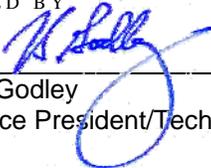


# Tarmac King Road Limestone Mine Project Biological Assessment

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# Introduction

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Tarmac America is proposing a Tarmac King Road Limestone Mine project area on a ±9,277-acre site located one mile west of U.S. 19 and two miles north of S.R. 40 in Levy County, Florida (Figures 1 – 3). The overall project purpose is to excavate construction-grade limestone aggregate, including limestone aggregate that meets FDOT’s specifications, in west-central Florida to provide a long-term source of supply for Tarmac’s and its customers’ use in the regional market.

Tarmac submitted a Section 404 Clean Water Act dredge and fill permit application to the US Army Corps of Engineers (COE) on 14 September 2007. As a result of this application, the COE determined that an Environmental Impact Statement (EIS) would be required and advertised the initiation of the EIS process in the Federal Register on 19 February 2008. On behalf of the Applicant, ENTRIX, Inc. (F.K.A. Biological Research Associates), submitted to the COE and the U.S. Fish and Wildlife Service (USFWS) a wildlife survey report for the project on 15 October 2008. In accordance with 50 CFR §402.12, this Biological Assessment (BA) report provides the information necessary to support the EIS and an “effect determination” of the project on federally listed species.

The COE is evaluating various alternative mine plans as part of the EIS process. This process is not complete. This BA report provides a description of the proposed action (Applicant’s preferred alternative), the federally listed species that may be affected and their respective action areas, the general biology and status of the species under baseline conditions, the likely effects of the proposed action on these species, and conservation measures that the Applicant has proposed to minimize any potential negative effects.

## 1.1 DESCRIPTION OF THE PROPOSED ACTION

The Tarmac King Road Limestone Mine consists of a 4,751-acre Mine Parcel and a 4,526-acre Mitigation Parcel that are contiguous (Figure 4). Under the Applicant’s preferred alternative, mining and related infrastructure development will occur on ±3,899 acres of the Mine Parcel (Mine/Disturb Area) with the remainder of that parcel (±863 acres, No Mine Area) left undisturbed (Figure 5). These undisturbed areas include all intermittent streams on the Mine Parcel with minimum 25’ wetland setbacks, and a natural vegetative buffer of variable width around the perimeter of the Mine Parcel.

Mining will be conducted in the Avon Park deposit, which at this location is very close to the surface with only a few feet of overburden. Limerock mining is a multi-phased process. At the beginning of mining a quarry, the vegetation is removed and the overburden is stockpiled or used for perimeter storm berms. The limerock is then drilled and fractured by blasting to a depth of no deeper than 120’. The rock is removed by draglines in the wet and temporarily stockpiled to dry in windrows on work pads. A mobile primary crusher reduces the material in size, after which it is placed on an electric conveyor belt system and sent to the plant site for final crushing, sorting and washing. The finished products are stockpiled at the plant and shipped to market by dump truck. The waste by-product is then returned and stored in previously mined quarries. Approximately 30 acres is proposed to be mined each year over the life-of-mine.

Following submittal of the Wildlife Survey report in October 2008, the Description of the Proposed Action was refined and some additional wildlife observations on the project were made. A revised Wildlife Survey report was prepared to conform with this new information (attached).

## 1.2 LISTED SPECIES POTENTIALLY AFFECTED BY THE ACTION

Table 1 summarizes the federally listed species known for Levy County, according to the USFWS Jacksonville Field Office website. The West Indian Manatee, Florida Salt Marsh Vole, Gulf Sturgeon and four listed sea turtles are generally considered marine or estuarine species. None of these species were detected during wildlife surveys and potential habitat for these species only occurs on the Mitigation Parcel. The western limit of the Mine Parcel is located over a mile from marine or estuarine resources (Figures 1 – 4). Thus, no direct effects of the project are anticipated for the West Indian Manatee, Florida Salt Marsh Vole, Gulf Sturgeon and sea turtles. The Water Use Permit application for the project (SWFWMD File No. 20013273.00) indicates that the expected (modeled) decrease in average annual streamflow from the site to Withlacoochee Bay is less than 0.15 cfs. By comparison, the average annual outflow from Lake Rousseau to Withlacoochee Bay is 450 cfs. Thus, the modeled decrease of 0.03% in average annual streamflow to Withlacoochee Bay from the project will not have any indirect or cumulative effects on these marine and estuarine species.

No scrub or scrubby flatwoods exist on the site, therefore no Florida scrub-jays will be affected by the project (nearest known population is at Cedar Scrub State Preserve 18 miles to the northeast; Stith 1999). The red-cockaded woodpecker is a territorial species that inhabits open, mature pine forests with sparse midstory vegetation and excavates its cavities exclusively in old growth (over 60 years of age), living pine trees (USFWS 2003). The entire project site has been logged repeatedly and does not contain appropriate habitat for the red-cockaded woodpecker (nearest known population is at Goethe State Forest 5 miles to the northeast; Cox et al., 1994; FNAI database, accessed April 2009).

Category	Species Common Name	Species Scientific Name	Code
Mammals	West Indian (Florida) Manatee	<i>Trichechus manatus latirostris</i>	E/CH
	Florida Salt Marsh Vole	<i>Microtus pennsylvanicus dukecampbelli</i>	E
Birds	Florida Scrub-jay	<i>Aphelocoma coerulescens</i>	T
	Wood Stork	<i>Mycteria americana</i>	E
	Red-cockaded Woodpecker	<i>Picoides borealis</i>	E
Fish	Gulf Sturgeon	<i>Acipenser oxyrinchus desotoi</i>	T
Reptiles	Eastern Indigo Snake	<i>Dymarchon couperi</i>	T
	Green Sea Turtle	<i>Chelonia mydas</i>	E
	Leatherback Sea Turtle	<i>Dermochelys coriacea</i>	E
	Kemp's ridley Sea Turtle	<i>Lepidochelys kempii</i>	E
	Loggerhead Sea Turtle	<i>Caretta caretta</i>	T
Amphibians	None		
Mollusks	None		
Crustaceans	None		
Plants	None		

Code Key: E = Endangered, T = Threatened, P = Proposed, C = Candidate, CH = Critical Habitat

The joint COE/USFWS (2008) *Effect Determination Key for the Wood Stork in Central and Peninsula Florida* considers the following factors when making a determination of the potential impacts of a project on wood storks: 1) distance from an active colony site, 2) documented foraging on the project site, 3) impacts to suitable foraging habitat (SFH), and 4) compensatory mitigation of SFH. During seasonal wildlife surveys conducted between 1 August 2007 and 7 June 2008, a total of 78 wood storks were observed on five dates (Figure 6). All occurred on the Mitigation Parcel with most individuals associated with estuarine wetlands.

An additional 20 wood storks were observed each at two roost sites in the Mitigation Parcel (see Wildlife Survey report). No wood storks were observed foraging in wetlands on the Mine Parcel during about 15,000 hours of survey work on the project site. No nesting colonies of wood storks or other wading birds were detected on the Tarmac King Road Limestone Mine Project. Three wood stork colonies exist in the vicinity of the project (Figure 7); however, the 15-mile core foraging areas (CFA) of these central Florida colonies do not overlap the project and none of the three closest colonies were active during 2001 – 2006 surveys (USFWS 2009 wood stork database). The closest colony is 24 miles from the project.

Although the Mine Parcel contains some wetland types (e.g., FLUCFCS 616) that may constitute suitable foraging habitat, there was no documented use of these wetlands by wood storks during the wildlife surveys. On the Mine Parcel, those wetland types that may have a seasonal water depth suitable for foraging (2 to 15 inches) typically have a closed canopy that restricts access and makes landing by wood storks difficult. The major open-canopied wetland type on the mine parcel is road side ditches (FLUCFCS 510), but again, no usage of this habitat by storks was detected despite many trips on the adjacent roads. Wetlands beneath the power line corridor also are open-canopied, but off the mine parcel. No open-canopied estuarine wetlands occur on the Mine Parcel. Furthermore, the UMAM analysis indicates that the functional lift from the proposed Mitigation Plan exceeds the functional loss from the Applicant's preferred alternative (please note that the UMAM analysis is still under review by the COE but the mitigation plan ultimately must demonstrate that all unavoidable impacts are fully compensated). Under these conditions, use of the joint COE/USFWS (2008) *Effect Determination Key for the Wood Stork in Central and Peninsula Florida* leads to a "not likely to adversely affect" determination for the wood stork.

Although the bald eagle has been removed from the federal list of endangered and threatened species, it remains protected under the Bald and Golden Eagle Protection Act (BGEPA) and the Migratory Bird Treaty Act (MBTA). The species also was removed from the FWC list, but Florida adopted a Bald Eagle Management Plan (FWC 2008) and a special rule to protect bald eagles (Rule 68A-16.002, F.A.C.). No bald eagle nests were detected on the Tarmac King Road Limestone Mine project, although two active nests were found off-site during helicopter surveys (Figure 8). During the wildlife surveys, a total of 11 bald eagles were observed flying over or perched in trees on the property. In addition, an adult eagle was found dead (undetermined cause) in May 2007 and reported to both the USFWS and the FWC. However, as all known bald eagle nests are greater than 660' from the project boundary, the proposed action will not likely adversely affect the bald eagle.

During the fieldwork on the Tarmac King Road Limestone Mine Project (January 2005 to March 2009; approximately 15,000 hours of effort), a total of three Eastern indigo snakes were observed (Figure 9), one on the Mine Parcel and two on nearby, off-site property. All were crossing or immediately adjacent to roads. The adjacent habitat was wetland sloughs for two individuals (13 December 2007 and 6 October 2008) and a recent clear cut (12 December 2007) for the other specimen.

### 1.3 ACTION AREA

The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR §402.02). The action area considered for the Eastern indigo snake for this project includes all habitat which potentially may be adversely affected by the proposed action.

The Eastern indigo snake has the largest known home range of any North American snake (Hyslop 2007) and the home range of some individuals likely extends beyond the boundary of the proposed project. Home range size in snake species often varies with sex, season, habitat type and quality, the number of radiolocations and duration of study, and the method(s) used to calculate home range size (Macartney et al. 1988). In all radiotelemetry studies of the Eastern indigo snake conducted to date, males have larger home ranges than females (Moler 1985, Layne and Steiner 1996, Breininger et al. 2004, Dodd and Barichivich 2007, Hyslop

2007). To be conservative, the mean home range size of adult males using minimum convex polygon estimates averaged over the two-year field study (520 ha = 1,285 acres) of Hyslop (2007) was used. This mean home range estimate is the largest reported in the literature for this species. Thus, the action area of the proposed project for the Eastern indigo snake includes the  $\pm 9,277$ -acre project area and an 8,444' (1.6 miles) buffer to consider potential effects to indigo snakes that may have a home range that overlaps the project boundary (Figure 10). Please note that this action area incorporates the public portion of King Road from the east project boundary to U.S. 19, which will be used by vehicles to enter and exit the site.

