispersal of the caracaras from the site. However, as detailed below in the section on Conservation Measures, this direct impact to caracara habitat

will be offset by an in-kind replacement of habitat via improved pasture restoration or creation on existing agricultural lands within the RLSA.

### Indirect Effects

Indirect effects are those effects that result from the proposed action, and are reasonably certain to occur. The indirect effects this project will have on the crested caracara within the action area are discussed below and in the assessment of indirect impacts previously discussed. The project will result in increased vehicular traffic in the project vicinity. Caracara mortality due to vehicular trauma has been documented (*e.g.*, in the MSRP), particularly within the first 6 months of fledging. Based upon habitat considerations, most of the potential habitat for caracara (*i.e.*, improved pasture, dry prairie) outside the project site occurs more than 2 miles from the project site and major roads that serve it. Therefore, the Service believes project-related traffic effects on caracara demographics are not significant.

Indirect effects of the action also include potential disruption of nesting during the 2004-2005 breeding season, and the probable movement of the birds away from the site during and following construction activities. Thus far, the caracaras at the proposed project site display a high tolerance for farm-related vehicular traffic and human activity, even during nesting. The birds have been observed sitting 15 feet from the main internal farm road as trucks, semi-tractor trailers, farmworker buses, and farm equipment pass by, without any visual sign of disruption. The birds also come in close contact with humans at the farmworker lunch area onsite, as they scavenge for leftover food. As detailed below in the section on Conservation Measures, these effects will be minimized through monitoring of the adult pair through the 2004-2005 breeding season, adherence to Dr. Morrison's recommendations for Primary and Secondary Zone activities during construction, and radio-tagging of nestlings to follow dispersal events post-construction.

### Interrelated and Interdependent Actions

An interrelated activity is an activity that is part of the proposed action and depends on the proposed action for its justification. An interdependent activity is an activity that has no independent utility apart from the action under consultation. This biological opinion is based on the maximum potential footprint of the proposed Town of Ave Maria DRI as proposed in the project's July 2004 DRI Application to the State/RPC/local government and dictated by the applicable portions of Collier County's Comprehensive Plan for the Rural Lands Stewardship Overlay. No further interrelated or interdependent actions are expected to result from the project.

### Conservation Measures

The conservation measures, some of which have already begun, consist of four elements: (1) improved pasture habitat creation and/or restoration; (2) monitoring of the adult pair through the 2004-2005 breeding season and radio-tagging of nestlings (if feasible); (3) monitoring of fledglings via radio-telemetry to document any dispersal events and the annual home-range; and

(4) gather as much data on caracara occurrence, territorial occupancy, breeding, etc., from other landowners within the RLSA.

Since habitat loss constitutes the major threat to caracara persistence and recovery, the applicant will create and/or restore improved pasture habitat that provides in-kind replacement for habitat converted at the project site. The pasture creation and/or restoration will occur on existing agricultural lands, which may include existing row-crop fields, fallow fields and/or unimproved pastures currently unsuitable for caracara due to the existing vegetation composition or structure (*e.g.*, dense shrub cover, high groundcover, etc.). The total direct impacts to improved pasture at the project site (calculated from GIS acreages) are  $601 \pm$  acres;  $480 \pm$  acres which are upland bahia grass pasture, and  $121 \pm$  acres which are dominated by knot grass transitional to wetland.

The compensation will provide in-kind replacement with pasture and/or native vegetation species, and will be designed in consultation with Dr. Morrison. If cabbage palms are not already present in sufficient number or location to serve as nest trees, they may be planted as deemed necessary. Cattle ponds, ditches, and other enhancements to concentrate fish, amphibians, etc., for caracara foraging may be added. Requirements for habitat management plans and legal agreements for maintaining the compensation will be included as permit conditions. Alternatively, if the Service, in coordination with Dr. Morrison, determines funding for caracara habitat acquisition in another part of the population's range may be more effective for caracara conservation, the applicant could provide acquisition funds or funds to put easements in place on ranchlands in these other areas, in lieu of easements on their land.

Weekly visual monitoring of the adult pair began on November 1, 2004, to establish the onset of breeding behavior, the location of a nest tree, and eventually, a breeding chronology for the 2004-2005 season. Monitoring is performed according to Morrison (2001) and in coordination with Dr. Morrison. If/when egg laying is confirmed, an attempt will be made to have Dr. Morrison radio-tag the nestlings. The relative ease of tagging the nestlings will provide useful data of the adult pair home range, since the fledglings will track with the adults for at least the first year. This effort is also notable as a conservation measure, because no detailed data exist on adult dispersals and establishment of a new home range.

The applicant has already enlisted other landowners within the RLSA to report known caracara occurrences and to be alert for any new sightings. It now appears landowners within the RLSA have been aware of caracara within the general area, but had no cause to report their presence. The RLSA program, which provides incentives to protect environmentally sensitive lands, has resulted in several reports of caracara, including a breeding pair near Lake Trafford. Landowners are now envisioning how the presence of caracara on their property may be an asset rather than a liability. This promising development echoes the main point of Morrison and Humphrey (2001), which states, "...finding new ways to forge partnerships among private and public landowners and conservation biologists are urgently needed steps toward workable conservation alternatives across both natural and managed landscapes." Since the caracara occur almost exclusively on private lands managed for cattle, these partnerships are essential for caracara recovery.

The overall effects of the action may include positive contributions to caracara conservation that the proposed action has already produced. Prior to the application for the proposed action, the status of caracara within Collier County was unknown. The MSRP (Service 1999) considered Collier County to be formerly occupied range, and the breeding range barely edged into the county (Figure 12). The proposed action, occurring within the RLSA context, has already identified two adult breeding pairs in the vicinity of Immokalee, and credible reports of resident caracara over a 100,000-200,000-acre area within the county. These positive effects are consistent with specific caracara recovery actions outlined in the MSRP.

#### CUMULATIVE EFFECTS – Florida Panther

Cumulative effects include the effects of future State, Tribal, local, or private actions reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions unrelated to the proposed action but located in the action area are not considered in this section because they require separate consultations pursuant to section 7 of the ESA. As discussed in the environmental baseline, the Service identified a variety of actions that may have a beneficial and/or an adverse effect on the Florida panther and has developed a mechanism to distinguish between those actions both likely and not likely to be future Federal actions, and thus meet the cumulative effects definition.

Within the action area, past and ongoing State and county actions affecting panther habitat include: (1) the issuance of Development of Regional Impact Orders (2001-2004); (2) Comprehensive Plan Amendments (2003-2004); (3) Zoning Amendments (2003-2004); (4) Planned Unit Developments (2001-2004); and (5) Environmental Resource Permits (2003-2004). To evaluate these effects, the Service incorporated the Florida Land Use, Cover and Forms Classification System (FLUCCS) mapping to determine properties that may be exempt from Federal Clean Water Act section 404 wetland regulatory reviews by the Corps. For listing purposes, properties with less than 5 percent wetlands were considered by the Service to be generally exempt from regulatory review as these quantities of wetlands could be avoided by project design. The Service cross-referenced the boundaries and approximate locations of the listed projects on recent aerial photographs. Table 7 provides a list of those projects, size in acres, year approved, and designation if wetlands are present. According to FLUCCS mapping, approximately 2,627.3 acres could be expected to be subject to development in the action area without Federal permit involvement through the Clean Water Act section 404. According to the most current home range estimates of the Florida panther (FWC 2004), this level of development represents 9.8 percent of a female panther home range and 2.7 percent of a male panther home range.

State and county land alteration permits not part of those actions listed above, generally included single-family residential developments within Northern Golden Gate Estates and Lehigh Acres. Vacant lands within the area of Northern Golden Gate Estates (north of I-75) total approximately 34,028 acres as of September 2004 (Figure 9). To evaluate these effects, the Service has overlaid the plat boundaries on 2004 aerials, noted lots with developments, compared those to 2003 aerials, and noted the changes. Vacant lands within the area of Northern Golden Gate Estates (north of I-75) total approximately 35,768 acres as of August 2003. The breakdown of

acres for August 2003 is: (1) wetlands, approximately 17,572 acres; (2) uplands, approximately 17,990 acres; and (3) water, approximately 210 acres. These changes were overlain on the National Wetlands Inventory (NWI) maps for presence of wetlands. This evaluation was used to estimate the percentage of properties that may be exempt from Federal Clean Water Act section 404 wetland regulatory reviews by the Corps (Figure 9). A comparison of the 2003 and 2004 data for Northern Golden Gate Estates indicates approximately 1,740 acres of land were converted from vacant to developed with the breakdown as: (1) wetlands, approximately 696 acres and (2) uplands, approximately 1,044 acres. Therefore, using NWI mapping, approximately 1,050 acres could be expected to be subject to development each year in this area without Federal permit involvement.

Vacant lands within the area of Lehigh Acres total approximately 34,852 acres as of April 2003 (Figure 10). The breakdown of acres is: (1) wetlands, approximately 1,057 acres; (2) uplands, approximately 33,592 acres; and (3) water, approximately 202 acres. A review of aerial photography and Lee County building permit data for Lehigh Acres from the 1-year period prior to April 2003 indicates approximately 441 acres of land was converted from vacant to developed during the 1-year period. The breakdown of converted acres is estimated as: (1) wetlands, 66 acres; (2) uplands, 375 acres; and (3) water, 0 acre. For the non-exempt projects, where permits were required by the Corps, the Service concurred with the Corps' determination of "may affect, but is not likely to adversely affect" for these individual projects. Therefore, using NWI mapping, approximately 375 acres could be expected to be subject to development each year in this area without Federal permit involvement.

The evaluation process discussed previously for both these subdivisions provided an estimate of 417 lots, totaling 1,044 acres for Northern Golden Gate Estates and 1,764 lots, totaling 375 acres for Lehigh Acres. Therefore, using NWI mapping for the Northern Golden Gate Estates and Lehigh areas, a total of approximately 1,419 acres could be expected to be subject to development each year in these areas without Federal permit involvement. Based on historical records for wetland permits issued by the Corps for these areas, most of these projects will involve the construction of single-family residences in partially developed areas and will involve less than an acre of impact. This level of development represents 3.7 percent of a female panther home range and 1.4 percent of a male panther home range.

In conclusion, the Service's cumulative effect analysis has identified approximately 4,046.3 acres within the action area that could be developed without Federal wetland permit involvement. This level of development is reasonably certain to occur, will not involve a Federal action, and therefore, meets the definition of a cumulative effect. This level of development represents 14.3 percent of a female panther home range, 5.4 percent of a male panther home range, and 0.22 percent of the private non-urban lands at risk in the core area. As previously discussed, these lands are generally on the fringes of occupied panther habitat, vegetated with exotics or in row crops, are in a partially developed area, and represent less than 1 percent of the private lands at risk in the core area. Therefore, we believe the loss of the habitat associated with these lands is not significant.

## SUMMARY OF EFFECTS – Florida Panther

The timing of construction of the project is anticipated to occur in phases over several years. The site is predominately cleared lands subject to active agricultural operations and sod farming. There are no known den sites within the project boundaries and the quality and quantity of the foraging prey base is low. Therefore, we believe panther usage of the property is limited and we do not believe project construction will result in direct panther mortality.

There will be construction-related traffic increase in the project vicinity and a gradual, long-term increase in general traffic, predominately from the project's intersection with Oil Well Road westward to Immokalee Road. Given the low utilization of lands south of Oil Well Road by panthers, however, we believe it is unlikely the traffic generated by this project will result in direct road mortality of panthers.

The Service, based on the habitat evaluations discussed previously, believes the project will result in the loss of 4,995 acres of mostly low quality panther habitat. Habitat types are primarily cropland and sod farm areas with minimal denning or stalking opportunities. Wildlife utilization of the property shows limited foraging values to panther prey species. The loss of these 4,995 acres of poor quality habitat represents 0.26 percent of the 1,881,318 acres of available non-urban private lands in the core area. The Service believes this small loss (0.26 percent) of poor quality habitat, coupled with the proposed compensation of high quality panther lands, will not adversely affect the Service's recovery and land conservation/preservation goals.

The project will provide for the preservation of 7,285 acres of Primary Zone habitat within the project action area. The preservation of these lands in the panther target core preservation area represents 1.64 percent of the 443,399 acres of private lands still needed for the population of 80 individuals and 0.67 percent of the 1,086,361 acres of private lands still needed for 100 individuals. Therefore, we believe the preservation of the 7,285 acres of panther habitat in the panther core preservation area will have a beneficial effect on the panther, will more than offset the habitat lost, and further the Service's goal in panther conservation. The lands protected by this preservation action, based on the Service's functional value assessment, provide a net benefit value (value of project site, 22,632 units; value compensation site, 58,134 units) of 35,502 functional units.

The project site is comprised primarily of cleared agricultural land subject to intense agricultural activity and is not located within known dispersal or connection corridors to larger publicly owned managed lands; therefore, fragmentation of panther habitat is not expected to result from project implementation.

Potential increase in intraspecific aggression and disturbance to the Florida panther was evaluated. However, the Service believes, as previously discussed, the habitat on the property provides marginal quality foraging for prey species, which directly affects the frequency and duration of use of the property by panthers. Therefore, the Service believes it is unlikely the loss of this limited use of the site by panthers will significantly increase the risk of mortality from

intraspecific aggression between panthers and increase disturbance to panthers in the project action area due to human activities.

