Gopher Tortoise Relocation Initiative on the Forever Wild Wehle Tract in Bullock County, Alabama

Section 6 Research Grant:
A Conservation Restoration Project for a High Priority Species

Final Report

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December 2006

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OVERVIEW

In 1994, the Forever Wild Land Trust Program purchased a 1,505 acre tract in rural Bullock County near Midway, Alabama. The tract lies within the Southern Hilly Gulf Coastal Plain region of the Southeastern Plains ecoregion and hosts a diversity of habitats (Griffith *et al.* 2001). Within the uplands, the dominant plant community is comprised of open pine woodlands with moderate grass and forb ground cover interspersed with shrubs. These uplands are moderately dissected and separated by hardwood floodplain bottoms along creeks and intermittent streams. Mixed hardwood-pine forests occur elsewhere. In 2002, the State Lands Division (SLD) and Wildlife and Freshwater Fisheries Division (WFFD) received designated areas of the tract from the Robert G. Wehle estate and manage them specifically for a Nature Preserve, Recreation Area, and Wildlife Management Area under the principle of multiple-use. The former management application targets the habitats of the property including the plant communities and associated faunal assemblages. One management criterion for Nature Preserves is to restore the natural components native to the surrounding ecosystem. This includes management practices that benefit specific community types to enhance conditions that maintain or improve biodiversity within the ecosystem (*e.g*. prescribed burn programs, etc.).

INTRODUCTION

Historically, the upland portions of the Forever Wild Wehle Tract (hereafter referred to as Wehle Tract) were once a component of a vast longleaf pine (*Pinus palustris*) ecosystem prior to timber removal by early European settlers. Now much of this area has regenerated from extensive agricultural usage to a fire maintained, open pine woodland dominated by loblolly (*P. teada*) and shortleaf (*P. echinata*) pine with some scattered longleaf. The upland soils are well-drained and sandy and host a diverse floral and faunal assemblage. Notable faunal species occurring on the tract include the eastern kingsnake (*Lampropeltis getula getula*), Bachman's sparrow (*Aimophila aestivalis*), and southeastern pocket gopher (*Geomys pinetis*), three species of greatest conservation need (GCN; Priority 2) that have declined significantly throughout much of their respective ranges as a direct result of habitat loss or alteration (Mirarchi 2004, WFFD 2005). An important faunal component currently missing from the Wehle Tract is the gopher tortoise (*Gopherus polyphemus*). Gopher tortoises have declined precipitously and have become fragmented throughout much of their range in the southeast. Declines are primarily attributed to direct habitat loss, habitat degradation, and early-period overexploitation for meat (Aresco and Guyer 2004). Although afforded state protection statewide and federal protection (listed as *threatened* under the Endangered Species Act) in Choctaw, Washington, and Mobile counties, populations in counties east of the Tombigbee River have no protection against habitat destruction or alteration posing continued risks of further declines. Recently, only ten public lands in Alabama were thought to support gopher tortoise populations (Aresco and Guyer 2004); with only two locations (Fort Rucker and Conecuh National Forest) having populations exceeding 500 individuals (M. Bailey, pers. comm., 26 September 2006). However, recent surveys have documented small tortoise populations on seven Forever Wild tracts.

Today, most existing gopher tortoise populations in Alabama occur on private lands and the current status and distribution of these populations are poorly known. Although this species is

state protected under the WFFD nongame regulation and recognized as a GCN Priority 2 species, there is currently no stipulation prohibiting "incidental take" of individuals as a result of habitat destruction or alteration supporting populations outside of the federally protected counties in Alabama. Since management is under the discretion of the private land owner, many populations may be vulnerable to altered or deteriorating habitat conditions (*e.g*. agriculture, silviculture, development, fire suppression, etc.), which may result in future declines of this species in the state. This continued threat of decline compounded with the amount of habitat already lost to human development has contributed to the recent petitioning of this species to be listed as *threatened* under the Endangered Species Act (ESA) for the remainder of its "unlisted" range.

As a means of reintroducing a key component of the pine-sandhill community and to help prevent additional ESA listing, the SLD implemented a gopher tortoise relocation initiative to establish a preserve on the Wehle Tract. SLD felt this enhancement action would be feasible on the Wehle Tract given the past successes of relocation and establishment of gopher tortoise populations on nearby private lands in Bullock and Macon counties during the early 1980s by researchers from Auburn University. This initiative was executed not only to benefit this keystone species, but also the myriad of vertebrate and invertebrate commensals that depend on its burrows. Additionally, two species of conservation concern that may subsequently benefit from the gopher tortoise's establishment on the Wehle Tract include the Gopher Frog (*Rana capito*) and Pine Snake (*Pituophis melanoleucus* ssp.).

Primary objectives of this relocation initiative were to: 1) identify areas on the Wehle Tract that have similar or same soils, canopy cover, and herbaceous cover as targeted donor sites; 2) establish holding pens on identified areas using square hay bales and create starter burrows within pens; 3) relocate a minimum of ten gopher tortoises from donor sources to the Wehle Tract's recipient site for establishment; and 4) manage and monitor the relocated gopher tortoises following standardized guidelines.

METHODS

Since the ADCNR does not currently have policy requirements for gopher tortoise relocation activities in Alabama, SLD primarily followed recommendations outlined by Ashton and Ashton (2004). Additionally, SLD personnel attended a 3-day field training program in July 2005 on gopher tortoise management and mitigation techniques instructed by the Ashton Biodiversity Research and Preservation Institute in Newberry, Florida. Related topics instructed included performing burrow counts, habitat analysis, trapping techniques, penning, and developing management plans among others subjects. The purpose of this training was to enable SLD personnel to become experienced in the necessary techniques required to capture, handle, and relocate gopher tortoises safely before initiating this project.

Gopher Tortoise Donor Sources

SLD initially selected the Three Notch Plantation (hereafter referred to as Three Notch) in Bullock County as a donor source to remove a portion of the gopher tortoise population on the tract (Figure 1). It was chosen because of its close proximity to the Wehle Tract (*ca*. 13 km) and the land owner was agreeable to it. Three Notch is privately owned by Ms. Virginia Swift and is

managed primarily for Northern Bobwhite (*Colinus virginianus*) and other game species to facilitate sportsmen activities. Habitats on Three Notch are very similar to those of the Wehle Tract consisting of numerous sandy uplands dissected by hardwood drains. Most of the existing tortoise population on Three Notch today is a collection of relocated individuals that were released by Dr. Dan Speake of the Alabama Cooperative Fish and Wildlife Research Unit (ACFWRU) at Auburn University during the early 1980s. The relocated tortoises were originally collected from ITT Rayonier property located west of Tifton, Georgia near the Alapaha River (D. Speake, pers. comm., 22 December 2006). Interestingly, a very small and isolated native population of tortoises exists on the southwest side of Three Notch near the community of Ox Level by Mallard Chapel (D. Speake, pers. comm., 22 December 2006) and was not targeted for capture or relocation efforts because of its native status. Three Notch personnel permitted the capture of six individuals for relocation to the Wehle Tract.

The remaining gopher tortoises acquired for relocation to the Wehle Tract were through the donation of waifs from several private individuals. Many of the waifs donated were found in precarious situations in Bullock or neighboring counties by concerned citizens and taken to experienced gopher tortoise handlers, who in turn contacted SLD.

Donor Site Assessment

Prior to initiating gopher tortoise capturing, onsite assessments of Three Notch were conducted to locate active/inactive tortoise burrows and to determine the soil types and vegetation composition surrounding them. This was done to enable SLD to identify and locate a suitable recipient site on the Wehle Tract that would closely resemble the area surrounding the donor site. The closer two sites resemble each other, the more likely the relocation efforts should be successful barring any complications/problems from the actual relocation efforts (Ashton and Ashton 2004). Gopher tortoise burrow searches were focused primarily at known release sites on the tract. Most burrows were located by walking transects or by driving an ATV where vegetation was tall. However, several burrows were found simply by spotting them from a vehicle while driving the roads. When located, burrows were flagged, numbered, geo-referenced, and assigned an activity status. Burrows located in close proximity to each other were identified as a pod (Figure 2). Soil types at burrow locations were then determined by reviewing soil survey maps of Bullock County (Stubbs 1997). Pods were mostly associated with the Luverne soil series (Figure 3). To address the available forage, an inventory of the surrounding plants was performed around the northernmost pod to document species composition. Floral composition was documented using a timed meander method (Goff *et al.* 1982). Afterwards, the amount of available forage (by percentage) was derived from the completed plant inventory by referencing a comprehensive list of plant species that are known gopher tortoise forage. The comprehensive list was supplied by the Ashton Biodiversity Research and Preservation Institute, which compiled information from numerous published papers and their own findings.

