GOPHER TORTOISE COUNCIL

2010 Annual Meeting - Columbiana, Alabama

Location

Our meeting is being held at the Alabama 4-H Center. The GTC business meeting, all presentations, socials, coffee breaks, and the poster session will take place in the Auditorium. Meals will take place in the Dining Room.

SCHEDULE

THURSDAY, OCTOBER 7TH, 2010

Time	Event/Title
12:00	*Lunch*
5:30	*Dinner*
6:15	GTC Business Meeting

FRIDAY, OCTOBER 8TH, 2010

Time	Event/Title	Presenter
8:00	*Breakfast*	
9:30	*Coffee Break*	
9:50	Welcome/Introduction	David Steen
10:00	Conservation Banking of Gopher Tortoises in Alabama	Craig Guyer
11:00	Eastern Indigo Snakes in Alabama: Project Summary	Jim Godwin
11:15	Eastern Indigo Snakes in Alabama: From the Field	Jimmy Stiles
11:30	Perdido River Tract Longleaf Pine Restoration	Brent Shaver
11:45	Kingsnake Ecology in Rainey Slough, Florida	Steve Godley
12:00	*Lunch*	
1:30-	Gopher Tortoise Federal Listing Panel Discussion	
2:45	*Coffee Break*	
5:30	*Dinner*	
7:00	Social/Poster Session	

SATURDAY, OCTOBER 9TH, 2010

Time	Event/Title	Presenter
8:00	*Breakfast*	
9:30	*Coffee Break*	
9:50	Introduction	David Steen
10:00	Rattlesnake Roundups: Alabama's Prominent Role	Bruce Means
11:00	Intra-latitude Phenologies of *Crotalus adamanteus*	Mike Martin
11:15	The Timber Rattlesnake in Middle Tennessee	Eric Fann
11:30	Canebrake Rattlesnake Overwintering Ecology	Jayme Waldron
11:45	Timber Cruises for Tortoise Habitat Evaluation	Sharon Hermann
12:00	*Lunch*	
1:30	Blood and Tissue Archives in Wildlife Research	Jessica Gonynor
1:45	Genetics of Eastern and Western Gopher Tortoises	Daniel Gaillard
2:00	Genetic Structuring of Tortoise Populations in Florida	Colleen Sinclair-Winters
2:15	Tortoises at the University of North Florida	Kris Amatuli
2:30	Tortoises at White Oak Plantation, Nassau County, Florida	Rachel Smith
2:45	*Coffee Break*	
3:15	Florida's Conservation Plan for the Gopher Tortoise	Deborah Burr
3:30	Tortoise Population Estimates at the Extremes	Jonathan Stober
3:45	Distribution and Abundance of Tortoises in Alabama	Sybil Glenos
4:00	An Overlooked Herpetological Hotspot?	Sean Graham
4.15	A New Predator of the Gopher Tortoise in Alabama	Mark Bailey
4:30	A Tribute to Ray Ashton	Joan Berish
5:30	*Dinner*	
7:00	*Social with Olin Howlin*	

SUNDAY, OCTOBER 10TH, 2010

Time	Event/Title
8:00	*Breakfast*

SCHEDULE DETAIL

FRIDAY

8:00 Breakfast

9:30 Coffee Break

9:50 Introduction

10:00
Conservation Banking of Gopher Tortoises in Alabama
Craig Guyer, Department of Biological Sciences, Auburn University

Conservation banking is a growing industry for state and federal agencies charged with implementing conservation policy. A quick-and-dirty web search indicates that Alabama has an unusually high profile in this field. In this talk I will review the likely extent of tortoise habitat in Alabama before the massive and rapid alteration of the landscape by modern human cultures and I will review the status of remaining populations in the state. I will use this to summarize accumulated information on banking efforts and the key biological data available to help us decide how big such banks should be and how many tortoises they should contain if they are to maintain populations long term.

11:00
Eastern Indigo Snakes in Alabama: Project Summary
Jim Godwin, Alabama Natural Heritage Program Environmental Institute, Auburn University

The eastern indigo snake has been absent from southern Alabama for approximately 55 years. Attempts to reintroduce the species during the mid-1970s to mid-1980s were unsuccessful. In 2007 the idea of a reintroduction program was revived. In 2008, 2009, and 2010 gravid female eastern indigo snakes were brought into the lab at Auburn University and held until eggs were laid. Young from these snakes are being reared in captivity as stock for a release and reintroduction project in Conecuh National Forest. In June 2010 the first release of 17 snakes, nearly 2 years of age, was done. All snakes were surgically implanted with a radio transmitter and PIT tag.

Currently, research is being conducted using data gathered from radio telemetry on the snakes released in 2010. We will discuss the first four months of tracking data including movements and observations made while following the snakes. Ultimately information gathered through radio tracking should help guide the reintroduction efforts to a successful goal of establishing a viable population of eastern indigo snakes in Alabama.

11:15
Eastern Indigo Snakes in Alabama: Updates From the Field

Jimmy Stiles, Department of Biological Sciences, Auburn University

See above abstract.

