Dr. John Black  
Mrs. Michelle Goff  
c/o East Georgia College  
131 College Circle  
Swainsboro, GA 30401

Re: East Georgia College – Environmental Masterplan Report  
East Georgia College, Swainsboro, Georgia  
CE Project No. 05-137-EGC

Dear Mrs. Goff:

Cushman Enterprises, LLC, (CE) is pleased to submit this Environmental Masterplan Assessment Report for East Georgia, for certain wetland and upland areas of the approximate 219.657-acre site in Swainsboro, Georgia. CE has completed its survey and assessment of the various habitats and compiled our findings into the following report.

Work conducted during this survey was completed in general accordance with the CE Work Authorization between CE and East Georgia College to perform requested wetland delineations in accordance with Phase I of the Environmental Masterplan.

1.0 PROJECT INFORMATION

We understand that the client would like to determine the extent of jurisdictional waters of the U.S., including wetlands, within the East Georgia College property boundaries and develop a masterplan for the natural resources management of East Georgia College. The property represents an approximate 219.657 acres consisting of institutional development with predominantly undeveloped, forested land. The property is located north of Lambs Bridge Rd., east of Thigpen Dr., and south of Sunset Dr. A site location map is included as Figure 1 of this report.

We hope EGC finds the enclosed report sufficient for continuing its effort to preserve and enhance the unique environment located on campus. If there are any questions or concerns, please do not hesitate to contact us.

Sincerely,

Larry J. Cushman  
Principal, Senior Environmental Scientist
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1.0 Introduction

East Georgia College (EGC) contracted with Cushman Enterprises, LLC (CE), in May of 2005 to perform a natural resource assessment for development of a final Integrated Natural Resource Management Plan (INRMP). CE proposed to complete this project in two phases, as requested, given the priorities set before us in a May 2, 2005, meeting. As this project was the beginning point for future development of an INRMP, the importance of natural resources was at an utmost concern for EGC. As the campus begins its activities towards the master planning/design of its growth and expansion, it will also begin to implement actions to be part of the INRMP, that will preserve existing natural resources with sustainable enhancement. The initial goal is to promote the continued existence of on-site Threatened and Endangered Species, provide supportive habitat for future occurrences of the species known to occur in the county, and restore and/or enhance existing wetlands and streams throughout the site. Upon completion of all preliminary construction activities (master plans, designs, permitting, etc.), the INRMP should be finalized to ensure the proper management and handling of the remaining natural resources with hopes of promoting future occurrences of wildlife resources and a sustainable ecosystem.

The property represents an approximate 219.657 acres consisting of institutional development with predominantly undeveloped, forested land. The property is located north of Lambs Bridge Rd., east of Thigpen Dr., and south of Sunset Dr. A site location map is included as Figure 1 of this report. Per contract between EGC and CE, CE personnel performed a Threatened & Endangered Species Survey (TESS), a Wetland Delineation, a Wildlife Habitat Evaluation, and a Prescribed Burn as preliminary investigations and initial management steps. The TESS was conducted on March 23 & 24, 2005; the wetland delineation, in conjunction with the Wildlife Habitat Evaluation, was performed on June 21-24, 2005; the Prescribed Burn was performed between December 16 and 23.

1.1 Wetland Delineation

In order to determine the best and final management plan for the undeveloped portions of the East Georgia College Campus, a site-wide delineation was performed. This task determined the extents of the wetland areas on-site and outlined areas that require restoration or enhancement. The delineation task also served as a habitat survey demarcating the different types of wetlands on-site and assisted in determining which activities will be necessary to restore impacted or overgrown areas.

The jurisdictional wetland system is composed of two drainage features located along the central and eastern portions of the property and originates off-site and runs southwest to northeast through the property, and exits the property to the north towards Sunset Drive. Due to the topography, wetland characteristics, origination, and termination points of this drainage system, this area is considered under the jurisdiction of the U.S. Army Corps of Engineers. A total of 34.07 acres were delineated as jurisdictional wetlands and waters of the U.S. Since the U.S. Army Corps of Engineers maintains jurisdiction over these areas, we recommend prior consultation and permitting for any future activities, impacts, or restoration in or near the jurisdictional areas.

1.2 Wetlands Assessment

CE performed a wetland delineation within the property boundaries to locate the possible presence of any jurisdictional waters of the U.S., including wetlands, within certain drainages.
1.2.1 Methodology

CE and its personnel are qualified to perform wetland delineations and surveys through certification training by the U.S. Army Corps of Engineers (USACE). The site inspection for the jurisdictional waters boundaries consisted of using a combination of in-house research and field investigations. In-house research included a review of information sources such as U.S. Geologic Survey 7.5-minute topographic quadrangle (Swainsboro Northeast, Georgia), historical aerial photography, and National Wetlands Inventory (NWI) maps. Subsequent to the in-house review, possible jurisdictional waters of the U.S., including wetlands, were assessed in the field utilizing USACE methodology. Jurisdictional waters of the U.S., including wetlands, are defined by 33 CFR Part 328.3 and are protected by Section 404 of the Clean Water Act (33 USC 1344) currently administered and enforced by the USACE.

The assessment for jurisdictional waters of the U.S., including wetlands, was performed utilizing the Routine On-Site Determination Method as defined in the 1987 U.S. Army Corps of Engineers Wetlands Delineation Manual. This technique uses a multi-parameter approach, which requires positive evidence of three criteria:

- **Hydrophytic vegetation**
- **Hydric Soils**
- **Wetland Hydrology**

Areas exhibiting the above three (3) wetland characteristics, as well as surface waters, were considered jurisdictional, and marked in the field with fluorescent pink surveyors tape.

1.2.2 Results and Discussions

The subject property consists of approximately 219.657 acres and is predominantly upland sandhills with portions of bottomland hardwood forest (Acer Rubrum – Nyssa Sylvatica Saturated Forest Alliance), bog type pine forest, and swamp forest habitats. Three (3) jurisdictional regions are located on the property (Sheets 1-9). A total of 34.07 acres were delineated as jurisdictional wetlands and waters of the U.S.

**Upland Sandhills**

Upland Sandhills are the remains of ancient beach dunes outlining the ocean shoreline of the Cretaceous period. Sands deposited and sorted by ocean currents were piled as undulating ridges 65 million years ago. These sands can reach 60 meters (197 feet) in depth. Sandhill soils are characteristically dry and infertile. Topography, soil nutrients or the lack thereof, and fires are the primary factors that exert selective pressure on the plant species and influence their distribution on the sandhills. The combined environmental factors in the sandhills interact creating an open landscaped-like appearance of scattered oak or oak-pine communities much like the sparse placement of vegetation in a park. The understory growth in the sandhills habitat is sparse to moderate. This combined with the other environmental factors makes the habitat a choice location for the Gopher Tortoise (*gopherus polyphemus*) and other animals that will inhabit their burrows.

The vegetation located in the East Georgia College upland sandhills habitat includes turkey oak (*Quercus laevis*), bluejack oak (*Quercus incana*), long-leaf Pine (*Pinus Palustris*) in the canopy with a wire grass (*Aristida stricta*) and turkey oak sub canopy. Other trees commonly associated with turkey oak, but not documented at the upland sampling point of this survey include scrub post oak (*Quercus margareta*), blackjack oak (*Quercus marilandica*), and blackgum (*Nyssa spp.*).
**Bottomland Hardwood Forest**

The bottomland hardwood forests of East Georgia College represent typical mixed hardwood forests of low saturated areas of the southeastern coastal plain. These forests are typically located along stream corridors and extend to stream deltas, where swamps begin. Bottomland hardwood forests occupy more moist habitats than bluff or upland sandhills and may be seasonally flooded. Frequency, depth, and duration of these floods create variations in forest composition and vegetation patterns in the bottomlands. Flooding in the bottomlands is usually restricted to high water periods in late winter or early spring when plants are still dormant. Variation in plant species is related to the duration of flooding and also to the amount of time since the original substrate deposit by streams or rivers.

The vegetation located in the bottomland hardwood forest habitat of East Georgia College includes red maple (*Acer rubrum*), long-leaf pine (*Pinus palustris*), sweetbay magnolia (*Magnolia virginiana*), water tupelo (*Nyssa aquatica*), and sweetgum (*Liquidambar styraciflua*) in the canopy. The subcanopy consisted of holly (*Ilex Opaca*), and azalea (*Rhododendron spp.*). The herbaceous layer was made up of partridge-berry (*Mitchella repens*), netted chainfern (*Woodwardia areolata*), and Christmas fern (*Polystichum acrostichoides*).