In the cumulative analysis, the Service identified the potential loss of approximately 4,046.3 acres within the action area that could be developed without Federal wetland permit involvement. The 4,046.3 acres represent a small percentage (0.22 percent of the 1,881,318 acres) of available non-urban private lands in the core area. In general, these lands are primarily within previously impacted areas or are in the western more urbanized portion of the Florida panther's consultation area. Although this small percentage of lands will be lost from the core area of private lands available for panther conservation, the Service believes sufficient lands are available to meet the needs of the Service's recovery goal and land conservation/preservation goals.

Conversely, the State and county have acquired, within the last year, 2,351 acres of lands which represent 0.53 percent of the 443,399 acres of private lands still needed for the population of 80 individuals and 0.22 percent of the 1,086,361 acres of private lands still needed for 100 individuals. These lands are generally located within the core preservation area of the Florida panther and are actively managed for the benefit of many wildlife species including the Florida panther. The preservation of these lands in the panther core preservation area will have a beneficial affect on the panther and further the Service's goal in panther conservation.

#### CONCLUSION – Florida Panther

In summary, the Service believes there will be no direct take of the Florida panther resulting from this project. Taking into consideration the status of the species, remaining habitat, and other factors considered by this biological opinion such as the overall recovery objectives and other cumulative effects from actions in the action area, the loss of lower quality habitat from implementing the project will be offset by the conservation of other, superior habitat. Therefore, the proposed construction of the Ave Maria University, associated town center, and the balance of the DRI is not likely to jeopardize the continued existence of the Florida panther. No critical habitat has been designated for this species; therefore, none will be affected.

#### CUMULATIVE EFFECTS – Audubon's Crested Caracara

Cumulative effects include the effects of future State, Tribal, local, or private actions reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

The Collier County RLSA program, as noted in the section on Florida panther, will protect approximately 17,000 acres of environmentally sensitive lands in order to entitle the project. The program has the added benefit of providing landowner incentives for preserving agricultural land uses, such as cattle ranching, that benefits caracara.

Given this project will preserve caracara habitat, and activity within the RLSA has already expanded the known breeding range of the population, the cumulative effects for caracara can

reasonably be projected to be positive or at least neutral. In conclusion, the Service has considered cumulative effects within the action area in the above discussion, and does not identify any additional cumulative effects beyond those already discussed.

#### CONCLUSION – Audubon’s Crested Caracara

After reviewing the status of the crested caracara in Florida, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service’s biological opinion that the construction of Ave Maria University, associated town center, the balance of the DRI, the provision of in-kind compensation for direct impacts to improved pasture habitat, and the protection of associated SSA lands, as proposed, is not likely to jeopardize the continued existence of the caracara. No critical habitat has been designated for this species in Florida; therefore, none will be affected.

#### INCIDENTAL TAKE STATEMENT – Florida Panther

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

#### AMOUNT OR EXTENT OF TAKE

Although there may be some minor traffic increase from the project, the traffic flow pattern to and from the proposed DRI will be generally to the west, into urban areas. Considering this information, distances from the project site to documented collisions, and low instances of documented panther movement across the affected portion of Oil Well Road, the Service believes no direct mortality of Florida panthers is expected from the proposed action. Accordingly, the Service is not authorizing any direct take or mortality.

However, the Service anticipates incidental take of panthers in the form of harm and harassment associated with the loss of 4,995 acres of panther habitat within the Primary and Secondary Zones and is authorizing take which results from such loss.

## EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined this level of anticipated take is not likely to result in jeopardy to the species. The amount of panther habitat affected by the proposed action is approximately 0.2 percent of an estimated 2 million acres (Kautz et al. In Review) of habitat occupied by the panther. It would represent approximately 5 percent of the average home range of a male panther (FWC 2004) and 13 percent of the average home range of a female panther (FWC 2004). Based on a density of 1 panther per 31,923 acres (Kautz et al. In Review), the amount of habitat affected by the proposed action would represent 0.16 panther.

The proposed action will result in the preservation of 7,285 acres of Primary Zone panther habitat within the action area. The proposed action will increase the preservation acreage of panther habitat through permitted Federal actions by about 37 percent, from 18,463 acres to 25,748 acres (see Table 1). The cumulative increase in the preservation of panther habitat to permitted Federal actions will be from 700 acres in 1990 to 25,748 acres following issuance of a permit, if issued, by the Corps.

The proposed action will result in the loss of 4,995 acres of mostly poor quality panther habitat. The proposed action will increase the impacts from direct and indirect effects to panther habitat from residential and commercial developments, mining, and agriculture by about 6 percent, from 79,696 acres to 84,692 acres. Of the 84,692 acres of impacts, 39,918 acres are due to agricultural conversion and 44,774 acres to development and mining. The 44,774 acres impacted by development and mining included a mixture of agricultural fields consisting of row crops and citrus groves, and natural lands with varying degrees of exotic vegetation. The non-agricultural impacts are permanent land losses, whereas the agricultural conversions may continue to provide some habitat functional value to panthers although of less value than native habitats.

The lands proposed for compensation/preservation from the proposed take of panther habitat are large land parcels within the Primary Zone and are consistent with the Service's panther conservation goal to locate and preserve sets of lands containing sufficient area and appropriate land cover types to ensure the long-term survival of the Florida panther south of the Caloosahatchee River. Therefore, based on the evaluations provided above for the project's direct, indirect, and cumulative effects, the status of the species, and the compensation proposed by the applicant, the Service believes the proposed construction of the Ave Maria University, associated town center, and the balance of the DRI will not jeopardize the survival and recovery of the Florida panther.

## REASONABLE AND PRUDENT MEASURES

The Service believes the Corps and the applicant have incorporated all reasonable and prudent measures necessary and appropriate to minimize impacts of incidental take of Florida panthers into the design of the proposed action. In summary, the Corps and the applicant will ensure no more than 4,995 acres of panther habitat will be lost as a result of implementation of the

proposed action and 7,285 acres of compensation lands within Primary Zone areas will be preserved to benefit the Florida panther and its prey.

## TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the ESA, the Corps must comply with the following terms and conditions, which implement the reasonable and prudent measures, described above, and outline reporting/monitoring requirements. The terms and conditions described below are non-discretionary, and must be undertaken by the Corps so they become binding conditions of any grant or permit issued to Baron Collier Investments, Incorporated as appropriate, for the exemption in section 7(o)(2) to apply.

The Corps has a continuing duty to regulate the activity covered by this Incidental Take Statement. If the Corps (1) fails to assume and implement the terms and conditions or (2) fails to require Baron Collier Investments, Incorporated to adhere to the terms and conditions of the Incidental Take Statement through enforceable terms that are added to the permit(s) or grant document, the protection coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Corps or Baron Collier Investments, Incorporated must report the progress of the action and its impact on the species to the Service as specified in the Incidental Take Statement [50 CFR § 402.14(i)(3)].

The Corps will include, as special conditions to the permit instrument, the conservation measures listed below in the description of the proposed action that commits the applicant to preserve and manage high quality panther habitat, which is necessary and appropriate to minimize incidental take of panthers by the proposed action. Specifically, to compensate for impacts to 4,995 acres of Florida panther habitat, the applicant proposes to preserve 7,285 acres of panther habitat as described herein. Habitat to be preserved is within the Primary Zone designation (Kautz et al. In Review).

The Corps will provide a copy of the confirmation of project qualification for utilization of Nationwide 12 permit and DRI-wide final Corps Individual 404 permit to the Service upon issuance. The Corps will monitor the permit conditions regarding conservation measures to minimize incidental take of panthers by providing the Service a report on implementation and compliance with the conservation measure within 1 year of the issuance date of the permit(s). The Corps will provide documentation to the Service of verification of the execution and terms of the conservation easement.

Upon locating a dead, injured, or sick panther specimen, initial notification must be made to the nearest Service Law Enforcement Office: Fish and Wildlife Service; 9549 Koger Boulevard, Suite 111; St. Petersburg, Florida 33702; 727-570-5398. Secondary notification should be made to the FWC: South Region; 3900 Drane Field Road; Lakeland, Florida 33811-1299; 800-282-8002.

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

#### INCIDENTAL TAKE STATEMENT – Audubon’s Crested Caracara

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

#### AMOUNT OR EXTENT OF TAKE

The Service anticipates incidental take of caracaras associated with the loss of 601± acres of improved pasture habitat and an active nest site along the project site’s northeast boundary. The incidental take is expected to be in the form of harassment. No direct mortality of caracaras is expected from the proposed action. Our effects analysis indicates incidental take due to vehicular trauma is also not anticipated for the proposed action. Based on the analysis provided in the previous sections, the Service believes this level of anticipated take is not likely to result in jeopardy to the species.

#### EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined this level of anticipated take is not likely to result in jeopardy to the species. The proposed action will result in the creation and/or restoration of 601± acres of improved pasture habitat offsite in areas placed under RLSA stewardship easements. The proposed action will maintain the acreage of similar caracara habitat within the RLSA while providing for perpetual management of the 601± acres of caracara habitat similar to habitat lost to the project.

The proposed action will result in the loss of  $601\pm$  acres of improved pasture habitat for caracara, which include  $480\pm$  acres of upland bahia grass pasture and  $121\pm$  acres of knot-grass areas that are transitional between upland and wetland. The direct impacts of development are permanent land losses. The lands proposed for compensation/preservation related to the proposed take of caracara habitat are lands near to, and part of a system of, larger tracts of preserved lands and are consistent with the Service's emphasis on landscape-scale conservation and multi-species recovery. Alternatively, the applicant has offered to provide funding for acquisition of caracara habitat or easement development in areas that may be more critical to caracara conservation, at the joint discretion of Dr. Joan Morrison and the Service.

## REASONABLE AND PRUDENT MEASURES

The Service believes the Corps and the applicant have incorporated all reasonable and prudent measures necessary and appropriate to minimize impacts of incidental take of the crested caracara into the design of the proposed action. In summary, the Corps and the applicant will ensure the loss of  $601\pm$  acres of improved pasture habitat for caracara is offset by the creation/restoration/preservation of  $601\pm$  acres of improved pasture, which will be preserved and managed to benefit the caracara. An alternative of funding caracara habitat acquisition has also been proposed. The applicant will also provide for radio-tagging and monitoring of caracara nestlings/fledglings to track the home-range dynamics of the caracaras before, during, and after construction activities, providing detailed data that do not currently exist for the species.

## TERMS AND CONDITIONS

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

The Corps will include as special conditions to the permit instrument(s), the conservation measures listed below and in the description of the proposed action that commits the applicant to preserve and manage suitable high quality caracara habitat, which is necessary and appropriate to minimize incidental take of caracara by the proposed action.

The applicant is proposing conservation measures to minimize the direct and indirect effects of the project to the caracara. To compensate for impacts to  $601\pm$  acres of caracara habitat, the applicant will preserve and enhance  $601\pm$  acres of grassland/pasture and dry prairie within SSA3, SSA4, or SSA6. Such caracara compensation lands may be coincidental with Florida panther compensation lands.

The Corps will provide a copy of the confirmation of project qualification for utilization of Nationwide 12 permit and DRI-wide final Corps Individual 404 permit to the Service upon issuance. The Corps will monitor the permit conditions regarding conservation measures to minimize incidental take of caracara by providing the Service a report on implementation and compliance with the conservation measure within 1 year of the issuance date of the permit(s).

The Corps will provide documentation to the Service for verification of the execution and terms of the conservation easements for the SSA areas.

#### CONSERVATION RECOMMENDATIONS

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

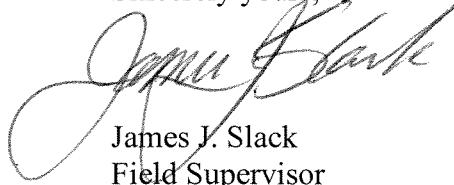
The Service is not proposing any additional conservation recommendations at this time.

#### REINITIATION NOTICE

This concludes formal consultation on the Ave Maria University, associated town center, and balance of the Town of Ave Maria DRI project. As provided in 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; (3) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease, pending reinitiation.

Thank you for your cooperation and effort in protecting Florida's fish and wildlife resources. If you have any questions regarding this project, please contact Allen Webb at 772-562-3909, extension 246.

Sincerely yours,

A handwritten signature in black ink, appearing to read "James J. Slack".

James J. Slack  
Field Supervisor  
South Florida Ecological Services Office

cc:

Corps, Fort Myers, Florida (Skip Bergman)  
District, Fort Myers, Florida  
EPA, West Palm Beach, Florida (Richard Harvey)  
FWC, Punta Gorda, Florida (Jim Beever)  
FWC, Naples, Florida (Darrell Land)  
FWC, Tallahassee, Florida  
Service, Atlanta, Georgia (Noreen Walsh)  
Service, Florida Panther NWR, Naples, Florida (Layne Hamilton)  
Service, Vero Beach, Florida (Cindy Schulz)

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**Table 1.** Biological opinions prepared by the Service for projects affecting Florida panther habitat from March 1984 through March 2005.