11:30
Perdido River Tract Longleaf Pine Restoration Project: A Cooperative Restoration Project by The Nature Conservancy and Alabama Department of Conservation and Natural Resources, State Lands Division, State Lands Division

Brent Shaver, Conservation Forestry Project Director; and **Keith Tassin**, Director of Science and Stewardship; ADCNR-State Lands Division personnel

The Nature Conservancy acquired the Perdido River Tract from International Paper Company in 2006 as part of a transaction encompassing some 280,000 acres of forest land across the U.S. Perdido River Tract, totaling approximately 14,177 acres of industrial loblolly pine (*Pinus taeda*) plantations and intermingled streamside habitats, protects approximately 14 miles of Perdido River shoreline. The Perdido River, which delineates the state boundary between Alabama and Florida, is one of the last undammed blackwater rivers flowing freely into the Gulf of Mexico. As recently as the 1990's the Perdido River Tract included natural longleaf pine (*Pinus palustris*) habitats that showcased this ecosystem's herbaceous species diversity (averaging 30 to 40 species per square meter on many sites, with up to 60 species per square meter). Included here are Atlantic white-cedar (*Chamaecyparis thyoides*) forests bordering the tannin-stained waters of the Perdido River; pitcher plant bogs containing extraordinary carnivorous plants that sustain themselves on unsuspecting insects, and varied wildlife habitats supporting populations of gopher tortoise (*Gopherus polyphemus*) and other imperiled wildlife. However, due to an industrial pine plantation management strategy much of the area was converted to loblolly pine plantations.

Currently, the Perdido River Tract is owned and managed cooperatively by The Nature Conservancy and the State of Alabama, with The Conservancy holding a 15-year timber reservation on 5,660 acres of the property. The Conservancy's contribution to the Perdido River Tract Longleaf Pine Restoration Project includes complete oversight and management of the longleaf pine restoration process throughout the 15-year timber reservation. As restoration activities are complete, areas will be transferred to the State of Alabama who will manage the property for public use in perpetuity as a Nature Preserve, Recreation Area, and Wildlife Management Area. In addition to The Conservancy's purchase of the Perdido River Tract, numerous conservation acquisitions on both the Alabama and Florida sides of the Perdido River have occurred in recent years, helping to insure long-term protection of this unique river.

The Perdido River Tract was acquired by The Conservancy to address stresses

and threats to southern forests from large-scale timber management strategies and other causes. The main threats to the Perdido River Tract are: altered fire and hydrologic regimes, degraded water quality, incompatible forestry practices, invasive exotic species, and development. To address these issues this restoration project is: 1) restoring longleaf pine on 5,660 acres industrial loblolly pine plantations, 2) reintroducing fire to those areas, 3) promoting native groundcover, 4) protecting water quality through implementation of best management practices, 5) protecting special sites such as pitcher plant bogs and ephemeral ponds by restricting access during restoration activities, 6) encouraging recreation and public use, 7) practicing sustainable forest management through a third-party verified system, and 8) monitoring progress through data collection and monitoring.

The Conservancy's goal is to fully restore longleaf pine to all 5,660 acres by the end of the timber reservation. The desired future condition of the Perdido River Tract is a vast, fire-maintained, longleaf pine dominated forest similar to what naturally occurred there. Open pine sandhills supporting longleaf pine, turkey oak (*Quercus laevis*), bluejack oak (*Quercus incana*) and other scrub oak species with a wiregrass (*Aristida beyrichiana*) dominated herbaceous layer are desired on the deep sandy knolls and hills. Longleaf pine savannas with widely-spaced trees and an herbaceous layer dominated by native grasses and wildflowers with embedded bogs and ponds are the goal for side slopes and mesic areas. Slash pine (*Pinus elliottii*), Southern bald-cypress (*Taxodium distichum*), swamp tupelo (*Nyssa biflora*), and Atlantic white-cedar will dominate the river's edge and meandering forested wetlands. The Perdido River Tract may provide crucial habitat for many imperiled species including: gopher tortoise, black pine snake (*Pituophis melanoleucus lodingi*), eastern indigo snake (*Drymarchon corais couperi*), flatwoods salamander (*Ambystoma cingulatum*), and red-cockaded woodpecker (*Picoides borealis*). Additionally, the Perdido River Tract is part of a planned longleaf pine migration corridor that will connect black bear (*Ursus americanus*) populations in Alabama, Mississippi and Florida.

11:45

Ecology of Eastern Kingsnakes (*Lampropeltis getula*) at Rainey Slough, Florida: A Vanished Eden

Steve Godley, ENTRIX, Inc.

A mark-recapture study of kingsnakes (*Lampropeltis getula*) inhabiting a 1.1-km canal bank/water hyacinth community was conducted at Rainey Slough, Glades County, Florida from 1975 - 1978. Annual recapture probability averaged 0.50 and annual survival probability was 0.66 with roadkill being a major source of mortality. In the three study years the population consisted of 13 to 21 adult kingsnakes with a total biomass of 9.7 to 15.6 kg. The sex ratio of first-captured individuals was equal, but males were significantly larger in body size, spent more time above ground and were more susceptible to capture than females. Kingsnakes overwintered in rodent burrows on canal banks. Many burrows were used by multiple individuals often over several years, and burrows abutting a wooden