**Swamp Forests**

Most swamp forests have at least a brief seasonal period when the water table is at or below the soil surface. These low water periods, usually in late summer, are essential for perpetuation of the forest. Seed germination and seedling establishment cannot occur in standing water. Seed germination and seedling establishment do however require moist soil substrate. Forest stands, subject to longer flooding periods than bottomland forests, but more shallow than deep swamps, contain a larger population of species such as red ash (*Fraxinus Spp.*), red maple (*Acer rubrum*), American elm (*Ulmus Americana*), and sweetgum (*Liquidambar styraciflua*). Vine cover and understory vegetation is less dense in the swamp forests than in bottomland hardwood forests. Although slow water drainage and a canopy shade limit the ground cover, vines such as greenbrier (*Smilax rotundifolia*), poison ivy (*Toxicodendron radicans*), cross vine (*Anisostichus capreolata*), and pepper vine (*Ampelopsis arborea*) are common in swamp forests.

The dominant species in the swamp forests of East Georgia College are tupelo gum (*Nyssa aquatica*) and red maple (*Acer rubrum*) with sweetgum (*Liquidambar styraciflua*) and long-leaf pine (*Pinus palustris*) occupying levees or islands of the swamp forest. The subcanopy consists of saplings of these dominant species as well as laurel oak (*Quercus laurifolia*) and sparsely located box elder (*Acer negundo*). Poison ivy (*Toxicodendron radicans*) and greenbrier (*Smilax rotundifolia*) were also abundant in the subcanopy.

**Bog Type Pine Forest**

The bog forest habitat located at East Georgia College is a Pinus Elliottii saturated temperate forest alliance with portions of Pinus Palustris saturated woodland alliance and Alnus Serrulata saturated shrubland alliance. The Pinus Elliottii forest alliance typically accommodates flatwoods and other moist coastal plain environments dominated by mixtures of long-leaf pine (*Pinus palustris*) and slash pine (*Pinus elliottii*). These forest alliances often occur where prescribed burning or other silviculture management techniques are or were practiced. Slash pines (*Pinus elliottii*) are prevalent on the coastal plains of the southeastern United States and will hybridize with the loblolly pine (*Pinus taeda*), sand pine (*Pinus clausa*), and long-leaf pine (*Pinus palustris*).
The vegetation located in the East Georgia College Pinus Elliottii saturated temperate forest alliance was dominated by a slash pine (*Pinus elliottii*) and long-leaf pine (*Pinus palustris*) canopy and strands of tag elder (*Alnus serrulata*) in the subcanopy. Green pitcher plants (*Sarracenia purpurea*) and hooded pitcher plants (*Sarracenia minor*) were abundant in areas of open canopy. The soils are saturated and sandy with concretions and organic streaking indicating hydric conditions.

1.2.3 Soils And Hydrology

The soils located on the subject property are of the Pelham, Nankin, Bonifay, Cowarts, Dothan, and Ailey series. These soils are also dominant throughout Emanuel County, Georgia. Emanuel County is located in the Southern Coastal Plain Major Land Resource Area. The county consists of well-developed streams over gravelly, clayey sand. The upland soils are well drained with moderate to poor drainage of the floodplain soils.

Field observations of soils at various sampling sites located on the subject property consisted primarily of loamy sand. The bottomland and swamp forest soils have chromas of 10YR 3/1, 5/1, as well as 2.5Y 2.5/1, and 4/1 (Munsell Soil Color Charts). These soil colors do represent the low chroma soils, which are considered hydric soil indicators by the USACE. The upland soils have chromas of 10YR 4/2 and 5/2. These colors were found from the soil surface to approximately twelve (12) inches in depth or shallower.

Hydrology on the subject property is supported mainly by topography, surface water runoff towards Lake Hazel, and springheads located in the swamp forest habitats. No other indicators of hydrology were noted along the project corridor. Two (2) of the three (3) wetlands on site are connected to perennial streams that flow north to Lake Hazel. All jurisdictional areas within the subject property were delineated.

1.3 Conclusion

The jurisdictional wetland assessment performed on the East Georgia College property identified evidence of jurisdictional waters of the U.S., including surface waters and wetlands. These delineated areas are wetlands and streams within the proximity of the subject property. These jurisdictional areas were marked in the field with fluorescent pink surveyor’s tape. A total of 34.07 acres were delineated as jurisdictional wetlands and waters of the U.S.

2.0 Threatened & Endangered Species Survey / Wildlife Habitat Evaluation

Upon completion of the wildlife habitat evaluation, we recommend utilizing the USFWS and GADNR for specific guidance of certain areas that may be found critical and environmentally sensitive. This can be performed by developing a portion of the INRMP as an wildlife habitat management plan with guidance from CE and review by the resource agencies. This masterplan should outline specific management of individual areas for the support and encouragement of wildlife species. Part of the plan should also include a prescribed burn schedule, as described later in this report.

The goal of the wildlife management plan will be to encourage the known T&E species to utilize areas unsuitable for habitat. Once the plan is initiated, it may take up to 5 years or more to receive the results expected. Monitoring should be included in the plan for the management of certain species. Of most importance to the campus is the present and future occurrence of the Gopher Tortoise, Indigo Snake, and Red Cockaded Woodpecker.
Four habitat types have been classified for purposes of this survey and report: Dense Pine Forest, Open Pine Forest, Pine Hardwood Forest, and Open/Field. On March 23 & 24, 2005, a stand level survey was conducted of all habitat types using the survey protocols established by the U.S. Fish and Wildlife Service. Each habitat type was surveyed according to the protocols and observations were noted in field logs. Increment boring of individual tree stands was also included to determine the average age of each stand (Photo Log).

The preceding information was used to assess the possibility of foraging habitat or nesting habitat within the project area. The results of the survey are included below.

2.1 Status of the Species/Critical Habitat within Emanuel County, GA

CE has reviewed the federal and state listings of threatened and endangered species and their habitats for Emanuel County, Georgia (Table 1). The listed species include: Bald eagle (Haliaeetus leucocephalus), Red-cockaded woodpecker (Picoides borealis), Wood stork (Mycteria americana), Eastern indigo snake (Drymarchon corais couperi), Gopher tortoise (Gopherus polyphemus), and Flatwoods salamander (Ambystoma cingulatum). The species/critical habitat description, life history, population dynamics, and status/distribution of the species is included within this section.

Bald Eagle

The bald eagle has a wingspread of about seven (7) feet. Its plumage is mainly dark brown, and adults have a pure white head and tail. First year juveniles are often chocolate brown to blackish, sometimes with white mottling on the tail, belly, and underwings. The head and tail become increasingly white with age until full adult plumage is reached in the fifth or sixth year. An opportunistic predator, the bald eagle feeds primarily on fish but also takes a variety of birds, mammals, and turtles (both live and as carrion) when fish are not readily available.

The breeding season of bald eagles varies with latitude. The general tendency is for winter breeding in the South with a progressive shift toward spring breeding in northern locations. In the Southeast, nesting activities generally begin in early September; egg laying begins as early as late October and peaks in late December. The female does most of the nest construction but the male assists. The typical nest is constructed of large sticks with softer materials such as dead weeds, cornstalks, grasses, and sod added as nest lining. Bald eagle nests are very large, sometimes measuring up to six (6) feet in width and weighing hundreds of pounds. Many nests are used year after year. Eagles may lay from one (1) to three (3) eggs, but the usual clutch size is two (2) eggs. A second clutch may be laid if the first is lost. Incubation lasts thirty-four (34) to thirty-eight (38) days. The young fledge nine (9) to fourteen (14) weeks after hatching but parental care may continue for another four (4) to six (6) weeks. Bald eagles reach sexual maturity at four (4) to six (6) years of age. Life span is not known, but it is potentially long since eagles have been known to live for fifty (50) years in captivity.

The bald eagle is primarily riparian, associated with coasts, rivers, and lakes, usually nesting near bodies of water where it feeds. Selection of nesting sites varies tremendously depending on the species of trees growing in a particular area. In the Southeast, nests are constructed in dominant or codominant pines or cypress. Nests are usually constructed in living trees, but bald eagles will occasionally use dead ones.

There are certain general elements, which seem to be consistent among nest site selection. These include (1) the proximity of water (usually within one-half mile) and a clear flight path to a close point on the water; (2) the largest living tree in a span; and, (3) an open view of the surrounding area. The proximity of
good perching trees may also be a factor in site selection. An otherwise suitable site may not be used if there is excessive human activity in the area.

Bald eagle wintering areas possess many of the same characteristics as nest sites. The birds, however, are not as closely limited to shores at this time, with both adults and immature gathering food where it is most easily available. Roost sites are an important component of wintering areas. Eagles may roost singly or in groups exceeding one hundred birds.

**Red-cockaded Woodpecker**

The red-cockaded woodpecker is eighteen (18) to twenty (20) centimeters long with a wingspan of thirty-five (35) to thirty-eight (38) centimeters. There are black and white horizontal stripes on its back, and its cheeks and underparts are white. Its flanks are black streaked. The cap and stripe on the side of the neck and the throat are black. The male has a small red spot on each side of the black cap. After the first post-fledgling molt, fledgling males have a red crown patch. This woodpecker's diet is composed mainly of insects including ants, beetles, wood-boring insects, caterpillars, and corn ear worms if available. About sixteen (16) to eighteen (18) percent of the diet includes seasonal wild fruit.