Biological Opinion Date	Corps Application No.	Project Name	County	Habitat Impacts (Acres)	Habitat Preserved Onsite (Acres)	Habitat Preserved Off-site (Acres)	Total Habitat Preserved (Acres)
03/29/84	83M-1317	Ford Test Track	Collier	530	0	0	0
02/21/85	Unknown	I-75	Collier/Broward	1,517	0	0	0
10/17/86	Unknown	Exxon Master Plan	Collier	9	0	0	0
1/07/86	861PM-20130	Collier Enterprises (Citrus Grove)	Collier	11,178	0	0	0
01/11/88	Unknown	NERCO - Clements Energy	Collier	3	0	0	0
02/23/88	Unknown	Shell Western E&P	Collier/Monroe	0	0	0	0
02/10/89	FAP IR-75-4(88)81	SR 29/I-75 Interchange	Collier	350	0	0	0
08/15/90	Unknown	I-75 Recreational Access	Collier	150	0	0	0
09/24/90	89IPD-20207	U.S. Sugar Corporation	Hendry	28,740	700	0	700
03/12/91	90IPD-02507	Lourdes Cereceda	Miami-Dade	97	0	0	0
01/14/92	199191279	Dooner Gulf Citrus	Collier	40	40	0	40
09/25/92	Unknown	BIA, STOF, BCSIR	Hendry	1,995	0	0	0
06/18/93	199300393	Corkscrew Road	Lee	107	0	0	0
02/25/94	199301131	Daniels Road Extension	Lee	65	0	0	0
05/09/94	199202019	Corkscrew Enterprises	Lee	563	437	0	437
10/27/94	199302371 199400807 199400808	Florida Gulf Coast University Treeline Boulevard	Lee	1,088	526	0	526
05/24/95	199302130	Turner River Access	Collier	1,936	0	0	0
08/07/95	199405501	Bonita Bay Properties	Collier	509	491	0	491
08/15/95	199301495	SW Florida Airport Access Road	Lee	14	0	0	0
09/19/96	199302052 199301404	I-75 Access Points	Broward	116	0	0	0
03/10/98	L30(BICY)	Calumet Florida	Collier/Broward/Miami-Dade	0	0	0	0
03/27/98	199604158	Willow Run Quarry	Collier	359	190	0	190
09/27/99	199130802	Daniels Parkway	Lee	2,093	0	94	94
06/11/99	199800622	STOF	Hendry	1,091	0	0	0

**Table 1.** (continued)

Biological Opinion Date	Corps Application No.	Project Name	County	Habitat Impacts (Acres)	Habitat Preserved Onsite (Acres)	Habitat Preserved Off-site (Acres)	Total Habitat Preserved (Acres)
12/08/99	199607574	Cypress Creek Farms	Collier	239	0	24	24
04/17/00	199507483	Miromar	Lee	1,323		194	194
06/09/00	199900619	Naples Reserve	Collier	833	0	320	320
02/21/01	199803037	Wortzel and Landl	Lee	106	0	0	0
04/17/01	200001436	WCI	Lee	1,183	0	408	408
07/30/01	199003460	Naples Golf Estates	Collier	439	175	0	175
08/31/01	199900411	Colonial Golf Club	Lee	1,083	0	640	640
12/14/01	199301156	Southwest Florida Airport	Lee	8,058	0	6,986	6,986
01/30/02	199402492	Florida Rock	Lee	5,269	802	0	802
03/07/02	199901251	Southern Marsh Golf	Collier	121	75	80	155
04/24/02	199901378	Hawk's Haven	Lee	1,531	267	0	267
09/24/02	200001574	Verandah	Lee	1,456	0	320	320
10/08/02	199602945	Winding Cypress	Collier	1,088	840	1,030	1,870
01/27/03	200003795	Walnut Lakes	Collier	157	21	145	166
02/21/03 03/10/05R	200001926	Mirasol	Collier	800	914	145	1,059
05/19/03	200200970	Apex Center	Lee	95	10	18	28
06/18/03	199701947	Twin Eagles Phase II	Collier	593	57	98	155
06/23/03	199905571	Airport Technology	Lee	116	55	175	230
07/02/03	199507483	Miromar	Lee	342	158	340	498
10/06/03	200102043	Bonita Beach Road	Lee	1,117	145	640	785
09/01/03	200206725	SR 80	Lee	33	2	12	14
12/29/03	200202926	The Forum	Lee	650	0	310	310
06/14/04	199603501	Terafina	Collier	436	210	261	471
01/18/05	199702288	Bonita Springs Utilities	Lee	79	0	108	108
02/22/05 03/16/2005R	20030946	Ava Maria DRI	Collier	4,995	0	7,285	7,285
			<b>Totals</b>	84,692	6,155	19,633	25,748

**Table 2.\*** Targeted and Acquired Acreage Totals of Conservation Lands in South Florida Directly Affecting the Panther

Name	Targeted <sup>1</sup> Acreage	Acquired Acreage	Indian Reservation
<b>Federal Conservation Lands</b>			
Everglades National Park	1,508,537	1,508,537	--
Big Cypress National Preserve	720,000	720,000	--
Florida Panther National Wildlife Refuge	26,400	26,400	--
<b>Subtotal</b>	<b>2,254,937</b>	<b>2,254,937</b>	--
<b>State of Florida: Florida Forever Program</b>			
Belle Meade	28,505	19,107	--
Corkscrew Regional Ecosystem Watershed	69,500	24,028	--
Twelvemile Slough	15,653	7,530	--
Panther glades	57,604	22,536	--
Devil's Garden	82,508	0	--
Caloosahatchee Ecoscape	18,497	2,994	--
Babcock Ranch	91,361	0	--
Fisheating Creek	176,760	59,910	--
<b>Subtotal</b>	<b>540,388</b>	<b>136,105</b>	--
<b>State of Florida: Other State Acquisitions</b>			
Water Conservation Area Number 3	491,506	491,506	--
Holey Land Wildlife management Area	33,350	33,350	--
Rotenberger Wildlife Management Area	25,019	20,659	--
Fakahatchee Strand State Preserve	74,374	58,373	--
Picayune Strand State Forest	55,200	55,200	--
Okaloacoochee Slough State Forest and WMA	34,962	34,962	--
Babcock-Webb Wildlife Management Area	79,013	79,013	--
<b>Subtotal</b>	<b>793,424</b>	<b>773,063</b>	--
<b>Indian Reservations<sup>2</sup></b>			
Miccosukee Indian Reservation	--	--	81,874
Big Cypress Seminole Indian Reservation	--	--	68,205
Brighton Seminole Indian Reservation	--	--	37,447
<b>Subtotal</b>	<b>--</b>	<b>--</b>	<b>187,526</b>
<b>GRAND TOTALS</b>	<b>3,588,749</b>	<b>3,164,105</b>	<b>187,526</b>

<sup>1</sup> Targeted acres not available for all lands. In Such cases, targeted equals acquired acreage.

<sup>2</sup> Indian lands are included due to their mention in the MSRP. Acreages taken from GIS data.

\* Table 2 was excerpted from the Brief of Amicus (2003). However, the lands shown as acquired in this table may include some private in-holdings and may include lands currently under sales negotiations or condemnation actions.

**Table 3.** Habitat suitability scores from the Florida Panther Subteam (2002) as adjusted by the Service for use in assessing habitat value to the Florida panther.

Land Cover Type	Score	Land Cover Type	Score	Land Cover Type	Score
Water	0	STA	4.5		
Urban	0	Shrub swamp	5	Cypress swamp	9
Coastal strand	1	Shrub and brush	5	Sand pine scrub	9
Reservoir	1.5	Dry prairie	6	Sandhill	9
Mangrove swamp	2	Grassland/pasture	7	Hardwood-Pine forest	9
Salt marsh	2	Freshwater marsh	9	Pine forest	9
Exotic plants	3	BOTTOMLAND HARDWOOD	9	Xeric oak scrub	10
Cropland	4	Bay swamp	9	Hardwood forest	10
Orchards/groves	4	Hardwood swamp	9		

**Table 4.** Panther-Vehicle Collisions within Ava Maria Panther Consultation Area

Date	Panther Number	Result	Location	Distance from Project
12/23/1979	UCFP04-(G80-4)	Death	SR 29 JUST N SR 84	20.6 miles south
2/7/1980	UCFP05-(G80-15)	Death	SR 29 NEAR SUNNILAND	21.2 miles south
4/19/1981	UCFP06-(G81-19)	Death	SR 29 NEAR COPELAND	29.2 miles south
12/14/1983	FP01	Death	SR 84 18 MM	20.2 miles south
11/12/1984	UCFP12-(G84-26)	Death	SR 84 16 MM	21.4 miles south
1/8/1985	UCFP13-(G85-BNZ)	Death	SR 84 MM16	21.2 miles south
4/18/1985	FP04	Death	SR 84 17 MM	20.6 miles south
5/12/1985	NONE	Injury	CR 951 2 M N US 41	31 miles southwest
10/26/1985	FP07	Death	SR 29 4 MI S SR 84	21.3 miles south
11/15/1986	UCFP15	Death	SR 84 16.5 MM	20.8 miles south
6/17/1987	FP20	Injury	CR 858 .8 M E SR 29	8.8 miles south
12/14/1987	FP13	Death	SR 29 SUNNILAND	9.1 miles south
1/25/1989	UCFP18-(RK-850)	Death	CR 850 1.5 M S SR 80	22.8 miles south
11/26/1990	FP37	Death	SR 29 .5 M N I-75	16.4 miles south
2/4/1991	UCFP20-(FP11'S)	Death	SR 29 PISTOL POND BRIDGE	10 miles south
4/7/1992	NONE	Injury	ALICO RD. 1	35 miles northwest
12/6/1993	FP50	Death	CR 846 5 M E OF IMMOKALEE	14 miles northeast
3/3/1994	FP31	Death	SR 29 SUNNILAND	8.4 miles south
1/14/1995	FP52	Death	CR 846 NEAR DUPREE ROAD	15.1 miles northeast
4/24/1996	UCFP29	Death	5.5 M E SR 29 ON CR 832	27.6 miles north
7/13/1997	UCFP31	Death	CR 846 1.5 M W CR 858	15.2 miles northeast
2/14/1998	FP64	Injury	SR 29 AT CLEARCUT, FPNWR	10 miles south
6/13/1998	UCFP25	Death	CR 846 3 M E CR 858	22.9 miles northeast
7/17/1998	FP51	Death	SR 29 @ BEAR ISLAND GRADE	12 miles south
7/8/1999	UCFP27	Death	FARM ROAD E HENDRY PRISON	16.5 miles east
2/10/2000	FP80	Death	200 FT. W SWAMP SAFARI, BCSIR	25.2 miles east
2/28/2000	K76-(FP66	Death	1 MI W SR 29, ON CR 858	4.8 miles east
3/23/2000	UCFP34	Death	CR846 2 MILES E COUNTY LINE	20.8 miles northeast
6/23/2000	UCFP35	Death	CR846 2 MILES E IMMOKALEE	11.2 miles northeast
8/13/2000	UFP36	Death	CR 846 E IMMOK. NEAR POWERLINE	15.2 miles northeast
12/29/2000	UCFP37	Death	4.5 MI E SR29 ON CR846	12.4 miles northeast
5/7/2001	UCFP39	Death	SR 29 1/2 MI N OF JEROME	27.6 miles south
5/7/2001	UCFP40	Death	SR 29 1/2 MI N OF JEROME	30 miles south
6/14/2001	UCFP42	Death	CR846, 1 MILE EAST POWERLINE	22.4 miles northeast
8/17/2001	UCFP43	Injury	CR846 1 MILE EAST OF POWERLINE	22.3 miles northeast
4/10/2002	UCFP46	Death	1/2 MI N OF DEEP LAKE, COLLIER	21.2 miles south
7/1/2002	FP98	Death	1 KM N PISTOL POND, SR 29	10.1 miles south

**Table 4.** (continued)

Date	Panther Number	Result	Location	Distance from Project
11/10/2002	UCFP48	Death	CR846 5-6 MI E IMMOKALEE	15.4 miles northeast
11/25/2002	UCFP49 (K98)	Death	CR846 3-4 MI E IMMOKALEE	13.6 miles northeast
11/28/2002	FP99	Death	CR846 1/4 MI N COLLIER FAIRGRN	22.4 miles west
1/26/2003	UCFP50 (K33)	Death	CR846 3.4 MI E EVERGLADES BLVD	12.8 miles north
02/20/2003	FP106	Death	SR29ATSUNNILANDMINE ENTRANCE	8.8 miles south
5/25/2003	UCFP53	Death	SR29, 1.4 MI N CR858, COLLIER	7.6 miles east
6/3/2003	UCFP54	Death	SR29, 1.7 MI N CR858, COLLIER	8 miles east
6/30/2003	UCFP58	Death	CR846 3-4 MI E EVERGLADES BLVD	12.6 miles north
11/2/2003	UCFP59	Death	CR858 1.2 MI W SR29	5.2 miles east
12/10/2003	UCFP60	Death	US41 1 MI E CR92, CSSP	36 miles southwest
12/25/2003	UCFP61	Death	CR833, 1.7 MI N of CR846	35 miles northeast
02/26/04	UCFP 63	Death	I-75, MM99	31 miles southwest
04/06/04	UCFP65	Death	SR 29, Bear Island Grade	12.2 miles south
06/27/04	UCFP 66	Death	I-75, MM 93	25 miles southwest

**Table 5.** County and State Acquisitions within the Action Area (Acres)

Year	County	State
1998	1,723	*
1999	315	*
2000	1,237	*
2001	700	*
2002	369	767
2003	2,291	60
<b>Totals</b>	<b>6,635</b>	<b>827</b>

\* Acreages per-year data are under request from the State of Florida

**Table 6a.** Florida Panther Habitat Matrix for Development Site

Land Cover Types	Habitat Values	Project Development-Primary Zone 2,125 acres				Project Development-Secondary Zone 2,870 acres			
		Pre		Post		Pre		Post	
		Acres	FUV	Acres	FUV	Acres	FUV	Acres	FUV
Water/Urban	0	15.2	0	2,125	0	11.2	0	2,870	0
Exotic Plants	3	76.5	230	0	0	93.6	281	0	0
Cropland	4	1,923	7,692	0	0	1,955.8	7,823	0	0
Shrub swamp	5	20.8	104	0	0	0	0	0	0
Shrub and brush	5	0	0	0	0	34.9	175	0	0
Dry prairie	6	0	0			66.8	401		
Grassland/pasture	7	37.5	263	0	0	589	4,123	0	0
Freshwater marsh	9	30.1	271	0	0	69	621	0	0
Hardwood-pine forest	9	3	27	0	0	5.6	50	0	0
Cypress Swamp	9	7.2	65	0	0	6.2	56	0	0
Pine Forest	9	12	108	0	0	38	342	0	0
<b>Totals</b>		2,125	<b>8,760</b>	2125		2,870	<b>13,872</b>	2,870	

