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by Sean P. Graham, David A. Steen,
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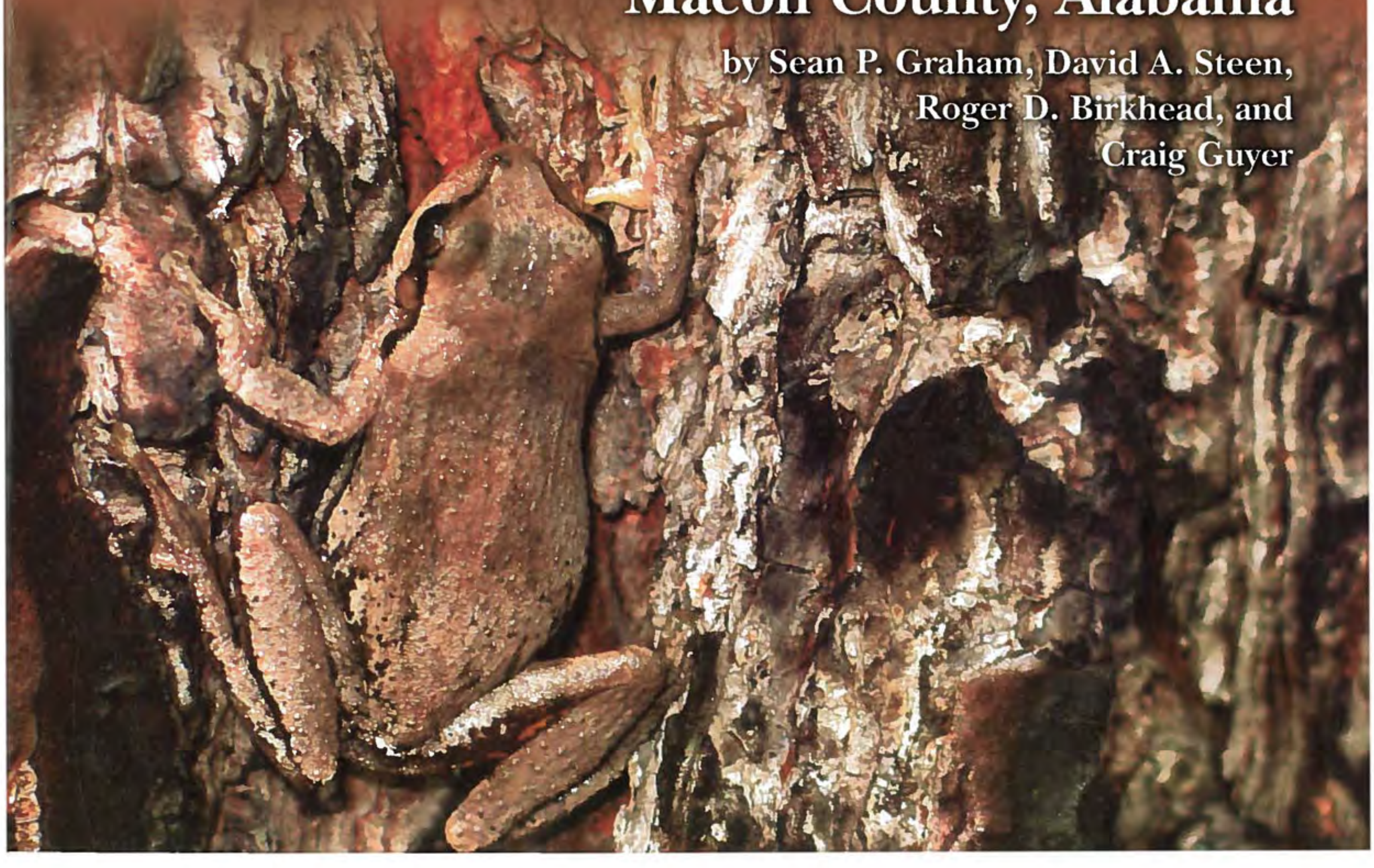

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THE UNIVERSITY OF ALABAMA
TUSCALOOSA, ALABAMA
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The Amphibians and Reptiles of Tuskegee National Forest, Macon County, Alabama.

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Abstract—Alarm over declines in amphibian and reptile populations worldwide has increased the need for baseline and long-term data on well-known herpetofaunas. Here, we compile natural history and relative abundance information for the herpetofauna of Tuskegee National Forest (TNF), Macon County, Alabama. Collection records and our recent four-year survey of TNF wetlands indicate at least 81 amphibian and reptile species are present, along with several additional species that have not been verified but are considered likely to occur in the forest. The relative abundance of most species based on detections in field surveys was not greatly misrepresented by their abundance in museum collections. However, some common and widespread species were represented by few if any museum specimens, and some rare species were represented by many specimens. Most species collected in the past were found during the recent survey, although *Ambystoma tigrinum*, *Pseudacris ornata*, *P. brachyphona*, and *Anaxyrus quercicus* were not, indicating that these amphibians may be extirpated from TNF. In addition, anecdotal information indicates that the snakes *Pantherophis gutattus* and *Lampropeltis getula* may have declined significantly in the area. Quantitative relative abundance and detection probability data are presented for the TNF herpetofauna, with the hope that future surveys will have a valuable point of reference for comparison.

INTRODUCTION

As concern grows over the global biodiversity crisis and the associated issues of amphibian and reptile population declines (Mittermeier et al. 1992; Gibbons et al. 2000), detailed information on well-studied amphibian and reptile faunas has become imperative to establish baseline information for future studies and to allow comparisons across sites. Some well-known herpetofaunas have received thorough treatment, and we have learned much from the numerous reports and synopses of long-term research from such study areas as the Tallgrass Prairie Reserve in Kansas (Fitch, 1999), Savannah River Site in South Carolina (Gibbons and Semlitch, 1991; Gibbons et al. 1997), Great Smoky Mountains National Park in Tennessee and North Carolina (Tilley and Huheey, 2001; Dodd, 2004), La Selva Biological Station in Costa Rica (Guyer and Donnelly, 2005; Whitfield et al., 2007), and Reserva Cusco Amazonico in Peru (Duellman, 2005). However, many more well-studied sites have not received thorough treatment or analysis, or in some cases information about these sites is available only in unpublished 'grey literature' reports written for government agencies that lack appropriate external review.