bridge over Rainey Slough were a focal point of activity. Kingsnakes were detectable on canal banks primarily in winter and spring, when they emerged from burrows 13 – 19% of the sampling days each year, basked to body temperatures of > 30^0C, and returned to burrows before dusk. Frequent bouts of basking, shedding and courtship without feeding resulted in males losing on average 39.3% of their body mass from late fall through spring, while females only lost 3.4%. From April through November kingsnakes dispersed into the aquatic habitat and rapidly regained weight, feeding principally on snakes. Concurrent sampling in water hyacinths and canal banks suggested that the snake prey base likely was not a limiting factor to the kingsnake population at Rainey Slough. The density of six potential snake prey species in the water hyacinth community averaged 3,534 individuals/ha with an estimated total biomass of 135.8 kg/ha. Most (96.3%) of these snakes were of a size suitable for ingestion (mean mass ratio ≤ 0.83), kingsnake biomass was 2.6 – 4.2% of the snake biomass in the water hyacinths, and the kingsnake population probably consumed only 11.5 – 18.5% of the standing crop of these snakes each year.

The last kingsnake recorded from Rainey Slough was in 1984. The primary causes of extirpation of this population likely included increased mortality from replacement of the wooden bridge with a concrete structure during the winter of 1979 and higher traffic volumes when the dirt road was paved the same year. Publishing the locality of this population in 1982 may have lead to the removal of these easily collected snakes for the pet trade. Follow-up sampling of the herpetofaunal water hyacinth community at Rainey Slough in 2006 and 2008 revealed much more insidious losses. Four previously abundant salamander species also appear to be extirpated with a 40-fold decrease in total salamander densities. Two snake species that feed principally on salamanders were missing and snake densities in hyacinths were reduced 5.7-fold.

12:00 Lunch

1:30 Panel Discussion: Potential Ramifications of a Federal Listing for Eastern Populations of the Gopher Tortoise

Moderator
Steve Godley, Entrix, Inc.

Panel Participants
Hal Balbach, U.S. Army ERDC-CERL
Rachael Sulkers, Environmental Services, Inc.
Tom Mann, Mississippi State Representative, Gopher Tortoise Council
John Jensen, Georgia Department of Natural Resources
Deborah Burr, Florida Fish and Wildlife Conservation Commission
Larry Carlile, Fort Stewart Fish and Wildlife Branch

2:45 Coffee Break

5:30 Dinner

7:00 Poster Session and Social

Poster Abstracts

Ecology of the Eastern Kingsnake in Southwestern Georgia
Jennifer M. Linehan, Lora L. Smith, and David A. Steen, Joseph W. Jones Ecological Research Center

Historically, Eastern Kingsnakes (*Lampropeltis getula*) were common throughout the southeast. However, they have become increasingly rare in parts of their southern range. Habitat fragmentation and loss, road mortality, natural succession of uplands, and collection for the pet trade have all been implicated as potential contributing factors to population declines. The apparent decline is surprising given that this species feeds on a wide array of prey and has been documented in a variety of habitats across its range. With the exception of a few published studies, much of the information pertaining to Eastern Kingsnakes is based on anecdotal observations. Yet, understanding basic biological requirements is vital to successful management and conservation. Therefore, the objective for our research was to examine a population of Kingsnakes on a large protected area in Georgia, focusing on aspects of spatial ecology, habitat selection, and activity patterns.

Distribution and Habitat Utilization of the Gopher Tortoise Tick (*Amblyomma tuberculatum*) in Southern Mississippi
Joshua Ennen, U.S. Geological Survey, Southwest Biological Science Center, and Carl Qualls, Department of Biological Sciences, University of Southern Mississippi

The distribution of the gopher tortoise tick (*Amblyomma tuberculatum*) has been considered intrinsically linked to the distribution of their primary host, gopher tortoises (*Gopherus polyphemus*). However, the presence of *G. polyphemus* does not always equate to the presence of *A. tuberculatum*. There is a paucity of data on the ecology, habitat preferences, and distribution of *A. tuberculatum*. The goals of this study were to 1) assess the distribution of *A*. *tuberculatum* in south Mississippi and 2) to determine which, if any, habitat parameters explain the distribution pattern of *A. tuberculatum*. During 2006-2007, we examined 13 *G. polyphemus* populations in southern Mississippi for the presence of *A. tuberculatum* and measured a suite of habitat parameters at each site. Only 23% of the *G. polyphemus* populations supported *A. tuberculatum* suggesting a more restricted distribution than its host. The results of our multivariate analyses identified several habitat variables (e.g., depth of sand and percent of sand in the topsoil and burrow apron) as being important in discriminating between sites with and without *A. tuberculatum*. *Amblyomma tuberculatum* was only found at sites with a mean sand depth of greater than 100 cm and a mean percentage of topsoil and burrow apron sand composition

greater than 94.0 and 92.4, respectively. Thus, environmental factors and not just its host's range appear to influence the distribution of *A. tuberculatum*.