# Eastern Indigo Snake

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## 2.1 STATUS OF THE SPECIES/CRITICAL HABITAT

This section summarizes the biology and ecology of the Eastern indigo snake as well as information regarding the status and trends of the species throughout its entire range. The USFWS uses this information to assess whether a federal action is likely to jeopardize the continued existence of the species. The “Environmental Baseline” section summarizes information on status and trends of the species, specifically within the action area. This summary provides the foundation for the assessment of the effects of the proposed action, presented in the “Effects of the Action” section.

### 2.1.1 Species/Critical Habitat Description

The U.S. population of the Eastern indigo snake was federally listed as Threatened on January 31, 1978, primarily because of population declines caused by habitat destruction and degradation, over-collecting for the pet trade, and mortality from gassing of gopher tortoises (*Gopherus polyphemus*) burrows to collect rattlesnakes (43 FR 4026). No critical habitat has been designated for the species, so none will be affected.

The Eastern indigo snake is the longest snake in North America reaching lengths up to 8.5 ft (2.6 m) (Conant and Collins 1991, but see Devitt et al. 2007). This non-venomous snake is bright blue-black in coloration with the gular region being reddish or cream colored. The scales are large and smooth, except adult males have slightly keeled mid-dorsal scales (Layne and Steiner 1996).

Within its current known range of Florida and southern Georgia, the Eastern indigo snake occupies a wide range of habitat types including pine flatwoods, scrubby flatwoods, scrub and sandhill, hammocks, wetlands, coastal dunes and human-altered habitats (USFWS 2008). Below-ground refugia include the burrows of gopher tortoises (*Gopherus polyphemus*), nine-banded armadillos (*Dasypus novemcinctus*), rodents and land crabs (*Cardisoma guanhumii*), as well as hollow logs, stump holes and other crevices (Hyslop 2007). Seasonal shifts in habitat use have been widely reported, with indigos typically spending the winter in tortoise burrows in xeric uplands and foraging more frequently in wetlands during the warmer months (Layne and Steiner 1996, Hyslop 2007, Stevenson et al. 2009). In the Gulf Hammock Wildlife Management Area, hollow root channels and rodent burrows in the base of live oak trees were the most common den sites, and the edges of wetlands were favorite foraging locations (Moler 1985). The species is diurnal throughout its range (USFWS 2008).

### 2.1.2 Life History/Population Dynamics

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

Adult males are also significantly longer and heavier than females, which is attributed to male-male combat in this species (Shine 1994, Stevenson et al. 2009). Although both sexes mature at about the same total length (150 cm), males continue to grow after sexual maturity, whereas females apparently devote most available energy to vitellogenesis (USFWS 2008, Stevenson et al. 2009). Maturity is reached in 3 – 4 years and in captivity adult females lay of clutch of 4 – 12 eggs annually (USFWS 2008).

Radiotelemetry and mark-recapture have been used to estimate home range size (convex polygon method), daily and seasonal movement patterns, habitat use and the extent of habitat required to support population of this species. In central Florida Layne and Steiner (1996) estimated the mean home range size of 12 males to be 74.3 ha and 7 females to be 18.6 ha. Males also moved significantly more often between successive locations and moved greater distances. In the Gulf Hammock region of Florida, Moler (1985) reported mean home ranges of 48.2 ha – 533.0 ha for four males and 50.8 ha for one female. A single male occupied a home range of 185 ha in north-central Florida (Dodd and Barichivich 2007). In southern Georgia the mean home range of 19 males (520.0 ha) was significantly larger than 13 females (103.4 ha), and males move more frequently and greater distances (Hyslop 2007).

Using a combination of radiotelemetry and population models, Breininger et al. (2004) investigated the effects of habitat fragmentation on the viability of Eastern indigo snake populations in east-central Florida. In this study males had an average home range size of 120 ha (females = 41 ha; Hyslop 2007), snakes living along primary roads soon died, and edge/area effects were more important than area alone in determining population survival. Layne and Steiner (1996), Enge and Wood (2002), and Hyslop (2007) also found roads to be an important source of mortality in indigo snakes. Moler (1992) suggested that at least 1,000 ha of contiguous habitat was required to sustain Eastern indigo snakes.

Indigo snakes consume a wide variety of prey including birds, small mammals, anurans, lizards, snakes and turtles (Ernst and Ernst 2003, Stevenson et al. 2009).

### **2.1.3 Status and Distribution**

Historically, the Eastern indigo snake occurred throughout Florida and in the coastal plain of Georgia, Alabama and Mississippi (USFWS 2008). Today, the only remaining viable populations occur in southern Georgia and Florida.

Stevenson (2006) reported recent (1995 – 2006) records for 25 counties in Georgia. In the panhandle of Florida west of the Suwannee River, the Eastern indigo snake persists in low numbers (Gunzburger and Aresco 2007). The species is more widespread and remains commonly observed in peninsular Florida with records from over 80 public lands since 2001 (USFWS 2008). The USFWS (2008) recently completed a 5-year review of the Eastern indigo snake and recommended no change to its current status as a threatened species.

## **2.2 ENVIRONMENTAL BASELINE**

Little is known about the Eastern indigo snake in the action area or in the immediate vicinity, other than the information published by Moler (1985). The Florida Natural Areas Inventory (FNAI) has seven locality records in the vicinity of the project (Figure 11), which includes the five snakes radio-tracked by Moler (1985; sites 4 – 7 of Figure 11). The species also was reported from an undetermined site on the Waccasassa Bay State Preserve (Kevin Enge, pers. comm.). As noted in Section 1.2, only three indigo snakes were observed in about 15,000 hours of field effort over a 5-year period in the action area of the Tarmac King Road Limerock Mine. In the same general area and habitat 25 years earlier, Moler (1985 and 2009, pers. comm.) and several colleagues with much less field effort collected six indigo snakes in about 3 months, suggesting that the local population has declined substantially in the intervening years. The major differences between

these two study periods appear to be an increase in secondary roads, traffic and human activity (including the intensity of silviculture) over time and a decrease in the amount of intact hydric hammock; the percentage of recent clearcuts were about the same (Moler 2009, pers. comm.). By comparison, on protected habitat with limited and controlled access, Stevenson et al. (2008) captured an average of one indigo snake per five person-hours during their mid-November through 31 March survey periods in Georgia, and Layne and Steiner (1996) marked and released an average of 12.4 indigo snakes during intensive effort from 1980 – 1987 at Archbold Biological Station (ABS).

No reliable estimate of the population density of Eastern indigo snakes in the action area exists. Layne and Steiner (1996) estimated a population density of 1.6 to 2.6 adult indigo snakes/100 ha at ABS depending on the underlying assumptions, and the best estimate at Kennedy Space Center (Breininger et al. 2004) was 5.0 adults and subadults/100 ha. No statistical confidence limits around these means were published. Both of these sites are considered near-optimal habitat for the species with an abundance of gopher tortoise burrows, foraging habitat and controlled access to limit road mortality. Although visual surveys are notoriously inaccurate at predicting snake densities (Parker and Plummer 1987), one can compare the ratio of yearly indigo snake sightings within the Tarmac King Road Limestone Mine action area (3 snakes/5 years of field effort = 0.6/yr) with the mean number of captures at ABS (12.4/yr). Multiplying this ratio (0.048) by the density estimates at ABS (1.6 to 2.6/100 ha) yields an estimated density of 0.08 to 0.13/100 ha within the action area, or about 2.9 to 4.7 indigo snakes within the project limits and 25.1 to 40.7 individuals in the action area.

The five Eastern indigo snakes tracked by Moler (1985) primarily denned at the base of live oak trees (34 of 58 den sites; 58.6%), although limestone solution holes (17.2%), hollow logs (13.8%) and armadillo burrows (10.4%) also were used. Gopher tortoises (*Gopherus polyphemus*) are rare in the Gulf Hammock (see Wildlife Survey report), and accordingly, their burrows are not an important refugia at this site. It is likely that Eastern indigo snakes in the action area experience higher than normal mortality as a result of road kill, intentional killing and forestry operations. An overlay of the existing road network in the action area on a 120-ha home range grid (Breininger et al. 2004) suggests that at this home range size, all adult male indigo snakes would cross an existing road and be subject to road kill (Figure 12). If the average size of male Eastern indigo snakes in Gulf Hammocks approaches that of those in Georgia (520 ha; Hyslop 2007), then the home range of all adult males would be intersected by multiple roads (Figure 13). Breininger et al. (2004) estimated that adult annual survivorship of indigo snakes decreased from 0.88 to 0.67 in females and from 0.80 to 0.53 in males if a primary road intersected a 120-ha home range grid.

The effect of road mortality and intentional killing of Eastern indigo snakes in the action area cannot be estimated accurately, but is assumed to be potentially significant. Enge and Wood (2002) found that on rural roads (including unpaved limerock roads) in Hernando County, Florida, with less than 1,000 vehicles per day, annual snake mortality rates and traffic volume were not correlated. Furthermore, paired drift fence/funnel trap surveys showed indigo snakes were proportionately trapped three times more frequently in intact habitats on public lands than at this rural site, suggesting that road mortality had already reduced the indigo snake population at the rural site (Enge and Wood 2002). Deliberate killing of snakes on roads is known to be a common activity throughout the world (Andrews et al. 2006).

No primary (paved) roads currently exist in the action area and most of the year the limestone roads see relatively little traffic, however, during peak hunting season, the roads can become well traveled at relatively high speeds. Traffic levels tend to fluctuate throughout the year as timber trucking, hunting and local residential use changes. However, anecdotal evidence and observed roadkill indicates that local drivers go out of their way to run over snakes on the road. Road mortality in many other snake species was commonly observed during site reviews. Some snakes also were found shot by guns in the action area. In the 24,465-acre Gulf Hammock Wildlife Management Area, 450 recreational hunting permits are issued annually each year (FFWCC records) that allows vehicular and off-road vehicle use. The main hunting season coincides with the breeding season of indigo snakes, increasing the likelihood of road mortality as males search for

mates. Furthermore, within 1.6 miles of the boundary of the Tarmac King Road Limerock Mine, there are approximately 300 privately-owned lots, many with hunting cabins or homes that are used year-round. Logging trucks are common and site access by the public is generally unrestricted.

Intensive silvicultural activities have been identified as a threat to the Eastern indigo snake (USFWS 2008). Each cycle of clear-cutting and mechanized site preparation during timber harvest may result in direct mortality to adults, juveniles and eggs. Most of the action area has been harvested two or three times since the initial clearing of Gulf Hammock in the early 1970s. Also, the removal of stumps and hollow logs reduce the number and availability of shelter sites (USFWS 2008). In the Gulf Hammock, Moler (1985) found that hollow root channels and rodent burrows at the bases of live oak trees were the most important refugia for Eastern indigo snakes. However, since these trees typically are poisoned to make room for more commercially valuable pine trees in the action area, this resource eventually may be lost (Moler 1985).

Silvicultural activities may also strongly affect the prey base, thermal regime and habitat selection of Eastern indigo snakes at this site. Moler (1985) suggested that in the Gulf Hammock, wetland edges were used frequently as foraging sites and that most indigo snakes avoided uncut hammocks with relatively little groundcover. He found that indigos preferentially used recent clearcuts, suggesting that that these sites likely supported a higher diversity of prey and more basking opportunities (P. Moler, pers. comm.). In southern Georgia, Hyslop (2007) also found that within their activity season, indigo snakes also preferred wetlands where 65% of the total foraging events and behavior were recorded. She also noted that indigos avoided dense planted pine monocultures and favored recent clearcuts where gopher tortoise burrows were common.