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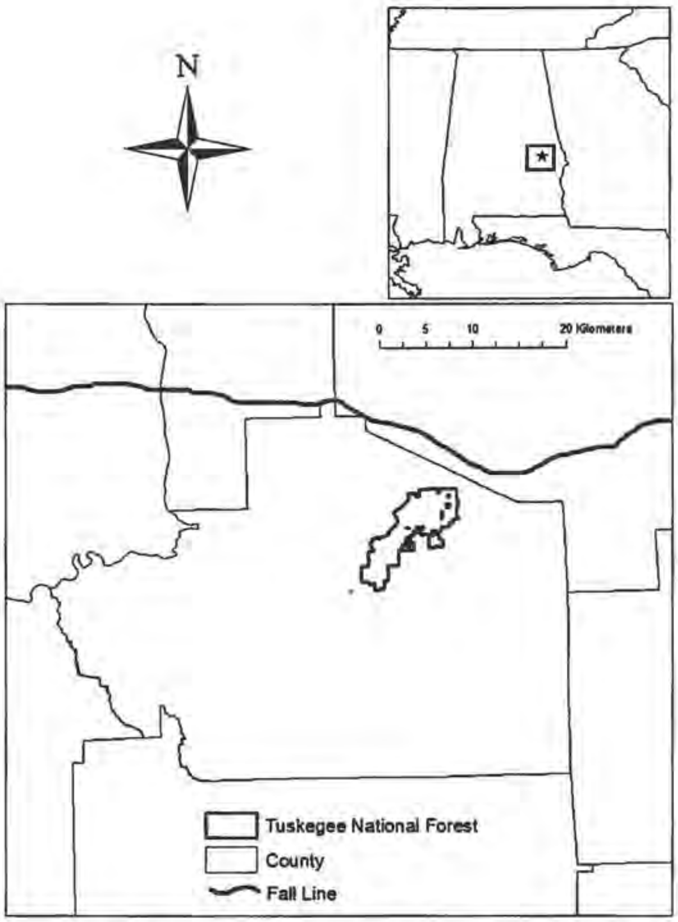

Figure 1 Map of the location of Tuskegee National Forest in Alabama.

Here, we compile distribution, relative abundance, detection probability, and natural history information for the herpetofauna of Tuskegee National Forest (TNF), Alabama, an area that has been utilized for research and teaching by students and faculty from nearby Auburn University for over fifty years. This is the first synthesis of herpetofaunal information for this small yet diverse parcel of public land, and in addition, we present the results of a recent, intensive survey of TNF wetlands. In this synthesis, we compile a species list for the site and describe details and observations of the natural history for species within TNF, compare patterns of abundance from the recent past to those of the past four years, and explore the origins and current conservation issues of this fauna.

MATERIALS AND METHODS

Study Site

The study area was the 75.54 km^2 Tuskegee National Forest (Fig. 1). Tuskegee National Forest (TNF) is the smallest property in the national forest system, and was established in 1959. For a history of land use at TNF and its establishment as a national forest, see Pasquill (2008). At the time of its designation as a national forest, TNF was composed largely of severely eroded and exhausted farmland, and was targeted for reforestation efforts (Pasquill, 2008). Since this time, ecological succession has proceeded and the forest is now a mosaic of lowland hardwood, mixed pine-hardwood, and wetland habitats. Higher elevations within TNF are composed of gravelly sandhills capped with upland longleaf pine (*Pinus palustris*) habitats that are currently being maintained by the U.S. Forest Service using prescribed burning. TNF is entirely within the Coastal Plain Physiographic Province, although its northern boundary is within 5 km of the contact with the Piedmont Physiographic Province (i.e., the Fall Line; Fig. 1). Geologically, TNF uplands are composed of Cretaceous gravel and sands of the Tuscaloosa and Eutaw formations, and lowlands are composed of Quaternary sand deposits and terraces (Markewich, 1982). Erosion has been so extensive within TNF that Paleozoic crystalline rocks underlying these younger deposits are exposed in some places (Markewich, 1982), for example, the slopes along the Bartram Trail and Choctafaula Creek floodplain S of State Road 186.

HABITATS OF TUSKEGEE NATIONAL FOREST

Wharton (1978) provides a detailed description of the plant and animal associations of the Fall Line and Upper Coastal Plain. Based on that reference, we recognized the following seven major habitats with TNF.

Permanent Ponds: These are permanent wetlands, including either natural ponds (oxbow lakes, beaver ponds; Fig 2) or man-made impoundments and borrow pits (e.g., the Tsinia Viewing Area ponds). These ponds usually contain large areas of open water with Spadderdock (*Nuphar advena*), Bladderwort (*Utricularia* spp.), and Water Shield (*Brasenia schreberi*), and shallow areas with heavy emergent vegetation (often with Bur Reed, *Sparangium americanum*) and occasionally standing dead trees. Black and Water Gum (*Nyssa sylvatica* and *N. aquatica*) are often the only trees able to grow in or near these ponds due to their long hydroperiod. Shrubs such as Buttonbush (*Cephalanthus occidentalis*), Virginia Sweetspire (*Itea virginica*), and alders (*Alnus* spp.) grow in shallow areas, and pond margins are lined with Dog-hobble (*Leucothoe axillaris*) and Storax (*Styrax americanus*), and woody vines such as Greenbrier (*Smilax* spp.) and American Wisteria (*Wisteria frutescens*). Water depth is up to 3 m, though most areas are considerably shallower. Permanent ponds are excellent breeding habitat for many frogs. Species closely associated with these ponds include *Acris gryllus* and *A. crepitans*, *Hyla cinerea*, *H. avivoca*, *Lithobates catesbeianus*, *L. clamitans*, *L. sphenocephalus*, *Siren intermedia*, *Amphiuma tridactylum*, *Agkistrodon piscivorus*, and pond turtles, such as *Trachemys scripta*, *Deiro-*

Figure 2 Permanent Pond. Beaver pond ("pond 1") S of FS 937. Photo taken in Apr, facing E along the beaver dam (32.43328°N; 85.64391°W).

chelys reticularia, *Chrysemys dorsalis*, and *Sternotherus odoratus*. Examples of permanent ponds include the Horseshoe Oxbow ("pond 4"; Fig. 3), beaver ponds S of FS 937 ("ponds 1-3", and "5"; Figs. 2, 3), and the Tsinia Wildlife Viewing Area ponds (see Appendix 1 for precise localities).