Egg laying occurs during April, May, and June with the female utilizing her mate's roosting cavity for a nest. Maximum clutch size is seven (7) eggs with the average being three (3) to five (5) eggs. From egg laying to fledging requires about thirty-eight (38) days, and then another several weeks are needed before the young become completely independent. Most often, the parent birds and some of their male offspring from previous years form a family unit called a group. A group may include one breeding pair and as many as seven other birds. Commonly, these groups are comprised of three (3) to five (5) birds. Rearing the young birds becomes a shared responsibility of the group. However, a single pair can breed successfully without the benefit of the helpers.

This bird's range is closely tied to the distribution of southern pines. Historically, the red-cockaded woodpecker occurred from East Texas and Oklahoma, to Florida, and North to New Jersey. The present distribution is similar, except the species has been extirpated from Missouri, Maryland, and New Jersey. The remaining populations are fragmented into isolated, island populations. Current population level is estimated at 4,500 groups or 10,000 to 12,000 birds.

Open stands of pines with a minimum age of eighty (80) to 120 years, depending on the site, provide suitable nesting habitat. Longleaf pines (*Pinus palustris*) are most commonly used, but other species of southern pine are also acceptable. Dense stands (stands that are primarily hardwoods or that have a dense hardwood understory) are avoided. Foraging habitat is provided in pine and pine hardwood stands thirty (30) years old or older with foraging preference for pine trees ten (10) inches or larger in diameter. In good, well stocked, pine habitats, sufficient foraging substrate can be provided on eighty (80) to 125 acres.

Roosting cavities are excavated in living pines, and usually in those which are infected with a fungus producing what is known as red-heart disease. The cavity tree ages range from sixty-three (63) to 300 plus years for longleaf, and sixty-two (62) to 200 plus years for loblolly and other pines. The aggregate of cavity trees is called a cluster and may include one (1) to twenty (20) or more cavity trees on three (3) to sixty (60) acres. The average cluster is about ten (10) acres. Completed cavities in active use have numerous, small resin wells which exude sap. The birds keep the sap flowing apparently as a cavity defense mechanism against rat snakes and possibly other predators. The territory for a group averages about 200 acres, but observers have reported territories running from a low of around sixty (60) acres, to
an upper extreme of more than 600 acres. The expanse of territories is related to both habitat suitability and population density.

**Wood Stork**

Wood storks are large, long-legged wading birds, about fifty (50) inches tall, with a wingspan of sixty (60) to sixty-five (65) inches. The plumage is white except for black primaries and secondaries and a short black tail. The head and neck are largely unfeathered and dark gray in color. The bill is black, thick at the base, and slightly decurved. Immature birds are dingy gray and have a yellowish bill.

Small fish from one (1) to six (6) inches long, especially topminnows and sunfish, provide this bird's primary diet. Wood storks capture their prey by a specialized technique known as grope feeding or tactolocation. Feeding often occurs in water six (6) to ten (10) inches deep, where a stork probes with the bill partly open. When a fish touches the bill it quickly snaps shut. The average response time of this reflex is twenty-five (25) milliseconds, making it one of the fastest reflexes known in vertebrates.

The wood stork is a highly colonial species usually nesting in large rookeries and feeding in flocks. Age at first breeding is four (4) years. Nesting periods vary geographically. In South Florida, wood storks lay eggs as early as October and fledge in February or March. However, in north and central Florida, Georgia, and South Carolina, storks lay eggs from March to late May, with fledging occurring in July and August. Nests are frequently located in the upper branches of large cypress trees or in mangroves on islands. Several nests are usually located in each tree. Wood storks have also nested in man-made structures. Storks lay two (2) to five (5) eggs, and average two (2) young fledged per successful nest under good conditions.

The current population of adult birds is difficult to estimate, since not all nest each year. Presently, the wood stork population is believed to number 11,000 adults. Recent United States breeding is restricted to Florida, Georgia, and South Carolina. The birds formerly bred in most of the southeastern United States and Texas. Another distinct, non-endangered population breeds from Mexico to northern Argentina.

Storks from both populations move northward after breeding, as far as Arkansas and Tennessee in the Mississippi Valley and North Carolina on the Atlantic coast. There have been occasional sightings in all States east of the Mississippi River, and sporadic sightings in some States west of the Mississippi and in Ontario.

Storks are birds of freshwater and brackish wetlands, primarily nesting in cypress or mangrove swamps. They feed in freshwater marshes, narrow tidal creeks, or flooded tidal pools. Particularly attractive feeding sites are depressions in marshes or swamps where fish become concentrated during periods of falling water levels.

Wood storks have a unique feeding technique and require higher prey concentrations than other wading birds. Optimal water regimes for the wood stork involve periods of flooding, during which prey (fish) populations increase, alternating with dryer periods, during which receding water levels concentrate fish at higher densities coinciding with the stork's nesting season. Loss of nesting habitat (primarily cypress swamps) may be affecting wood storks in central Florida, where nesting in non-native trees and in man-made impoundments has been occurring recently.
Eastern Indigo Snake

The longest of North American snakes (7+ feet), the eastern indigo snake is heavy-bodied and shiny blue-black overall with chin, throat, and sides of head variably suffused with cream, orange, or red. Copulation occurs November-April. Eggs are laid in May-June (also reportedly as early as April) with a clutch size usually of 5-10. Hatchlings appear from late July through October. Females can lay fertile eggs after several years of isolation.

The species ranges widely in warmer months, with home range 50-100 ha or more and in winter, usually stays fairly close to a deep shelter, with home range usually less than 10 ha. It may move seasonally between upland wintering sites and wetter lowland feeding areas. It is known to occur in high pineland (sandhills, scrub, etc.), flatwoods, and most types of hammock in Florida and southeastern Georgia. It is often near wetlands; often in association with gopher tortoise burrows within mature pine forests in central and northern Florida, flatwoods, dry glades, tropical hammocks, and muckland fields in southern Florida, and sandhill regions dominated by mature longleaf pines, turkey oaks, and wiregrass in Georgia.

It prefers pineland habitat maintained by periodic fires and requires relatively large tracts of suitable habitat. When inactive, it often occupies tortoise burrow, stump hole, land crab burrow, etc., as available. Eggs may be laid in gopher burrows.

The eastern indigo snake eats small mammals, birds, frogs, snakes, lizards, and other vertebrates of appropriate size. It is an active forager; often searches along edges of wetlands. It is primarily diurnal, but partly nocturnal in some areas and will become inactive for a week or two prior to shedding.

Gopher Tortoise

The gopher tortoise is a relatively large (carapace length often 15-28 cm, but up to 38 cm) terrestrial turtle with a domed carapace, short elephantine hindlimbs, shovellike forelimbs, a gular projection from the anterior plastron, and a short tail. The anterior surface of the flattened forelimb is covered with 7-8 rows of large scales. Often the surface of the carapace is quite smooth in adults, reflecting the abrasion it receives as an individual enters or exits its burrow. The carapace is keelless and oblong, with the greatest width just anterior to the well-developed bridge (connecting the carapace to the plastron), and the greatest height in the sacral region. The carapace drops off abruptly to the rear of the highest region. The carapace of an adult varies from dark-brown to grayish-black. In Florida, individuals from coastal areas are generally darker than those from central populations. The gular scutes of the robust, hingeless plastron project below the chin. Males often have longer gular projections than do females. However, because both sexes use their projections during agonistic encounters, the gular projections are often broken and may not be an accurate diagnostic feature of the sex of an individual. Most gopher tortoises have well defined "growth rings" on the scutes of the yellowish plastron. Use of the growth rings to age individuals must be done with caution, as there is much variation in the number of "false" growth rings throughout the range of this taxon.

Female gopher tortoises become sexually mature at a carapace length of about 23-24 cm. Males are somewhat smaller at maturity and do not obtain the large body size of females. The best indicator of the sex of an adult gopher tortoise is the depth of the plastral concavity. Mature males have a shallow depression in the posterior, central portion of the plastron to facilitate mounting a female for copulation. Large females may have a shallow plastral concavity (2-4 mm) compared to the deeper concavity found on mature males (5-8 mm). Males often have larger integumentary glands under the chin than do females, but the size of these integumentary glands varies seasonally.
Hatchlings emerge from their eggs at a carapace length of generally about 3-5 cm. Coloration of the vertebral and costal scutes of the carapace of hatchlings is yellowish to yellowish-orange, and each scute is bordered by brownish coloration. The skin on the head and limbs is likewise brightly colored yellow to yellowish-orange. The bright coloration of hatchlings darkens during the first year or two of life. The gular scutes of young tortoises do not project forward as in the adult tortoises, and the claws of young tortoises are long and sharp. Hatchlings dig their own burrows, often just a few meters away from the nest from which they emerged. Hatchlings and juveniles, up to an age of 5-7 years, have relatively soft shells and are highly vulnerable to predation. Eggs are white, nearly spherical, and brittle-shelled with an average maximum egg diameter of 42-43 mm and an average wet mass of 40.9 g.