## **2.3 EFFECTS OF THE ACTION**

This section included an analysis of the direct and indirect effects of the proposed action on the indigo snake including beneficial effects, and interrelated and interdependent activities.

### **FACTORS TO BE CONSIDERED**

Factors considered in the analyses for effects of the action include the distribution of the geographic areas where disturbance will occur relative to the potential value of that area to indigo snakes, the type of disturbance, the proximity of the action to natural areas outside of the project site but within the action area that may support indigo snakes, the timing of project activities relative to sensitive periods in the snake's life cycle, the duration of potential effects on indigo snakes and their habitat, and the construction, operation and maintenance of the project.

Indigo snakes are expected to be present in low numbers in the action area. Initial site clearing and construction activities will affect less than 100 acres per year. When mining commences, about 25 acres will be cleared annually over the 100 year life of mine. Due to the mining methodology, there will be a couple of times over the mine life when more than 25 acres will need to be cleared. At these times it could be up to 100 acres to provide working pads and stock pile areas, as well as to prepare future mine phases. At a clearing rate of 100 acres per year, all proposed impacts could occur within the first 40 years, however, there is no intent by the applicant to clear more area than would be required to maintain an operational mine. Under the currently proposed mine schedule, less than 500 acres would be cleared during years one thru five, and approximately 25 acres would be cleared each year thereafter (except as noted above). At the planned clearing rate, all impacts would occur by operation year 90

Besides potentially lost cover, habitat, and associated prey, disturbance may occur in the form of pedestrian, equipment, and vehicular traffic, as well as vibration from blasting. Construction noise and vibration could disturb snakes where it exceeds ambient conditions. Visual disturbance from personnel during construction could also affect snakes; however, this potential disturbance may lessen when these altered areas are reclaimed and post-construction vegetation conditions provide more or better cover. However, the timing and duration of clearing and reclamation activities will vary with the activities proposed at specific locations. Although construction personnel will be advised to avoid indigo snakes, the operation of equipment in brushy, grassy, or otherwise vegetated areas may disturb snakes that are not readily visible.

Construction and maintenance activities are most likely to occur during daylight hours – the same time that indigo snakes are active. Construction likely will occur year-round in at least some areas of the site. Indigo snake nesting season occurs between April and July, and potential loss of nest sites is anticipated.

### ANALYSES FOR EFFECTS OF THE ACTION

The indigo snake is difficult to detect and quantify for the following reasons: (1) it has a wide-ranging distribution; (2) it has a patchy distribution within suitable habitat; (3) it has limited detectability due to use of burrows or holes for shelter; (4) there is likely unoccupied suitable habitat; (5) juveniles have limited detectability due to their affinity for thick vegetation; and (6) it may use cryptic sheltering areas that may be temporarily established during construction (e.g., brush piles, equipment stockpiles, and dirt mounds). The lack of practical methods to survey, in conjunction with wide-ranging activity and usage of a variety of habitat types, makes it difficult to estimate the approximate number of indigo snakes that may be affected by the action.

### BENEFICIAL EFFECTS

Deeding the ±4,526-acre Mitigation Parcel to the State of Florida will expand permanently protected and occupied indigo habitat on the adjacent Waccasassa Bay State Preserve. The proposed action also will eliminate the destructive and potentially lethal effects of intensive silvicultural activities on the Eastern indigo snake, and restore the Mitigation Parcel to the historic Gulf Hammock landscape. Placing the property under public ownership will greatly limit uncontrolled access relative to the baseline condition, and reduce the likelihood of road mortality in this snake species. However, the details of this transaction (e.g., timing, phasing, long-term management responsibilities, authorized and prohibited activities) will not be known until final permit issuance, and will be conditions of the permit(s).

### DIRECT EFFECTS

Direct effects are those effects that result from the proposed action (including the effects of interrelated actions and interdependent actions) that affect the species of its habitat.

**Injury and mortality:** Because of the nature of the proposed construction (i.e., vegetation removal, debris piling and burning, blasting, mining, reclamation, truck traffic to and from U.S.19), some of the indigo snakes present at the time of the action could be adversely affected by the project. Snakes in the portion of the mine parcel under construction or on the King Road access route are presumed to be most at risk for injury or mortality.

It is difficult to determine the number of indigo snakes (adults, juveniles, hatchlings, and nests) that would be directly subject to mortality or injury by the project. As noted above, the best available science suggests that as few as 3 to 5 adult indigo snakes are present on the project site, and 21 to 45 adults in the action area. Assuming an adult sex ratio of 2 males: 1 female (Stevenson et al. 2009) and that females nest each year (USFWS 2008), then about 1.0 to 1.7 clutches may be deposited on the project site each year. To estimate the number of juveniles and subadults in the population (< 4 years old), we used the female portion of the Leslie matrix for Eastern indigo snakes in Table 27.2 of Breininger et al. (2004) and iteratively estimated a stable

age distribution for their Table 27.3 “Least Favorable” and “Best Estimate” calculations for survival and fecundity (Table 2). Table 2 also assumes that these survival and fecundity estimates are constant over time and independent of population density (Begon et al. 1996). These simplifying assumptions are requirements of the model (Begon et al. 1996), and the former assumption is particularly unrealistic, as the indigo snake population in Gulf Hammock appears to have declined substantially in the last 25 years (see Section 2.2).

**Table 2. Projected age distribution of Eastern indigo snake on the Tarmac King Road Limerock Mine project area (±9,277 acres) and action area (40,337 acres, see text for details).**

Least Favorable	Stable Age Distribution	Project Area		Action Area	
		Given 2.9 adults	Given 4.7 adults	Given 25.1 adults	Given 40.7 adults
1 Year Old	9%	0.31	0.50	2.76	4.37
2 Year Old	6%	0.21	0.35	1.87	2.95
3 Year Old	6%	0.20	0.32	1.77	2.80
4+ Year Old	80%	2.90	4.70	25.10	40.70
Total		3.62	5.87	31.50	50.82

Best Estimate	Stable Age Distribution	Project Area		Action Area	
		Given 2.9 adults	Given 4.7 adults	Given 25.1 adults	Given 40.7 adults
1 Year Old	26%	1.64	2.65	14.18	22.99
2 Year Old	16%	1.02	1.65	8.84	14.33
3 Year Old	13%	0.80	1.30	6.92	11.23
4+ Year Old	46%	2.90	4.70	25.10	40.70
Total		6.36	10.31	55.04	89.25

Injury and mortality as a direct effect of the project likely will be largely limited to the mining area on the Mine Parcel (“project area”) as a result of construction activities when indigo snakes and their nests are hidden from view. As noted under Minimization Measures below, all contractors and equipment operators on the project will be trained in the Service’s *Standard Protection Measures for the Eastern Indigo Snake* (USFWS 2004) and required to follow these measures, so road mortality and intentional take from these individuals on the project site or in the action area will be minimized. Nevertheless, we request incidental take though harm (by injury or mortality) of one Eastern indigo snake and one indigo snake nest per year during the construction phase of this project. If our estimates of current indigo snake population densities in the Gulf Hammock are low, it may be necessary to reinitiate consultation some time in the future.

**Disturbance during construction:** The increased human presence on the site during construction along with the operation of construction equipment and vehicles may disturb indigo snakes to the point they leave the project area. This may result in missed foraging and mating opportunities and these individuals may be more vulnerable to predation and intraspecific aggression; however, this is difficult to estimate.

**Habitat conversion and conservation:** The mine will represent a permanent change to about 3,899 acres (42.0%) of the project landscape for indigo snakes. However, about 1,114 acres of mine pits are proposed to be completely backfilled with mine tailings and revegetated. These areas are immediately adjacent to the ±863 acres of No Mine Areas and will provide a travel corridor and habitat for indigo snakes on the Mine Parcel once construction and reclamation are completed.

**Minimization measures:** Although the Applicant agrees to implement the Service's *Standard Protection Measures for the Eastern Indigo Snake* (USFWS 2004), a potential for mortality, injury or harassment of indigo snakes from construction and operation activities within the action area still remains. Standard construction conditions will require the education of contractors and equipment operators, posting of speed limit signs on all roadways during project construction and operation, on-site signs explaining penalties of intentionally running over snakes, and instructions that construction will cease if indigo snakes are observed.

### INDIRECT EFFECTS

Indirect effects are those that are caused by or result from the proposed action, are later in time and are reasonably certain to occur. The indirect impacts evaluated for the project include: (1) post-construction traffic by vehicles accessing the area for project monitoring, operations, maintenance; and (2) post-construction maintenance of roads, stormwater ponds and reclaimed quarries (including vegetation management methods such as mowing, herbicide applications, and physical removal). The indirect effects that the proposed action may have on indigo snakes within the action area are discussed below.

Once construction is completed, vehicular traffic will access the area because of project monitoring, operations and maintenance. A small number of indigo snakes may occupy the Mine Area during operation and maintenance for the life of the project. These snakes may be subject to injury, mortality or harassment from the operation of vehicles and equipment, including mowing and minor herbicide application. The *Standard Protection Measures for the Eastern Indigo Snake* (USFWS 2004) will remain in effect during this period with expectation that no mortality of indigo snakes will occur, although some snakes may be disturbed.

### 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 interdependent utility apart from the action under consultation. There are no interrelated or interdependent actions expected for this project.

### CUMULATIVE EFFECTS

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

As noted above, there are about 300 privately-owned lots in the 1.6 mile buffer zone surrounding the project with the remainder being owned either by Plum Creek or the State of Florida (Figure 14). Conversion of surrounding lands that currently support indigo snakes to more intensive residential uses that would support fewer indigo snakes would be the most likely cumulative effect. The primary threat today to the indigo snake is habitat loss and fragmentation due to development (Moler 1992, USFWS 2008). Besides loss of habitat, residential developments also increase the risk of harm to indigo snakes in the interface areas between suburban and native habitats because it increases the likelihood of snakes being killed by property owners and domestic pets. Increased traffic associated with development may also lead to increased indigo snake mortality.

It is difficult to predict the spatial extent or timing of indigo snake habitat loss due to land use conversion within the action area (but outside of the project site). There are  $\pm 40,337.3$  acres of potential indigo snake habitat in the action area outside of the project site. Of this acreage,  $\pm 8,665.7$  acres are within the Waccasassa Bay State Preserve and presumed secure from cumulative effects,  $\pm 22,195.85$  acres are owned by Plum Creek, and  $\pm 9,478.78$  acres are private in holdings. The relatively remote location of the project, absence of paved access roads and past history of Plum Creek suggest that sale of their holdings in the immediate vicinity of the project for residential development is unlikely. The extent of isolated, non-jurisdictional wetlands on the  $\pm 9,478.78$  acres of private in holdings is unknown. Assuming that the percentage of uplands (44.6%) and of wetlands (55.4%) on the Mine Parcel is similar on these in holdings, then about 5,251.2 acres of these private lands consist of wetlands. On the Mine Parcel, the Applicant elected to use a Preliminary Jurisdictional Determination for purposes of Corps permitting (see Regulatory Guidance Letter No. 08-02), which assumes that all waters and wetlands that would be affected in any way by the permitted activity are jurisdictional. The best estimate for the Mine Parcel is less than 5% of the on-site wetlands are isolated and non-jurisdictional. Applying this same estimate to the in holdings indicates that about 262.6 acres of wetlands may be developed without Federal review and represents future non-Federal actions.