**Table 6b.** Florida Panther Habitat Matrix for SSA 1 and SSA 2 Compensation Lands

Land Cover Types	Habitat Value	Compensation - Primary Zone			
		Pre		Post	
		Acres	FUV	Acres	FUV
Water/Urban	0	0	0	0	0
Cropland	4	0.28	1.12	0.28	1.12
Shrub swamp	5	0.89	4.45	0.89	4.45
Shrub and brush	5	8.95	44.75	8.95	44.75
Grassland/pasture	7	0.08	0.56	0.08	0.56
Freshwater marsh	9	325.53	2,929.77	325.53	2,929.77
Hardwood swamp	9	47.59	428.31	47.59	428.31
Cypress swamp	9	361.35	3,252.15	361.35	3,252.15
Hardwood-pine forest	9	81.44	732.96	81.44	732.96
Pine forest	9	24.44	219.96	24.44	219.96
<b>Totals</b>		850.55	7,614.03	850.55	<b>7,614.03</b>

**Table 6c.** Florida Panther Habitat Matrix for SSA 3 and SSA 4 Compensation Lands

Land Cover Types	Habitat Value	Compensation - Primary Zone			
		Pre		Post	
		Acres	FUV	Acres	FUV
Water/Urban	0	0	0	0	0
Cropland	4	710	2840	710	2840
Shrub swamp	5	222	1110	222	1110
Shrub and brush	5	44	220	44	220
Dry Prairie	6	133	798	133	798
Grassland/Pasture	7	1109	7763	1109	7763
Freshwater marsh	9	1286	11574	1286	11574
Cypress Swamp	9	355	3195	355	3195
Hardwood-pine forest	9	355	3195	355	3195
Pine Forest	9	133	1197	133	1197
Hardwood forest	10	88	880	88	880
<b>Totals</b>		4435	32,772	4435	<b>32,772</b>

**Table 6d.** Florida Panther Habitat Matrix for SSA 6 Compensation Lands

Land Cover Types	Habitat Value	Compensation - Primary Zone			
		Pre		Post	
		Acres	FUV	Acres	FUV
Shrub swamp	5	63	315	63	315
Hardwood swamp	9	510	4590	510	4590
Cypress swamp	9	1018	9162	1018	9162
Pine forest	9	409	3681	409	3681
<b>Totals</b>		2000	17748	2000	<b>17748</b>

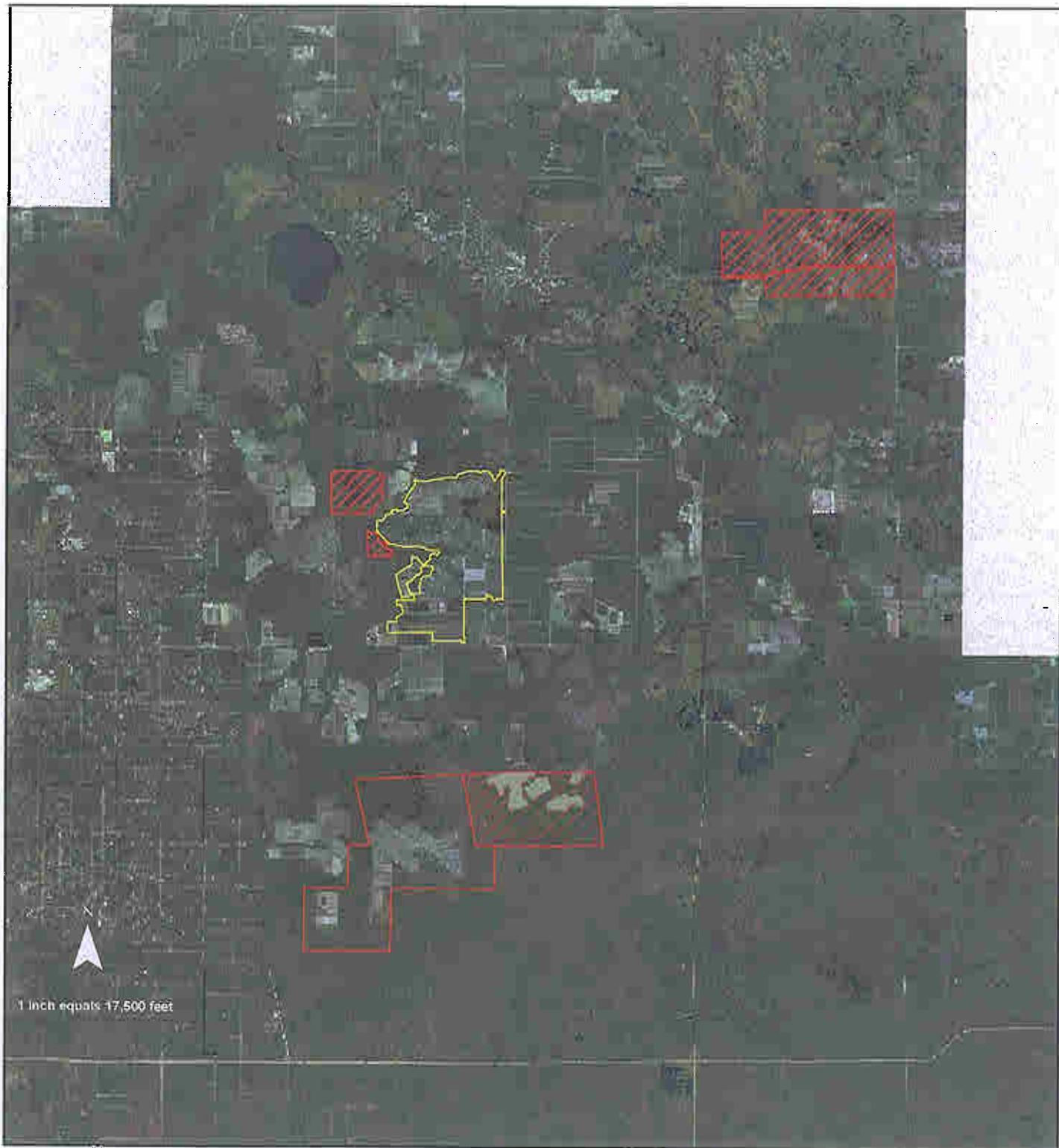
$$\text{SSA FUVs} = 7,614 + 32,772 + 17,748 = 58,134$$

**Table 7.** Ave Maria – Florida Panther Consultation Area Project List

Less than 5 percent Wetland Areas		Permits Issued								
Project Name		Total Acres	Wetland Acres	% -Wetland Acres	City	Comp Plan	DRI	PUD	Rezoning	District
Schuman Insurance		0.25	0.00	0.00%					2003	
Gunnery Road Commercial		0.26	0.00	0.00%					2003	
HMB Rezoning		0.47	0.00	0.00%					2004	
Sellstate Associate R		0.50	0.00	0.00%					2004	
II Rezoning		0.52	0.00	0.00%					2004	
Sunbelt Realty Sales C		0.56	0.00	0.00%					2003	
Djans Embroidery Design		0.75	0.00	0.00%					2003	
707 Canterbury Circle.		0.81	0.00	0.00%					2004	
Gunnery Rd Residential		1.24	0.00	0.00%					2003	
Wanda Hall Rezone		1.30	0.00	0.00%					2003	
Florida Landmark Community		1.93	0.00	0.00%					2004	
Coffey Discount Furniture		4.88	0.00	0.00%					2004	
Charter School		5.82	0.00	0.00%	2003					
Colonades al Santa Barbara		6.82	0.00	0.00%				0		
Immokalee Senior Housing		7.39	0.00	0.00%				0		
Summer Glen Apartments		7.58	0.00	0.00%				0		
GGFD		9.08	0.00	0.00%				0		
Egret Isles		9.99	0.00	0.00%				0		
Talavera Estates		10.12	0.00	0.00%					2004	
Bonus Density Woodward		16.34	0.00	0.00%					2003	
Bristol Pines		17.67	0.00	0.00%			2003			
Delacruz 19 Acre		18.98	0.00	0.00%					2003	
Dominion Video Satellite		21.81	0.00	0.00%						2004
Veterans Park Rezoning		36.04	0.00	0.00%					2003	
New Hope Ministries		39.99	0.00	0.00%				0		
ASGM Business Center of Naples		40.77	0.00	0.00%				2001		
Santa Barbara Landings		42.61	0.00	0.00%				0		
Collier County Gov't Center		59.78	0.00	0.00%		2004	2004			
ASGM Business Park		128.12	0.00	0.00%						1004
Glen Eagle Golf & Cntry Club/BretonnePark		300.91	0.00	0.00%		2001				
Parklands West		304.04	0.00	0.00%		2001	2001			
Orange Blossom Ranch		641.84	0.00	0.00%				0		2004
Serengeti Subdivision		29.60	0.02	0.07%						2003
Airside Plaza		121.81	0.15	0.12%		2003	2004			
Village Walk at Bonita Springs		649.40	0.87	0.13%						2004
The Brooks of Bonita Springs		18.60	0.06	0.32%		2002	1997			
Eastwood Professional Center		158.09	2.81	1.78%						2004
River Pointe		38.75	0.74	1.91%						2004
<b>TOTALS:</b>		<b>2,627.3</b>	<b>4.65</b>							

**Figure 1A**

Ave Maria DRI Regional Aerial with DRI and SSAs



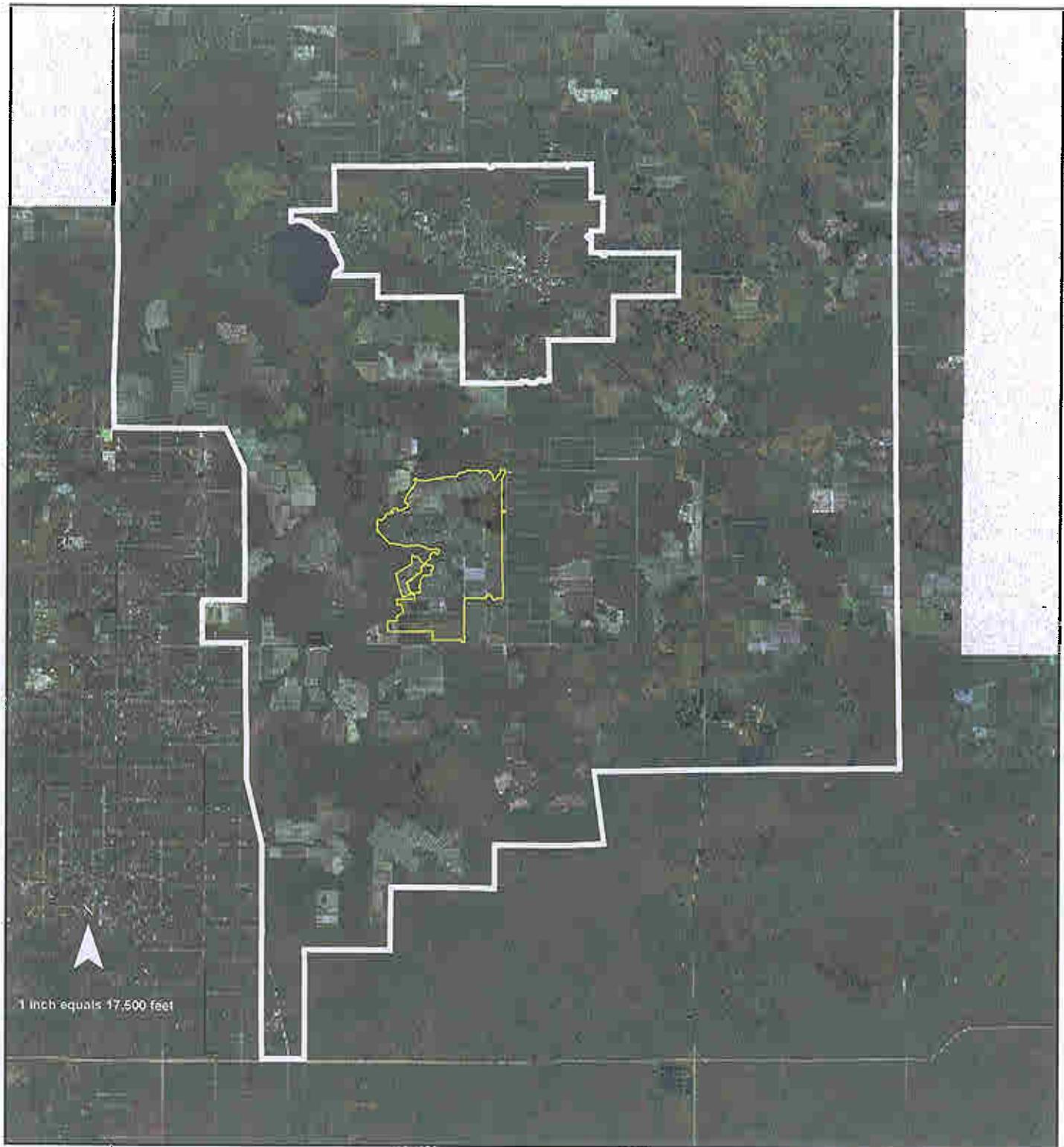
**AVE MARIA DRI**

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**FIGURE 1A**  
**REGIONAL AERIAL WITH DRI AND SSAs**