Gopher Tortoise Population Health in a Changing Georgia Landscape: Preliminary Results

Jessica Gonynor, Lora Smith, and Michael Yabsley, Joseph W. Jones Ecological Research Center, Warnell School of Forestry and Natural Resources and the Southeastern Cooperative Wildlife Disease Study

Upper respiratory tract disease (URTD) in the gopher tortoise (*Gopherus polyphemus*) is highly contagious and has been implicated in the reduction of populations throughout their range. Gopher tortoises are state listed as threatened in Georgia, USA where their populations are threatened by habitat loss and fragmentation. The prevalence of URTD in Georgia tortoise populations is poorly known. There are populations of gopher tortoises, including those at the Jones Center, that test positive for exposure to *Mycoplasma*, one of the causative agents of URTD, but rarely show clinical signs. This has led researchers to speculate that clinical illness may be triggered by other factors such as stress or co-infection with other pathogens. In order to manage a population effectively, it is important to understand the factors that contribute to the overall health of the population. Based on our preliminary data, our central hypothesis is that exposure to *Mycoplasma* will vary spatially among Georgia tortoises and land management practices that are conducive to gopher tortoises and overall condition of the habitat, will keep stress to the animals to a minimum and thus decrease risk of clinical disease. To test our hypothesis we will pursue two specific aims: 1) To determine the geographic distribution of *Mycoplasma* in free ranging tortoises in select populations in Georgia by using a combination of serologic and PCR testing. 2) Investigate the population health of the tortoises at each of the chosen sites.

Influence of Longleaf Pine Restoration on Avian Assemblages and Occupancy of Species Associated with the Native Ecosystem

David Steen, Lora Smith, Mike Conner, Kevin Hiers, and Louis Provencher, Joseph W. Jones Ecological Research Center, Auburn University, Jackson Guard-Eglin Natural Resources, and The Nature Conservancy

Varied strategies have been attempted to restore longleaf forests by reducing hardwood tree densities. However, forest management may have unintended or unknown effects on local wildlife. To determine the effects of varied hardwood removal strategies on breeding birds, we sampled for these animals in a Longleaf Pine forest subjected to prescribed burning, application of herbicides, or mechanical removal of hardwood trees. General trends indicated Longleaf Pine restoration that removes hardwood trees increased species richness of the entire avian assemblage. The probability of occupancy of species highly associated with the native ecosystem was influenced by several factors but generally included method of restoration. Our results indicate hardwood removal is likely to have beneficial effects on avian assemblages that may not be observed when prescribed fire is used alone, although

these management strategies may not replicate reference conditions in the short-term. Different methods of reducing hardwood density may have disparate effects on probability of occupancy by species highly associated with Longleaf Pine forests, but the mechanisms behind these differences remain unidentified.

The Gopher Tortoise Activity Book
Zander Srodes, Turtle Talks (Recipient of The Gopher Tortoise Council Donna J. Heinrich Environmental Education Grant)

The focus of Turtle Talks is as an educational outreach program to share information on the Gopher Tortoise, freshwater turtles and sea turtles. It is facilitated through eco-literacy presentations at schools, libraries, and nature events. The original course started out focused on the plight of sea turtles. Several years ago, the Gopher Tortoise was introduced into the science road show. This year freshwater turtles have been included. When Zander Srodes was eleven years old, he began visiting schools and giving youth seminars on turtles. The inspiration for the project began nine years ago with the awareness of the trials and tribulations that sea turtles face as they circumvent the globe. Zander learned that being a pelagic reptile was a very precarious life. It was at that time that he wrote an activity book on sea turtles. In 2007, Zander was asked to investigate the life cycle of the Gopher Tortoise. He was shocked to learn how many obstacles they face in their home range and agreed to pen a fun with a purpose booklet about the tortoise.

SATURDAY

8:00 Breakfast

9:30 Coffee Break

9:50 Introduction

10:00
Rattlesnake Roundups: Alabama's Prominent Role in Their History
Bruce Means, Coastal Plains Institute

11:00
Examining relationships among behavior, weather, and the human dimensions of rattlesnake conservation: intra-latitude phenologies of the Eastern Diamondback Rattlesnake (*Crotalus adamanteus*)

Michael Martin, University of South Carolina

Weather has strong implications for seasonal behaviors in poikilotherms. Weather patterns vary throughout the range of the Eastern Diamondback Rattlesnake (EDB), resulting in regional differences in the species phenology. Some

coarse behavioral patterns with defined phenologies expose rattlesnakes to human interactions and can result in acute risks of direct human-caused mortality (DHCM). For example, males move greater distances during the breeding season, and are thus more likely to encounter humans. The acute risk of DHCM is often confounded with the chronic risk of landscape-scale habitat degradation, fragmentation, and loss; however, the link between behavioral patterns and weather adds plasticity to the human dimensions of rattlesnake conservation. In addition, current fitness tradeoffs may be disjunct from evolutionary trends, thus emphasizing the importance of understanding the link between behavior and human interaction. In this study, we examined radio telemetry-derived behavioral data and weather data for five EDB populations within an intra-latitude gradient that included mid-coastal-range populations and limital, inland populations. Seasonal behaviors (i.e., breeding, parturition, dates of ingress/egress for hibernation, etc.) and NOAA weather data were used to examine the links among behavioral plasticity, weather, and potential human-rattlesnake interactions.