Although these wetlands may be adversely affected by non-federally reviewed actions and the habitat for indigo snakes may be affected, the cumulative loss or reduction in habitat value is judged to be insignificant for the following reasons:

The density of indigo snakes even in the higher quality habitat in the action area appears to be very low (Section 1.2).

Most smaller private in holdings are concentrated in two areas to the south and west sides of the project adjacent to major access roads, and most of these lots already have a hunt cabin or residential lot.

Such fragmented habitat is already highly degraded (Section 2.1.2).

All the larger private in holdings are used for hunting or have been converted to pasture/cropland.

## CONCLUSION

After reviewing the current status of the indigo snake, the environmental baseline of the action area, the effects of the proposed action and cumulative effects, it is the opinion of this Biological Assessment that the project as proposed, is not likely to jeopardize the continued existence of the indigo snake. Limited mortality of indigo snakes and their nests from construction, operations and maintenance may occur. The indigo snake is not anticipated to be extirpated from the action area but will be confined to the suitable habitat remaining in the project site and the surrounding areas. The indigo snake also has some ability to move away from situations, which may result in direct injury or disturbance and can access adjacent habitat if escape opportunities are made available. Application of the *Standard Protection Measures for the Eastern Indigo Snake* (USFWS 2004) will reduce potential risks to the species. The Mitigation Parcel will expand permanently protected and occupied indigo snake habitat on the adjacent Waccasassa Bay State Preserve. The proposed action will not appreciably reduce the number, distribution, and reproduction of indigo snakes in Florida.

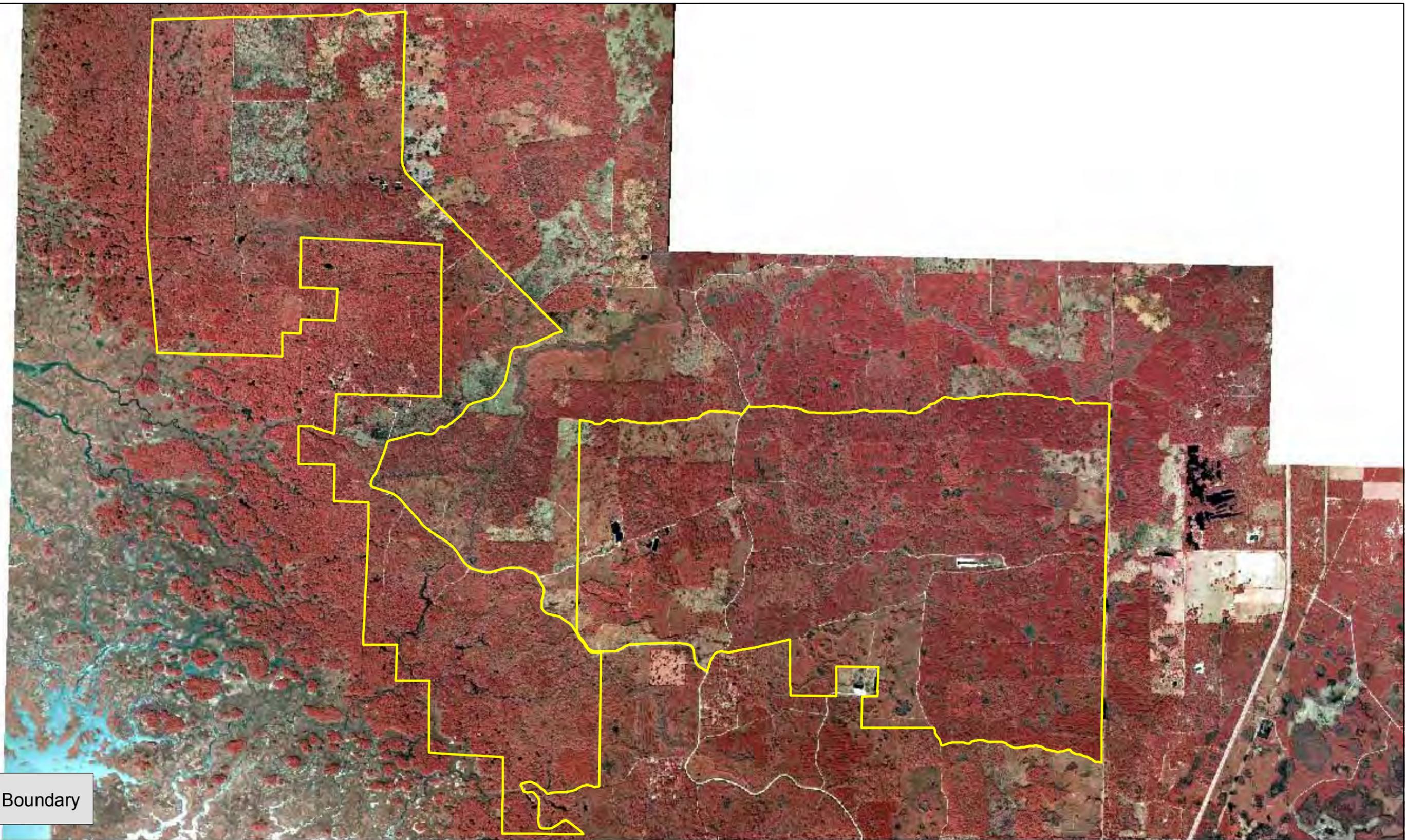
# Literature Cited

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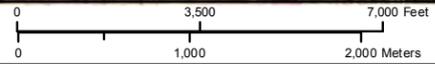
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 Project Boundary



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**Figure 2 - Aerial Map**  
**Tarmac King Road Limestone Mine**  
**Levy County, Florida**

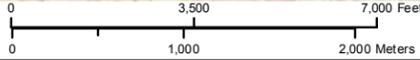
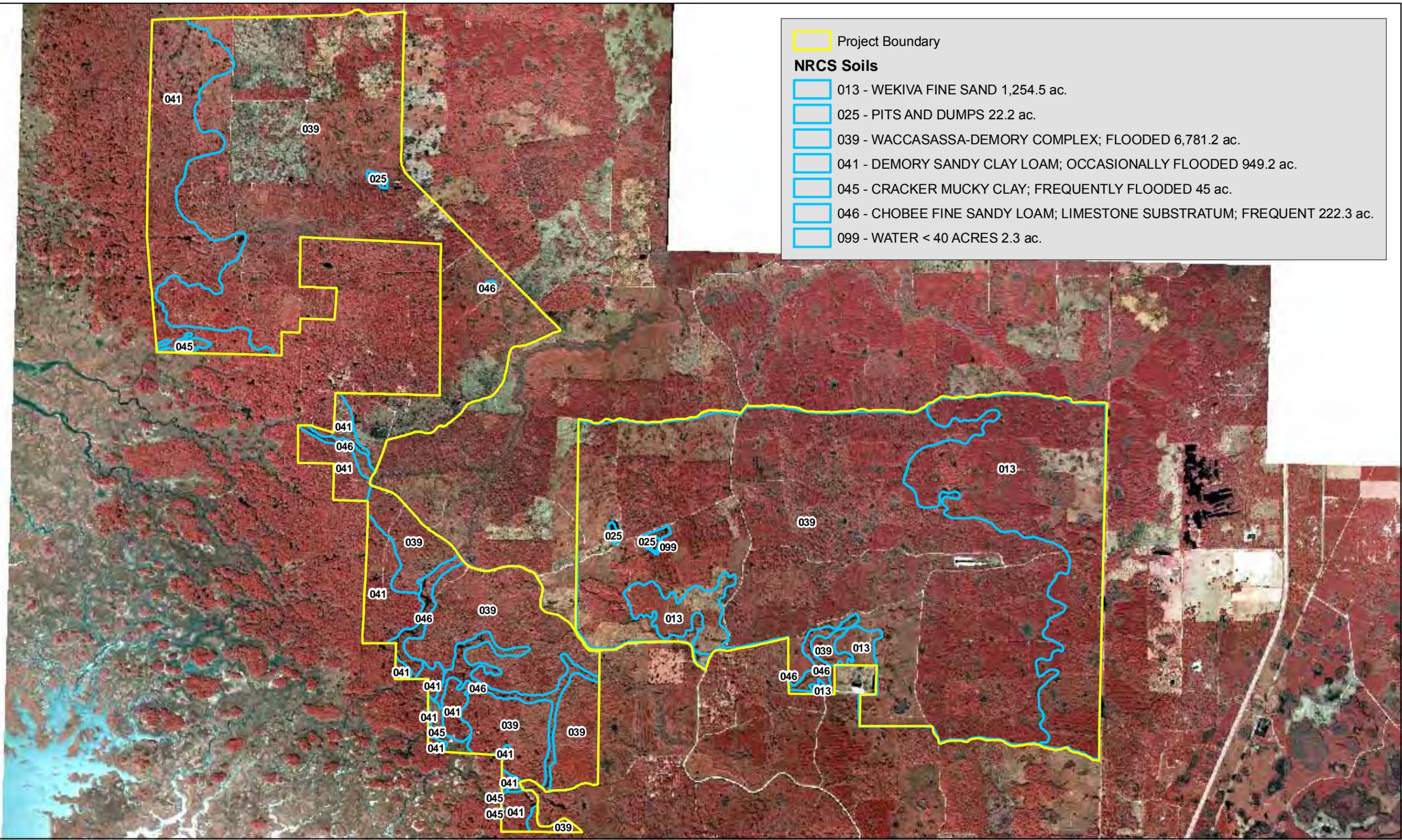