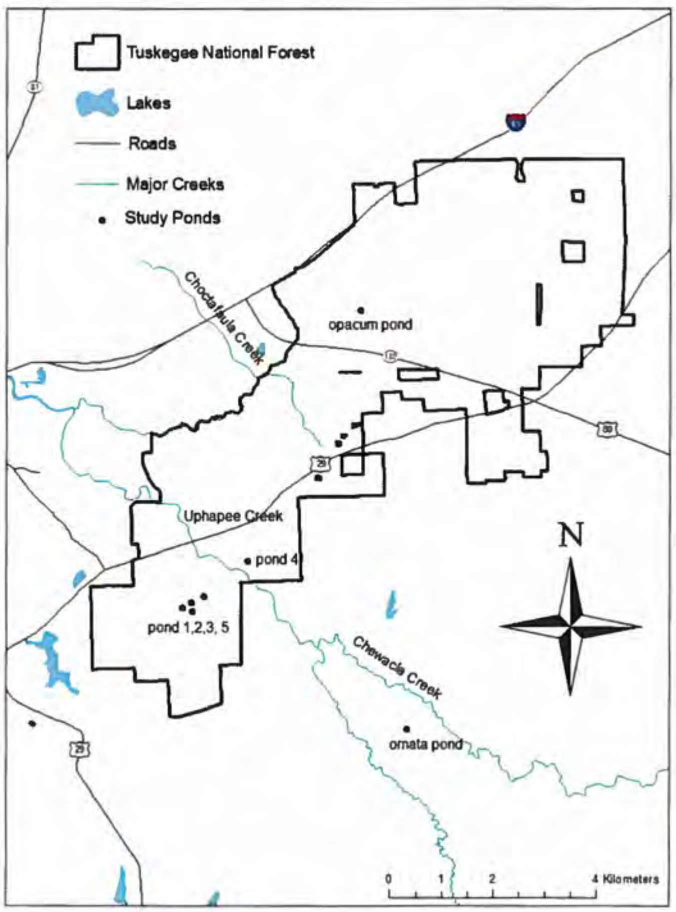

Figure 3 Map of Tuskegee National Forest with major streams, roads, and study ponds indicated (see text for details).

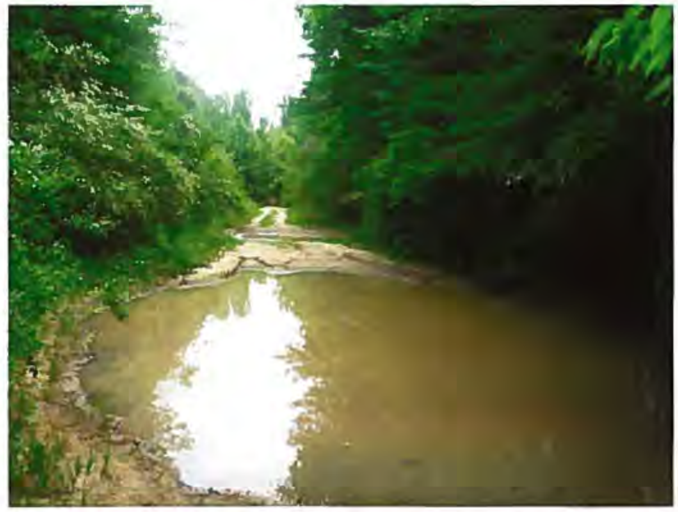

Figure 4 Ditch at the south terminus of FS 937. Photo taken in Apr, facing S (32.43648°N; 85.64624°W).

Temporary ponds: These are depression-type wetlands, including road side ditches (Fig. 4), that fill during winter and spring but dry out during the summer. These ponds are usually small with no outlet (isolated), and do not usually contain large predatory fish. For this reason they are excellent breeding habitats for most amphibians. Two major types occur in the area and differ in their herpetofaunal assemblage: woodland pools and grassy depressions. Woodland pools often have a closed canopy of hardwoods, dark water with no vegetation, and a thick layer of leaf litter on the bottom (Fig. 5). They are sometimes surrounded with heavy growth of sphagnum moss. Woodland pools are excellent breeding and larval habitat for *Ambystoma maculatum*, *A. opacum*, and *Hemidactylium scuta-*

Figure 5 Opacum Pond. Woodland pool NW of FS 900-906 intersection. Photo taken in Apr, facing N (32.48718°N; 85.6056°W).

Figure 6. Ornata Pond. Grassy depression S of TNF along Macon County Road 22. Photo taken in Apr, facing S (32.409042°N; 85.60119°W).