Recipient Site Identification and Preparation

Following onsite assessments at Three Notch, a recipient site was chosen in the northeast portion of the Wehle Tract along the north side of a power line right-of-way (Figure 4). Although more

hilly than the donor site, soils matched the Luverne soil series and the surrounding vegetation was similar with ample forage available (Figure 5). The area surrounding the recipient site was flagged to mark pen boundaries. Then vegetation was mowed along the flagged boundaries using a bush hog to establish a lane within the herbaceous layer. Square hay bales were purchased and then placed tightly end-to-end forming an enclosure pen approximately 1.7 hectares (4.3 acres) in size. The mowed lanes allowed the hay bales to be placed flat on the ground to eliminate any potential gaps between them to reduce the likelihood of tortoise escapes (see Appendix A showing enclosure pen setup images). SLD chose to pen the tortoises because recent studies have shown that tortoises are more likely to establish residency by being penned over a span of months as opposed to just being released in areas with no pens (Tuberville *et al.* 2005). In addition, the longer tortoises are penned the more likely they are to establish residency. Following pen completion, six starter burrows were dug using a shovel and a posthole digger and placed randomly within the enclosure. All starter burrows were dug at least one meter (3.3 ft) deep at an angle to accommodate incoming tortoises. The excavated sand and dirt was sculpted around the hole to form an apron to mimic the appearance of a tortoise burrow. Finally, a detailed inventory of the flora within the enclosure pen was completed using the same meander methodology performed at Three Notch for comparisons. Based on initial assessments of soils and available forage, SLD was comfortable that the 1.7 ha enclosure could easily support the recommended two to three tortoises per acre (Ashton and Ashton 2004) to achieve the initial goal of relocating ten tortoises to the Wehle Tract.

Prior to release into the hay bale pen, all captured/donated tortoises were going to be tested for Upper Respiratory Tract Disease (URTD). To address this, SLD built a small isolation pen using regular silt fencing within a small section of the hay bale pen to temporarily hold tortoises during the short interim between URTD testing and subsequent release. The isolation pen was placed within the hay bale pen to enable relocated tortoises to begin acclimation to the recipient site. The pen was built specifically to hold captured Three Notch tortoises together and also to keep them isolated from other foreign donated tortoises. SLD chose to place all captured Three Notch individuals together in the isolation pen because they would all be associated with the same pod (those living in close proximity to one another). The reasoning was that individuals associated with a pod interact with each other on a regular basis, and because of their social nature, an infected individual would have likely exposed the others within the pod already. Additionally, tortoises within pods have social bonds with each other and keeping them together may help reduce stress during relocation and site acclimation. The remaining tortoises received from donors were kept separately in bins or small partitioned pens at a private residence in Montgomery until URTD test results were received. However, there was one exception. One female tortoise donated to SLD had already been tested for URTD with negative results. Once it was received by SLD personnel, it was immediately taken to the Wehle Tract and released inside the hale bale pen and outside of the temporary isolation pen.

In the event that any tortoises tested positive for URTD, a second enclosure pen was planned nearby the established hay bale pen, thereby separating infected and non-infected individuals from each other during establishment.

Tortoise Capture Methodology

Gopher tortoises were captured at Three Notch within the northernmost pod using 18.9 liter (5 gallon) plastic buckets (pitfall traps) placed directly in front of burrow entrances. Before buckets were placed in the ground, holes were drilled in the bottoms to allow for water drainage during rain events. During trap setup, holes were dug deep enough where the tops of the buckets could be placed flush with the ground and angled with the slope of the burrow entrance. The tops of the buckets were then covered with brown packaging paper, pulled tight, and secured along the outer edge by packing sand tightly around it. Once positioned, sand was gently pushed and smoothed over the packaging paper and then manicured to make it appear natural. Shade was then provided by placing two partially-opened hinged pieces of square plywood to form an "A-frame" shaped cover over the hidden bucket trap. Additionally, leafy vegetation was collected and placed behind the cover to provide additional shade (see Appendix B for complete sequence of trap setup images). Without shading, tortoises trapped in buckets would be susceptible to overheating and possible death. All traps were checked twice daily; once in morning and once in late afternoon. Following capture, buckets were pulled out of the ground and gopher tortoises were placed in dark plastic bins for subsequent transport and processing. The bucket holes in front of the burrow entrances were then filled in with surrounding sand and dirt.

Processing Methodology

After a tortoise was captured or donated, it was immediately sexed, measured, weighed, and permanently marked for future identification. All data were recorded on standardized capture data sheets supplied by the Ashton Biodiversity Research and Preservation Institute. Sex was determined by examining the level of concavity on the plastron; whereby a deep indention is a male and a shallow or no indention is a female (McRae *et al.* 1981). Body measurements included straight-line carapace length (CL) and plastron length (PL) and were recorded in millimeters (mm) using tree calipers. Body mass was measured using a 35 kilogram (kg) Pesola® spring scale and converted into grams (g). Tortoises were permanently marked by drilling holes in one or a combination of marginal scutes representing a unique numerical value (Cagle 1939; Ernst *et al.* 1974). Additionally, all tortoises were given a health evaluation, which included assessments on general appearance, eyes, nares, mouth, cloaca, skin, shell, and whether or not ectoparasites were present. No attempts were made to age tortoises. The final step of processing was to draw blood for URTD testing. However, SLD personnel had no experience in drawing blood from gopher tortoises. To address this, SLD contracted a veterinarian knowledgeable with turtles to give a workshop on gopher tortoises. During the interim between initial processing and the workshop, captured tortoises were temporarily placed in the isolation pen to await URTD testing. The workshop was held at the Wehle Nature Center on 30 August 2006 and involved a presentation on tortoise diseases and hands-on instruction for bleeding tortoises. Processed tortoises awaiting URTD testing were transported from the isolation pen to the Wehle Nature Center during the workshop and blood samples were drawn from all individuals. After blood samples were taken, all tortoises were returned to the temporary isolation pen, except one waif, and held until test results were determined (see Appendix C for complete sequence of tortoise processing images).

URTD Testing

URTD is caused by the bacterium *Mycoplasma agassizii*, which is believed to be highly contagious in desert (*Gopherus agassizii*) and gopher tortoises. The disease can be lethal to populations and often kills or debilitates tortoises, especially those that are stressed or immunosupressed. Clinical signs of URTD include nasal or ocular discharge, swollen eyelids, and conjunctivitis (E. Blankenship, pers. comm., 30 August 2006). During each tortoise's physical examination, blood was collected from the brachial vein using a syringe. Blood was then placed into heparinized tubes and mixed by slowly inverting the tube several times to separate the plasma from the blood cells. After sitting in a refrigerator over night, at least 0.1 cubic centimeters (cc) of plasma was extracted and placed into a polypropylene tube and mailed for testing. All samples were immediately sent overnight to the University of Florida's Department of Infectious Diseases and Pathology for enzyme-linked immunosorbent assay (*ELISA*) tests. The *ELISA* test measures for the presence of *M. agassizii*-specific antibodies. Following tests, SLD personnel were immediately notified of the results for each individual tortoise tested.

RESULTS

Ten of eleven gopher tortoises were relocated to the Wehle Tract in 2006 (Table 1); one was retained for treatment for intestinal parasites. Six individuals were relocated from Three Notch, while the other five were either donated by private individuals or randomly found by SLD personnel. All tortoises tested negative for *Mycoplasma* antibodies which meant none were infected with URTD. Immediately after test results were received, the isolation pen fencing was removed to free Three Notch tortoises within the confines of the entire enclosure pen. Additionally, the subsequent donor tortoises that were isolated from the Three Notch population were also released within the pen. Sex ratios of the eleven tortoises include 4 males, 6 females, and 1 juvenile (sex undetermined). Adult males averaged 254.8 ± 12.0 mm (10.0 ± 0.5 inches) in CL (n = 4, range 221–275 mm [8.7–10.8 in.]) and 3,275 ± 492 grams (7.2 ± 1.1 pounds) in weight (range 2,000–4,100 g [4.4–9.0 lbs.]), whereas adult females averaged 269.0 ± 17.0 mm (10.6 ± 0.7 in.) in CL (n = 6, range 195–317 mm [7.7–12.5 in.]) and 4,000 ± 610 g (8.8 ± 1.3 lbs.) in weight (range 1,400–6,000 g [3.1–13.2 lbs.]).