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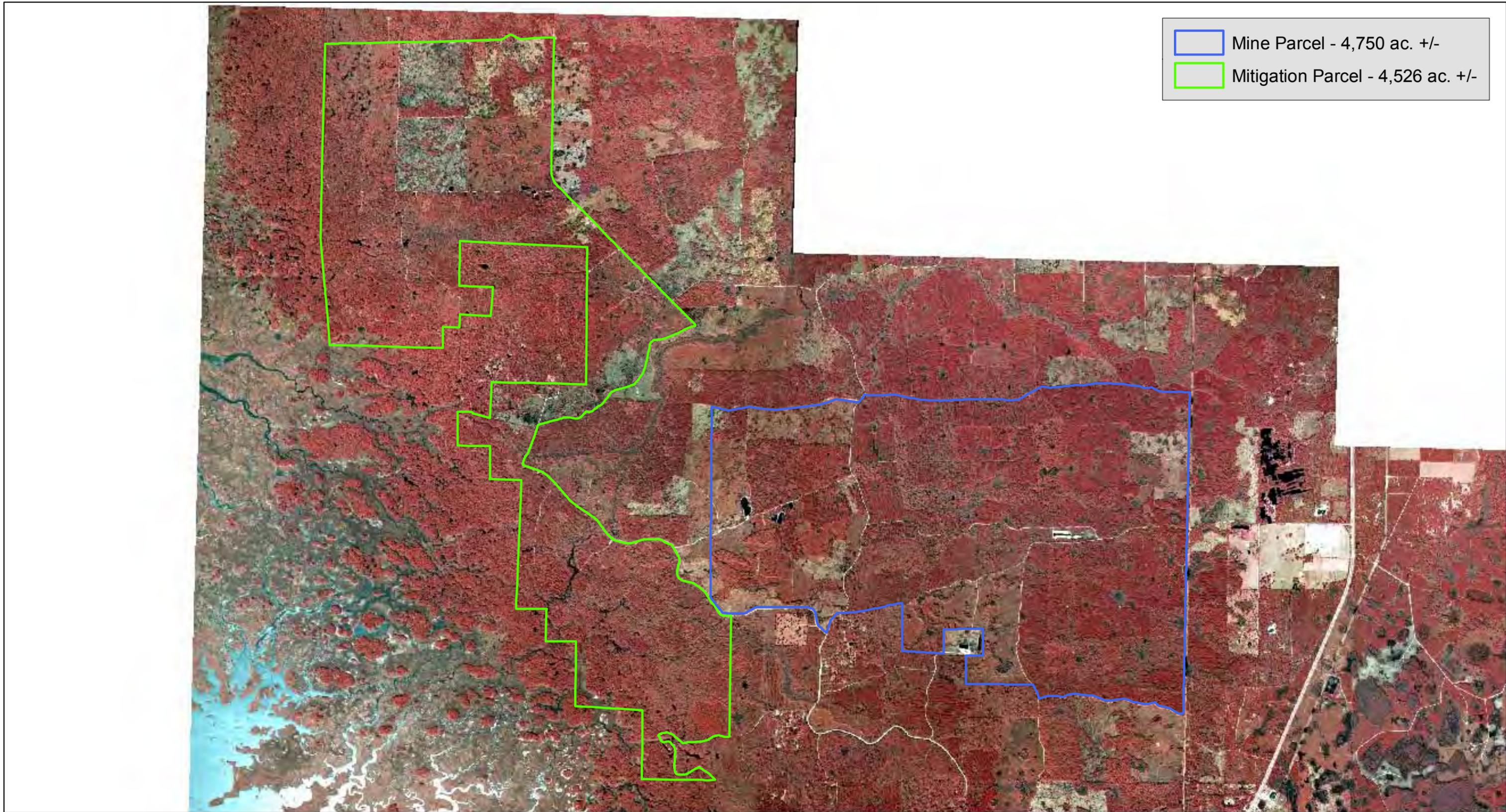


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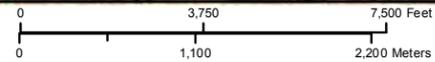
**Figure 3 - NRCS Soils Map**  
**Tarmac King Road Limestone Mine**  
**Levy County, Florida**

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- Mine Parcel - 4,750 ac. +/-
- Mitigation Parcel - 4,526 ac. +/-



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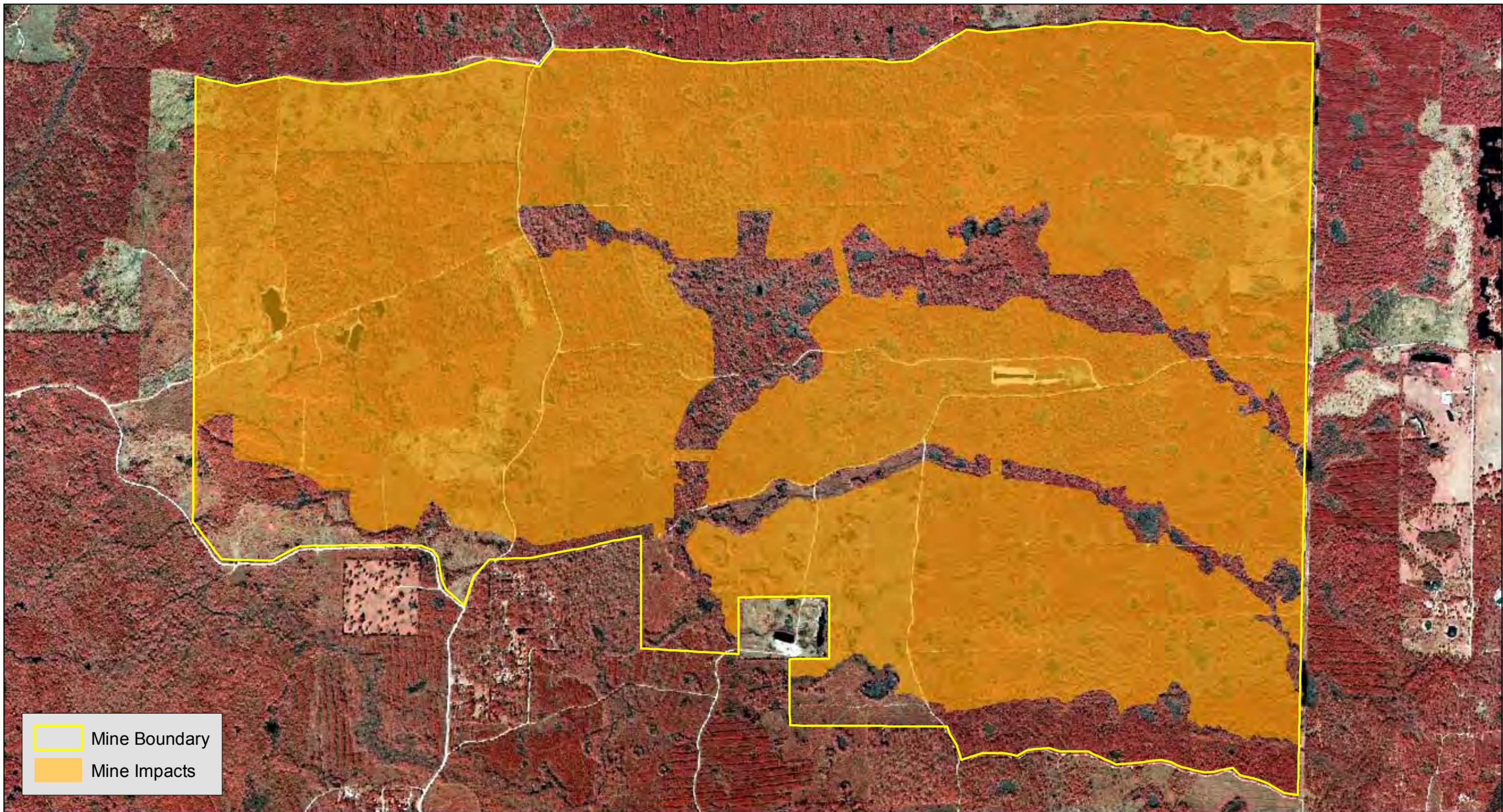
**Figure 4 - Aerial Map**  
**Tarmac King Road Limestone Mine**  
**Levy County, Florida**



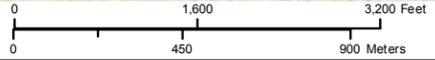
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Mine Boundary  
 Mine Impacts



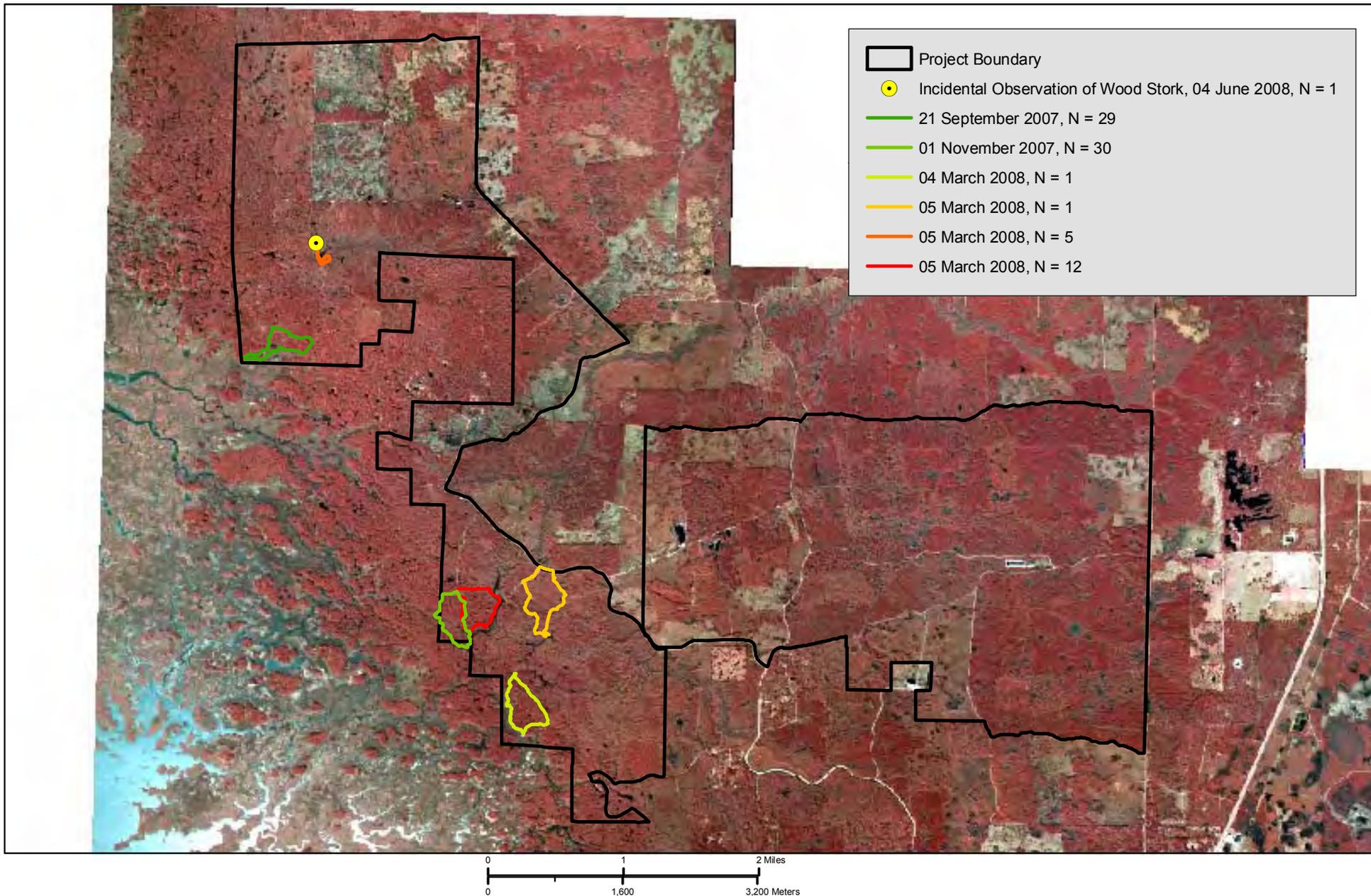
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**Figure 5 - Mine / Disturbance Areas Map**  
**Tarmac King Road Limestone Mine**  
**Levy County, Florida**