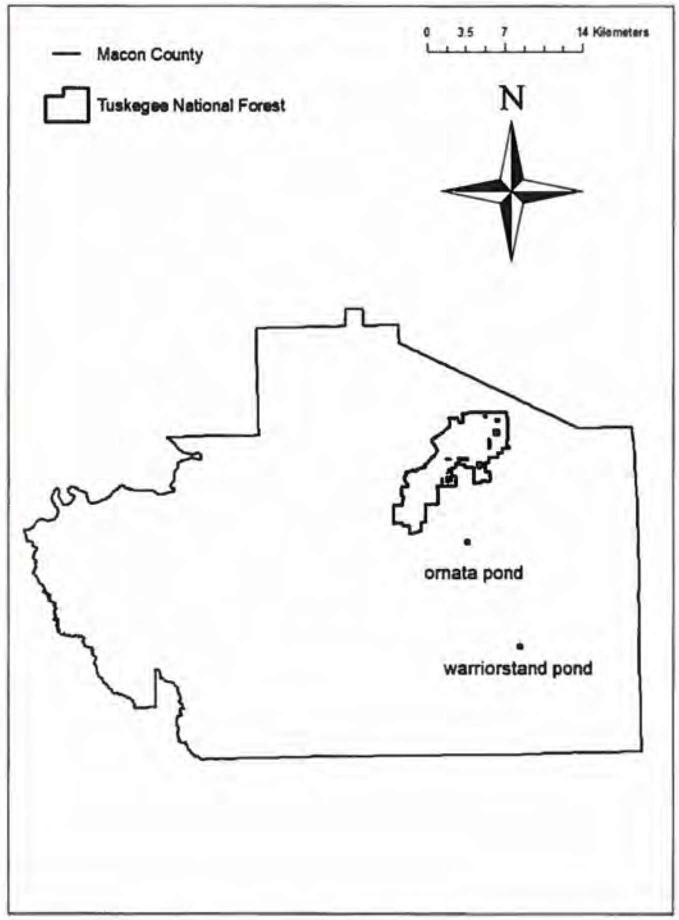

Figure 7. Map of Macon County, with Tuskegee National Forest (TNF) and Warriorstand and Ornata Ponds are indicated.

tum, and examples are found near the intersection of FS 900/906 ("Opacum Pond"; Figs. 3, 5). Grassy depressions are often found in open pine forests with sandy soils; these have clear water with abundant grassy growth and some shrubs (Fig. 6). These are excellent breeding habitat for *Ambystoma tigrinum*, *A. talpoideum*, *Acris gryllus*, *Anaxyrus terrestris*, *A. quercicus*, *Hyla gratiosa*, *H. femoralis*, and *Pseudacris ornata*. Examples probably once occurred in TNF at the intersection of Macon County Road 53 and U.S. Hwy 80, however, none which support this characteristic amphibian fauna are currently known at TNF. Therefore, we include two good examples of this pond type that occur close to TNF and are mentioned frequently in the species accounts. These are a pond just S of Macon County Road 22 ("Ornata Pond"; Figs. 3, 6, 7), and a pond at the intersection of Macon County Road 5 and 10 ("Warriorstand Pond"; Figs. 7-9), both of which were visited frequently during the study period due to the presence of amphibians of conservation interest. A detailed description of the late 1970s vegetation of Warriorstand Pond can be found in Botts (1978; Fig. 8). This pond has undergone considerable ecological succession and is now more similar to a woodland pool (Fig. 9). See also Appendix 1.

Large Creeks: These creeks are 15-30 m wide, with areas of both faster current and slow meanders with extensive sandbars (Fig. 10). Large logs and snags are common and provide habitat for basking turtles. Sometimes large accumulations of leaf litter can be found in sluggish areas,

Figure 8. Warriorstand Pond, 1976. Photo scanned with permission from Botts (1978: Fig. 2).

Figure 9. Warriorstand Pond, 2011. Near intersection of Macon County Road 5 and 10; photo taken in Apr (the pond is now dry), facing N (32.2993°N; 85.53989°W).

and these are excellent habitat for adults of certain salamanders (*Necturus*, *Siren*, and *Amphiuma*) and the larvae of plethodontid salamanders. Large creeks are homes for river turtles such as *Graptemys pulchra*, *Pseudemys concinna*, *Sternotherus minor*, and *Apalone spinifera*. Some snakes, such as *Nerodia sipedon*, are more closely associated with large creeks than other wetlands. In TNF, these creeks have very steep banks that are disconnected from their historical floodplains. Examples of larger creeks include Choctafaula and Uphapee Creeks (Fig. 3, 10).

Figure 10. Choctafaula Creek. Photo taken in Apr from FS 900 bridge, facing W (32.48975°N; 85.60397°W).

Figure 11. Seepage creek. Unnamed tributary of Choctafaula Creek on FS 900, N of the FS 900 Bridge over Choctafaula Creek. Photo taken in Apr, facing E (32.49626°N; 85.60985°W).

Small Creeks: Small creeks drain uplands and commonly feed into beaver ponds. Most are shallow, less than 2 m wide, and usually originate in seepage areas (Fig. 11). Deeper areas often support leaf litter accumulations where plethodontid salamander larvae are common. First-order streams can have a steeper gradient or sluggish zones with extensive muddy seepages, sometimes with thick layers of sphagnum moss (Fig. 12). Small creeks are good breeding habitat for stream-breeding salamanders, such as *Pseudotriton ruber*, *Eurycea cirrigera*, *E. chamberlaini*, and *Desmognathus conanti*. Seepages are excellent habitat for these species as well as for *P. montanus* and *Pseudacris brachyphona*. *Diadophis punctatus* is often found near seepages as well, probably since their salamander prey is abundant here. See Appendix 1 for precise localities.

Figure 12. Sphagnum seep associated with unnamed tributary of Choctafaula Creek (see Fig. 11).

Hardwood Forests: These are mature, late successional forests dominated by oaks (*Quercus* spp.) and hickories (*Carya* spp., Fig. 13). Bottomland hardwoods often have Spruce Pine (*Pinus glabra*), Southern Magnolia (*Magnolia grandiflora*), Overcup Oak (*Quercus lyrata*), Swamp Chestnut Oak (*Quercus michauxii*), and gums (*Nyssa* spp.). Slope forests, with the dominant trees American Beech (*Fagus grandifolia*), White Oak (*Quercus alba*) and Southern Magnolia, are common in some areas (Fig. 14), and these may be places where amphibians and reptiles of a more northern affinity (e.g., *Plestiodon anthracinus*, *Carphophis amoenus*), which are not currently known from TNF, may eventually be found. When flooded, hardwood forests can provide habitat (floodplain pools) for breeding salamanders and frogs, and during the summer, snakes, salamanders, and frogs forage in these woods, usually spending most of their time in the leaf litter. Excellent hardwood forest stands are found along Uphapee Creek at U.S. Hwy 80 and Choctafaula Creek at State Road 186 (Fig. 13). Slope forests are common along this same floodplain near FS 900 north and south of U.S. Hwy 80 (Fig. 14).