Tortoise Details

Tortoises 1–6 (2 males/4 females): The first six tortoises were captured at Three Notch over the span of 9 trap nights. All six tortoises showed no abnormalities or injuries and were all active and strong when captured. Although bucket traps were placed at burrows in three separate pods, tortoises were only captured from the northernmost pod comprising of seven located burrows (Figure 6). During confinement in the temporary isolation pen, female tortoise #5 escaped before being tested for URTD. No gaps were found between the hay bales (which made up half of the temporary isolation pen), so it is conceivable that the female may have climbed over the pen. Interestingly, a few adult tortoises on several occasions were observed "bull rushing" hay bales situated on a slope to attempt to climb over the barrier, which may explain how the female eventually escaped. A couple weeks after the female escaped, a freshly excavated burrow was discovered along the south side of the hay bale enclosure within the power line right-of-way. A

subsequent visit to the site confirmed that is was the escaped female. No attempts were made to recapture the female since it was getting late into the active season and that she had established a burrow within the recipient site location. The isolation pen fencing was removed from within the enclosure on 11 September 2006.

Tortoise 7 (male): This male was found crossing U.S. Hwy 82 by Courtney Graydon (SLD Biologist Aide) a few miles east of Union Springs, Bullock County. The tortoise showed no abnormalities or injuries and was active and strong when captured. The quality of habitat adjacent to the highway was poor consisting of a dense pine plantation to the north and houses with extensive clearings to the south. Based on the unfavorable surroundings, SLD decided to relocate this individual to the Wehle Tract. This tortoise was kept isolated in a partitioned pen at a private residence in Montgomery before it was cleared for release. This male was released in the enclosure pen on 8 September 2006.

Tortoise 8 (female): This female was a donation from Roger Birkhead of Auburn, AL (Gopher Tortoise Council State Representative for Alabama). The tortoise was in good health when it was donated to SLD. The story behind this tortoise is interesting in that it was originally reported by a 9 year old boy named Jesse Wiatrak who found it in a neighborhood in Mountain Brook, AL (a suburb of Birmingham, AL). Mr. Wiatrak discovered the female on 9 September 2005 while walking to piano practice through a woodlot between houses in the neighborhood. The Wiatrak family contacted Roger Birkhead and brought it to him shortly afterwards for care giving. It is likely that the tortoise was taken by someone irresponsibly for a pet that had either escaped or was later released. Shortly after receiving the tortoise, Roger had it tested for URTD and the result was negative. He kept it in his possession until it was donated to SLD on 30 August 2006. It was then released into the hay bale pen immediately afterwards. This female was the first tortoise to be released into the enclosure pen and it readily took to a starter burrow.

Tortoises 9–10 (1 male/1 female): The precise origins of these tortoises are unknown. They were brought to Dr. William Birkhead (Columbus State University) by concerned citizens who found them in urban areas; one in Phenix City, AL and the other in Columbus, GA (W. Birkhead, pers. comm., September 2006). They were taken to Roger Birkhead who then turned them over to SLD on 19 September 2006. The physical condition of the female was good; however, the male was infected with intestinal parasites. Tests were done at a local veterinary clinic in Montgomery and the sick male was treated with Panicure. Because of its poor physical condition, SLD decided to hold the male tortoise over the winter so it could recover in a monitored environment. Following recovery, it will be released into the enclosure pen sometime during spring 2007. The female tortoise was released in the enclosure pen on 6 October 2006.

Tortoise 11 (juvenile): This juvenile was a donation from Dr. Sharon Hermann (Auburn University). This tortoise was found by an Auburn student along a rural road in east Macon County and was taken to Dr. Hermann. It is conceivable that this tortoise is offspring of gopher tortoises established from a relocation effort on private property in east Macon County during the early 1980s by Dr. Robert Mount and Dr. Dan Speake of Auburn University (D. Speake, pers. comm., 22 December 2006). Dr. Hermann had it tested for URTD and the result was negative. She had it in her possession until it was donated in good health to SLD on 29 September 2006. It was released in the enclosure pen on 7 October 2006 following receipt of the URTD test results.

Vegetation Analysis and Forage Availability

Two one-day plant inventories were performed in late August 2006 by Dr. Wayne Barger (SLD Botanist); one at Three Notch surrounding the donor pod and the other within the 1.7 ha enclosure pen on the Wehle Tract. Floral similarities between the donor and recipient sites were made by reviewing the species compositions and determining the amount forage available; plant species that have been documented as gopher tortoise forage. Three Notch and the Wehle Tract shared 47 of the same plant species comprising of 64% and 85% of the total number of species documented, respectively. Although Three Notch had more plant species than the Wehle Tract overall, both sites had almost equal percentages of available forage species at 84% and 85%, respectively (Table 2). These high percentages demonstrate the wealth of forage available for gopher tortoises, which are considered an important criterion for supporting gopher tortoise populations (Ashton and Ashton 2004). SLD floral assessments were made once in late summer and provided only a "snapshot" of the species present at both sites. Undoubtedly, additional inventories on the Wehle Tract during other seasons will increase the total number of plant species present as well as the amount of forage species available for gopher tortoises.

DISCUSSION

SLD was able to achieve its stated objectives of identifying a suitable recipient site, setting up an enclosure pen and successfully relocating ten gopher tortoises to the Wehle Tract. The relocated tortoises are currently penned (as of December 2006) except for the escaped female that established a burrow outside the enclosure. SLD has chosen to keep the hay bale enclosure in place for at least twelve months after relocation since studies have shown that a one year penning duration is important in significantly reducing dispersal and increasing site fidelity to a new location (Tuberville *et al.* 2005; R. Ashton, pers. comm., August 2006). Two additional considerations were taken into account to potentially increase the effectiveness of the penning process. The first was relocating individuals from a pod. This should allow tortoises to become re-associated with familiar individuals in a new setting, which should expedite the social interactions that are necessary during establishment (Tuberville *et al.* 2005). The second consideration was relocating and releasing tortoises in September and October; months that are near the onset of the winter dormancy period. Although no research has specifically addressed this topic, there have been suggestions that penning just before the winter dormancy period may influence site fidelity (Tuberville *et al.* 2005). Ultimately, it will take time before SLD can determine if the relocated tortoises have become established, especially when the hay bale enclosure is removed from the surrounding population in fall 2007. During the current penning period and after its subsequent removal, SLD will periodically monitor tortoises on an annual basis to observe individual movements, survivorship, social interaction, and reproduction to finally determine if residency has become established on the Wehle Tract.

Contribution to gopher tortoise conservation in the southeast

This restoration initiative was the first attempt by ADCNR to relocate gopher tortoises for the purpose of establishing and conserving this species in perpetuity on state conservation lands. Although currently small, the establishment of the Wehle gopher tortoise preserve should contribute toward alleviating the vulnerability of populations along the northern periphery of

their native range to altered or deteriorating habitat conditions that is currently impacting this species. SLD is currently developing additional plans for the Wehle Tract to initiate complimentary tortoise expansion efforts. There is considerable acreage of suitable "sandhill" habitat to significantly increase the tortoise population. Further, SLD is planning to copy this tortoise relocation "model" and incorporate it into the restoration plans of other Forever Wild tracts within this species' range. The implementation of these efforts on applicable tracts will collectively have a major impact on the conservation of gopher tortoises in Alabama. Moreover, the Wehle relocation project compliment's other conservation initiatives in the southeast, particularly those identified by the Southeast Regional Partnership for Planning and Sustainability (SERPPAS). SERPPAS is a multi-agency partnership that identifies and addresses regional sustainability issues that affects the interests of its partners collectively. Among the projects recently described by SERPPAS is addressing the need to conserve gopher tortoises throughout the southeast to prevent potential ESA listing east of the Mobile-Tensaw River Delta. Potential listing would significantly compromise the missions and activities of numerous federal, state, non-governmental, and private entities. A technical work group under SERPPAS, comprising of a consortium of partners including ADCNR, is currently working on the development of a regional Candidate Conservation Agreement (CCA) that will provide guidelines for the management of gopher tortoises on non-federal lands.

Alternative material for enclosure pen setup

A laborious aspect of this relocation initiative was the establishment of the hay bale enclosure pen. The transportation and placement of hay bales required significant resources and manpower (see Appendix A). Additionally, numerous hay bales could not be used for placement because the strings holding them together broke. Hay bales may also serve as undesirable seed sources posing the risk of introducing non-native plants that could compete with the native flora. Finally, hay bales are mostly available during the summer and fall months and prices may vary annually. To reduce the challenges of using hay bales, a more dependable material can be used as an alternative for pen setup (M. Aresco, pers comm., 3 October 2006). It is a professional grade silt fence made of woven polypropylene monofilament yarn that is double stapled to hardwood stakes. The hardwood stakes are sturdier and last longer than conventional pinewood stakes. The fencing is Beltech #935 (36 in. x 75 ft. roll) made by Belton Industries, Inc. of South Carolina and is distributed by Pallen Industries of Conyers, Georgia. Rolls cost from $30.00 to $40.00 each depending on the quantity ordered. Installation requires the rental of a self-propelled ditch digger to make the trenches for fence placement. The fence stakes are then easily hammered into the ground to create a secure enclosure pen. This is a heavy duty fence that can easily withstand the elements for over a year insuring that gopher tortoises will not escape during the penning duration.