**Figure 1B**

Ave Maria DRI Aerial with RLSA Boundary



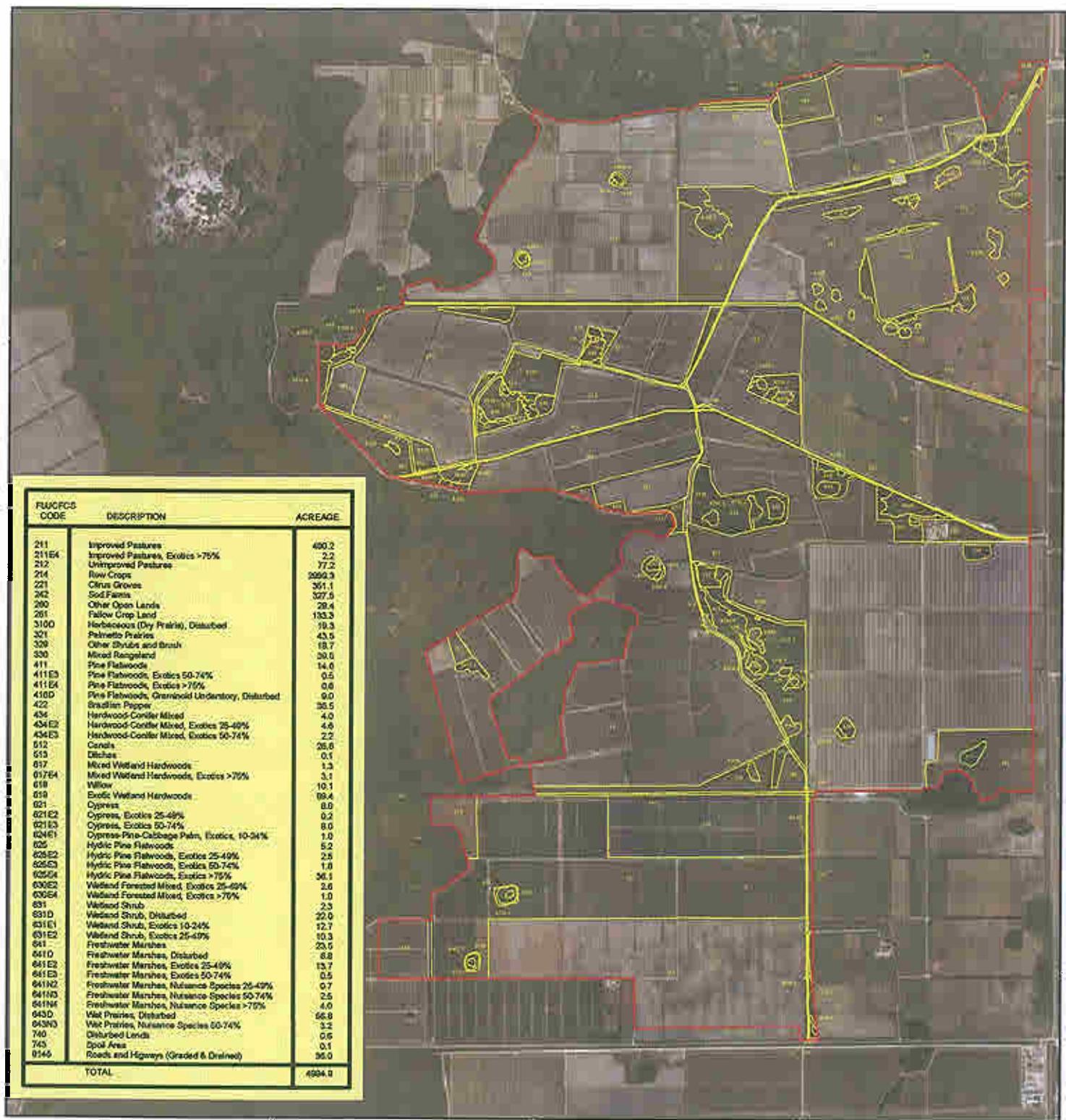
**AVE MARIA DRI  
RLSA MAP**

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**FIGURE 1B  
AERIAL WITH RLSA BOUNDARY**

**Figure 2**

Ave Maria DRI FLUCCS Map



**AVE MARIA DRI  
FLUCCS MAP**

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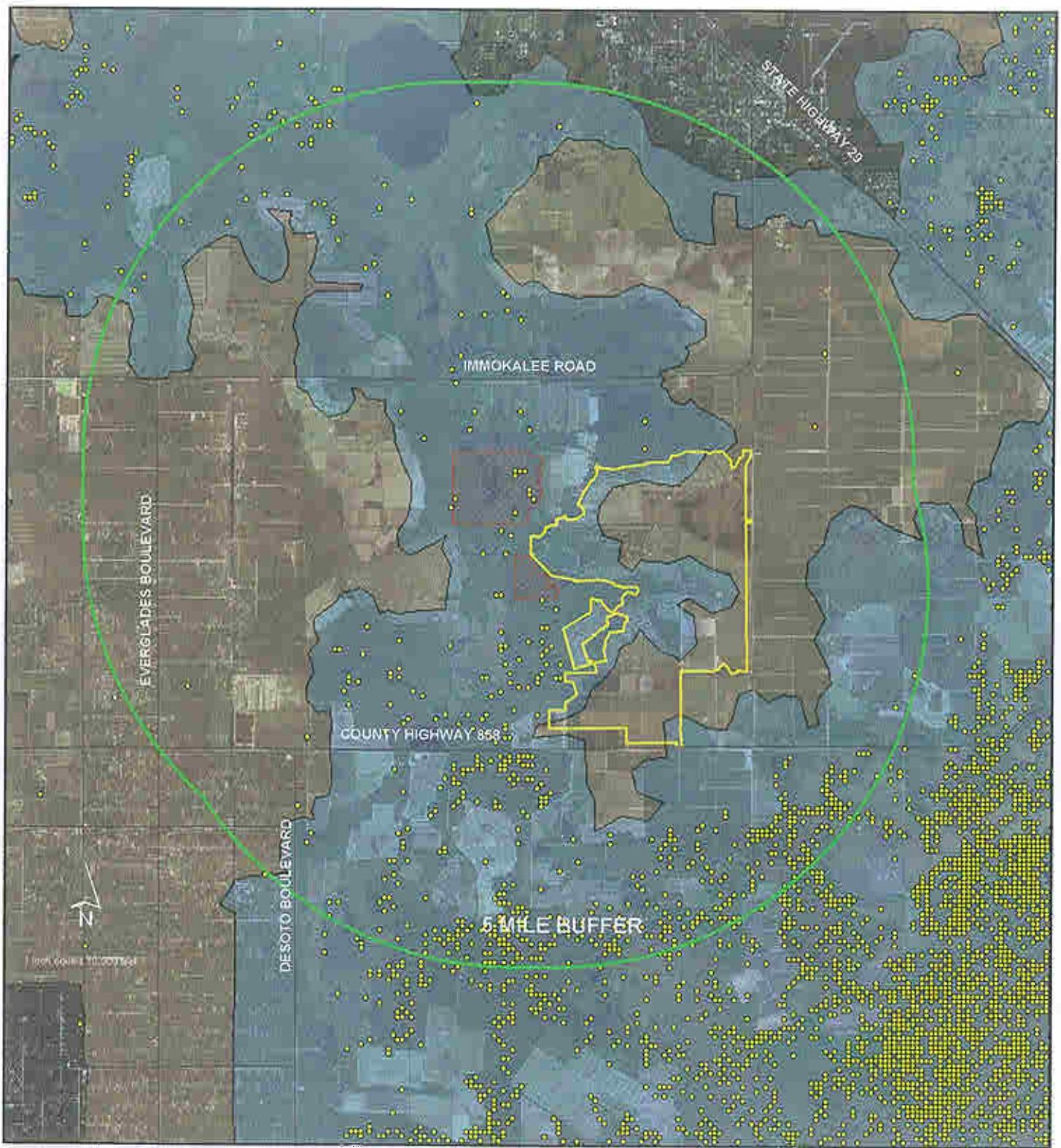
**FIGURE 2**



1 inch equals 3,000 feet

**Figure 3A**

Ave Maria DRI and Ssas 1 & 2 In Relation To Primary and Secondary Zones and Telemetry



### AVE MARIA DRI

**FIGURE 3A**  
**DRI AND SSAs 1 & 2 IN RELATION TO PRIMARY  
 AND SECONDARY ZONES AND TELEMETRY**

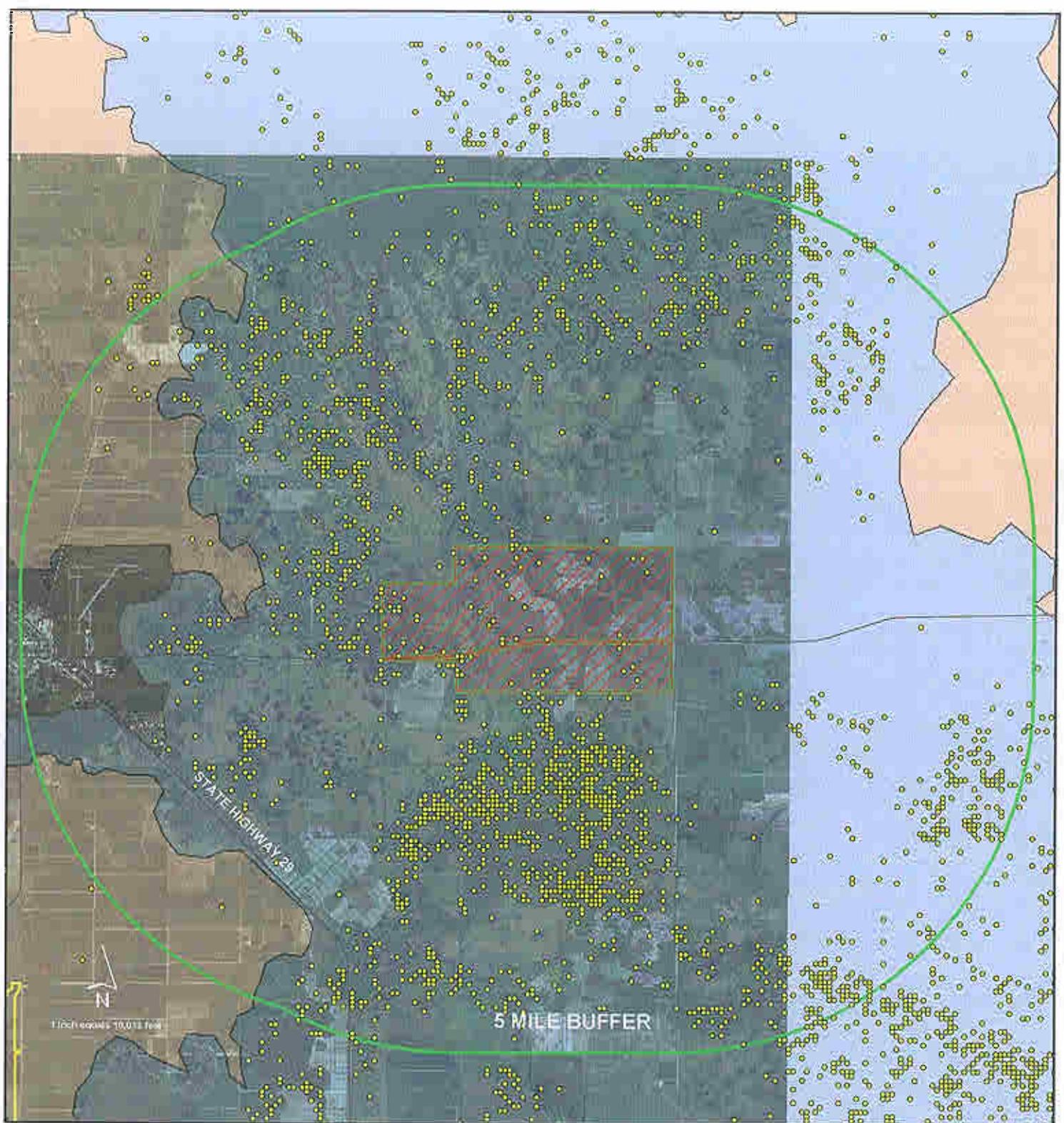
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**Figure 3B**