Mixed Pine-Hardwood Forests: These are successional forests found on slopes and low areas throughout TNF; they are dominated by Sweetgum (*Liquidambar styraciflua*), Sourwood (*Oxydendrum arboreum*), Loblolly Pine (*Pinus taeda*), and young oaks (*Quercus* spp.) and hickories (*Carya* spp.) (Fig. 15). They usually contain thick underbrush with Greenbrier (*Smilax* spp.), Blackberry (*Rubus* spp.), and shrubs such as American Beautyberry (*Callicarpa americana*). In some places, the heavy growth of young pines and shrubs form impenetrable pine jungles. Sunny openings in these young forests can be preferred habitat for lizards and snakes, and the abundant coarse woody debris on the forest floor is used by *Pantherophis spiloides* and *Agkistrodon contortrix*. Examples include the forests surrounding the numerous beaver ponds S of FS 937, and along FS 937 S of U.S. Hwy 80.

Figure 13. Hardwood Forest. Choctafaula Creek floodplain E of FS 186. Photo taken in Apr facing S (32.47809°N; 85.62027°W).

Figure 14. Beech Magnolia Forest. Slope near Choctafaula Creek floodplain, along FS 900 N of State Road 186. Photo taken in Apr, facing W (32.48272°N; 85.61212°W).

Figure 15. Mixed Pine-Hardwood Forest. Photo taken along FS 900 N of U.S. 80, facing S (32.48106°N; 85.61465°W).

Upland Pine Forests: These are areas on sand ridges, and are characterized by open stands of Longleaf Pine (*Pinus palustris*) with an herbaceous groundcover (usually warm season grasses such as *Andropogon* ssp., legumes such as Goat's Rue, *Tephrosia virginiana,* and Bracken Fern, *Pteridium aquilinum*), or scrub-dominated understory (Fig. 16). Occasional specimens of xeric-adapted vegetation and mature relict longleaf pines indicate these forests once dominated much more of the landscape. Examples of this relict vegetation (see Appendix 1) include Turkey Oak (*Quercus laevis*) and Bluejack Oak (*Quercus incana*). This forest type requires frequent fire to maintain a natural state, and most upland sites are now being actively managed using prescribed fires. These areas are home to *Masticophis flagellum* and *Aspidoscelis sexlineatus*, and such rarities as *Plestiodon inexpectatus*, *P. egregius*, and *Tantilla coronata.* Well-managed tracts of open longleaf pine are now found on ridges adjacent to U.S. Hwy 80 NE of Uphapee Creek.

Figure 16. Upland Longleaf Pine Forest. Photo taken along U.S. Hwy 29 E of Tuskegee (32.45495°N; 85.62590°W).

COLLECTIONS AND SURVEYS

Museum collections are considered a valuable indicator of general population trends for amphibians and reptiles (Boundy, 2005), although variation in collection effort is a confounding factor. Therefore, interpretation of museum collections must be treated with caution. We compiled numbers of individuals and species richness of amphibian and reptiles from TNF by evaluating the Auburn University Herpetological Collections (AUM). TNF has been the destination for Auburn University vertebrate biology and herpetology field trips for decades, and most museum specimens were collected during such trips, especially during the 1970's and early 1980's, when collections were required for the two courses.

From these collections, we compiled a species list for the TNF herpetofauna; from the numbers of each species collected from 1959-2010 we categorized the relative abundance of TNF amphibians and reptiles. Species collected only once during this period were considered 'rare,' species collected two-five times were considered 'uncommon,' species collected 6-25 times were considered 'common,' and species collected over 25 times during this period were considered 'abundant.' The number of specimens of each species collected from 1959-2010 are listed in Table 1.

From Apr-Oct 2007-2009, a herpetofauna census was conducted in TNF wetlands; two to four researchers conducted visual encounter surveys (VES; Heyer et al., 1994) at five TNF wetlands (four beaver marshes and an oxbow lake; ponds 1-5; Fig. 3) twice a week (one each during the day and once during the following night) for each week of the active season (Apr through Oct) of most of the herpetofauna. Visitation to these ponds was rotated such that each was sampled twice per month. During these surveys, observers walked slowly along the wetland margin and counted each individual of each amphibian and reptile species encountered.

Survey effort was calculated by recording the amount of time spent by each observer during the VES and subtracting the processing time for herpetofauna captured. During 2007-2009, un-baited hoop (n = 2-4) and crayfish traps (n = 9) were set for one night each week at one of the above ponds, such that each pond was trapped once per month. Traps were checked the next day for captured amphibians and reptiles. Crayfish traps were placed in 0.5 m deep water along the pond margin, usually in emergent vegetation. Hoop traps were placed in 1 m deep water, usually in the deep channel along beaver dams. Minnow trap and drift fence sampling was also conducted once a

Table 1. Summary of amphibian and reptile abundance estimates from TNF, 1959-2010. Numbers encountered were derived from the 2007-2010 survey, either during visual encounter surveys (/h) or by trap nights (/tn). * Indicates that the species was detected during the 2007-2010 survey. ** Indicates both *Acris gryllus* and *A. crepitans* were recorded as a single taxon; both species are morphologically similar and require time to distinguish, and field encounters were simply recorded as "*Acris* sp." † Indicates this number refers to a large number of metamorphic individuals detected. See text regarding how abundance categories were generated.