Gopher tortoises most commonly are found in upland areas that are characterized by a deep, well-drained, sandy substrate suitable for construction of their extensive burrows. The gopher tortoise prefers relatively open-canopied habitats that provide sunlit areas for nesting and thermoregulation, and ample herbaceous ground vegetation for forage. Because the gopher tortoise is seldom found above ground outside of its burrow, it is often necessary to use tortoise burrows as a means of assessing populations. Burrows within a defined area are designated a status or condition based on time since occupancy. The width of a burrow can be measured to estimate the size of the current resident tortoise. With these survey data, population counts and size class distributions can be determined for populations under study.

**Flatwoods Salamander**

The flatwoods salamander is a slender, small-headed mole salamander that rarely exceeds thirteen (13) centimeters (cm) in length when fully mature. Adult dorsal color ranges from black to chocolate-black with highly variable, fine, light gray lines forming a netlike or cross-banded pattern across the back. Undersurfaces are plain gray to black with a few creamy or pearl-gray blotches or spots. Sexual dimorphism (the existence of separable male and female forms) is only apparent in breeding males (swollen cloacal region) or in gravid (with fertilized eggs) females. Flatwoods salamander larvae are long and slender, broad-headed and bushy-gilled, with white bellies and striped sides. They have distinctive color patterns, typically a tan mid-dorsal stripe followed by a grayish black stripe on the back and sides, a pale side stripe, a blue-black lower lateral stripe, and a pale yellow stripe on the belly. The head has a dark brown stripe passing through the eye from the nostril to the gills.

Optimum habitat for the flatwoods salamander is open, mesic (moderate moisture) woodland of longleaf/ slash pine flatwoods maintained by frequent fires. The ground cover supports a rich herbivorous invertebrate community that serves as a food source for the flatwoods salamander. Adult and sub-adult flatwoods salamanders are adapted for living underground. They enlarge crayfish burrows or build their own. Preliminary data indicate that flatwoods salamander males first breed at one (1) year of age and females at two (2) years of age. Adult flatwoods salamanders move to their wetland breeding sites during rainy weather, in association with cold fronts, from October to December. Breeding sites are isolated pond cypress, black gum or slash pine dominated depressions which dry completely on a cyclic basis. They are generally shallow and relatively small. A relatively open canopy is necessary to maintain the herbaceous component, which serves as cover for flatwoods salamander larvae and their aquatic invertebrate prey.

The females lay their eggs (singly or in clumps) beneath leaf litter, under logs and sphagnum moss mats, or at bases of bushes, small trees, or clumps of grass. Embryos begin development immediately, but the egg must be inundated before it will hatch. Depending on when eggs are inundated, the larvae usually metamorphose in March or April; the length of the larval period varies from eleven (11) to eighteen (18) weeks. The timing and frequency of rainfall are critical to the successful reproduction and recruitment of flatwoods salamanders. Fall rains are required to facilitate movements to the pond and winter rains are
needed to ensure that ponds are filled sufficiently to allow hatching, development, and metamorphosis of larvae. In contrast, too much rainfall in the summer will keep pond levels from dropping below the grassy pond edge, as needed to provide dry substrate for egg deposition. This reliance on specific weather conditions results in unpredictable breeding events and reduces the likelihood that recruitment will occur every year. Adult flatwoods salamanders leave the pond site after breeding.

Flatwoods salamanders need to maintain moist skin for respiration and to control the amounts of water and salts in their bodies. Since they may disperse long distances from their breeding ponds to upland sites where they live as adults, drying out can be a limiting factor in their movements. Thus, it is important that areas connecting their wetland and terrestrial habitats are protected in order to provide cover and appropriate moisture regimes during their migration.

The flatwoods salamander inhabits the lower Southeastern Coastal Plain from southern South Carolina, southward to Marion County, Florida, and westward through Georgia to extreme southwestern Alabama. In Georgia, the species occurs mainly in the lower coastal plain, but is also found in portions of the upper coastal plain; however, it is absent from the area between the Ocmulgee and Ohoopee Rivers. The inclusion of North Carolina and Mississippi on old range maps is apparently the result of misidentification of larval specimens. No subspecies are recognized. Most secure populations of flatwoods salamanders appear to be in Florida, where 32 extant populations are known to occur west of the Suwannee River. The only known extant Florida population east of the Suwannee River is found in the Osceola National Forest. In Georgia, extant populations of flatwoods salamanders occur at opposite ends of the state. Flatwoods salamanders presently exist at Fort Stewart and the Naval Bombing Range in southeastern Georgia and Ichauway Plantation in southwestern Georgia. Flatwoods salamanders have not been observed in Alabama since 1981. Although not observed in South Carolina between 1991 and 1994, flatwoods salamanders were confirmed as still using a historic breeding site in October 1995.

2.2 Environmental Baseline

An analysis of the habitat likely to support the endangered species within Emanuel County includes:

- fresh and brackish wetlands or other wooded swamps
- xeric sandridge habitat
- creek bottoms
- upland forests
- agricultural fields
- well-drained, sandy soils in forest and grassy areas
- pine stands/overstory with open understory with grass and groundcover with sunny areas for nesting

It is known that the Eastern Indigo Snake, Gopher Tortoise, and Flatwoods Salamander could potentially inhabit these areas. The adjacent tract to EGC currently has one colony of Gopher Tortoises with over 15 known tortoise burrows, both active and inactive. The adjoining property is currently under a management plan for the tortoise colony.

2.2.1 Status of the species On-Site

Excluding the indigo snake, gopher tortoise, and flatwoods salamander, potential for on-site occurrence for the listed species within Emanuel County is low due to current land uses, historic land uses, lack of suitable habitat, or non-observance during recent surveys. Habitat found on site did not meet the necessary criteria for occurrence of some of the individual species (Table 1).
Upon field surveys, it was determined that the habitats on-site could support the Eastern Indigo Snake, Gopher Tortoise, and Flatwoods Salamander. Pedestrian surveys were conducted to locate any eastern indigo snake, gopher tortoise, or flatwoods salamander burrows, habitat, or individuals within the proposed alignment and surrounding properties (when possible).

The pedestrian surveys for the eastern indigo snake and gopher tortoise consisted of visual surveys throughout the subject property. During the pedestrian surveys, multiple burrows were found and determined to be those of the Gopher tortoise. The burrows exhibited characteristic semi-circular openings with large mounds of scattered sand at the openings. The geographic positions of the burrows were recorded using a sub-meter accurate Trimble GeoXT Geographic Positioning System handheld unit. The data for the location was downloaded and placed into a GIS database.

To determine if the burrows were active or inactive, an investigation with visual observations of tortoise activity (tracks, freshly moved earth, etc) and USFWS approved scoping techniques with a pole mounted infrared camera was performed. The scoping method via infrared camera recommended by the USFWS avoids any accidental "take" or "harassment" incidents and is the preferred method when determining the presence of an active colony of tortoises. Colony size determination based on visual activity outside of the burrow can be inaccurate because of the tortoise's use of multiple burrows and was avoided for this project.

Of the burrows investigated, most were noted as actively used by gopher tortoises and few were found to be inactive. No eastern indigo snake was noted in any of the burrows. Of the active burrows, many were determined to be inhabited by juvenile tortoises, based on the size of the burrow opening. Although, a majority were determined to be those of adult tortoises. The combined population shows evidence of a sustainable habitat; however, recent evidence of unknown burrow intruders was found during the burn event in December. It appeared that foraging or predacious wildlife had begun excavating the burrows. To date, these have not been identified.

The pedestrian survey for the flatwoods salamander consisted of visual surveys throughout the subject property. During the pedestrian surveys on the subject and adjoining properties, no flatwoods salamander individuals or their breeding habitat were observed. In addition, a jurisdictional waters of the U.S. delineation was performed on the subject property, which is to be verified by the United State Army Corps of Engineers (USACE) to determine if any topographically isolated wetlands are located on-site. In addition, no designated critical habitat for this species is known to be located in Emanuel County, Georgia.

2.3 Survey Protocols (USFWS, 2003)

Survey protocols were based on the USFWS guidelines and recommendations for surveys and monitoring of Threatened and Endangered Species.