Ave Maria DRI SSA 3 & 4 In Relation To Primary Zone and Telemetry



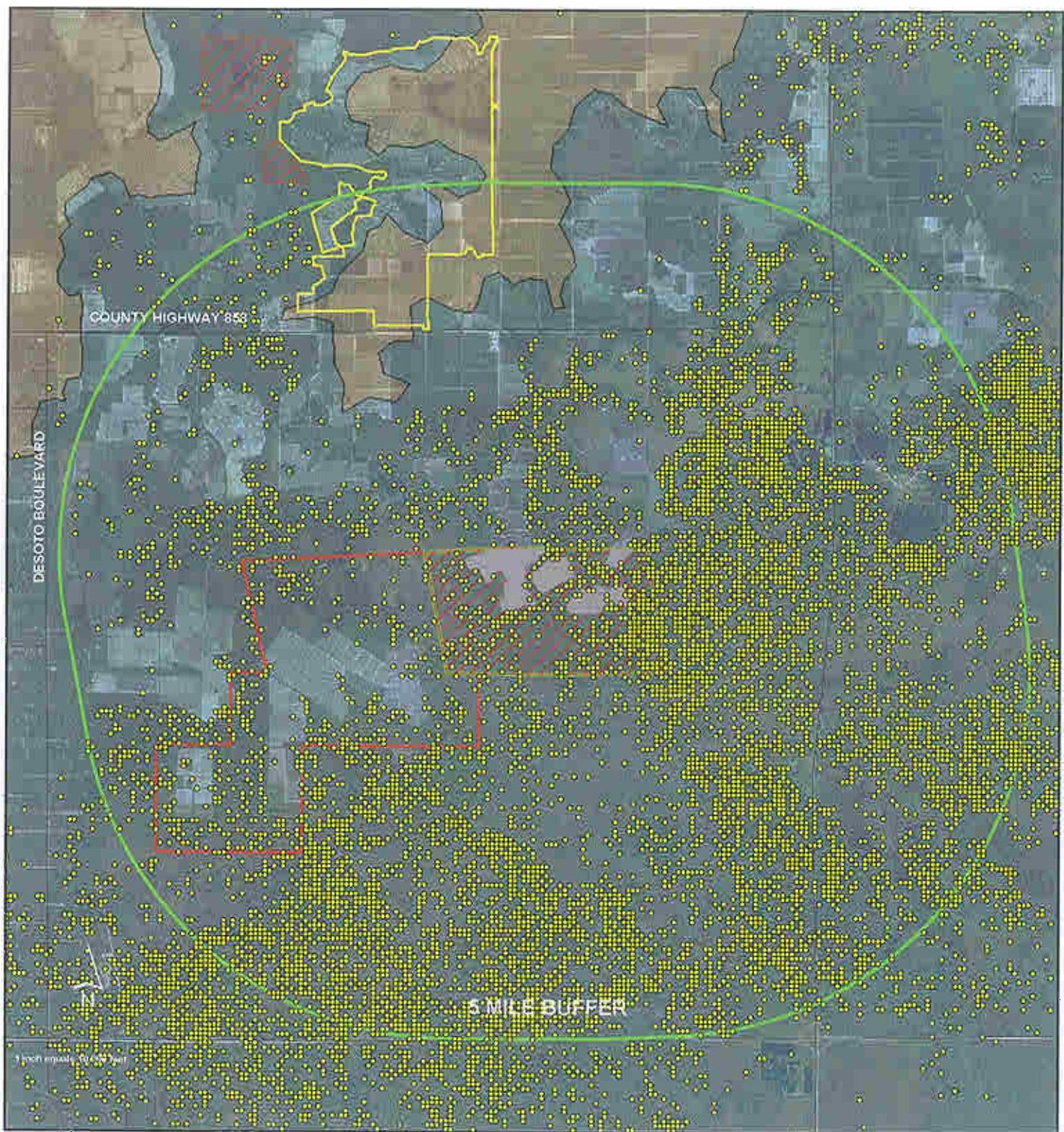
**AVE MARIA DRI**  
**FIGURE 3B**  
**SSA 3 & 4 IN RELATION TO PRIMARY  
ZONE AND TELEMETRY**

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**Figure 3C**

Ave Maria DRI SSA6 In Relation To Primary Zone and Telemetry



**AVE MARIA DRI**

**FIGURE 3C**  
**SSA6 IN RELATION TO PRIMARY  
 ZONE AND TELEMETRY**

Prepared by: V. Pellegrino - 1/2005  
 X:\Webroot\Env\103786\Biological Opinion\SSA 6

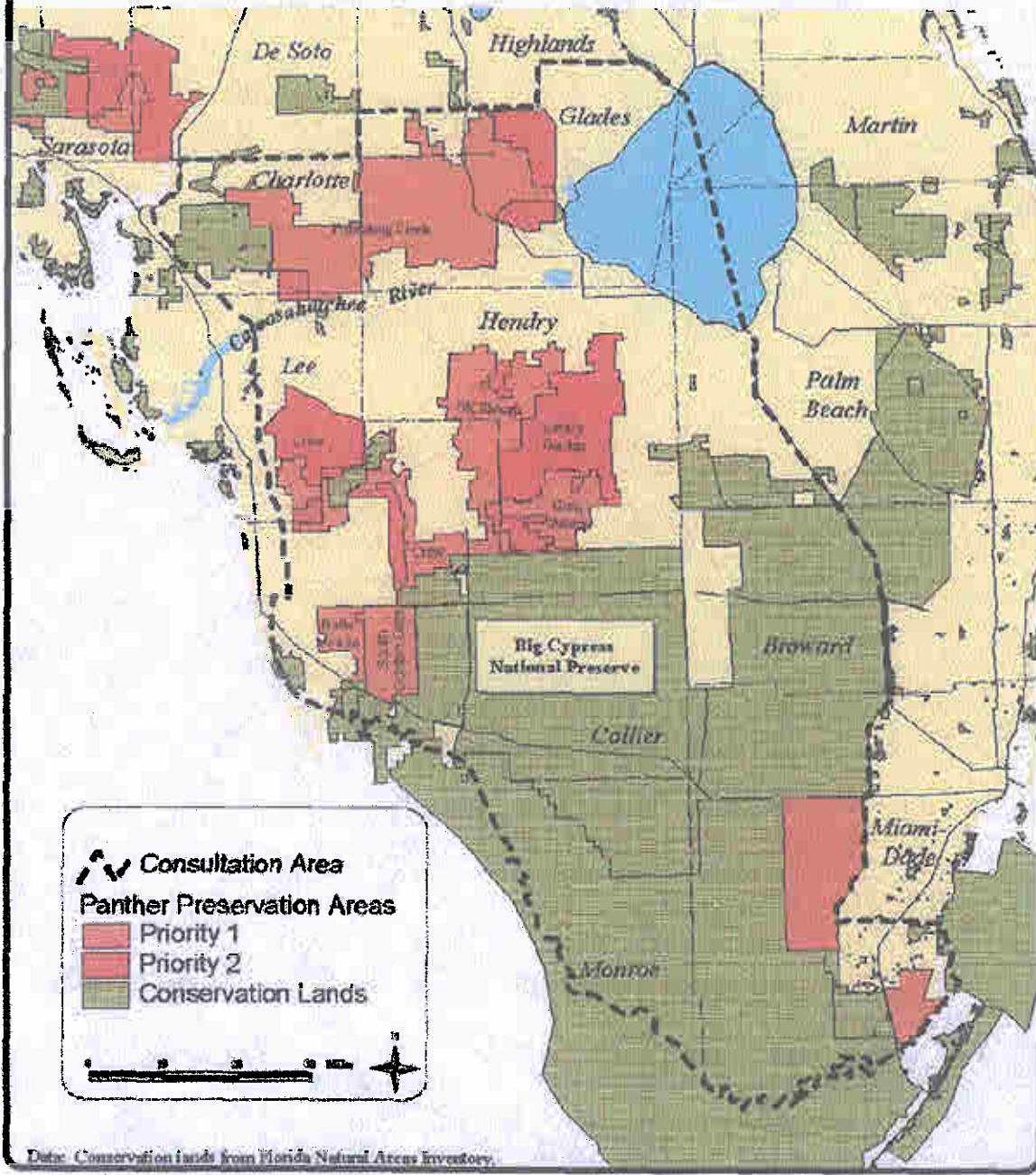
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**Figure 4**

Panther Consultation Area

## Florida Panther Consultation Area



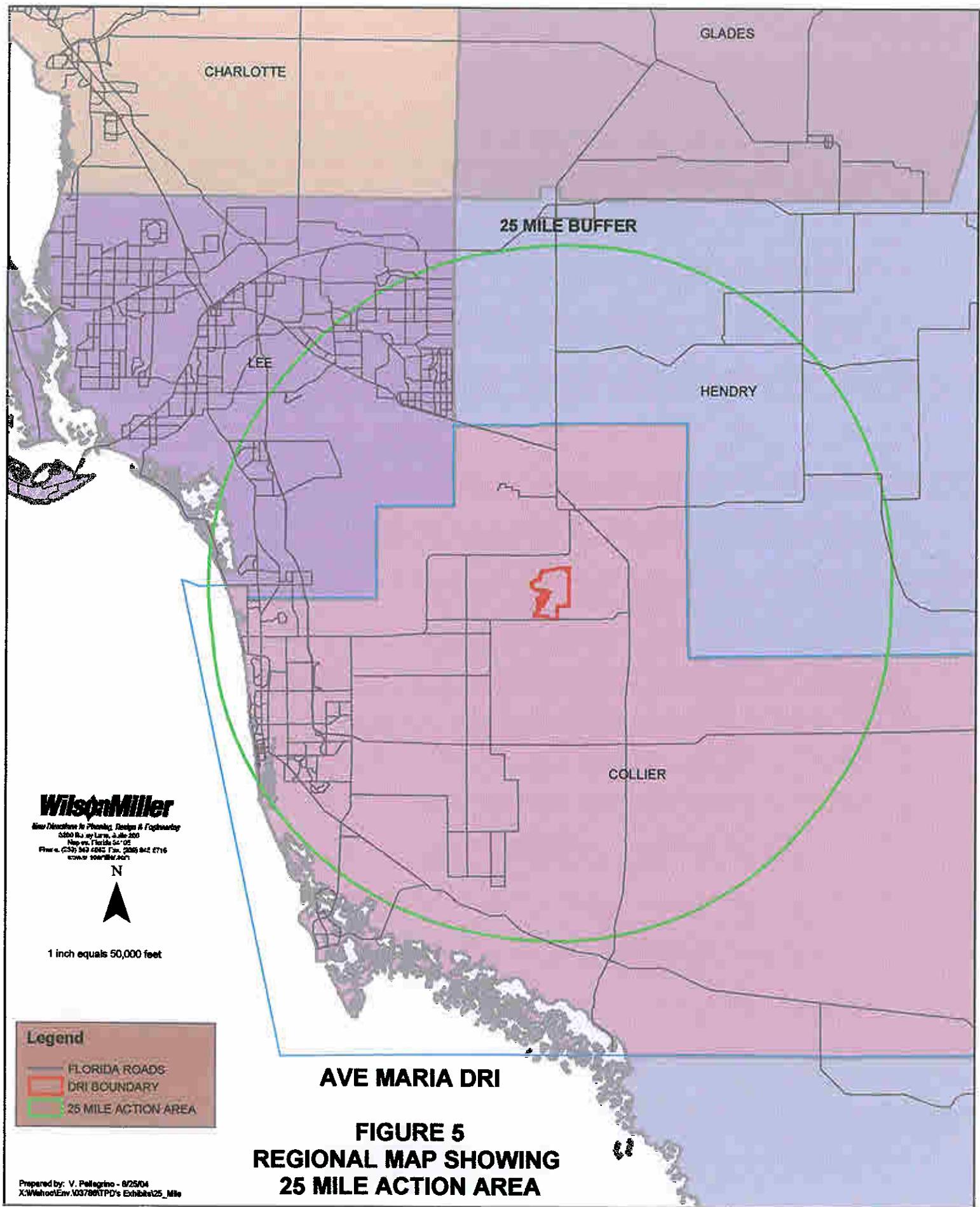
**FIGURE 4**  
**PANTHER CONSULTATION AREA**

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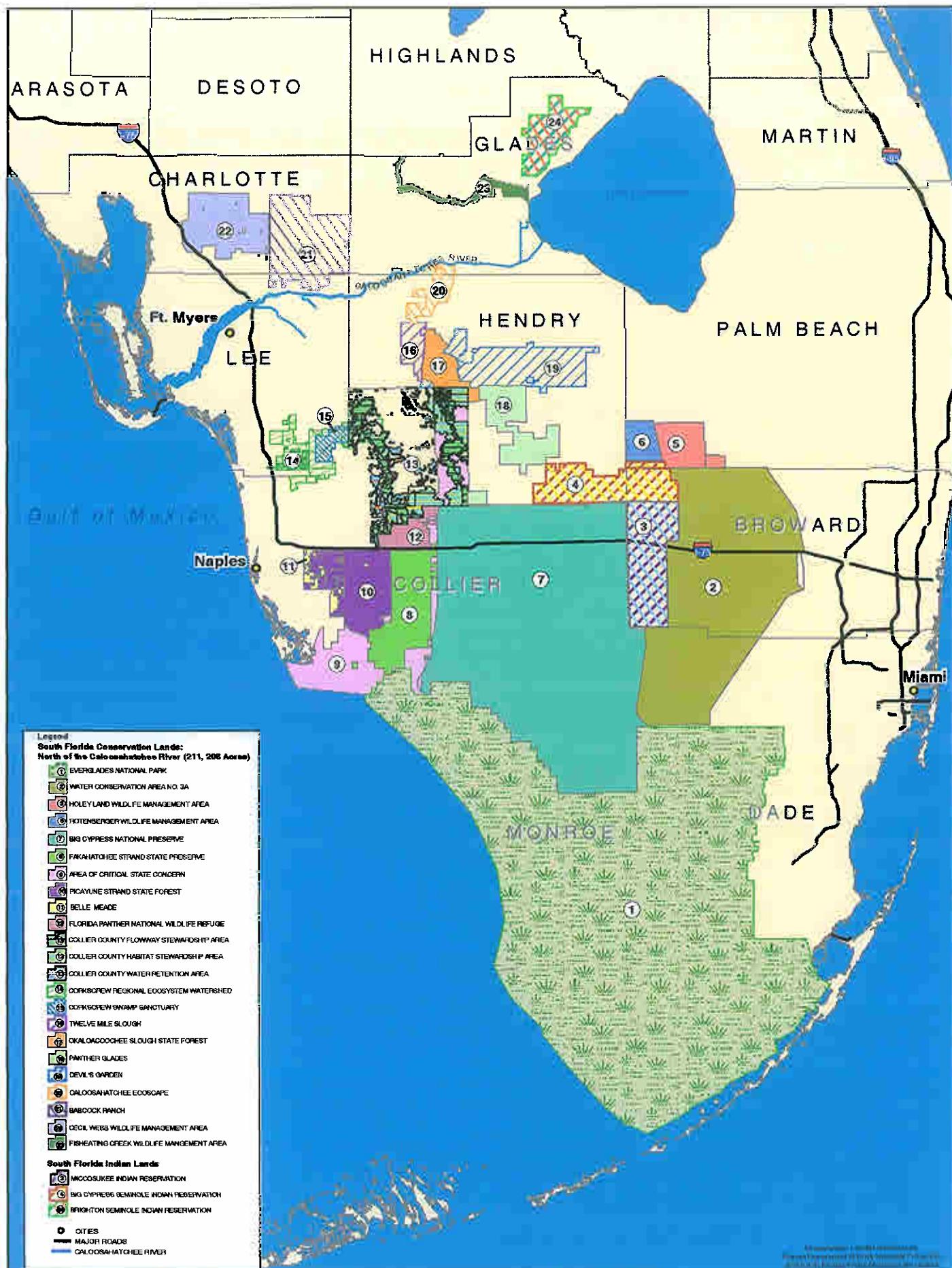
**Figure 5**