Importance of Forever Wild tracts

This project serves as the first demonstration of a direct species relocation initiative on state conservation land. More importantly, this project's ultimate goal is to restore key components of an important natural community in Alabama. These efforts would not have been possible were it not for the Forever Wild Program and the significant lands that it has protected through acquisition. SLD fully anticipates that through the cooperative efforts and complimentary goals

of conservation programs such as ESA Section 6 and USFWS State Wildlife Grants (guided by the Alabama CWCS), the Forever Wild Program and the tracts of land that it conserves will play an integral role in the conservation of Alabama's rich natural heritage. These opportunities will also play a significant role in preventing the additional listing of terrestrial species like the gopher tortoise under the ESA, as well as down listing many which are currently protected under the act.

ACKNOWLEDGMENTS

Numerous people were very helpful with various aspects of this relocation initiative. I am very grateful and appreciative for the generosity and patience of Ms. Virginia Swift who allowed SLD to relocate six gopher tortoises from Three Notch Plantation. Without her participation, this project would not have been nearly as successful. Hunter McDuffy (Three Notch manager) provided keys and assistance during various stages of tortoise capture. From SLD, I especially thank Courtney Graydon who continuously checked bucket traps, transported, processed, temporarily housed, and treated tortoises. She also produced all GIS maps for this report. Thanks are extended to Dr. Wayne Barger for performing the plant inventories, Jo Lewis for assistance with processing tortoises; Donald Lampley and Chris O'Brian for loading, unloading, and transporting hay bales, and regularly monitoring the tortoises, and Penny Ragland, Bennie Jemison, Blake Lowery, Alonzo and Terence Washington for assisting with pen setup. I thank Roger Birkhead (Auburn University), Dr. William Birkhead (Columbus State University), and Dr. Sharon Hermann (Auburn University), for donating tortoises. I thank Dr. Emmett Blankenship for instructing the gopher tortoise workshop. Wade Harrison (GA TNC) provided ArcGIS shapefiles of Three Notch Plantation. I also thank Dr. Matt Aresco (Nokuse Plantation) Ray Ashton (Aston Biodiversity Research & Preservation Institute), Mark Bailey (Conservation Southeast), Mark Sasser (ADCNR, Wildlife & Freshwater Fisheries), and Dr. Dan Speake for providing helpful information that contributed toward numerous phases of this project. Additionally, sincere thanks are given to the late Robert G. Wehle for the legacy he created in this tract. Finally, gratitude is extended to the Forever Wild Board of Trustees for purchasing the Wehle Tract and providing a management plan that contributed toward the restoration and preservation of this biologically diverse tract.

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TABLES

TABLE 1. Summary of Gopher Tortoise Measurements, Capture Locations/Origins, Capture/Donation Dates, *ELISA* Test Dates, *ELISA* Test Results, and Pen Release Dates. *Indicates individual not released (NR) due to poor health.

Gopher Tortoise Id #	**Sex**	**Carapace Length (mm)**	**Weight (g)**	**Capture Location/ Donation Origin**	**Capture/ Donation Date**	***ELISA* Test Date**	***ELISA* Test Result**	**Pen Release Date**
1	Female	195	1400	Three Notch	8/24/06	9/08/06	Negative	9/11/06
2	Male	268	4000	Three Notch	8/25/06	9/08/06	Negative	9/11/06
3	Female	276	4500	Three Notch	8/25/06	9/08/06	Negative	9/11/06
4	Male	275	4100	Three Notch	8/26/06	9/08/06	Negative	9/11/06
5	Female	317	6000	Three Notch	8/26/06	Escaped	N/A	N/A
6	Female	258	3600	Three Notch	8/30/06	9/08/06	Negative	9/11/06
7	Male	221	2000	Bullock County	8/27/06	9/08/06	Negative	9/08/06
8	Female	273	4200	Jefferson County	8/30/06	~10/2005	Negative	8/30/06
9	Female	295	4000	Unknown	9/19/06	9/29/06	Negative	10/06/06
10*	Male	255	3000	Unknown	9/19/06	9/29/06	Negative	NR
11	Juvenile	142	-	Macon County	9/29/06	10/05/06	Negative	10/07/06

TABLE 2. Summary of Donor and Recipient Site Vegetation Analysis and Forage Species Availability (see Appendices D and E for complete lists of plant species).

	Three Notch Plantation	**Wehle Preserve (*within pen*)**
Species Richness (August 2006)	74	55
No. Plant Genera Represented	64	45
No. Plant Families Represented	33	24
No. Woody Species	19	16
No. Woody Genera	15	12
No. Woody Families	13	11
No. Herbaceous Species	55	39
No. Herbaceous Genera	49	33
No. Herbaceous Families	20	13
No. Forage Species	62	47
No. Forage Genera	52	36
No. Forage Families	27	20
No. Non-native Species	6	4
Forage Species Available (%)	84%	85%

FIGURES

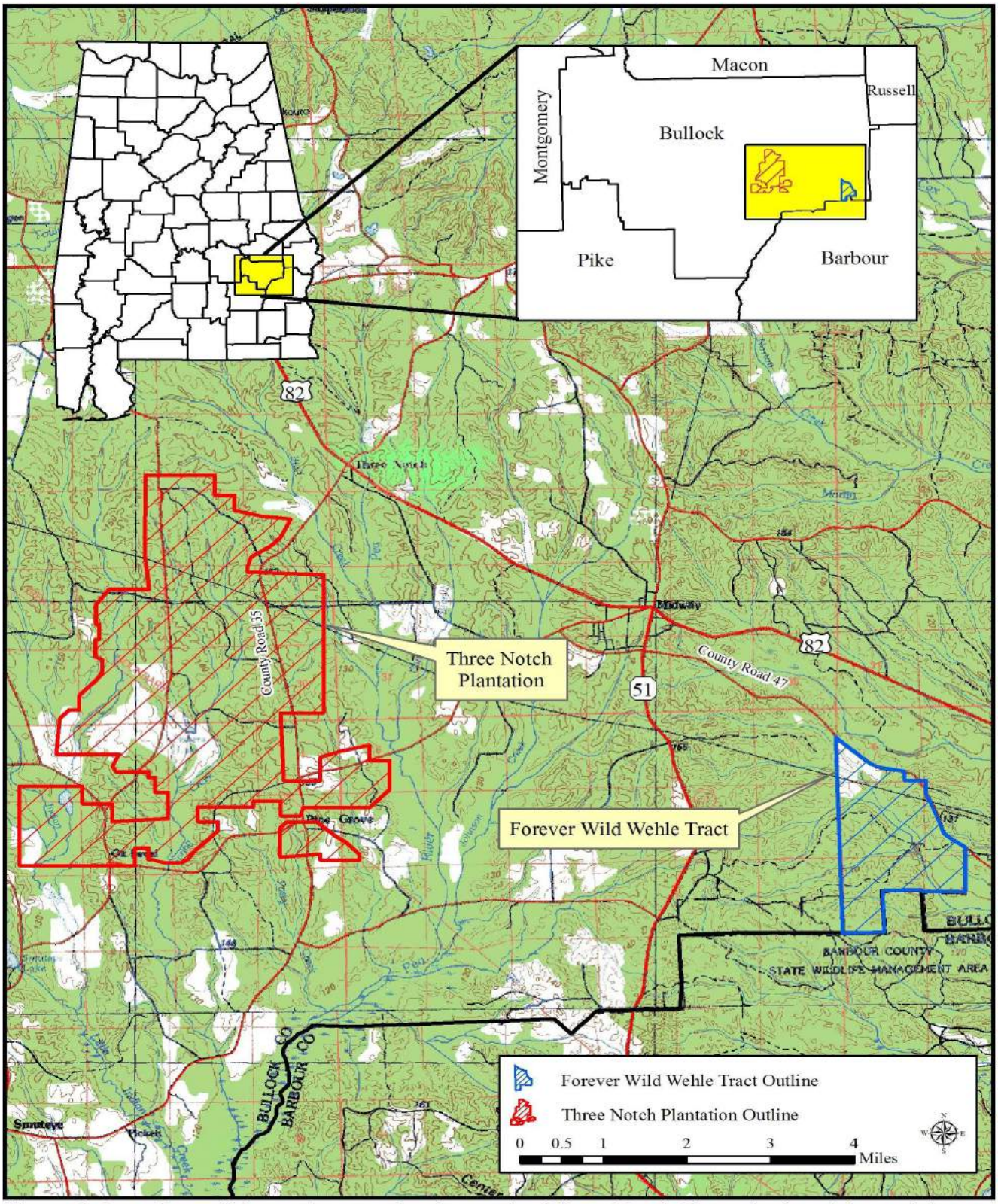

Figure 1: Locations of the gopher tortoise donor site (Three Notch Plantation) and the recipient site (Forever Wild Wehle Tract) in Bullock County, Alabama.