2.3.1 Indigo Snake Pedestrian Survey Methods and Times

The pedestrian surveys for the eastern Indigo Snake consisted of visual surveys throughout the project corridor and 100 linear feet from the centerline of the corridor. The visual surveys searched for any evidence of the Indigo Snake, including recent skin sheds, scat, or tracks. The surveys were conducted late in the month of October, between 1000 and 1600 hours.
October is the latter range of hatchling appearance and the early time range of copulation activities. The possibility of a sighting of the Indigo Snake could be considered high during the time between September and February as the species may be migrating between wetter lowland feeding areas to upland wintering sites. The winter months are generally accepted by the scientific community as the best times to conduct surveys.

During the pedestrian surveys, three (3) burrows were found and determined to be those of the Gopher Tortoise. The burrows exhibited characteristic semi-circular entrances with large mounds of scattered sand at the openings. The geographic positions of the burrows were recorded using a sub-meter accurate Trimble GeoXT Geographic Positioning System handheld unit. The data for the locations were downloaded and placed into a GIS database.

To determine if the burrows were active or inactive, an investigation with visual observations of tortoise activity (tracks, freshly moved earth, etc.) and USFWS approved scoping techniques with a pole mounted infrared camera was performed. The scoping method via infrared camera recommended by the USFWS avoids any accidental “take” or “harassment” incidents and is the preferred method when determining the presence of an active colony of tortoises.

Colony size determination based on visual activity outside of the burrow can be inaccurate because of the tortoise’s use of multiple burrows and was avoided for this project.

Of the three (3) burrows investigated, two were noted as actively used by Gopher Tortoises and one as inactive. No eastern Indigo Snake was noted in any of the three burrows. Of the two (2) active burrows, one was determined as inhabited by a juvenile tortoise based on the size of the burrow opening. The other was determined to be that of an adult tortoise. Both burrows were empty with evidence of recent departure by the tortoises.

Each burrow area was extensively investigated for evidence of the Indigo Snake using a 50-foot radius. No sheds, scat, or tracks were noted within the areas. Although the absence of any Indigo Snake evidence suggests an unlikely occurrence, the surrounding habitat is still suitable for its habitat and should be surveyed periodically.

### 2.3.2 Potential Flatwoods Salamander Habitat

The pedestrian surveys for the Flatwoods Salamander consisted of visual habitat surveys throughout the project corridor and 100 linear feet from the centerline of the corridor. The visual surveys searched for any evidence of the Flatwoods Salamander, including habitat, crayfish or salamander burrows, egg clutches, or individual specimens. The surveys were conducted late in the month of October, which is the breeding range for the salamander. Adult flatwoods salamanders move to their wetland breeding sites during rainy weather, in association with cold fronts, from October to December.

Optimum habitat for the flatwoods salamander is open, mesic (moderate moisture) woodland of longleaf/slash pine flatwoods maintained by frequent fires. The ground cover supports a rich herbivorous invertebrate community that serves as a food source for the flatwoods salamander. Breeding sites are isolated pond cypress, black gum or slash pine dominated depressions that dry completely on a cyclic basis. They are generally shallow and relatively small. A relatively open canopy is necessary to maintain the herbaceous component, which serves as cover for flatwoods salamander larvae and their aquatic invertebrate prey.
During the surveys, bottomland-hardwood wetland habitats and one possible isolated wetland were encountered along the project corridor. The vegetation located in the bottomland-hardwood forests includes Red Maple (*Acer rubrum*), Long Leaf Pine (*Pinus palustris*), Sweetbay Magnolia (*Magnolia virginiana*), Water Tupelo (*Nyssa aquatica*), and Sweetgum (*Liquidambar styraciflua*) in the canopy. The subcanopy consisted of Holly (*Ilex Opaca*), and Azalea (*Rhododendron* spp.). The herbaceous layer was made up of Partridge-berry (*Mitchella repens*), Netted Chainfern (*Woodwardia areolata*), and Christmas fern (*Polystichum acrostichoides*).

The vegetation in the potential isolated wetland was similar to the bottomland forest with a monoculture of sweetgum and red maple species. The herbaceous layer was limited to saplings of canopy species. The wetland was later determined connected to an adjacent bottomland forest. During the determination, there was evidence that two drainages flowed away from the isolated wetland area, which would suggest an extended saturation regime with no xeric cycle or conditions.

Because the area has not been managed by fire as the adjacent tracts, the monotone of wetland species, history of silviculture activities, and lack of appropriate hydrologic regime, this area was determined unsuited for the flatwoods salamander.

### 2.3.2 Potential Red-cockaded Woodpecker Nesting and/or Foraging Habitat

The pedestrian surveys are used to determine whether the nesting and/or foraging habitat of a red-cockaded woodpecker group will be adversely impacted by a proposed project, such as a timber sale or development activity, on a particular tract of land. This is an important part of the conservation and management of this endangered species, and therefore the Fish and Wildlife Service has developed standard survey and analysis procedures for such determinations. These determinations must be undertaken prior to the initiation of any project within the southeastern United States that calls for removal of pine trees 30 years or older; typically such trees will be at least 25.4 cm (10 in) dbh or larger. The procedure is also used following new land acquisition by state and federal agencies in the southeast or any other circumstance in which the presence or absence of red-cockaded woodpeckers is to be assessed.

The first step in the survey procedure is to determine if suitable nesting or foraging habitat exists within the area to be impacted by the project. If no suitable nesting or foraging habitat is present within the project impact area, further assessment is unnecessary and a "no effect" determination is appropriate. If no suitable nesting habitat is present within the project impact area, but suitable foraging habitat is present and will be impacted, potential use of this foraging habitat by groups outside the project boundaries must be determined. This is accomplished by identifying any potential nesting habitat within 0.8 km (0.5 mi) of the suitable foraging habitat that would be impacted by the project. Any potential nesting habitat is then surveyed for cavity trees. This procedure is described in greater detail below. If no active clusters are found, then a "no effect" determination is appropriate. If one or more active clusters are found, a foraging habitat analysis is conducted to determine whether sufficient amounts of foraging habitat will remain for each group post-project.

For nesting and foraging habitat surveys within project impact areas and within 0.8 km (0.5 mi) of the project site, potential habitat is assessed at the level of the stand. A stand is a term often used to refer to a wooded area receiving past or current silvicultural treatment as a single management unit. Here we expand the term to include any subset of a tract of wooded land, divided by biological community type, management history, or any other reasonable approach. A small tract of land may be considered a single stand.
Identification of Suitable Foraging Habitat

For the purpose of surveying, suitable foraging habitat consists of a pine or pine/hardwood stand of forest, woodland, or savannah in which 50 percent or more of the dominant trees are pines and the dominant pine trees are generally 30 years in age or older. These characteristics do not necessarily describe good quality foraging habitat; rather, this is a conservative description of potentially suitable habitat.

Identification of pine and pine/hardwood stands can be made using cover maps that identify pine and pine/hardwood stands, aerial photographs interpreted by standard techniques, or a field survey conducted by an experienced forester or biologist. Age of stands can be determined by aging representative dominant pines in the stands using an increment-borer and counting annual growth rings. Stand data describing size classes may be substituted for age if the average size of 30 year-old pines is known, i.e., at least 25.4 cm (10 in) dbh or larger, for the local area and habitat type.

If no suitable foraging habitat is present within the project area (that is, no pines 30 years or older will be impacted), then further evaluation is unnecessary and red-cockaded woodpeckers are considered absent. If the project area contains any suitable foraging habitat that will be impacted by the project, that habitat, if it contains any 60 year old trees or older, and all other suitable nesting habitat within 0.8 km (0.5 mi) of the project site, regardless of ownership, must be surveyed for the presence of red-cockaded woodpeckers.

Identification of Suitable Nesting Habitat

For the purpose of surveying, suitable nesting habitat consists of pine, pine/hardwood, and hardwood/pine stands that contain pines 60 years in age or older and that are within 0.8 km (0.5 mi) of the suitable foraging habitat to be impacted at the project site (see above). Additionally, pines 60 years in age or older may be scattered or clumped within younger stands; these older trees within younger stands must also be examined for the presence of red-cockaded woodpecker cavities. These characteristics do not necessarily describe good quality nesting habitat; rather, this is a conservative description of potential nesting habitat.

Determination of suitable nesting habitat may be based on existing stand data, aerial photo interpretation, and/or field reconnaissance. All stands meeting the above description, regardless of ownership, are surveyed for cavity trees.

Surveying for Red-cockaded Woodpecker Cavity Trees

Once suitable nesting habitat is identified (above), it must be surveyed for cavity trees of red-cockaded woodpeckers by personnel experienced in management and/or monitoring of the species. Potential nesting habitat is surveyed by running line transects through stands and visually inspecting all medium-sized and large pines for evidence of cavity excavation by red-cockaded woodpeckers. Transects must be spaced so that all trees are inspected. Necessary spacing will vary with habitat structure and season from a maximum of 91 m (100 yards) between transects in very open pine stands to 46 m (50 yards) or less in areas with dense midstory. Transects are run north-south, because many cavity entrances are oriented in a westerly direction, and can be set using a hand compass.