Ave Maria DRI Regional Map Showing 25-Mile Action Area



**Figure 6**

South Florida Conservation Lands



**Figure 6**  
South Florida  
Conservation Lands



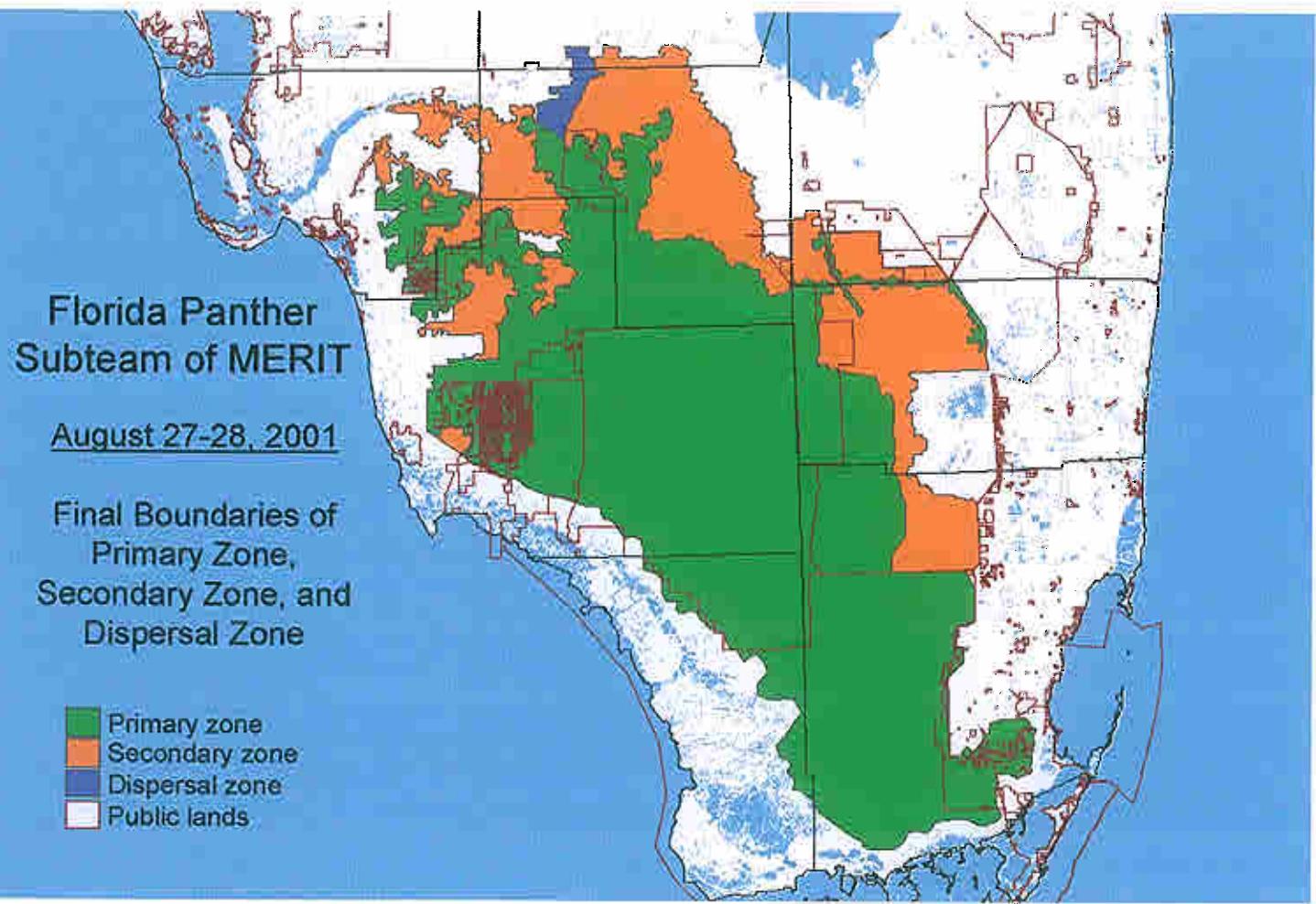
0 4.5 9 18 27 36 Miles

This information is provided using GIS data.  
Information is not limited to Federal, State,  
Local or Private lands. This map is not to scale.  
Does not represent data produced by the  
State or the Agency for any particular  
use. It is the responsibility of the user to  
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**Figure 7**

Primary, Secondary, and Dispersal Zones



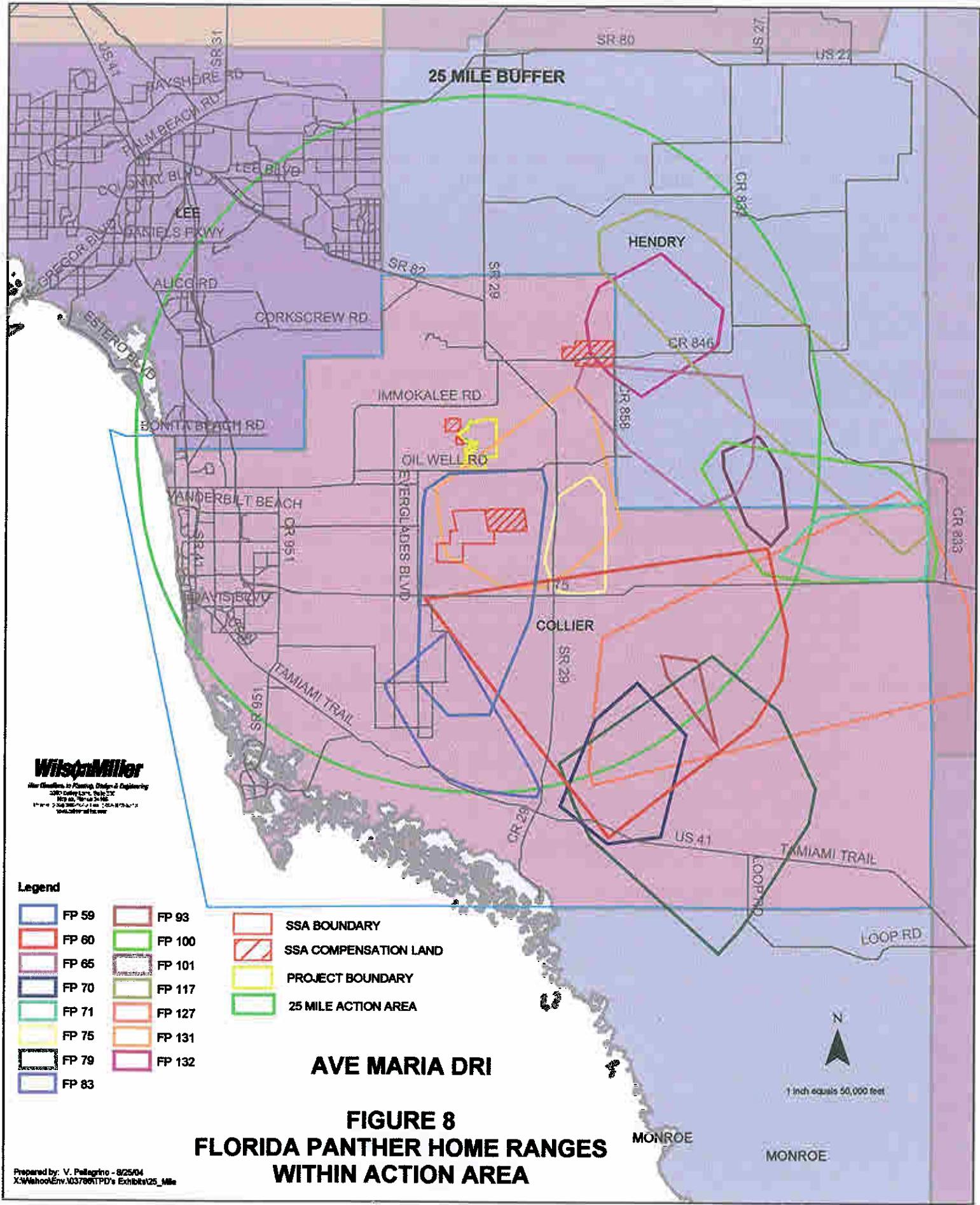
**FIGURE 7**

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**Figure 8**

Ave Maria DRI Florida Panther Home Ranges Within the Action Area



**FIGURE 8**  
**FLORIDA PANTHER HOME RANGES  
WITHIN ACTION AREA**

**Figure 9**

Golden Gate Estates Vacant Lands

**Golden Gate Estates Vacant Lands:  
Wetland Type (FLUCCS)**

Type	Acres
Upland	16946.2
Water	210.0
Wetland	16871.7

CR 849

OIL WELL GRADE RD

CR858/OIL WELL RD

IMMOKALEE RD/CR 846

LIVINGSTON RD

OAKS BLVD

HICKORY ROAD

CR31/AIRPORT RD

PINE RIDGE RD

GOLDEN GATE BLVD

EVERGLADES BLVD

SR 93 / I-75

MARIA BLVD

FERN STREET

DAVIS BLVD

COLLIER BLVD

SR 951

**Legend**

Golden Gate Estates

**Type**

Wetland

Upland

Water

Major Roads

0 0.5 1 2 3 4 Miles

1 inch equals 13,480 feet



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**Figure 9**

**Golden Gate Estates  
Vacant Lands, Wetlands and Uplands**

T9 Project#T9Project#0002\_InitialAerialMap\_HMU\_GoldenGateEstatesFLUCCS-110104.xlsd