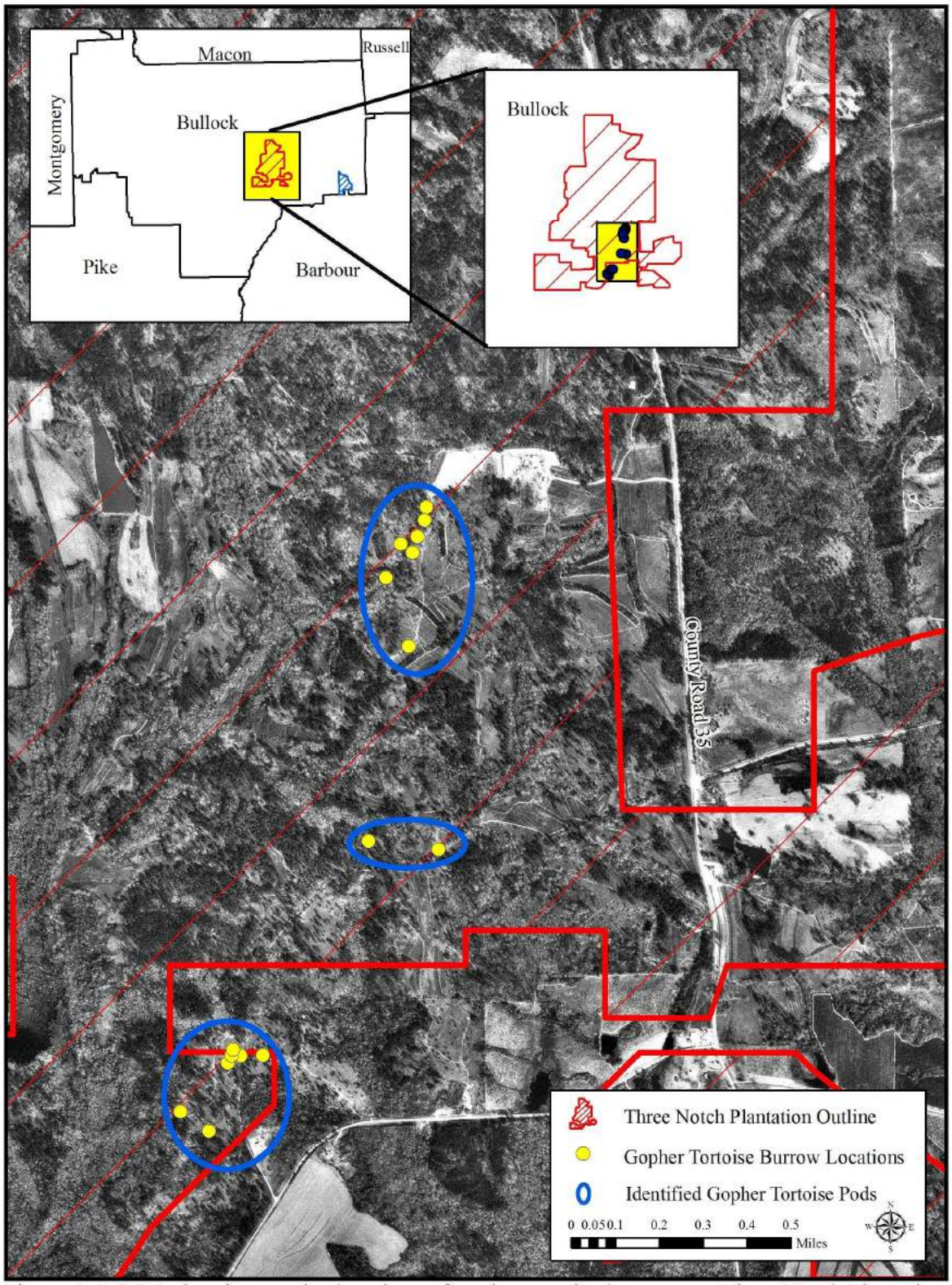

Figure 2: DOQQ showing precise locations of gopher tortoise burrows on Three Notch Plantation, Bullock County, Alabama, August 2006. Blue ovals indicate pods; burrows clustered in close proximity to each other.

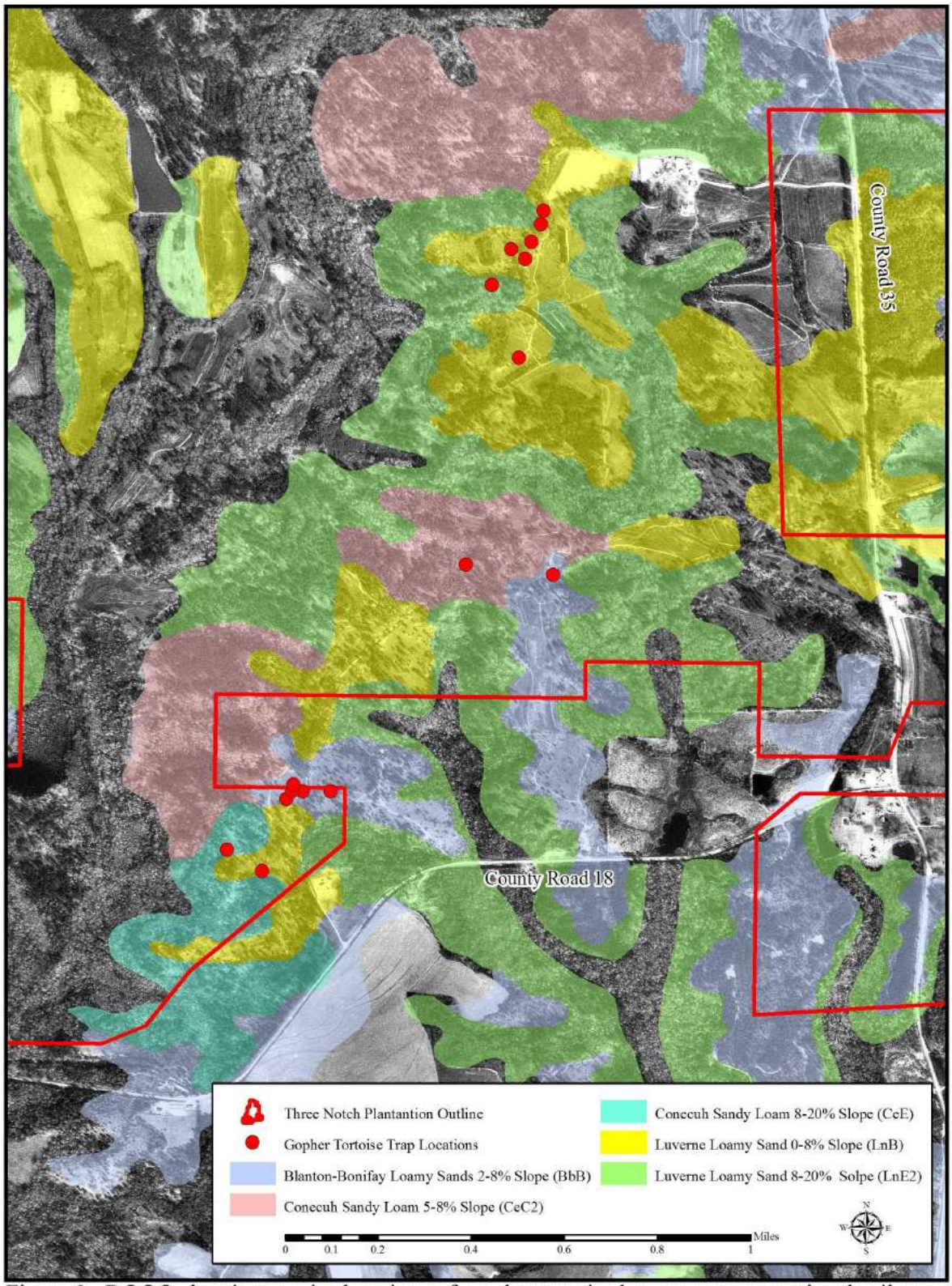

Figure 3. DOQQ showing precise locations of gopher tortoise burrows over associated soil types at Three Notch Plantation, Bullock County, Alabama.