When cavity trees are found, their location is recorded in the field using a Global Positioning System (GPS) unit, aerial photograph, and/or field map. Activity status, cavity stage (start, advanced start, or complete cavity), and any entrance enlargement are assessed and recorded at this time. Again, it is extremely important to have all surveys and cavity tree assessments performed by experienced personnel.
If cavity trees are found, more intense surveying within 457 m (1500 ft) of each cavity tree is conducted to locate all cavity trees in the area. Cavity trees are later assigned into clusters based on observations of red-cockaded woodpeckers as described in 3A. Any cavity trees or other evidence of red-cockaded woodpecker activity is reported to the Fish and Wildlife Service, at either a local office or the Clemson Field Office, Clemson, South Carolina.

2.3.2.1 Methods

Prior to stand level surveys, in-house surveys identified habitat types that should be assessed within the project alignment, based on protocol. These areas were demarcated through use of LandSat/GADNR Landcover maps, NWI maps, Soils maps, Flood Zone maps, and Infrared Aerial Photography. Of the 226-acres, four dominant habitats were noted and investigated; these include Dense Pine Forest, Open Pine Forest, Pine Hardwood Forest, and Open/Field habitats.

Field surveys were conducted during dawn and dusk over two days for RCW’s in all habitats. Transects were traversed north to south in each habitat with varying widths in between each transect, according to understory density. Based on the aerial photography and field conditions, Standard Protocol (as outlined above) was used during the survey along with other survey methods, including spherical densitometry and dendrochronology.

Habitat types were documented and compared to in-house surveys. Notes were taken on evidence of past management activities, understory densities, stand densities, and stand composition.

A Spherical Densitometer was used in the field to record both understory and canopy densities during habitat transects. A densitometer provides accurate, one person measurement of tree canopy density from unobstructed sighting positions. The instrument uses a spherical-shaped reflector mirror engraved with a cross-shaped grid of 24 quarter inch squares. To take readings, one holds the instrument level, 12" to 18" in front of body and at elbow height. Then one assumes four equi-spaced dots in each square of the grid and systematically counts the dots equivalent to quarter-square openings. The total count is multiplied by 1.04 to obtain percent of overhead area not occupied by canopy. The difference between this and 100 is an estimation of overstory density in percent.

Standard dendrochronology procedures were used to accurately determine the age of stands, as outlined in the USDA Spruce Budworm Handbook – Handbook 639, an accepted guide by scientists for tree ring sampling techniques and analysis. A tree auger was used to take tree ring samples of the largest trees in each stand and diameter at breast height (dbh) was recorded. Tree rings were counted in the field to confirm preliminary age estimates with final analysis in the lab. Final analysis included mounting and sanding of cores, electronic flatbed scanning, and stereoscopic analysis to provide an accurate age determination. Cross-referencing of tree rings provided confirmation of false rings and missing rings between each sample. A standardized tree ring series was constructed using tree ring analysis software (Cofecha, Arstan, etc.) from the University of Arizona Tree Ring Laboratory. A final estimate on stand age was determined for each habitat.

2.3.2.2 Results

Identification of Suitable Foraging Habitat

No suitable foraging habitat to be impacted was found on-site; however, very limited locations on the tract may be considered suitable for the foraging of the RCW (Figure 5), but unlikely due to the adjacent habitats. The adjacent habitats to these areas were within flood zones or developed for
institutional/residential uses. Average stand age of the sites was determined to be 38-years in older stands of dense understory, with average stand age of 22-years in less dense stands. Areas off-site provided similar stand age and midstory densities.

The habitat within certain areas of the site included dense midstory and understory conditions relatively composed of hardwoods and shrub vegetation with areas of open relatively young pines (10-20 years in age) mixed with scrub/shrub type midstory. Only a few pine trees of the appropriate foraging age were noted in the project ROW, but these were surrounded by dense midstory and understory. Field investigations during dawn and dusk of these areas provided no evidence of the RCW utilizing these areas.

Studies have shown the lack of preference of the RCW for these types of areas. In 2002, Rudolph, et. al. showed that dense midstory vegetation reduces the apparent suitability of habitat for the RCW. Comparing the results of densitometer readings to those found in Rudolph's 2002 study indicated equal if not greater midstory densities in potential habitats for the project ROW. Rudolph's study concluded the overall foraging behavior of the RCW in pine habitats indicated avoidance of the habitats with dense midstory. Other scientific studies support our findings of no suitable foraging habitats within the project alignment, based on the dense midstory and understory and juvenile pine trees in open areas (Van Balen and Doerr 1978, Repasky 1984, Hovis and Labisky 1985, Jackson et al. 1986).

Questionable areas within the tract included both open field habitats and open pine stands with maintained greenspace. The pines were of good health and 20–30 years in age. There were no signs of active foraging in these areas but given the acreages of the stands, these areas may be suitable for the foraging of the RCW, with proper management.

**Identification of Suitable Nesting Habitat**

No suitable nesting habitat to be impacted was found within the project alignment. The pine stands within the area of the habitat were less than 60 years of age and the midstory of the pine stands were too dense, based on field observations and scientific research. Surveys were performed during dusk and dawn for any evidence of the RCW, with transects traversed at 150 to 300 meters apart to visually note any evidence of the species.

No nesting trees were found on-site or in the adjacent habitats. These areas were examined for understory and midstory densities using a densiometer and found to be similar in characteristics of those habitats shown unsuitable and not utilized by the RCW in scientific research.

**Surveying for Red-cockaded Woodpecker Cavity Trees**

Because of the lack of suitable foraging habitats within the alignment, surveying for RCW cavity trees was unnecessary, as outlined in the U.S. Fish and Wildlife Service, 2003, Recovery plan for the red-cockaded woodpecker.

However, as part of EGC's plans for a site wide natural resource plan, CE performed a cavity tree survey on-site and within a 0.5-mile radius of the site (when practical with provided rights to access of surrounding properties). Upon surveys of all habitats on-site, no active or inactive cavity trees of the RCW were located. Adjacent sites provided similar results.

Although one cavity was found within the project alignment, it was within a pine tree "snag within a dense understory habitat and utilized by a Pileated Woodpecker (Snag trees are trees whose crowns have
been "snapped" off during storm events; See Attachment A, Photos). Unfortunately, the Pileated woodpecker was not caught on film, but the snag is clearly shown as being that of a deadwood tree and unsuitable for the RCW.

No pines were found on-site with characteristics of recent or past RCW activity. The habitat features typically found with the RCW (60± year old cavity trees, resinous cavity openings, open understory, fire managed stands, open foraging habitats, etc.) were also absent during our survey.

2.4 Conclusion

Preliminary results in the field determined that certain habitats were emerging as suitable habitat for the salamander, certain tree stands were of 30+ years of age with no 60+ year old trees, and that gopher tortoise burrows (Eastern Indigo Snake habitat) were present.

No individual salamanders or burrows were found, nor were any indigo snake evidence located inside or around the gopher tortoise burrows.

Verification of the suitable RCW habitat stand ages was performed in the lab. Areas of dense midstory provided a few trees suitable in age for foraging purposes, but lacked any field evidence of the RCW (sightings, etc.). No cavity clusters or colonies were noted in the on-site. Midstory vegetation has been shown to increase the probability of cluster abandonment (Conner and Rudolph 1989), to negatively impact foraging (Epting et al. 1995), and to be negatively associated with measures of fitness (Davenport et al. 2000)

3.0 Prescribed Burn/Fire Management Plan

A fire prescription was developed to be used along with the finalized INRMP. This prescription assessed the findings of the wildlife habitat survey and outlined areas that required burning to initiate habitat restoration. We proposed and initiated only one prescribed burn event in December of 2005, as the results of the burn will determine the amount and schedule of future burns.

3.1 Baseline Burn

EGC installed firebreaks and ditches as burn boundaries, to prevent escape of fire into other areas. The understory fuel (leaves, twigs, etc.) available produced a low intensity burn in the pine stand areas with a moderate intensity burn in the mixed upland hardwood/pine stand areas. The fire behavior on the burn was determined in part by the availability and type of fuels within the burn boundary. Fuel age, species, arrangement, and distribution was determined suitable for a low to moderate intensity burn. The fuel complex was defined in terms of forest floor cover (needle litter, grass), organic layer (duff), surface fuels (herbaceous cover, down woody material), ladder fuels (low, tall, dead, living), stand structure (stocking, crown closure, height to live crown) and composition (species).

Natural and constructed boundaries surrounding the burn were assessed to identify high risk boundaries which will affect ignition and suppression tactics. The burn boundary and other non-treatment areas within the burn boundary were then sectioned into different segments based on fuel type, topography or other factors likely to affect fire behavior.