Species	number of AUM specimens	**total encountered (encounter rate/h- or /tn)**	**relative abundance**	abundance change?
		Caudata		
*Ambystoma maculatum**	3	**2**	**uncommon**	
*Ambystoma opacum**	10	**29** (0.06/h; 0.35-1.97/h)	**abundant**	
*Ambystoma talpoideum**	3	**3** (0.006/h; 0.19-0.46/h)	**uncommon**	
Ambystoma tigrinum	1	**0**	**rare**	
*Amphiuma tridactylum**	4	**2**	**uncommon**	
*Desmognathus conanti**	4	**7** (0.02/h; 0.5-1.33/h)	**common**	
*Eurycea cirrigera**	18	**4** (0.01/h; 0.18-1/h)	**uncommon**	
*Eurycea chamberlaini**	5	**7** (0.03/h; 0.37-1/h)	**common**	
*Eurycea guttolineata**	14	**30** (0.07/h; 0.18-2/h)	**abundant**	
*Hemidactlium scutatum**	1	**1**	**rare**	
*Plethodon glutinosus**	6	**16** (0.66/h)	**common**	
*Pseudotriton montanus**	5	2	**rare**	
*Pseudotriton ruber**	1	**2** (0.006/h; 0.28-0.63/h)	**uncommon**	
*Notophthalmus viridescens**	0	**4** (0.01/h; 0.25-1/h)	**uncommon**	
*Siren intermedia**	7	**14** (0.04/h; 0.28-2.5/h)	**common**	
		Anura		
*Anaxyrus fowleri**	3	**36** (0.09/h; 0.17-1.97/h)	**abundant**	underestimated
Anaxyrus quercicus	3	**0**	**rare**	
*Anaxyrus terrestris**	0	13 (0.02/h; 0.29-1.72/h)	**common**	underestimated
*Acris crepitans**	**1**	**5134**** (15.55/h (0.35-154/h)	**abundant**	underestimated
*Acris gryllus**	59		**abundant**	
*Hyla avivoca**	6	**119** (0.26/h; 0.17-5.94/h)	**abundant**	
*Hyla cinerea**	6	**268** (0.62/h; 0.24-6.88/h)	**abundant**	
*Hyla chrysoscelis**	7	**35** (0.076/h; 0.19-2.86/h)	**abundant**	
*Hyla femoralis**	3	**18** (0.03/h; 0.23-2.62/h)	**common**	
*Hyla gratiosa**	2	**3** (0.008/h; 0.6-0.6/h)	**uncommon**	
*Hyla squirella**	0	**4** (0.013/h; 0.95-1.33/h)	**uncommon**	
Pseudacris brachyphona	6	**0**	**rare**	overestimated
*Pseudacris crucifer**	1	**58†** (0.15/h; 0.35-18.26/h)	**abundant**	underestimated

Table 1. *continued*

Species	number of AUM specimens	**total encountered (encounter rate/h- or /tn)**	**relative abundance**	abundance change?
*Pseudacris feriarum**	14	**1** (large choruses heard)	**common**	
Pseudacris ornata	15	**0**	**rare**	overestimated
*Gastrophryne carolinensis**	5	**17** (0.07/h; 0.32-3.2/h)	**common**	
*Lithobates catesbieanus**	4	**42** (0.135/h; 0.17-2/h)	**abundant**	underestimated
*Lithobates clamitans**	5	**73** (0.197/h; 0.31-4.35/h)	**abundant**	underestimated
*Litobates sphenocephalus**	4	**53** (0.179/h; 0.176-4/h)	**abundant**	underestimated
*Scaphiopus holbrookii**	13	4	**uncommon**	
Testudines				
*Chelydra serpentina**	1	**5** (0.03/tn; 0.75-1/tn)	**uncommon**	
*Chrysemys dorsalis**	0	**14** (0.05/tn; 0.25-1.25/tn)	**common**	underestimated
*Deirochelys reticularia**	2	**13** (0.05/tn; 0.16-0.5/tn)	**common**	
*Graptemys pulchra**	2	**2**	**uncommon**	
*Pseudemys concinna**	2	**4**	**uncommon**	
*Terapene carolina**	2	**11** (0.04; 0.16-1.33/h)	**common**	
*Trachemys scripta**	0	**8** (0.04/tn; 0.11-0.44/tn) **196** (0.79/tn; 0.25-13/tn)	**abundant**	underestimated
*Kinosternon cf. baurii**	0	**2**	**uncommon**	
*Kinosternon subrubrum**	4	**14** (0.02/tn; 0.11-0.44/tn) **25** (0.12/tn; 0.25-2.5/tn)	**abundant**	underestimated
*Sternotherus minor**	1	**1**	**rare**	
*Sternotherus odoratus**	0	**220** (0.39/tn; 0.11-11/tn) **65** (0.29/tn; 0.17-6.5/tn)	**abundant**	underestimated
*Apalone spinifera**	1	**1**	**rare**	
Squamata				
Ophisaurus attentuatus	1	**0**	**rare**	
*Ophisaurus ventralis**	1	**1**	**rare**	
*Sceloporus undulatus**	1	**4** (0.006/h; 0.25-0.44/h)	**uncommon**	
*Anolis carolinensis**	6	**118** (0.41/h; 0.17-9/h)	**abundant**	
Plestiodon egregius	1	**0**	**rare**	
Plestiodon inexpectatus	5	**0**	**rare**	
*Plestiodon fasciatus**	3	**36** (0.13/h; 0.19-2.5/h)	**abundant**	underestimated
*Plestiodon laticeps**	3	**2** (0.004; 0.19-0.36/h)	**uncommon**	
*Scincella lateralis**	6	**6** (0.01/h; 0.32-0.75/h)	**common**	
*Aspidoscelis sexlineatus**	2	**10** (0.06/h; 0.25-5/h)	**common**	
*Cemophora coccinea**	2	2	**uncommon**	

Table 1. *continued*

Species	number of AUM specimens	**total encountered (encounter rate/h- or /tn)**	**relative abundance**	abundance change?
*Coluber constrictor**	1	**9** (0.006/h; 0.25-0.37/h)	**common**	underestimated
*Diadophis punctatus**	9	**4** (0.01; 0.18-0.6h)	**uncommon**	
*Farancia abacura**	1	**4** (0.36/h)	**uncommon**	
*Heterodon platyrhinos**	0	**1**	**rare**	
*Lampropeltis getula**	2	1	**rare**	
Masticophis flagellum	1	**1**	**rare**	
*Nerodia sipedon**	0	**4** (0.014h; 0.27-1.5/h)	**uncommon**	
*Opheodrys aestivus**	0	**1**	**rare**	
*Nerodia erythrogaster**	6	**18** (0.048/h; 0.28-1/h)	**common**	
Pantherophis guttatus	1	**0**	**rare**	
*Pantherophis spiloides**	2	**2** (0.006/h; 0.34-0.61/h)	**uncommon**	
*Regina rigida**	3	1	**rare**	
Regina septemvitatta	1	0	**rare**	
*Storeria dekayi**	2	**3** (0.009; 0.37-0.67/h)	**uncommon**	
Storeria occipitomaculata	5	0	**uncommon**	
Tantilla coronata	4	0	**uncommon**	
*Thamnophis sauritus**	0	**5** (0.014/h; 0.28-0.7/h)	**uncommon**	
*Thamnophis sirtalis**	1	**2** (0.008/h; 0.22-1/h)	**uncommon**	
Virginia striatula	7	0	**uncommon**	overestimated
*Virginia valeriae**	4	1	**uncommon**	
*Agkistrodon contortrix**	1	**6** (0.27/h)	**common**	underestimated
*Agkistrodon piscivorus**	5	**494** (1.45/h; 0.19-9.03/h)	**abundant**	underestimated
*Crotalus horridus**	3	**2** (0.34/h)	**uncommon**	

week in 2008. Un-baited minnow traps (n = 6) were placed in emergent vegetation in beaver ponds, and 15 m drift fences with two bucket traps located opposite one another in the center of the array and minnow traps (n = 4; two on the end of each arm) were erected within 5 m of each beaver pond parallel with its margin.