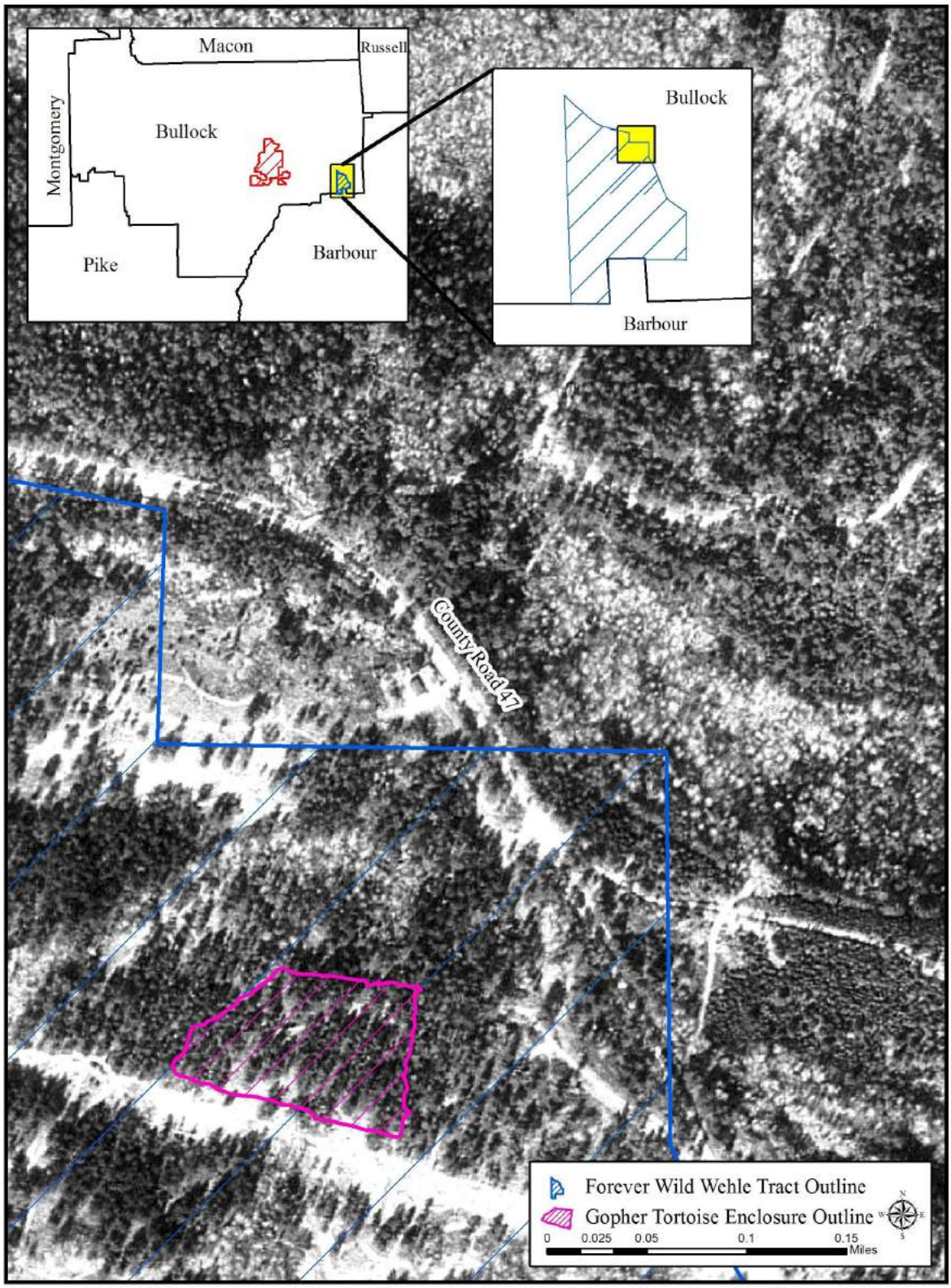

Figure 4: DOQQ showing percise location of gopher tortoise enclosure on the Forever Wild WehleTract, Bullock County, Alabama.

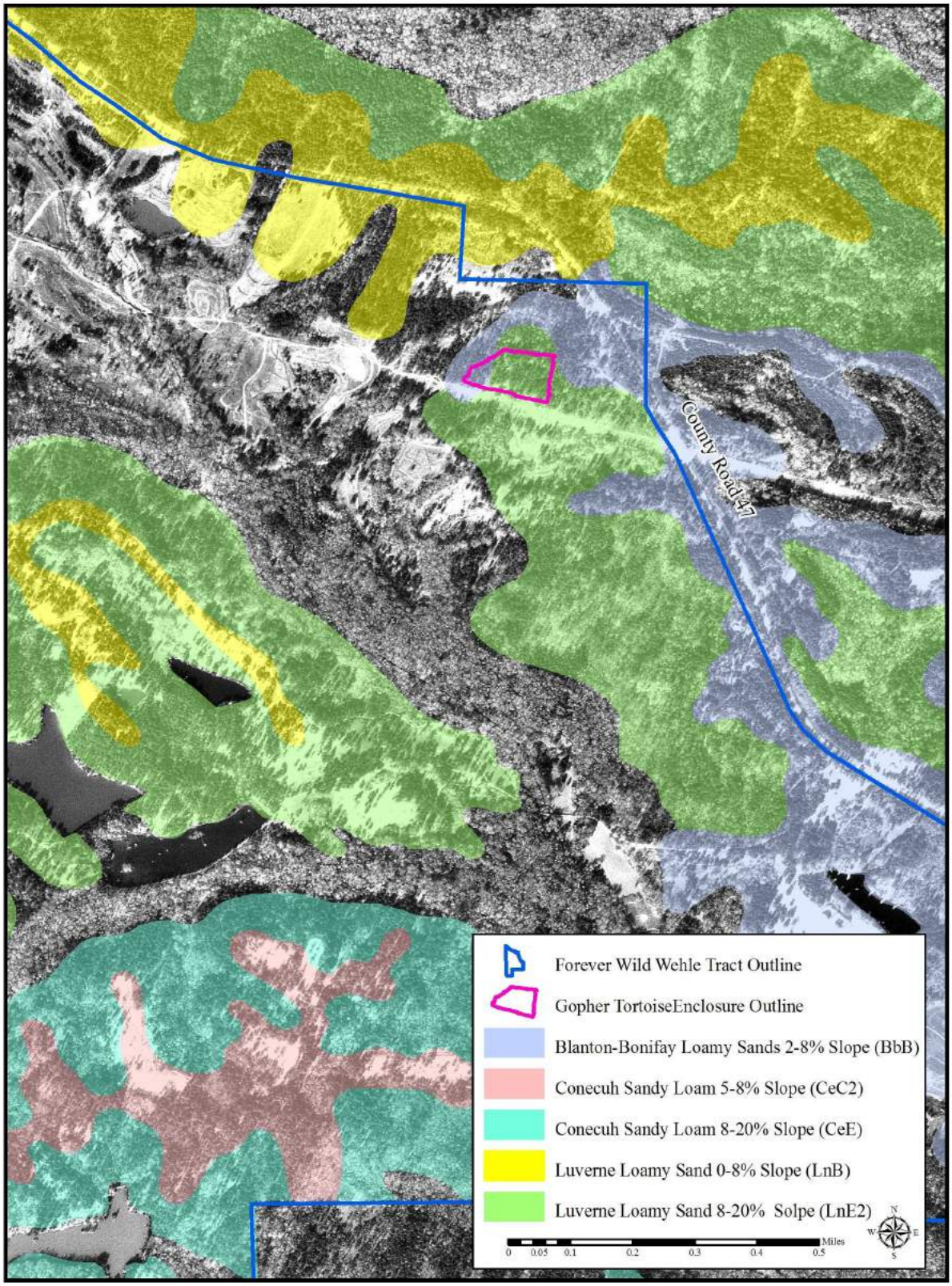

Figure 5: DOQQ showing location of gopher tortoise enclosure over associated soil types at the Forever Wild Wehle Tract, Bullock County, Alabama.