The fire weather and fuel moisture conditions necessary to achieve the desired results were identified during the habitat assessment. The prescription developed was based on the most common or most
important fuel complex. During prescription development, wind speed and direction, anticipated fire behavior, smoke management issues, and potentially negative environmental impacts were addressed.

On December 16, 2005, CE and a Fire Management Crew initiated a burn to the northern half of the prescription area. The following week, the burn was applied to the southern half of the prescription area. The burn was considered successful based on the amount of fuel removed and impact to invasive species.

Well-established invasive species will require intensive management to restore the pine stands to a habitat suitable for the T&E species. This may require hand slashing and application of herbicide to target trees prior to the next winter burn.

4.0 Recommendations

The recommendations for the East Georgia Site include the continuous management of the upland and wetland areas for restoration to suitable habitats for the indigenous wildlife. With the expansion of the campus, the individual areas adjacent to the expansion should be taken into consideration as high priority areas for management. This will serve two purposes: to educate visitors, staff and students of the campus as to the importance of the areas, and to begin a directional restoration towards the central areas of the natural resources.

4.1 Site-wide Environmental Masterplan

Based upon the College's plans for future expansion, CE recommends completion of the site-wide masterplan in three phases; Phase 1 would complete the assessment of the wetland areas as to the nature of the current impacts and proposed restoration; Phase 2 would implement a Wildlife Management Plan that would encourage the continued existence and expansion of the known T&E species; Phase 3 would monitor both areas and make modifications as necessary for continued success.

Phase 1 Wetland restoration

Masterplan for dry ponds & associated permits

The dry pond area located to the south of the property will require restoration to integrate it as an amenity to the campus while restoring it to a wildlife use area. The final master plan, in conjunction with the delineation, will determine the extents of the original pond area and assess the activities necessary to return it to its original state. Management of this pond may best be accomplished through the development of a "green tree reservoir" type system, where the depth of the pond is fluctuated throughout the growing seasons.

The dry pond area located in the central portion of the campus will also require restoration. This area is currently a fully functional wetland that could be enhanced through planting of native species. The plantings could include bald cypress, red maple, etc., to enhance the visual appearance of this wetland while increasing its functionality. Although the USACE and GADNR will not allow the change of wetland habitats to other types of wetlands, this pond area could be modified through selective thinning of invasive wetland species and replanting of native species. The selective thinning would also provide a means to restore the visual appearance of this area and enhance its overall ascetic value.

Both pond areas will require permits from the USACE and GADNR for enhancement to the wetland areas. The USFWS may find it necessary to request a T&E survey for restoration areas.
We recommend utilizing local nurseries and greenhouses for the thinning and restoration labor with CE providing project management.

Wetland restoration

The restoration of the wetland corridor will require the assessment of these areas and the removal of the invasive species located within. The wetlands will have to be assessed as to their types and values to determine the necessary restoration activities to take place. Activities including planting of wetland species, labor, and other restoration measures are not included in this proposal as they cannot be determined. We recommend utilizing local nurseries and greenhouses for the thinning and restoration labor with CE providing project management.

Phase 2 Wildlife Management Plan

RCW & GT Habitats

The upland areas are composed of mixed pine, wiregrass, and turkey oak communities that are suitable for the maintenance of the Gopher Tortoise, Eastern Indigo Snake, and Red Cockaded Woodpecker species. This habitat currently has an unknown population of endangered species and requires a continuous population survey to complete any master plan design for wildlife management. The future evaluation should be composed of T&E surveys in order to gain an exact population baseline with monitoring of the population.

We recommend utilizing the information contained herein and information from USFWS and GADNR as specific guidance for certain areas that were found critical and environmentally sensitive. The final masterplan should outline specific management of individual areas for the support and encouragement of wildlife species. Part of this plan includes a prescribed burn schedule, to occur every winter and spring to reduce the amount of invasive species, and to restore the pinelands to their original nature. This will aid in the promotion of suitable habitat for the T&E species.

Control Burn

The controlled burn should be initiated in the late winter and spring to reduce and eliminate invasive species of plants that create an unsuitable foraging habitat. The upland areas composed of mixed pine, wiregrass, and turkey oak communities are suitable for the maintenance of the Gopher Tortoise, Eastern Indigo Snake, and Red Cockaded Woodpecker species with a controlled burn. However, the lack of a historical fire regime and the emergence of the turkey oak communities suppress the area and makes it unsuitable for foraging activities. With a controlled burn, selective thinning, and restoration planting of native species, the habitat should emerge successful with growth and/or establishment of the T&E species.

Phase 3 Monitoring and Management Plan

Wetland Restoration/Creation Areas

All wetland restoration or creation areas should be monitored. A five (5) year monitoring plan should be implemented for the areas at the conclusion of the restoration activities and/or planting. Annual monitoring reports are based upon findings during the monitoring visits. These reports should be compared to the previous reports to determine stream and wetland hydrology, growth evaluation, death and damage ratio, pest conditions (if necessary), wildlife utilization, and if any recommended corrective actions are needed.
Routine inspections of the wetland restoration sites should be conducted during restoration to evaluate stabilization, planting methods, condition of planted material, erosion control measures, compliance with design plans, and progress. These inspections are qualitative in nature, commenting on the condition and progress of the restoration. Additionally, comprehensive inspections should be conducted on a quarterly basis for the first year and twice annually for the next four years following construction to accurately evaluate the effectiveness of the restoration projects.

During site inspections, photographs will be taken from fixed points that are to be installed during the planting event, to document and compare the condition of the creation area over time.

Any planted vegetation should be monitored during the site monitoring visits for growth and survivability. The acceptable survival rate for the planted trees and shrubs appears to be approximately 75%. This will be measured by random samples of individuals through the entire rights-of-way creation area. If any problems occur, such as a drop in the survival rate, the entire creation area will be examined for potential problems. All reasonable efforts will be made to control potential beaver impacts (i.e. tree tubes and utilization of non-food species).

If the survivability rate drops below 75%, replanting of the dead trees will be initiated to bring survivability above the 75% limit. If the tree survivability drops below 75% after two events of replacing the same tree species, contributing factors to the drop in survivability will be examined. Different species of trees will be evaluated depending upon hydrological factors found within the mitigation area. Any planting of trees or changes in species will be approved by the USACE prior to the corrective actions.

Hydrology should be monitored according to methods developed by The Interagency Workgroup On Wetland Restoration (TWOWR). This method will include the installation of two (2) to three (3) inch (in) slotted PVC pipes/wells, on-site quarterly monitoring of water depth within these pipes/wells, and surface flow patterns within and adjacent to the creation area. Initially, a well will be installed every four (4) ft along two intersecting transects. The wells will be designed and installed with a minimum of eighteen (18) in of PVC pipe/well below the surface, as per TWOWR guidance. This will be to allow percolation of water throughout the slotted subsurface portion of the well for the measuring of hydrology levels. In addition, rainfall amounts for the Emanuel County area will be included as a reference for the availability of natural hydrology and comparisons to actual water table levels on-site. This data should also be recorded and included within the results of the monitoring reports.

*Wildlife Habitat/Management Areas*

Upon field surveys, it was determined that the habitats on-site could support the Eastern Indigo Snake, Gopher Tortoise, and Flatwoods Salamander. During and after the controlled burn of the upland areas and restoration of wetland areas, pedestrian surveys should be conducted to locate any eastern indigo snake, gopher tortoise, or flatwoods salamander burrows, habitat, or individuals within the proposed restoration areas and surrounding properties (when possible).

The pedestrian surveys for the eastern indigo snake and gopher tortoise should be performed with documentation of burrow locations, conditions, and inhabitants. The pedestrian surveys for the flatwoods salamander should be performed throughout any created or restored isolated wetland areas. No topographically isolated wetlands are located on-site; however a few fragmented wetlands, those connected by ditches or impacted by existing roadways could serve as potential habitat.
5.0 Necessary Action List for INRMP Finalization

The first and foremost action is to determine what the needs of EGC are in relation to the campus’ overall growth. Establishment of the natural resource areas and beginning restoration activities can only be successful if the overall plan takes into consideration the future growth of the campus. Once the masterplan has been completed, the campus can begin integrating the natural resources into the surrounding development. One existing step has been the integration of the new roadway into the overall environment by providing the public information kiosks that describe the individual habitats they are entering and the sensitivity and uniqueness of these areas. Actions similar to this will bring both a beneficial development and create a sustainable environment for both the campus and the current wildlife.

The following is an action list to complete the INRMP.