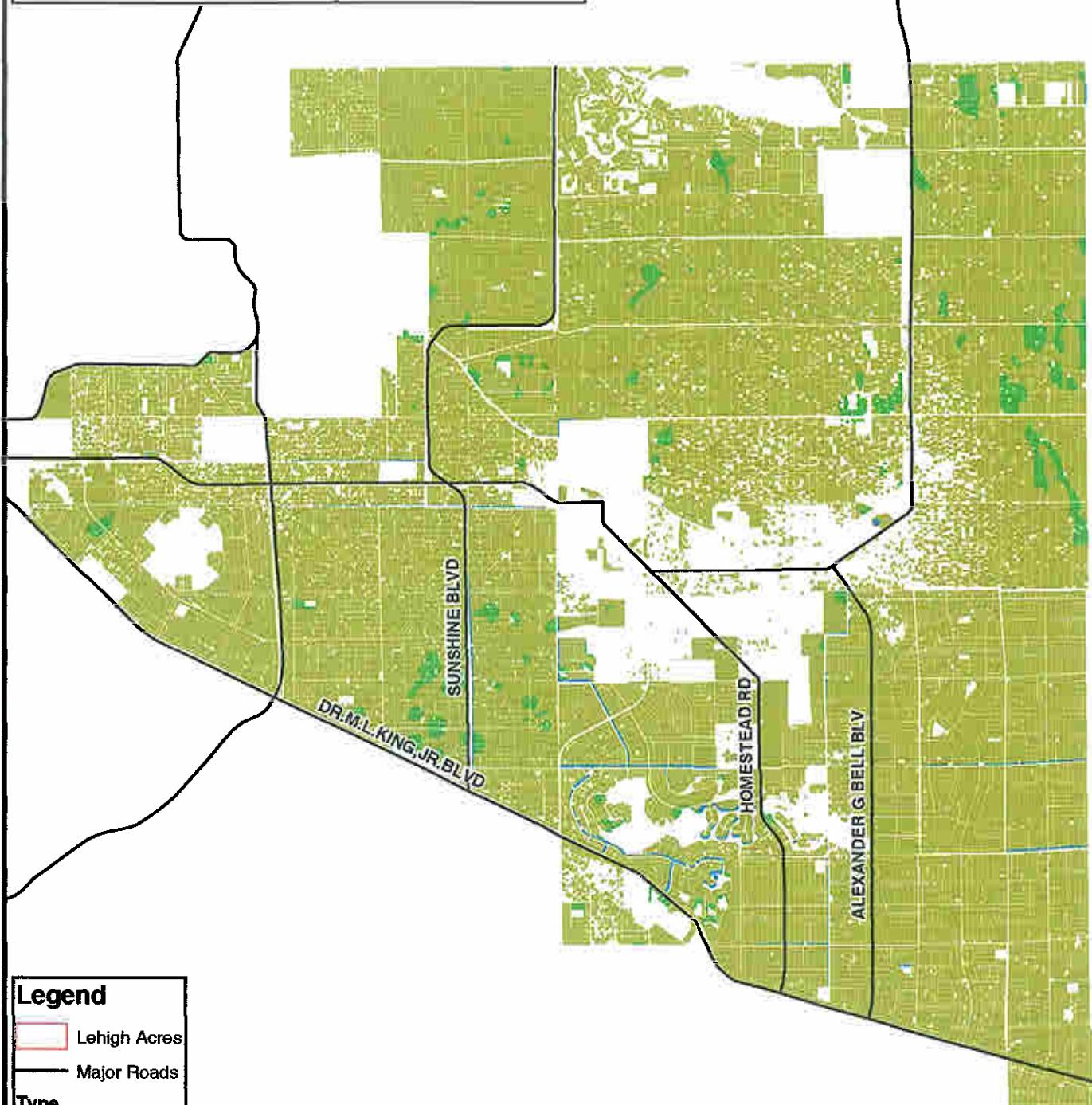
**Figure 10**

Lehigh Acres Vacant Lands

### Lehigh Acres Vacant Lands: Wetland Type (FLUCCS)

Type	Acres
Upland	33592.3
Water	201.9
Wetland	1057.5

MAIN ST/PALM BCH/1ST



**Figure 10**  
Lehigh Acres  
Vacant Lands, Wetlands and Uplands

0 0.5 1 2 3 4 miles  
1 inch equals 9,142 feet

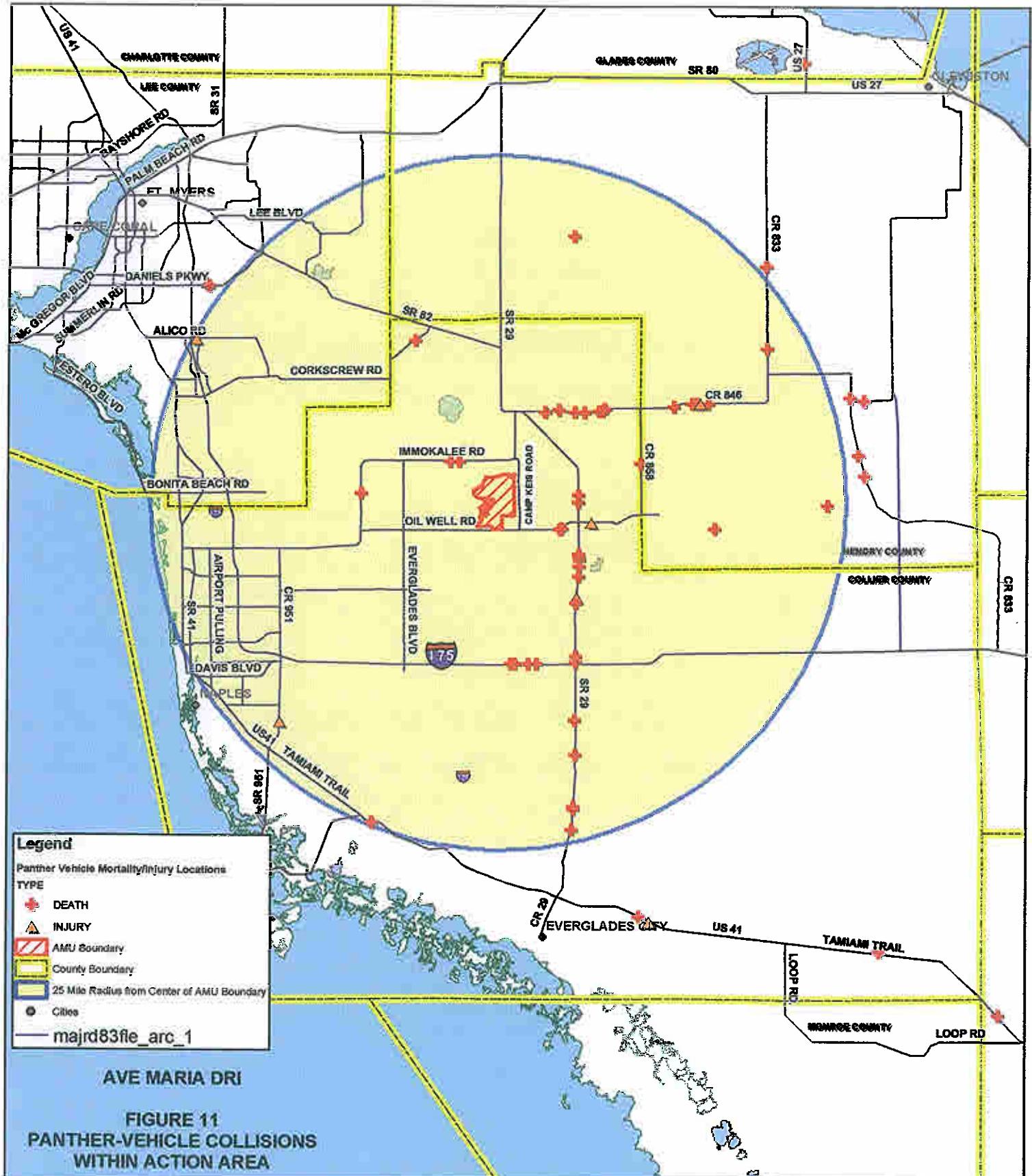


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**Figure 11**

Ave Maria DRI Panther-Vehicle Collisions within Action Area



Panther Vehicle Mortality/Injury Location Map

Ave Maria University: 25 Mile Radius  
Collier County, Florida

0 1 2 4 6 8 Miles  
1 inch equals 9 miles



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**Figure 12**

Audubon's Crested Caracara Breeding Range

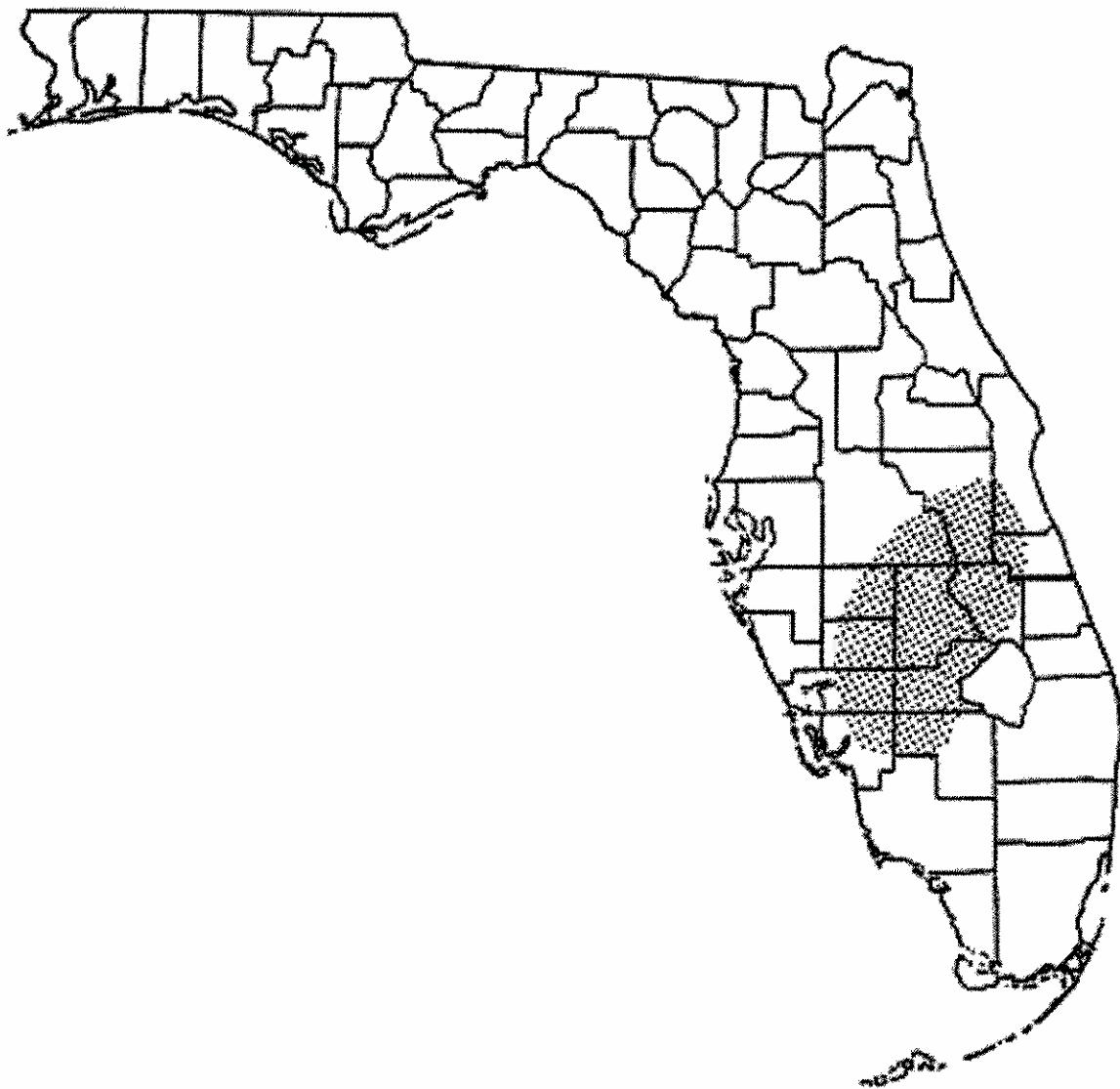
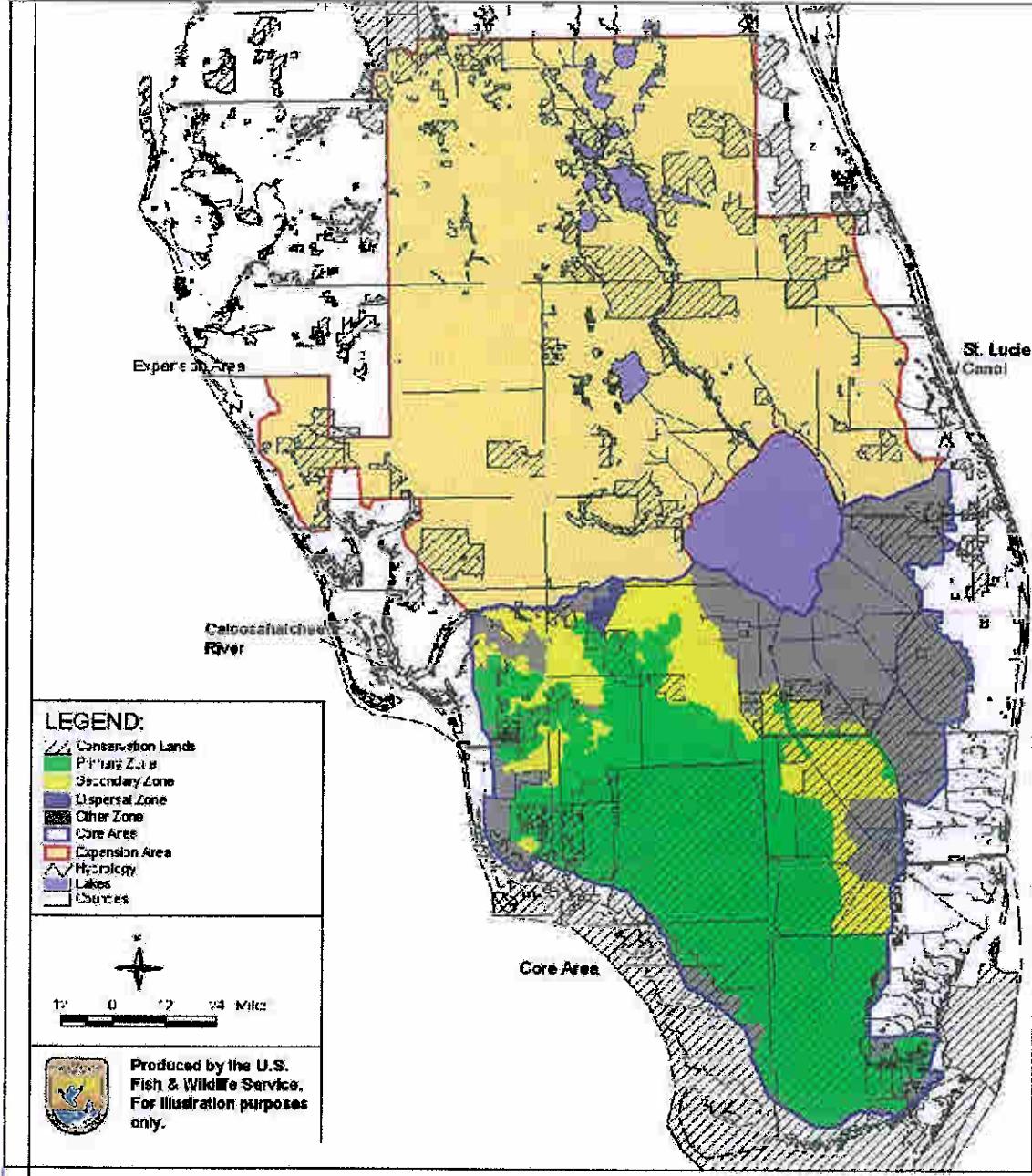


Figure 13: Depiction of the crested caracara's known breeding range in Florida, taken from Morrison (2001). Collier County occurs just south of the shaded area.

**Figure 13**

Florida Panther Core Area



**FIGURE 12**  
**FLORIDA PANTHER CORE AREA**

Prepared by: V. Pellegrino - 2/13/04  
X:\Wahoo\Env\03788\TPD's Exhibits\Panther Consultation Area

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