From the above data, we developed qualitative and quantitative detection rates for species encountered during the 2007-2010 survey. We compared the total number of each species encountered to the museum records using the same relative abundance categories. We considered species abundance to have been significantly underrepresented by museum records if the species moved more than two categories higher in abundance based upon surveys. Species were considered significantly overrepresented in museum records if they moved more than two categories down in abundance based upon surveys. The total number of individuals for each species encountered during the 2007-2010 field season, and these abundance comparisons, are found in Table 1. Quantitative abundance estimates included encounter rates for species encountered more than once (mean number observed per person hour, or mean number captured per trap night), and these are also included for each species in Table 1.

Anuran calling surveys were conducted concomitant with the above VES (twice a week Apr-Oct). Winter anuran calling surveys were conducted once every two weeks Jan-Mar during 2008 at the all of the above ponds and at Ornata Pond. During each day or night survey (ranging from 5 min for winter breeding surveys to several h for those conducted concomitant with VES surveys), the maximum calling index (Heyer et al., 1994) for each species at the pond surveyed was recorded. From these data we were able to determine an additional relative abundance index for TNF frogs; 1 = males calling such that individual males could be counted, 2 = individual males could be distinguished but calling overlap prevented counting males, 3 = steady calling pulses in which individual males could not be distinguished or counted. We used these data to create anuran calling phenograms for each species at TNF based upon seasonal variation in the calling index (Table 3 and 4). In addition, we were able to inform our relative abundance categories for each anuran species using this additional abundance estimate. See Appendix 1 for precise locality data for ponds surveyed.

From 2004-2010, opportunistic road cruising surveys were conducted on rainy nights. These surveys expanded from TNF, and covered areas of west central Georgia and east central Alabama. We used these data to infer patterns of seasonal activity and movement patterns of amphibians and reptiles known from TNF to supplement information in the species accounts. During 2007-2008 we noted snakes found dead or alive on Wire Road from SW of Auburn city limits to the western TNF boundary. These data were used to supplement snake natural history information. Various species were encountered incidentally at TNF during class field trips and other research unrelated to the standardized wetland surveys, and we included these incidental encounters as additional information for rarer species. Finally, various species present in TNF were studied by Auburn undergraduate and graduate students in the TNF area; these unpublished theses and dissertations represent a treasure trove of natural history information and were consulted to enrich the information in our species accounts.

The probability of detecting a species when it is present is unlikely to be 100% (Mazerolle et al., 2007). Therefore, abundance values and encounter rates should be regarded with caution unless detection probabilities have been incorporated into analyses (Mackenzie et al., 2006). Recent developments have allowed researchers to compensate for these varied detection probabilities while generating predicted occupancy rates over multiple sites. To integrate these advances into the current survey, we generated detection probabilities for all species represented by five or more individuals detected during visual encounter surveys, captured within hoop and crayfish traps, or detected on five or more occasions during anuran calling surveys. Detection probability is defined as the chance of detecting a species in a given sample at one site, assuming it is present. Our goal was not a comprehensive analysis identifying factors that influence the detection of a particular species; rather, we attempted to generate values that allowed us to evaluate the relative detection for the various species observed in TNF and put our observed values in context. For each species, we generated a single-season model (MacKenzie et al., 2002) with Program Presence (Hines, 2010) and report the detection probability as well as the observed and estimated occupancy rates. Estimated occupancy rates were the proportion of sites where the species is expected to be present. Our sites were each of the sampled ponds, and sampling occasions were defined as one visit (effort is described above for each sampling strategy).

RESULTS

Species Accounts

All known TNF amphibians and reptiles are treated briefly below. We attempted to include information that would be useful to land managers, conservationists, biologists, and the lay public. When details of their natural history are common to the entire family, they are given in the family heading above each species account. Consequently, readers should consult the family and species accounts for a thorough treatment of each species. In general, the species accounts include this information in the following order: relative abundance, habitats occupied, seasonal activity and breeding patterns, diet information, known predators, and reliable localities within TNF where they might be expected to be encountered. However, for some species more is known about their natural history within TNF since they were frequently observed during our research; thus, some species are treated in much more detail than others. For example, some species were not encountered during our study or were only rarely encountered, so information about these species is correspondingly sparse. In addition, some species are more thoroughly treated because specific research targeted them within or near TNF (e.g., they were the subjects of undergraduate or Master's research). Due to the ease with which some species are detected and observed (e.g., frogs and salamanders) versus others that are exceedingly difficult to observe (e.g., snakes and aquatic turtles), the amount of detail in the species accounts has obvious taxonomic biases. Finally, species considered to be of conservation concern contain additional discussion about their current or past status at TNF.

Details of each species' natural history were gleaned from museum records and our 2007-2010 research in an attempt to describe their local habits. More detailed synopses of their range wide ecology and natural history can be found elsewhere for salamanders (Petranka, 1998; Lannoo, 2005), frogs (Lannoo, 2005), turtles (Ernst and Lovich, 2009), lizards (Smith, 1946), and snakes (Ernst and Ernst, 2004). Details regarding their identification should be sought in field guides, such as Mount (1975) and Conant and Collins (1991). Taxonomic changes have been extensive in recent years and we have attempted to follow the most recent changes. An "*" indicates these species were encountered recently (2007-2010) during our studies within TNF. Appendix 1 provides precise locality data for study sites mentioned frequently in the species accounts.