1. Complete wetland masterplan to determine restoration areas in conjunction with EGC’s future development masterplan, which includes:
   a. Documenting restoration area types
   b. Assessing EGC’s vision of restoration areas
   c. Determining best suited restoration methods
   d. Implementing monitoring or restoration areas
   e. Development of a final INRMP

2. Begin monitoring of wildlife habitat areas for Gopher tortoises, Eastern Indigo Snakes, and Red Cockaded Woodpeckers
   a. Document known populations and habitats
   b. Monitoring of new occurrences

3. Begin prescribed burning regime,
   a. 1 winter burn, and 1 spring burn
   b. Thinning of invasive species

4. Restore wetland areas

6.0 Conclusion

We appreciate the opportunity to have provided our services on this project. Because we feel this project will grow to be an added asset to East Georgia College, we recommend the continued efforts by the administration and staff to enhance and preserve the unique surroundings to which EGC has become stewards. We look forward to actively assisting the university and should you have questions or concerns regarding the information contained within this report, please do not hesitate to contact us.

Sincerely,

David M. Cushman
Environmental Scientist

Laary J. Cushman
Senior Environmental Scientist
## Table 1. Listed Species in Emanuel County (updated May 2004)

<table>
<thead>
<tr>
<th>Species</th>
<th>Federal Status</th>
<th>State Status</th>
<th>Habitat</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bird</strong></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Bald eagle</td>
<td>T</td>
<td>E</td>
<td>Inland waterways and estuarine areas in Georgia.</td>
<td>Major factor in initial decline was lowered reproductive success following use of DDT. Current threats include habitat destruction, disturbance at the nest, illegal shooting, electrocution, impact injuries, and lead poisoning.</td>
</tr>
<tr>
<td><em>Haliaeetus leucocephalus</em></td>
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<tr>
<td>Red-cockaded woodpecker</td>
<td>E</td>
<td>E</td>
<td>Nest in mature pine with low understory vegetation (&lt;1.5m); forage in pine and pine hardwood stands &gt; 30 years of age, preferably &gt; 10&quot; dbh</td>
<td>Reduction of older age pine stands and encroachment of hardwood midstory in older age pine stands due to fire suppression</td>
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<tr>
<td><em>Picoides borealis</em></td>
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<tr>
<td>Wood stork</td>
<td>E</td>
<td>E</td>
<td>Primarily feed in fresh and brackish wetlands and nest in cypress or other wooded swamps</td>
<td>Decline due primarily to loss of suitable feeding habitat, particularly in south Florida. Other factors include loss of nesting habitat, prolonged drought/flooding, raccoon predation on nests, and human disturbance of rookeries.</td>
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<tr>
<td><em>Mycteria americana</em></td>
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<tr>
<td><strong>Reptile</strong></td>
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<tr>
<td>Eastern indigo snake</td>
<td>T</td>
<td>T</td>
<td>During winter, den in xeric sandridge habitat preferred by gopher tortoises; during warm months, forage in creek bottoms, upland forests, and agricultural fields</td>
<td>Habitat loss due to uses such as farming, construction, forestry, and pasture and to overcollecting for the pet trade</td>
</tr>
<tr>
<td><em>Drymarchon corais couperi</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gopher tortoise</td>
<td>No Federal</td>
<td>T</td>
<td>Well-drained, sandy soils in forest and grassy areas; associated with pine overstory, open understory with grass and forb groundcover, and sunny areas for nesting</td>
<td>Habitat loss and conversion to closed canopy forests. Other threats include mortality on highways and the collection of tortoises for pets.</td>
</tr>
<tr>
<td><em>Gopherus polyphemus</em></td>
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<tr>
<td><strong>Amphibian</strong></td>
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<tr>
<td>Flatwoods salamander</td>
<td>T</td>
<td>T</td>
<td>Adults and subadults are fossorial; found in open mesic pine/wiregrass flatwoods dominated by longleaf or slash pine and maintained by frequent fire. During breeding period, which coincides with heavy rains from Oct.-Dec., move to isolated, shallow, small, depressions (forested with emergent vegetation) that dry completely on a cyclic basis. Last breeding record for Emanuel County was in the 1940s.</td>
<td>Habitat destruction as a result of agricultural silvicultural practices (e.g., clearcutting, mechanical site preparation), fire suppression and residential and commercial development.</td>
</tr>
<tr>
<td><em>Ambystoma cingulatum</em></td>
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</tbody>
</table>
Figure 1. Site Location Map
East Georgia College
CE Job No. 04-103-EGC
Emanuel County, GA

Note: All data depicted on this map are derived from outside sources including USACE, USFWS, USGS, DOT, and County Tax offices. All depictions are preliminary until final verification by agencies with certain jurisdictions over depicted resources. All Site and Resource boundaries are best estimates based upon outside resources available at time of map completion. Cushman Enterprises, LLC is not responsible for the accuracy of the data depicted nor the negative consequences of actions based on such data.
Figure 2. Topography Map
East Georgia College
CE Job No. 04-103-EGC

Note: All data depicted on this map are derived from outside sources including USACE, USFWS, USGS, DOT, and County Tax offices. All depictions are preliminary until final verification by agencies with certain jurisdictions over depicted resources. All Site and Resource boundaries are best estimates based upon outside resources available at time of map compilation. Cushman Enterprises, LLC is not responsible for the accuracy of the data depicted nor the negative consequences of actions based on such data.
Figure 3. Soils Map
East Georgia College
CE Job No. 04-103-EGC

Legend

- Site

Note: All data depicted on this map are derived from outside sources including USACE, USFWS, USGS, DOT, and County Tax offices. All depictions are preliminary until final verification by agencies with certain jurisdictions over depicted resources. All Site and Resource boundaries are best estimates based upon outside resources available at time of map compilation. Cushman Enterprises, LLC is not responsible for the accuracy of the data depicted nor the negative consequences of actions based on such data.
Figure 4. National Wetlands Inventory Map
East Georgia College
CE Job No. 04-103-EGC

Note: All data depicted on this map are derived from outside sources including USACE, USFWS, USGS, DOT, and County Tax offices. All depictions are preliminary until final verification by agencies with certain jurisdictions over depicted resources. All Site and Resource boundaries are best estimates based upon outside resources available at time of map compilation. Cushman Enterprises, LLC is not responsible for the accuracy of the data depicted nor the negative consequences of actions based on such data.
Figure 5. Eco-Master Plan
East Georgia College
CE Job No. 04-103-EGC

Note: All data depicted on this map are derived from outside sources including USACE, USFWS, USGS, DOT, and County Tax offices. All depictions are preliminary until final verification by agencies with certain jurisdictions over depicted resources. All Site and Resource boundaries are best estimates based upon outside resources available at time of map compilation. Cushman Enterprises, LLC is not responsible for the accuracy of the data depicted nor the negative consequences of actions based on such data.
Legend

+ Site

affles Burn Areas

Figure 6. Prescribed Burn Masterplan
East Georgia College
CE Job No. 04-103-EGC

Note: All data depicted on this map are derived from outside sources including USACE, USFWS, USGS, DOT, and County Tax offices. All depictions are preliminary until final verification by agencies with certain jurisdictions over depicted resources. All Site and Resource boundaries are best estimates based upon outside resources available at time of map completion. Cushman Enterprises, LLC is not responsible for the accuracy of the data depicted nor the negative consequences of errors based on such data.
1.818-ACRE BOG

SCALE: 1" = 100'

CE JOB No. 05-137-EGC
07-06-2005
2.973-ACRE WETLAND
1.110-ACRE WETLAND

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EAST GEORGIA COLLEGE
JURISDICTIONAL WATERS OF THE U.S.
SWAINSBORO, GEORGIA

SCALE: 1" = 100'
CE JOB No. 05-137-EGC
07-06-2005

SHEET 4
OF 9
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BOARD OF REGENTS
(EAST GEORGIA COLLEGE)
219.657 ACRES

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SWAINSBORO, GEORGIA

SCALE: 1" = 200'
CE JOB No. 05-137-EGC
07-06-2005

SHEET 9
OF 9
Searching for Red Cockaded Woodpecker

Potential foraging habitat, but no evidence of Red Cockaded Woodpeckers
Searching for Red Cockaded Woodpecker at proposed project R/W

Tree Borings to determine the age of largest trees on site
Pine Snag with thick understory: Unsuitable habitat

Potential habitat, requires prescribed burning
Thick understory

Edge of Project site: View of off site residence / agricultural field
Scrub Shrub Habitat with Young Pines prior to burn

Juvenile invasive trees prior to burn
Juvenile invasive trees prior to burn

Thick Understory
Young Stand

Thick understory
Potential RCW habitat, but no evidence found

Potential RCW habitat, but no evidence found
Burn areas prior to prescribed burn

Burn areas prior to prescribed burn
Burn areas prior to prescribed burn

Burn areas prior to prescribed burn
Burn areas prior to prescribed burn

Burn areas prior to prescribed burn
Burn areas prior to prescribed burn

Gopher Tortoise Burrow after burn
Burn area near break, note decimated saplings of invasive species

Burn area, understory removed, some saplings remain and need to be cleared
Firebreak, note understory comparison

Burn area, understory removed