11:15
Population distribution and habitat preference of the Timber Rattlesnake in middle Tennessee

Eric Fann, South Carolina Aquarium

Few studies have examined the population distribution, and habitat preferences for the timber rattlesnake in the state of Tennessee. Over the past 18 years we have looked at the middle Tennessee populations, summer ranges, den sites, and birthing rookeries of the timber rattlesnake in middle Tennessee. Repetitive captures and observations do indicate that the timber rattlesnakes in Tennessee do prefer using historical hibernacula, birthing rookeries, and summer foraging areas throughout their lives. Additionally, we did find that on occasion some adults for unknown reason did choose near by den sites, but not historical sites. We were unable to correlate juveniles following or scent trailing adults to den sites in the fall.

11:30
Overwintering ecology of canebrake rattlesnakes (*Crotalus horridus*) in South Carolina: A comparison of coastal and inland populations using climate and habitat variables

Jayme Waldron, University of South Carolina

Timber rattlesnakes (*Crotalus horridus*), the rattlesnake with the broadest geographical range, exhibits a high level of phenological variability among populations in regards to breeding season, reproductive frequency, and hibernation patterns. Here, we investigate timber rattlesnakes in the southern part of their range (canebrakes). Data on 35 telemetered rattlesnakes were examined using coastal (Beaufort Co.) and inland (Hampton Co.) field sites. Our coastal location is a

20,000 acre former hunting preserve that was recently purchased by a residential development company. Our inland site and consists of almost 6,000 acres, but is adjoined by other Wildlife Management Areas that provide continuous habitats for rattlesnakes. Surface activity and the number of hibernacula used between October and April are analyzed within and among populations for potential effects of temperature and rainfall. We further investigate the influence of snake body size and the temperature at each tracked location. Habitat influences are incorporated into our models by comparing whether the dominant hibernacula type (e.g., stump, root mass, armadillo burrow), canopy cover, or distance to nearest opening vary among coastal and inland populations and how this potentially correlates with inter- and intraseasonal fluctuation in abiotic parameters. Lastly, we use the multi-year tracking data at our coastal site to assess potential effects of initial development activity on overwintering activity. These data allow us to not only further understand the variability of this predator among populations within a state, but permit the investigation of the possible flexibility of this ectothermic, low-maintenance predator to slight changes in its environment.

11:45
Initial Evaluation of Timber Cruises Modified to Assess Quality of Gopher Tortoise Habitat

Sharon Hermann, Department of Biological Sciences, Auburn University and Longleaf Pine Stand Dynamics Laboratory, School of Forestry & Wildlife Science, Auburn University

Background: The gopher tortoise and many other southeastern species of concern require open pine forest. In the past the assessment of the habitat description has been often been at the I-know-it-when-I-see-it level. Although good tortoise biologists can apply their knowledge to specific sites, this approach is not likely to promote healthy populations region-wide. "The Gopher Tortoise Management Plan" for the state of Florida (Florida Fish and Wildlife Conservation Commission 2007) defines optimal conditions for tortoise habitats in Florida as "upland forested pine and hardwood canopy cover below 60%" and "herbaceous groundcover, including grasses, legumes, and forbs, at 50% or greater." The suggested maximum shrub cover is set at 30% or less for "sandhill/upland pine forest". These guidelines have been adopted by other agencies, generally with little modification. Unfortunately there is no direct way to compare these habitat conditions with the results of traditional forest management.

Current Project: Foresters are often charged with implementing guidelines for desired gopher tortoise habitat. However that profession uses metrics and procedures that differ from those employed by ecologists to evaluate forested habitat. On both private and public property, a timber cruise is a common form of landscape assessment for forest management. We are currently evaluating gopher tortoise habitat using protocols for a traditional timber cruise as the framework our assessment. Much of the sampling has been done on Fort Benning using boundaries of timber stands (defined by the Natural Resource Land Management Unit) for areas

that currently support gopher tortoise management unit. We begin with a timber cruise based on evenly spaced tenth acres plots that sample a total of 1/10 of the total stand area for tree species, stem density, and basal area. Additional sampling based on information needs to evaluate tortoise habitat is superimposed one each 1/10 acre cruise plot. The goal of our project is to determine the minimal information required to "translate" between ecological and forestry ways of looking at a forest. In the talk we present preliminary evaluation of our data. In addition we consider small-scale spatial differences of soil types within stands at Fort Benning.

12:00 Lunch

1:30
The Importance of Blood and Tissue Archives in Wildlife Research

Jessica Gonynor, Joseph W. Jones Ecological Research Center, and Warnell School of Forestry and Natural Resources and the Southeastern Cooperative Wildlife Disease Study

Evaluating wildlife morbidity and mortality is often a difficult task, due to many factors such as quick decomposition times and limited historical surveillance. Disease surveillance is not only important to the wildlife, it can also impact human health. As new wildlife diseases emerge it is beneficial if researchers have the ability to retroactively evaluate the disease. Access to banked samples can help better understand the epidemiology of a newly discovered pathogen in a system. The ability to go back to these samples can help researchers address questions such as the history of a disease in the system and the species affected by the pathogen(s). Depending on the diagnostics necessary for detecting the pathogens, long term data can be compiled. Banking of samples is especially important for cryptic species that are rarely handled. Every effort should be made to collect blood and or other tissue samples, as permitted, in order to increase sample size. Collaborative use of samples is especially encouraged in this situation as utilization of these samples can provide researchers and wildlife managers with an important information in the management and response to disease. In addition to disease work, samples can also be useful for future genetic work as well.