Figure

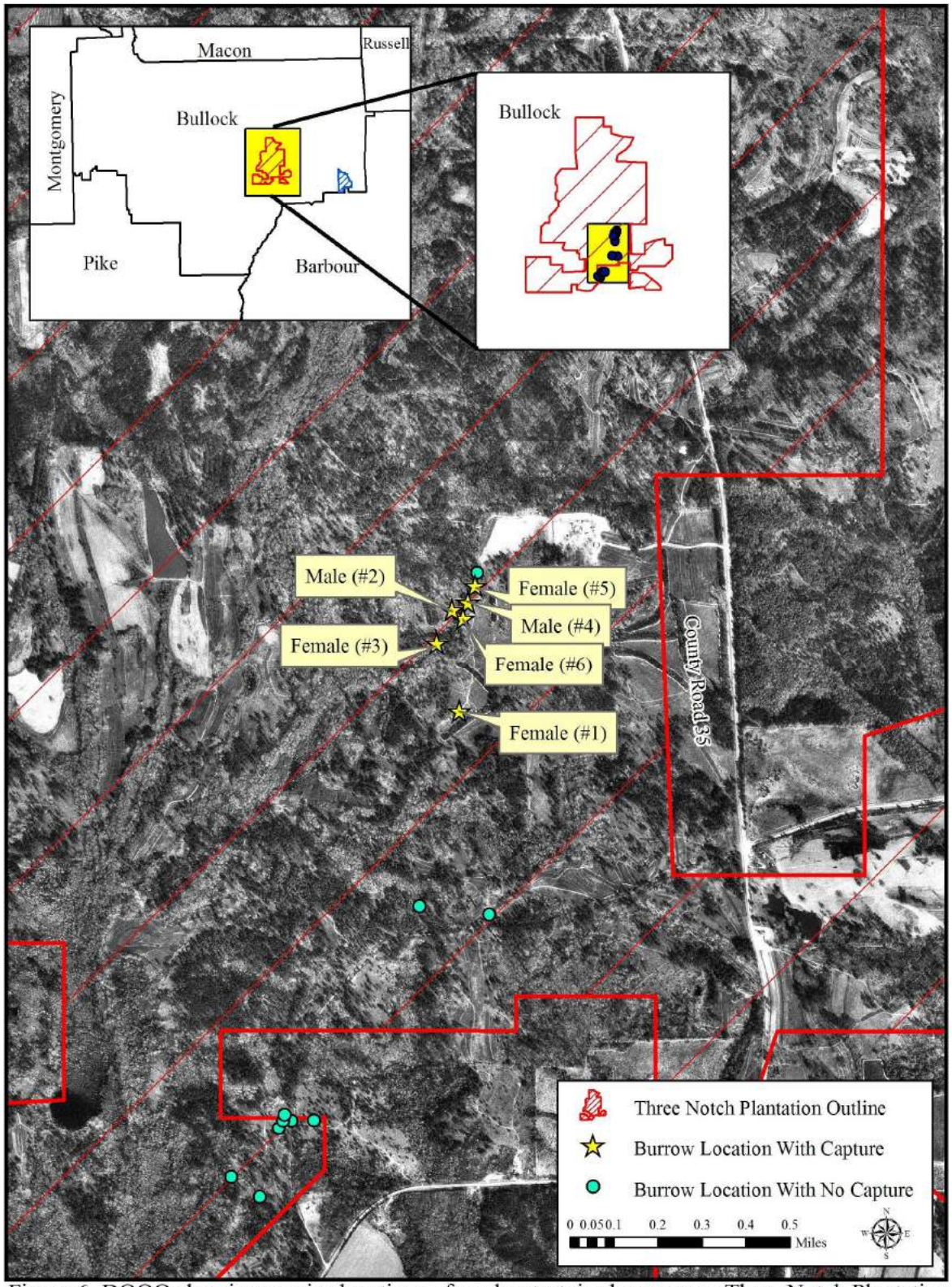

Figure 6: DOQQ showing precise locations of gopher tortoise burrows on Three Notch Plantation, Bullock County, Alabama, August 2006. Stars indicate where tortoises were captured.

Appendix A. Photographs of hay bale enclosure pen setup on the Forever Wild Wehle Tract, Bullock County, Alabama; 17 July 2006.

Stacked hay bales being transported to recipient site on Wehle Tract.

Unloading trailer to initiate placement of hay bales along mowed boundary.

Placed hay bales being pulled tightly together to eliminate gaps between them.

View of completed hay bale pen along south side of enclosure looking east.

View of completed hay bale pen along west side of enclosure looking south.

View of completed hay bale pen along east side of enclosure looking south.

Appendix B. Photographs of gopher tortoise bucket trap setup on Three Notch Plantation, Bullock County, Alabama; 22 August 2006.

Gopher Tortoise burrow entrance shown before bucket trap setup (burrow #5).

Initiation of bucket trap placement by digging hole at mouth of burrow entrance.

Five gallon bucket is placed in hole and angled with the slope of the burrow.

Packaging paper is fitted over bucket and folded around the edge.

Sand is packed against packaging paper to keep it tight over the bucket.

Sand is gently pushed over packaging paper and smoothed evenly.

Bucket trap is completed giving a normal burrow appearance.

Two hinged pieces of plywood are placed directly over trap to create shade.

Oak leaf branches are placed behind plywood to increase shade over trap.

Bucket trap setup is completed and ready for tortoise capture.

Torn packaging paper indicates successful capture.

Removal of shade cover reveals a trapped gopher tortoise.

Appendix C. Photographs demonstrating processing of gopher tortoises following a capture or donation.

Following capture, this subadult tortoise is sexed.

The carapace length is measured using a pair of tree calipers.

The tortoise is securely positioned so it can be permanently marked for identification.

A small hole is carefully drilled in a marginal scute using a cordless drill.

The final result is an easily recognizable hole in the marginal scute.

Dr. Emmett Blankenship gives a tortoise workshop at the Wehle Nature Center.

Dr. Blankenship shows attendees how blood is drawn for URTD testing.

Blood sample is then placed in heparinized tube to separate plasma from blood cells.

Data is recorded stating blood has been drawn from a tortoise.

This tortoise is finished being processed and is ready for release into the pen.

Appendix D. List of plant species documented around northernmost pod on Three Notch Plantation, Bullock County, Alabama; 23 August 2006.

Plant Species List at Three Notch Plantation
Determined By T. Wayne Barger

Anacardiaceae Cashew Family		
Rhus copallinum L.	Winged Sumac	Native
Asclepiadaceae Milkweed Family		
Asclepias tuberosa L.	Butterfly Milkweed	Native
Asteraceae Aster Family		
Ambrosia artemisiifolia L.	Annual Ragweed	Native
Antennaria plantaginifolia (L.) Richards.	Woman's Tobacco	Native
Aster spp.	Asters	Native
Chrysopsis mariana (L.) Ell.	Maryland Goldenaster	Native
Conyza canadensis (L.) Cronq.	Canadian Horseweed	Native
Elephantopus tomentosus L.	Elephant's Footprint	Native
Erigeron annuus (L.) Pers.	Eastern Daisy Fleabane	Native
Eupatorium hyssopifolium L.	Hyssopleaf Thoroughwort	Native
Gaillardia aestivalis (Walt.) H. Rock	Lanceleaf Blanketflower	Native
Gamochaeta purpurea (L.) Cabrera	Spoonleaf Purple Everlasting	Native
Liatris elegans (Walt.) Michx.	Elegant Blazing Star	Native
Pityopsis graminifolia (Michx.) Nutt. var. *graminifolia*	Narrowleaf Silkgrass	Native
Bignoniaceae Trumpet Creeper Family		
Campsis radicans (L.) Seem.	Trumpet Creeper	Native
Cactaceae Cactus Family		
Opuntia humifusa (Raf.) Raf.	Prickly Pear Cactus	Native
Campanulaceae Bellflower Family		
Wahlenbergia marginata (Thunb.) A. DC.	Southern Rockbell	Introduced
Clusiaceae St. John's-Wort Family		
Hypericum crux-andreae (L.) Crantz	St. Peterswort	Native
Hypericum gentianoides (L.) B.S.P.	Pineweed	Native
Hypericum hypericoides (L.) Crantz	St. Andrew's Cross	Native
Commelinaceae Spiderwort family		
Commelina erecta L.	Whitemouth Dayflower	Native
Convovulaceae Morning-Glory Family		
Jacquemontia tamnifolia (L.) Griseb.	Hairy Clustervine	Native
Cornaceae Dogwood Family		
Nyssa sylvatica Marsh.	Blackgum	Native
Cyperaceae Sedge Family		
Cyperus spp.	Sedges	Native
Euphorbiaceae Spurge Family		
Cnidoscolus stimulosus (Michx.) Engelm. And Gray	Tread Softly/Finger Rot	Native
Croton capitatus Michx.	Wooly Croton	Native
Croton monanthogynus Michx.	Prairie Tea	Native