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- Project Boundary
- Incidental Observation of Wood Stork, 04 June 2008, N = 1
- 21 September 2007, N = 29
- 01 November 2007, N = 30
- 04 March 2008, N = 1
- 05 March 2008, N = 5
- 05 March 2008, N = 12

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**Figure 6 - Wood Stork Observations Map**

**Tarmac King Road Limestone Mine  
Levy County, Florida**



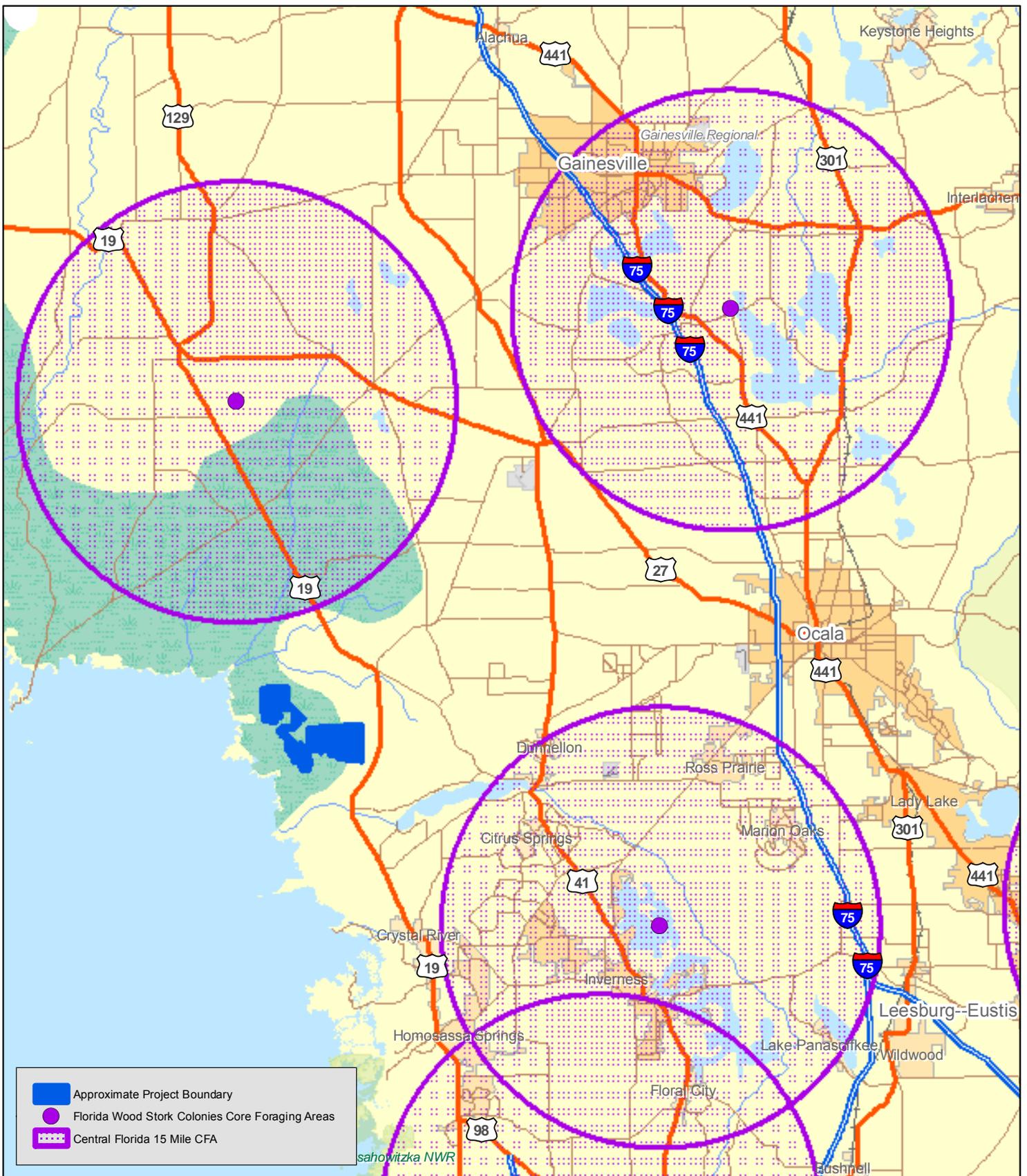
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## Figure 7 - Florida Wood Stork Colonies Core Foraging Areas Map

Tarmac King Road Limestone Mine  
Levy County, Florida



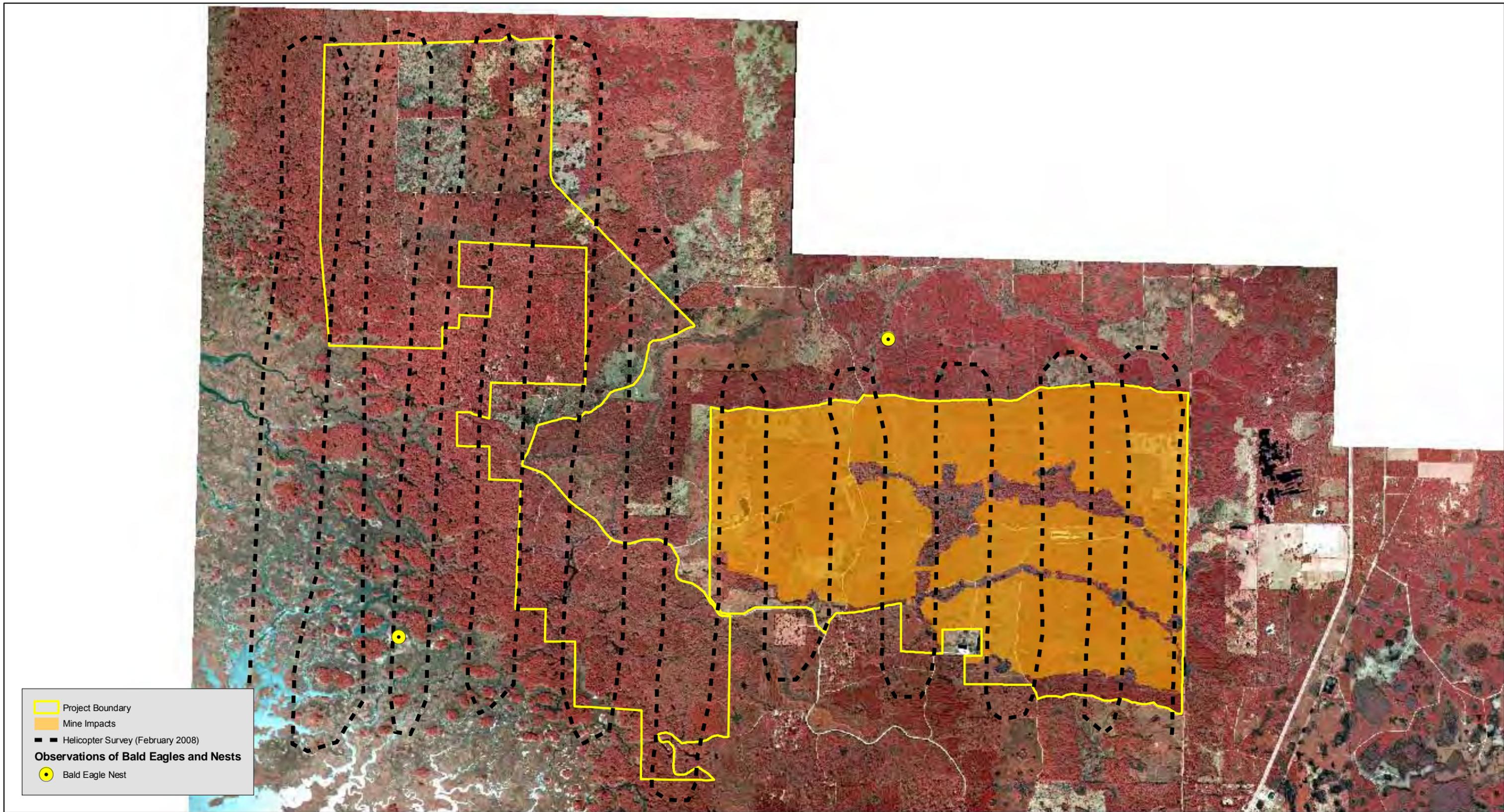
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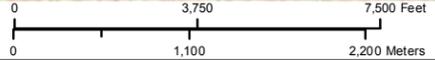
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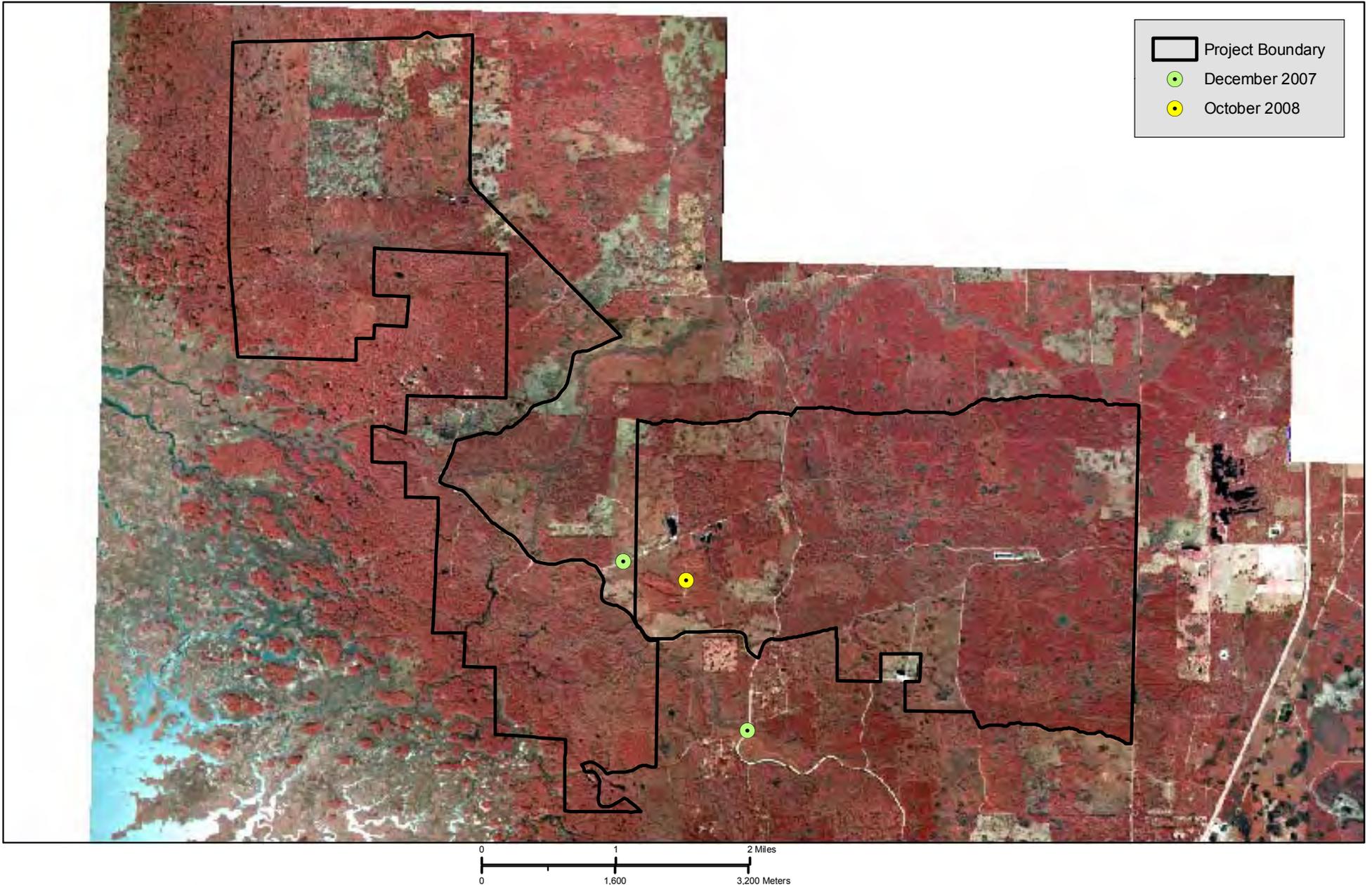
Project Boundary  
 Mine Impacts  
 Helicopter Survey (February 2008)  
**Observations of Bald Eagles and Nests**  
● Bald Eagle Nest