1:45
Comparing Genetic Diversity Between Eastern and Western Gopher Tortoise Populations

Daniel Gaillard, The University of Southern Mississippi Department of Biological Sciences

The gopher tortoise has undergone a range-wide population decline, with the greatest decline found in the western portion of the range (west of the Tombigbee and Mobile rivers). Population fragmentation/isolation coupled with substantial recent declines in numbers could be having a severe negative effect on western

tortoise populations. For example, Mississippi populations have lower hatching success (16.7-48%) than their eastern counter-parts (67-97%). Previous work in our lab, demonstrated that western populations have lower genetic diversity at nine microsatellite loci than their eastern counterparts. This observation suggests, but does not prove, a relationship between lower hatching success and decreased genetic diversity. Using 25 new microsatellite loci, we genotyped individuals from four western populations in Mississippi and one eastern population (Ft. Benning, GA). In support of the previous study, our data showed that western populations had significantly lower levels of heterozygosity and allelic richness when compared to their eastern-counterparts. Our study strengthens the call for further researching the association between low genetic diversity and low hatching success in western populations of gopher tortoises.

2:00
Genetic Structuring of Gopher Tortoise Populations in Florida: Panhandle vs. Peninsula

Colleen Sinclair-Winters, Department of Biological Sciences, Towson University

Current gopher tortoise mitigation policy in Florida allows animals to be relocated within 100 km north or south of the original population. No restriction is made on east-west relocations unless the relocated tortoise would be moved into a genetically unique population. Until recently little has been known about the genetic profiles of gopher tortoises across the state of Florida and in particular those located in the panhandle. In 2005 Schwartz and Karl used species-specific microsatellites to determine that gopher tortoises in the Florida peninsula formed five genetically distinct populations. In an effort to develop a more comprehensive profile of Florida's gopher tortoises, we analyzed the genetic diversity of tortoises in the Florida panhandle to determine if the tortoises subdivide into genetically distinct populations or if they form one continuous population. Secondly we compared the panhandle populations to the peninsula populations reported by Schwartz and Karl to determine if the panhandle populations are genetically distinct from the peninsula populations. DNA samples from 72 gopher tortoises from the panhandle were analyzed using species-specific microsatellites. Since the fragment analysis for our study was done on a different machine, DNA from 30 of the 294 tortoises analyzed by Schwartz and Karl was also examined to verify size readings between the machines. An analysis of molecular variance (AMOVA), global and pairwise F_{ST}, and assignment tests were run on the panhandle data alone and then the panhandle and peninsula data combined. The results for the panhandle alone suggest that gene flow has occurred between the panhandle populations (average pairwise $F_{ST} = 0.1574$). However, the existence of private alleles and the possibility that 42% of the tortoises may be migrants suggests that greater genetic structuring was once present. Analysis of the combined peninsula and panhandle data suggests that panhandle populations are genetically distinct from peninsula populations (average pairwise $F_{ST} = 0.3289$). These results suggest that partitioning of gopher tortoise populations does take place on an east-west axis and therefore should be

considered when relocating tortoises in the northern Florida peninsula and panhandle.

2:15
Studies of the Gopher Tortoise Population at the University of North Florida

Kris Amatuli, Department of Biology, University of North Florida

A Gopher Tortoise (*Gopherus polyphemus*) population on the campus of University of North Florida is part of an ongoing study initiated during the early 1990s, and I will present data on this population collected during the 2009-2010 field season. I started the project with three major objectives. First, I wanted to capture as many tortoises in this population as possible in order to compare current population structure to that in the early 1990s. Second, the study area underwent prescribed burning during the summer of 2009, and I wanted to assess the successional changes in the vegetation. Third, I wanted to evaluate reproductive effort and success. Tortoises were trapped or captured by hand when encountered outside their burrows. In total, 75 tortoises have been caught in 2010: 12 adult males, 16 adult females, and 47 juveniles. Of these 75 tortoises, 16 are recaptures from the research performed in the early 1990s. Four 100 meter vegetation transects in the burned area serve as our experimental and two more in unburned areas are the controls. Vegetation analyses are done bi-monthly and all plants are recorded as well as their percent of each plot. The most abundant plant recorded through all plots is milkpea. Preliminary analysis of post burn response has indicated increased groundcover in all burned transects. Adult burrow aprons were probed using a wire survey flag in an attempt to locate nests. We found two intact nests with this technique and recorded two other depredated nests that were unassociated with any burrow. The intact nests are protected with hardware cloth nest cages, and I will report on the hatching success of these.

2:30
A Preliminary Characterization of the Demography and Reproductive Biology of the Gopher Tortoise Population at White Oak Plantation, Nassau County, Florida, and Development of Management Recommendations

Rachel Smith, Department of Biology, University of North Florida

This study serves as a foundation for surveying the gopher tortoise population at White Oak Plantation and Conservation Center in Yulee, Florida. White Oak is privately owned, and the several populations on site have not previously been studied. My objectives are to characterize age classes, sex ratios, notable behaviors and nesting success for the two tortoise populations that I am researching. This is the first year of a two-year study. At its completion, I hope to propose management recommendations to ensure the continued existence and success of gopher tortoises on White Oak property. Currently, I have marked 25 tortoises – 7 adult males, 1 adult female, and 17 juveniles. I have also located three

tortoise nests which have not yet hatched, but I will be able to report on their hatching success by the time of the conference.