Fabaceae Legume Family		
Alysicarpus vaginalis (L.) DC.	White Moneywort	Introduced
Apios americana Medik.	Groundnut	Native
Centrosema virginianum (L.) Benth.	Climbing Butterfly Pea	Native
Chamaecrista fasciculata (Michx.) Greene	Partridge Pea	Native
Chamaecrista nictitans (L.) Moench	Sensitive Partridge Pea	Native
Crotalaria angulata Walt.	Rabbitbells	Native
Lespedeza bicolor Turcz.	Shrub Lespedeza	Introduced
Lespedeza cuneata (Dum.-Cours.) G. Don	Sericea Lespedeza	Introduced
Lespedeza repens (L.) W. Bart.	Creeping Lespedeza	Native
Mimosa microphylla Dry.	Littleleaf Sensitive-briar	Native
Senna obtusifolia (L.) Irwin & Barneby	Java Bean	Native
Strophostyles umbellata (Muhl. ex Willd.) Britt.	Pink Fuzzybean	Native
Stylosanthes biflora (L.) B.S.P.	Pencilflower	Native
Tephrosia spicata (Walt.) Torr. & Gray	Spiked Hoarypea	Native
Fagaceae Beech Family		
Quercus alba L.	White Oak	Native
Quercus falcata Michx.	Southern Red Oak	Native
Quercus nigra L.	Water Oak	Native
Quercus phellos L.	Willow Oak	Native
Hamamelidaceae Witch-Hazel Family		
Liquidambar styraciflua L.	Sweetgum	Native
Juglandaceae Walnut Family		
Carya illinoinensis (Wangenh.) K. Koch	Pecan	Native
Lauraceae Laurel Family		
Sassafras albidum (Nutt.) Nees	Sassafras	Native
Loganiaceae Logania Family		
Polypremum procumbens L.	Polypremum	Native
Melastomataceae Melastome Family		
Rhexia mariana L.	Maryland Meadow-Beauty	Native
Molluginaceae Carpet-weed Family		
Mollugo verticillata L.	Green Carpetweed	Native
Myricaceae Wax Myrtle Family		
Myrica cerifera (L.) Small	Wax Myrtle	Native
Onagraceae Evening-Primrose Family		
Oenothera biennis L.	Common Evening Primrose	Native
Oxalidaceae Wood-sorrel		
Oxalis stricta L.	Yellow Wood-sorrel	Native
Passifloraceae Passionflower Family		
Passiflora incarnata	Passionflower	Native
Pinaceae Pine Family		
Pinus taeda L.	Loblolly Pine	Native

Poaceae Grass Family		
Andropogon virginicus L.	Broomsedge Bluestem	Native
Dichanthelium spp.	Rosette Grasses	Native
Paspalum notatum Flueggé	Bahia Grass	Mixed
Poa spp.	Bluegrasses	Native
Setaria spp.	Bristlegrasses	Mixed
Sorghum bicolor (L.) Moench	Sorghum	Introduced
Rosaceae Rose Family		
Crataegus uniflora Muenchh.	Dwarf Hawthorn	Native
Rubus spp.	Blackberry	Native
Rubiaceae Coffee or Madder Family		
Diodia teres Walt.	Rough Buttonweed	Native
Richardia scabra L.	Rough Mexican Clover	Native
Stellaria pubera Michx.	Star Chickweed	Native
Smilacaceae Greenbrier Family		
Smilax bona-nox L.	Saw Greenbrier	Native
Smilax rotundifolia L.	Roundleaf Greenbrier	Native
Solanaceae Nightshade Family		
Physalis angulata L.	Cutleaf Groundcherry	Native
Verbenaceae Verbena Family		
Callicarpa americana L.	American Beautyberry	Native
Vitaceae Grape Family		
Ampelopsis arborea (L.) Koehne	Peppervine	Native
Vitis rotundifolia Michx.	Muscadine	Native
Xyridaceae Xyris Family		
Xyris difformis Chapman	Bog Yelloweyed Grass	Native

Appendix E. List of plant species documented within enclosure pen on the Forever Wild Wehle Tract, Bullock County, Alabama; 21 August 2006.

PLANT SPECIES LIST ON FOREVER WILD WEHLE TRACT
Determined By T. Wayne Barger

Anacardiaceae Cashew Family		
Rhus copallinum L.	Winged Sumac	Native
Asteraceae Aster Family		
Ambrosia artemisiifolia L.	Annual Ragweed	Native
Aster spp.	Asters	Native
Conyza canadensis (L.) Cronq.	Canadian Horseweed	Native
Elephantopus carolinianus Raeusch.	Carolina Elephant's Foot	Native
Elephantopus tomentosus L.	Elephant's Footprint	Native
Erigeron annuus (L.) Pers.	Eastern Daisy Fleabane	Native
Eupatorium hyssopifolium L.	Hyssopleaf Thoroughwort	Native
Gamochaeta purpurea (L.) Cabrera	Spoonleaf Purple Everlasting	Native
Mikania scandens (L.) Willd.	Climbing Hempvine	Native
Pityopsis graminifolia (Michx.) Nutt. var. *graminifolia*	Narrowleaf Silkgrass	Native
Rudbeckia hirta L.	Black-eyed Susan	Native
Bignoniaceae Trumpet Creeper Family		
Campsis radicans (L.) Seem.	Trumpet Creeper	Native
Campanulaceae Bellflower Family		
Wahlenbergia marginata (Thunb.) A. DC.	Southern Rockbell	Introduced
Clusiaceae St. John's-Wort Family		
Hypericum hypericoides (L.) Crantz	St. Andrew's Cross	Native
Cornaceae Dogwood Family		
Nyssa sylvatica Marsh.	Blackgum	Native
Cyperaceae Sedge Family		
Cyperus spp.	Sedges	Native
Euphorbiaceae Spurge Family		
Cnidoscolus stimulosus (Michx.) Engelm. And Gray	Tread Softly/Finger Rot	Native
Fabaceae Legume Family		
Centrosema virginianum (L.) Benth.	Climbing Butterfly Pea	Native
Chamaecrista fasciculata (Michx.) Greene	Partridge Pea	Native
Chamaecrista nictitans (L.) Moench	Sensitive Partridge Pea	Native
Crotalaria angulata Walt.	Rabbitbells	Native
Lespedeza bicolor Turcz.	Shrub Lespedeza	Introduced
Lespedeza cuneata (Dum.-Cours.) G. Don	Sericea Lespedeza	Introduced
Lespedeza procumbens Michx.	Trailing Lespedeza	Native
Lespedeza repens (L.) W. Bart.	Creeping Lespedeza	Native
Mimosa microphylla Dry.	Littleleaf Sensitive-briar	Native
Strophostyles umbellata (Muhl. ex Willd.) Britt.	Pink Fuzzybean	Native
Stylosanthes biflora (L.) B.S.P.	Pencilflower	Native
Tephrosia spicata (Walt.) Torr. & Gray	Spiked Hoarypea	Native
Fagaceae Beech Family		
Quercus phellos L.	Willow Oak	Native
Quercus alba L.	White Oak	Native

Quercus nigra L.	Water Oak	Native
Hamamelidaceae Witch-Hazel Family		
Liquidambar styraciflua L.	Sweetgum	Native
Juncaceae Rush Family		
Luzula bulbosa (Wood) Smyth & Smyth	Bulbous Woodrush	Native
Lamiaceae Mint Family		
Hyptis alata (Raf.) Shinners	Clustered Bushmint	Native
Loganiaceae Logania Family		
Polypremum procumbens L.	Polypremum	Native
Melastomataceae Melastome Family		
Rhexia mariana L.	Maryland Meadow-Beauty	Native
Myricaceae Wax Myrtle Family		
Myrica cerifera (L.) Small	Wax Myrtle	Native
Passifloraceae Passionflower Family		
Passiflora incarnata	Passionflower	Native
Pinaceae Pine Family		
Pinus echinata Mill.	Shortleaf Pine	Native
Pinus taeda L.	Loblolly Pine	Native
Poaceae Grass Family		
Andropogon virginicus L.	Broomsedge Bluestem	Native
Dichanthelium spp.	Rosette Grasses	Native
Paspalum notatum Flueggé	Bahia Grass	Mixed
Poa spp.	Bluegrasses	Native
Setaria spp.	Bristlegrasses	Mixed
Rosaceae Rose Family		
Rubus spp.	Blackberry	Native
Rubiaceae Coffee or Madder Family		
Diodia teres Walt.	Rough Buttonweed	Native
Diodia virginiana L.	Virginia buttonweed	Native
Smilacaceae Greenbrier Family		
Smilax bona-nox L.	Saw Greenbrier	Native
Smilax rotundifolia L.	Roundleaf Greenbrier	Native
Verbenaceae Verbena Family		
Callicarpa americana L.	American Beautyberry	Native
Vitaceae Grape Family		
Ampelopsis arborea (L.) Koehne	Peppervine	Native
Vitis rotundifolia Michx.	Muscadine	Native