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**Figure 8 - Eagle Nest Sightings Map**  
 Tarmac King Road Limestone Mine  
 Levy County, Florida

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	Project Boundary
	December 2007
	October 2008

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### Figure 9 - Indigo Snakes Observations Map

Tarmac King Road Limestone Mine  
Levy County, Florida

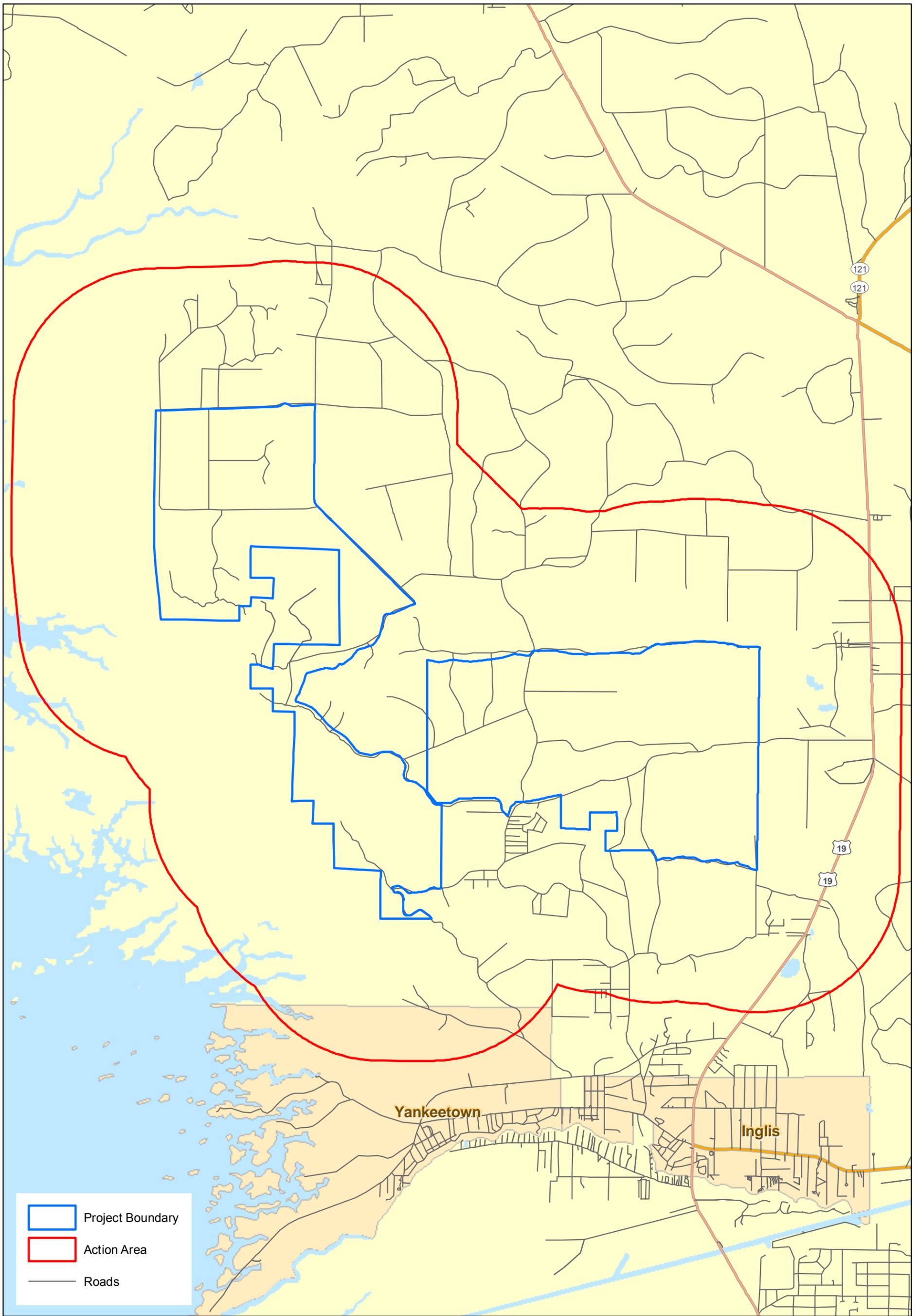


Image: 2007 IR



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**Figure 10 - Indigo Snake Action Area Map**  
**Tarmac King Road Limestone Mine**  
**Levy County, Florida**

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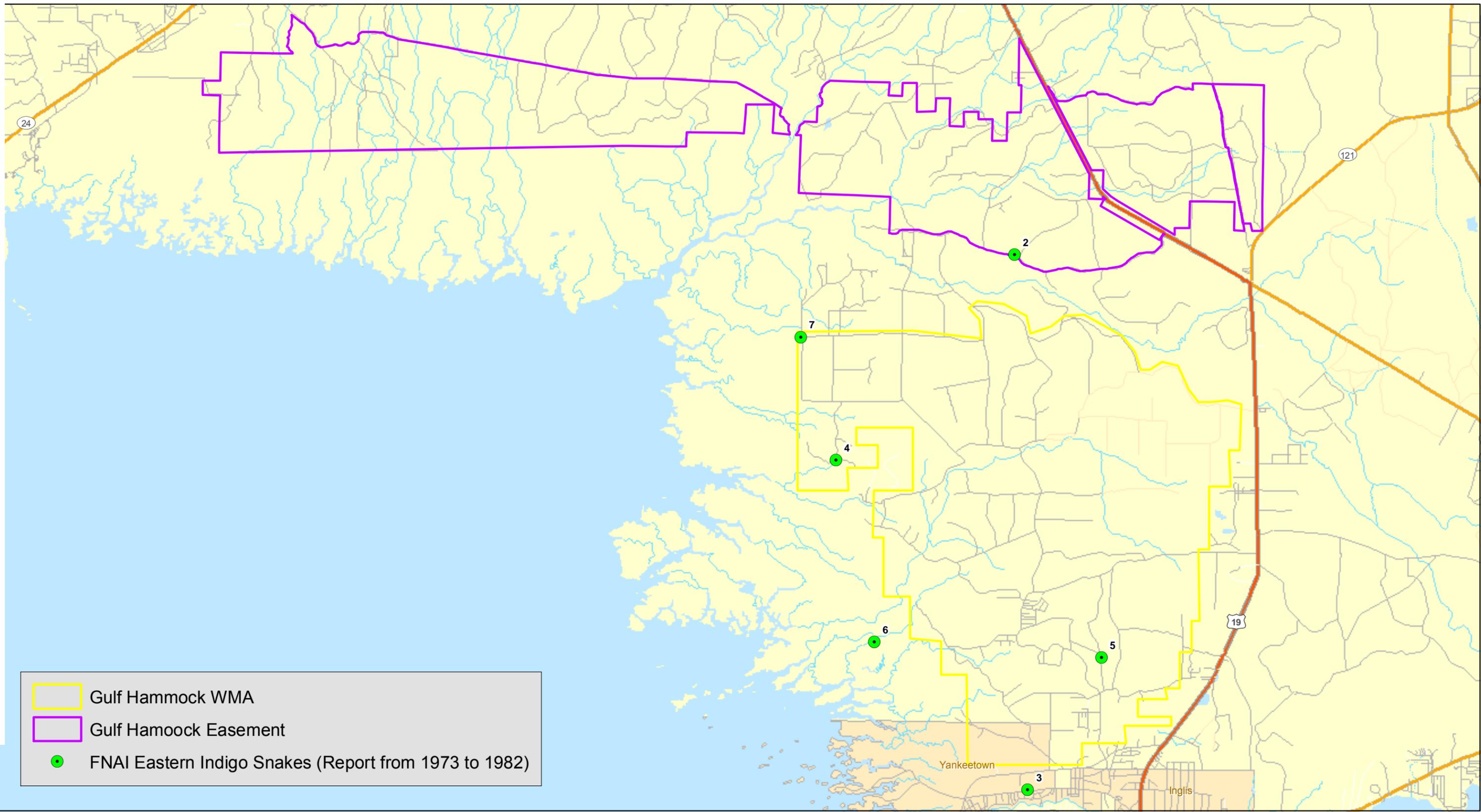
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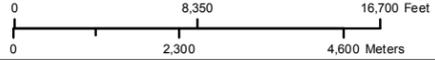
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	Gulf Hammock WMA
	Gulf Hammock Easement
	FNAI Eastern Indigo Snakes (Report from 1973 to 1982)