2:45 Coffee Break

3:15
Progress on Implementing Florida's Conservation Plan for the Gopher Tortoise

Deborah Burr, Florida Fish and Wildlife Conservation Commission

In September 2007, the Florida Fish and Wildlife Conservation Commission (FWC) approved the Gopher Tortoise Management Plan and reclassified the gopher tortoise from Species of Special Concern to Threatened. This Plan serves as the blueprint for gopher tortoise conservation in Florida and a model for managing gopher tortoises throughout their range. The Plan's overall conservation goal is restoring and maintaining viable gopher tortoise populations in Florida. Its four conservation objectives are managing tortoise habitat, preserving tortoise habitat, restocking tortoises, and minimizing tortoise mortality during land development. Each objective provides benchmarks and measurements for assessing progress towards the Plan's conservation goal. These objectives are accomplished by an extensive series of conservation actions outlined in the Plan. Conservation actions fall under the following categories: regulations, permitting, local government coordination, monitoring and research, law enforcement, habitat preservation and management, education and outreach, landowner incentives, disease management and population management.

In the two years since implementing the Plan, significant progress has been made across all categories. Accomplishments include developing and implementing a new permitting framework to decrease tortoise mortality during land development by relocating all gopher tortoises to protected, managed areas. Prescribed fire and habitat management activities have also been conducted on more than 40,000 acres of gopher tortoise habitat on public and private lands. In addition to a newly designed website (MyFWC.com/GopherTortoise), several publications have been completed and distributed to increase public awareness of gopher tortoise conservation. Research projects on Upper Respiratory Tract Disease, long-term population dynamics and Panhandle gopher tortoise genetics have been completed with some published ahead of schedule. Additional research on the compatibility of gopher tortoise relocation and cattle is underway to improve the success of gopher tortoise relocation where cattle occur. Coordination with governmental agencies and non-profit organizations in Florida and throughout the tortoise's range has resulted in implementation of gopher tortoise conservation activities on lands owned by local governments, state agencies, and military installations in Florida. Florida also led the effort to standardize reporting efforts throughout the species non-listed range as part of the Candidate Conservation Agreement. Overall, significant progress has been made in the first two years implementing Florida's conservation plan.

3:30
Tortoise Population Estimates at the Extremes

Jonathan Stober, Shoal Creek Ranger District Talladega National Forest

Status and trends of gopher tortoise (*Gopherus polyphemus*) populations are a critical information need for natural resource managers, researchers, and policy makers. Tortoise population estimates can be derived using line transects and burrow scoping with Program Distance for moderate to high density populations. However, model building for population estimates is often constrained by sample size, requiring a minimum of ~60 observations to obtain an appropriate level of measured confidence. Some tortoise populations occur at low densities at a small spatial extent, while others occur at low densities over areas of a large spatial extent. When deriving population estimates on a low density populations several sampling strategies can be employed to achieve appropriate sample size to model and estimate populations. We review three case studies that addressed different scenarios: 1) an extremely small tortoise population on a small property (40ha); 2) an extremely low density property on a large property (>7000ha); and 3) a moderately dense population that was post-stratified based on habitat characteristics. Repeated surveys and pooling observations allowed sufficient detections of tortoises for a population estimate at a small population on a small site. A modified circuit design and cluster analysis of all inhabitable burrows allowed model development for a low density population on a large property. For management purposes, surveys can be designed so that post stratification by habitat type or land-use can later be used to examine the relative densities of tortoise populations. These various techniques demonstrate that line transect distance sampling has a robust ability to derive population estimates under the most extreme conditions.

3:45
Influence of Forest Management and Soil Class on the Distribution and Abundance of Gopher Tortoises (*Gopherus polyphemus)* in South Alabama Forests

Sybil Glenos, Department of Biological Sciences, Auburn University

With declining populations and the current potential for Federal listing of the Gopher Tortoise (*Gopherus polyphemus*) in the remainder of its range, land managers are in need of sound recommendations regarding management for the preservation and restoration of Gopher Tortoise habitat. Currently, we are conducting a large-scale survey for Gopher Tortoise burrows in the Conecuh National Forest, Geneva State Forest, and Perdido River Longleaf-Hills Tract within southern Alabama to determine factors regulating population size, density, and size distribution of individuals. Here, we present preliminary results regarding active burrow density among property units and soil types, along with burrow size

distribution. Because Gopher Tortoise density is believed to be regulated by soil suitability, as well as overstory and herbaceous understory density, the long term goal of this study is to determine the strength and directness of each factor's influence on Gopher Tortoise populations. Field data is collected using a transect census technique. We plan to use remote sensing with on-site verification to determine vegetation type and coverage. Path analysis will be used to determine the strength of causality in factors regulating Gopher Tortoise density. The results will provide valuable data to land managers offering suggestions on how to preserve *Gopherus polyphemus* from further decline by implementation of appropriate forest management.

4:00
An overlooked hotspot? Rapid biodiversity assessment reveals a region of exceptional herpetofaunal richness in the southeastern United States

Sean Graham, Department of Biological Sciences, Auburn University

We conducted a competitive bioblitz survey in four Georgia counties to raise awareness of a unique and species rich herpetofauna in the Pine Mountain/ Fall Line Sandhills Region of Georgia, and compared documented species of these counties to other herpetofaunas of the southeast that have known high richness and/or were subject to thorough collection efforts. Our results demonstrate the efficacy of bioblitzes for documenting large numbers of species in a limited amount of time (62 amphibian and reptile species in only seven days, including 36 new county records and documentation gopher tortoises, gopher frogs, and an alligator snapper). Compared to areas of similar size, this area is among the most species-rich herpetofaunas in North America north of Mexico, with only three areas having higher documented richness. However, all areas we compared our site to have experienced much higher collection effort and contain much larger tracts of protected land. Thus, our data suggest the Pine Mountain/Fall Line Sandhills region is among the most important regions for amphibian and reptile conservation in North America.

4:15
A New Predator of the Gopher Tortoise in Alabama

Mark Bailey, Conservation Southeast

The jaguarundi (*Herpailurus yaguaroundi*) is a medium sized New World felid with a checkered taxonomic past, having been at various times placed in the genera *Felis* and *Puma* as well. Its recent revision to “herp-something” was resisted by traditional mammalogists in much the way that virtually every herpetologist balked at the placement of rat snakes in *Pantherophis,* a genus far better suited to a long-tailed cat than *Herpailurus* could ever be. But this talk is not about that. Jaguarundis probably don’t occur in Alabama. But they might, and some claim to have seen them. And although predation of gopher tortoises by jaguarundis has not

been documented, it has not been *disproven*, either. Hence the highly contrived title of this presentation. Weak, shaky, dubious, and unsubstantiated evidence will be presented to support the existence of the jaguarundi in south Alabama and the Florida Panhandle. The truth is out there.

4:30
A Tribute To Ray Ashton

Joan Berish, Florida Fish and Wildlife Conservation Commission

On March 11th, the state of Florida lost one of its most ardent advocates for conservation of our natural resources. Ray Ashton lost his battle with pancreatic cancer, but his legacy will live on through the work of his wife Patricia and his many friends and colleagues. Ray was truly a force of nature; he could be as reassuring as a spring breeze when assisting grass-roots organizations in their local conservation efforts, and, conversely, he became a major hurricane when he felt that resource agencies were not fulfilling their responsibilities. Although he is perhaps best known in Florida for his dedicated and passionate efforts to conserve gopher tortoises, he was an incredibly knowledgeable naturalist and visionary who promoted a big picture approach to conserving and managing ecosystems. Over the course of his long career, Ray wore many hats: professional zoologist, researcher, consultant, museum curator, ecotourism director, educator, and prolific author. His conservation work extended well beyond the borders of Florida to both national and international endeavors, and his expertise was sought by governments throughout the world. He and his wife created the Ashton Biodiversity Institute and the Gopher Tortoise Conservation Initiative to increase our knowledge about this keystone species and to empower Florida's citizens to conserve upland habitats as well as wetlands. His accomplishments are too numerous to fully encapsulate here today—but a mighty oak of a man has fallen, and his loss will be profoundly felt by Floridians and the international conservation community.

5:30 Dinner

7:00 Social Featuring Live Music with Olin Howlin

SUNDAY

8:00 Breakfast

The Gopher Tortoise Council would like to thank the following individuals and organizations for supporting our meeting:

Beer for our Friday social was provided by the Hulsey Little River Trust (http://www.hlrt.org/). From their website: The Hulsey Little River Trust (HLRT) was formed in 2006 to preserve and protect Little River Canyon and its watershed as a fitting memorial to our Son, Brother, and Friend, Shane Hulsey who lost his life there in a tragic boating accident.

The cost of beer and wine for our Saturday social was subsidized by Fine Wine and Beer by Gus (http://www.finewineandbeer.com/). All the beer and wine we purchased from Gus comes from Alabama breweries and vineyards. From their website: Fine Wine and Beer by Gus was created to sell wine and beer. In doing so, we hope to honor and respect the craft and culture of fine wine and quality beer. Grapes and hops are grown by farmers and perfected by artisans from around the world. We bring a little of that world to you.

Coffee for our silent auction was provided by Higher Ground Roasters, an Alabama-based company (http://www.highergroundroasters.com/). From their website: Higher Ground was born through the combination of a desire to produce the highest quality coffee and the hope of improving the act of doing business in today's world. We at Higher Ground began with a few goals: To purchase the best coffee available anywhere, to roast it to perfection, and to make it available - fresh - to anyone. With this in mind, the people at Higher Ground made the decision to roast exclusively Fair Trade, shade grown, organic coffees of specialty grade. That means that all Higher Ground coffees are grown naturally without the use of harsh chemicals and fertilizers, and they represent the very best of the world's harvest. In addition, all our beans are grown under the forest canopy, allowing farmers to preserve ancient forests and natural habitat.

Nathan Burkett-Cadena created our meeting logo. T-shirts were printed by Satisfactory Printing (http://www.satisfactoryprinting.com/).

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2010 Annual Meeting - Columbiana, Alabama