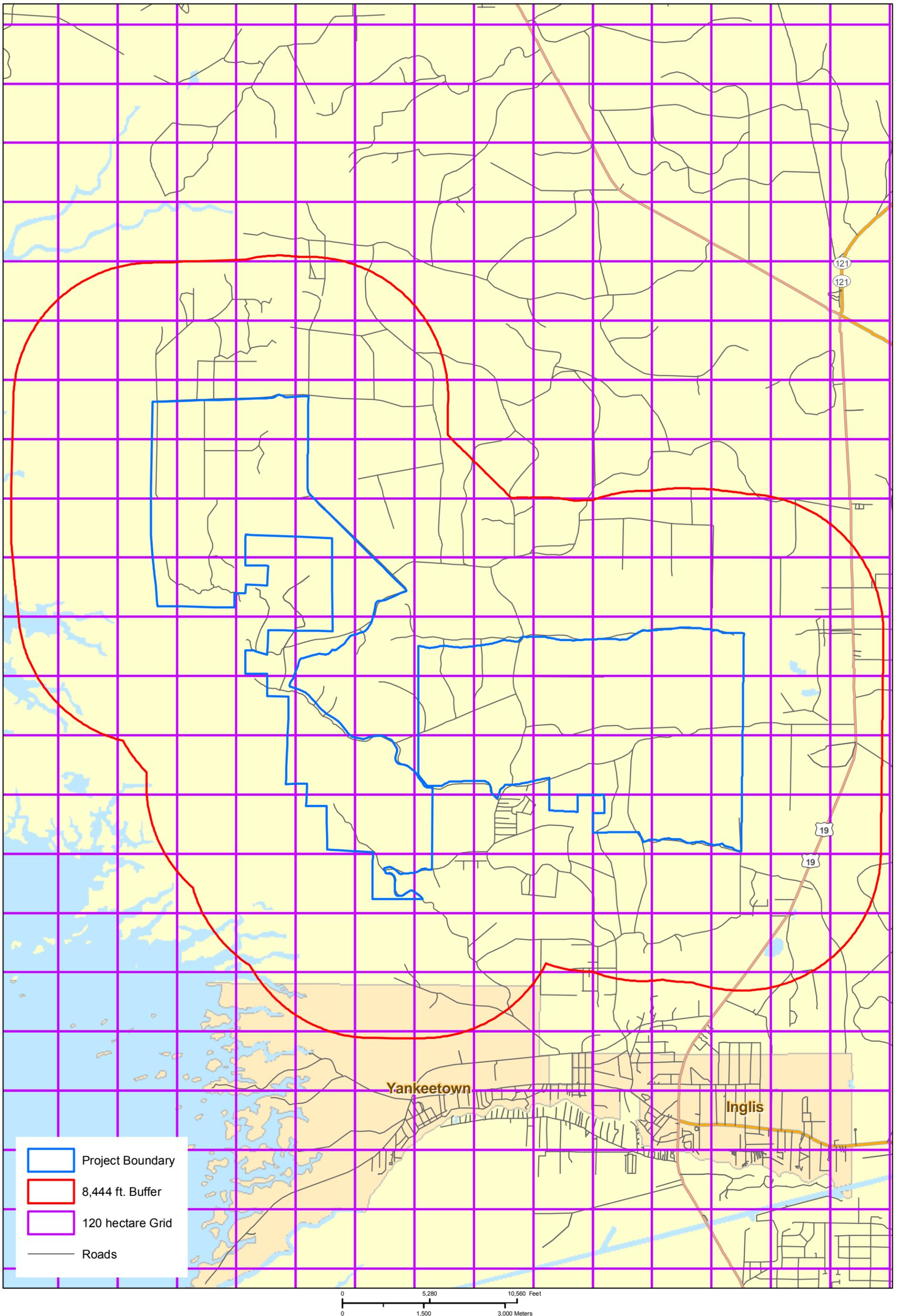
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**Figure 11 - FNAI Eastern Indigo Snake Observations Map**  
 Tarmac King Road Limestone Mine  
 Levy County, Florida



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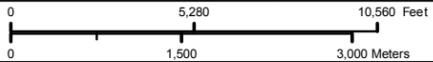
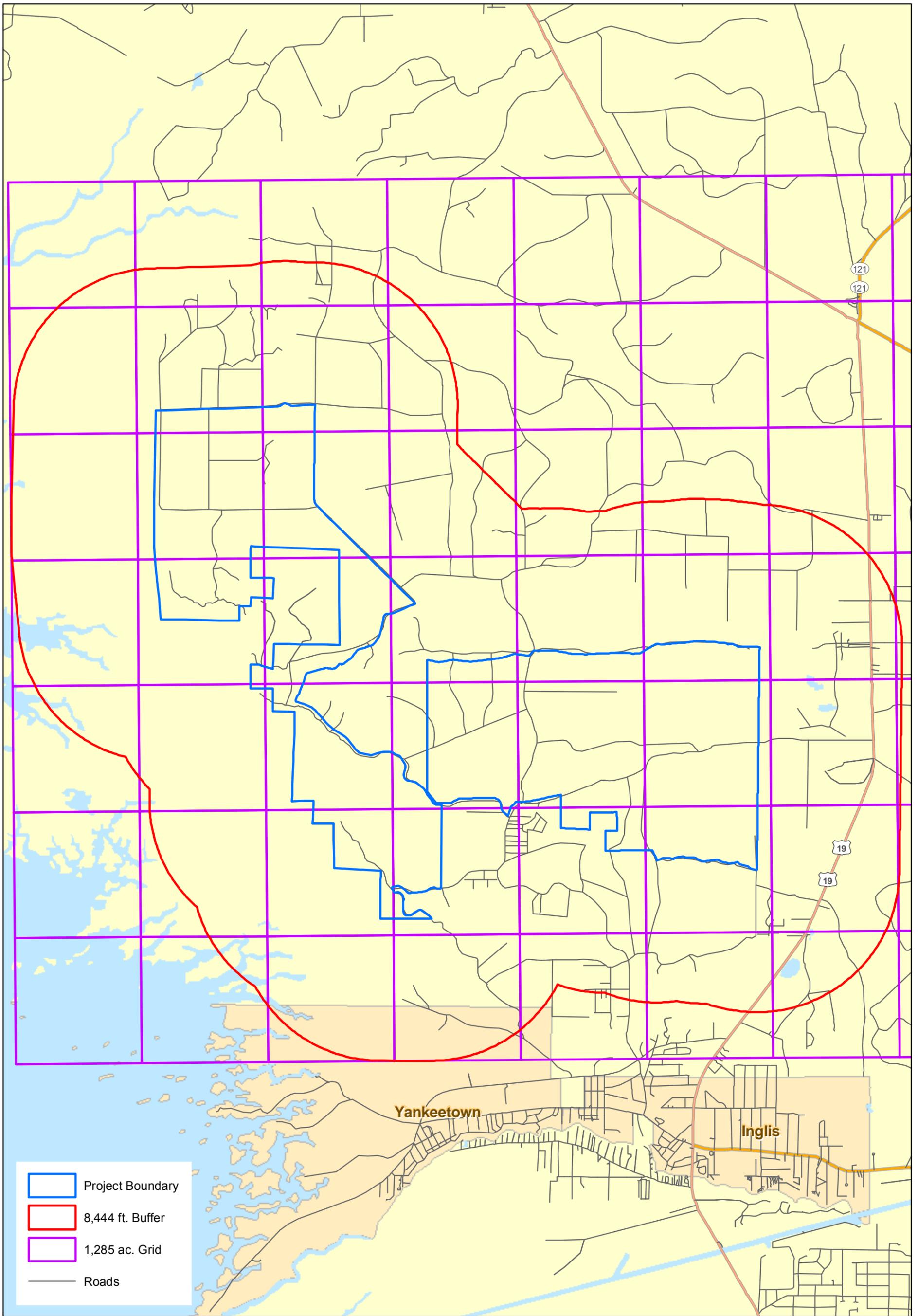
**Figure 12 - Indigo Snake Homerange/Roadway Overlap Map**  
**Tarmac King Road Limestone Mine**  
**Levy County, Florida**



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**Figure 13 - Indigo Snake Homerange/Roadway Overlap Map**  
Tarmac King Road Limestone Mine  
Levy County, Florida

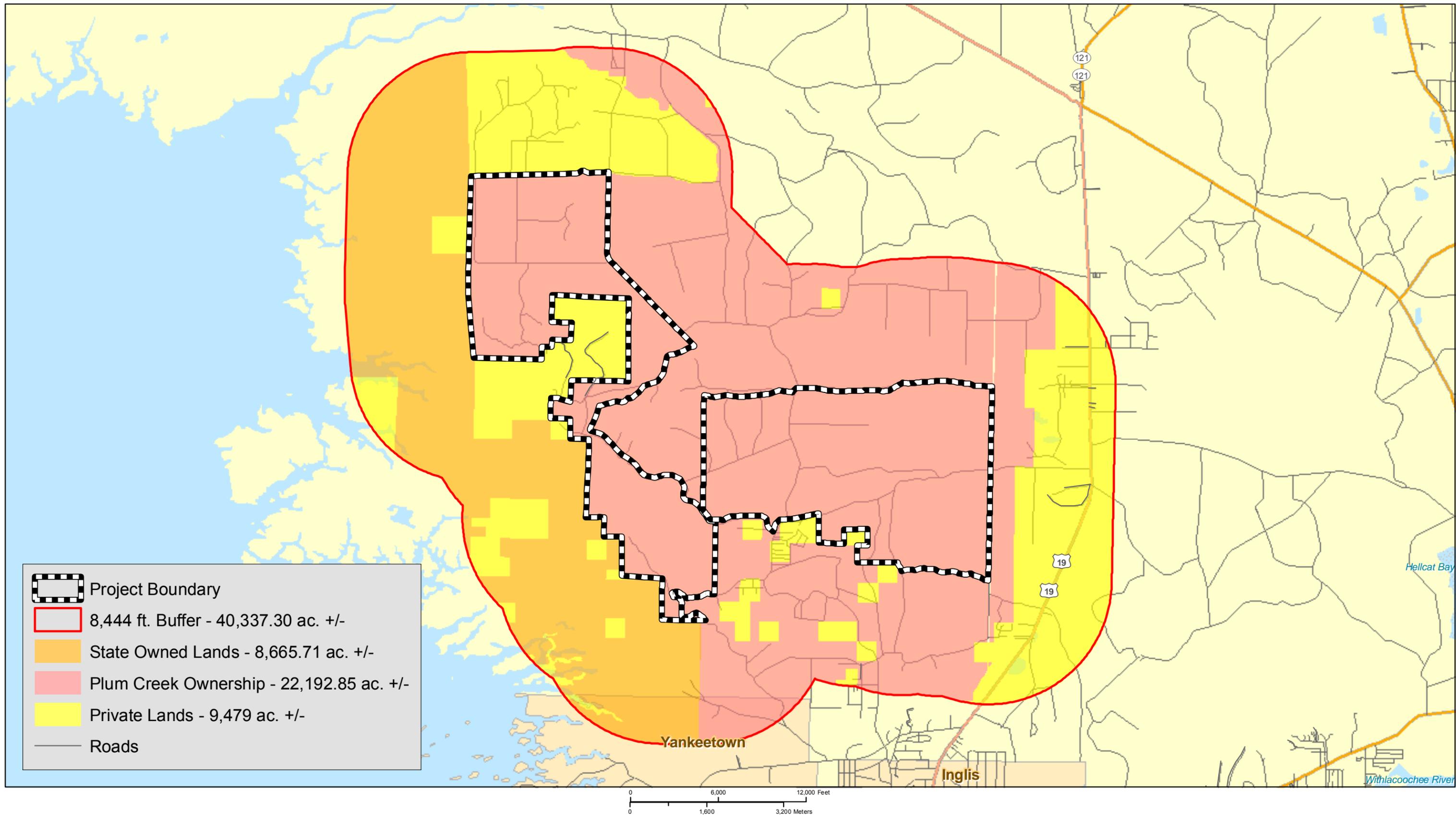


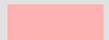
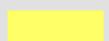
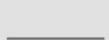
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Image: Basemap

Coordinate System:  
NAD 1983 UTM Zone 17N Meters



	Project Boundary
	8,444 ft. Buffer - 40,337.30 ac. +/-
	State Owned Lands - 8,665.71 ac. +/-
	Plum Creek Ownership - 22,192.85 ac. +/-
	Private Lands - 9,479 ac. +/-
	Roads

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**Figure 14 - Regional Property Owners Map**  
**Tarmac King Road Limestone Mine**  
**Levy County, Florida**

	3905 Crescent Park Drive Riverview, FL 33578-3625		ph. (813) 664-4500 fx (813) 664-0440
	www.entrix.com		
Coordinate System: NAD 1983 UTM Zone 10N feet			