Table 2. Occupancy rates and detection probabilities (± standard error) for TNF amphibians and reptiles. Occupancy rates approaching 1 = species detected or likely to be detected at all sites. Estimates for each species encountered more than five times for each survey type are indicated. See text for details regarding how these estimates were derived.

Species	observed occupancy	estimated occupancy	± SE	detection probability	± SE
Sternotherus odoratus					
Crayfish Trap	1	1	0	0.48	0.06
Hoop Trap	1	1	0	0.29	0.05
Kinosternon subrubrum					
Crayfish Trap	0.6	0.6	0.22	0.27	0.07
Hoop Trap	0.8	0.87	0.21	0.18	0.05
VES	0.4	0.57	0.32	0.05	0.03
Trachemys scripta					
Hoop Trap	1	1	0	0.51	0.06
Dierochelys reticularia					
Hoop Trap	0.8	0.85	0.2	0.17	0.05
Chrysemys dorsalis					
Hoop Trap	0.6	0.76	0.24	0.17	0.05
Chelydra serpentina					
Hoop Trap	0.2	0.27	0.25	0.11	0.09
Nerodia erythrogaster					
VES	1	1	0	0.1	0.02
Agkistrodon piscivorus					
VES	1	1	0	0.78	0.034
Thamnophis sauritus					
VES	0.6	1	0	0.03	0.01
Lithobates clamitans					
VES	1	1	0	0.21	0.03
Call	1	1	0	0.41	0.04
Lithobates catesbieanus					
VES	1	1	0	0.2	0.03
Call	1	1	0	0.22	0.03
Lithobates sphenocephalus					
VES	1	1	0	0.21	0.03
Call	1	1	0	0.2	0.03
Hyla cinerea					
VES	1	1	0	0.32	0.04
Call	1	1	0	0.4	0.04
Hyla chrysoscelis					
VES	0.8	0.88	0.21	0.08	0.03
Call	1	1	0	0.19	0.03
Hyla avivoca					
VES	1	1	0	0.2	0.03

Table 2. *continued*

Species	observed occupancy	estimated occupancy	± SE	detection probability	± SE
Call	1	1	0	0.4	0.04
Hyla femoralis					
VES	0.6	1	0	0.02	0.01
Call	1	1	0	0.17	0.03
Acris crepitans					
Call	1	1	0	0.29	0.03
Acris gryllus					
VES	1	1	0	0.75	0.04
Call	1	1	0	0.53	0.04
Hyla squirrella					
Call	0.4	0.46	0.26	0.07	0.03
Pseudacris crucifer					
VES	0.8	0.83	0.19	0.08	0.03
Call	0.8	0.8	0.18	0.21	0.03
Pseudacris ferarium					
Call	0.8	0.81	0.18	0.13	0.03
Anaxyrus terrestris					
VES	0.8	1	0	0.03	0.01
Call	0.6	0.74	0.3	0.04	0.02
Anaxyrus fowleri					
VES	0.8	0.81	0.18	0.15	0.03
Call	0.8	0.87	0.2	0.08	0.02
Gastrophyrne carolinensis					
VES	0.8	1	0	0.07	0.02
Call	1	1	0	0.07	0.02
Eurycea guttolineata					
VES	0.4	0.44	0.24	0.15	0.04
Eurycea chamberlaini					
VES	0.8	1	0	0.05	0.02
Ambystoma opacum					
VES	1	1	0	0.08	0.02
Siren intermedia					
VES	0.2	0.23	0.2	0.12	0.05
Desmognathus conanti					
VES	0.4	0.58	0.34	0.05	0.03
Anolis carolinensis					
VES	1	1	0	0.25	0.04
Scincella lateralis					
VES	0.6	1	0	0.03	0.01
Plestiodon fasciatus					

Table 2. *continued*

Species	observed occupancy	estimated occupancy	± SE	detection probability	± SE
VES	1	1	0	0.14	0.3
Aspidoscelis sexlineatus					
VES	0.2	0.23	0.2	0.12	0.05
Terrapene carolina					
VES	0.8	1	0	0.05	0.02

Caudata (Salamanders)

Ambystomatidae (Mole Salamanders). Mole salamanders are relatively large and heavy-bodied, and spend most of their existence in subterranean burrows. They are found most often above ground in winter and early spring en route to temporary ponds during rains, and in and around the margin of these ponds during breeding. Most species lay aquatic eggs in gelatinous masses that hatch into larvae with pond-type morphology (large, bushy gills, robust body shape, with tall tail fins). The larvae feed on aquatic invertebrates and amphibian larvae, transform in late spring-early summer, and recently metamorphosed individuals migrate away from ponds at this time. Mole salamanders typically breed in fishless wetlands, since larvae cannot tolerate fish predation. Adults likely feed on insects and other invertebrates, and may fall prey to snakes and small mammals. Excellent examples of ephemeral woodland pools suitable for ambystomatid salamander breeding can be found at the intersection of FS 900/906 in the Choctafaula Creek floodplain (Opacum Pond).

Ambystoma maculatum (Spotted Salamander*). Uncommon. Adult Spotted Salamanders (Fig 17, pg. 20) occupy subterranean retreats in hardwood forests, and migrate to woodland pools Dec-Feb to breed. Males in breeding condition were observed on area roads on 15 Dec and 7 Jan (2007), and gravid females were observed on roads 7 and 22 Feb (2006). Large concentrations of adults breed explosively in other parts of this species' range, but no explosive breeding events were observed during the study period; instead, this species seems to be dispersed across the landscape in very small ponds located in hardwood forests. Egg masses (4-6) were observed at Opacum Pond on 19 Jan (2009), and 10-20 were observed adjacent to beaver ponds E of Choctafaula Creek on 27 Feb (2007). The timing of metamorphosis and pond egress at TNF was not observed. Adults, egg masses, and larvae are reliably observed at Opacum Pond.

Ambystoma opacum (Marbled Salamander*). Abundant. Adult Marbled Salamanders (Fig 18, pg.20) occupy subterranean retreats in hardwood forests, and migrate to dry woodland pools with the onset of fall rains from Sep-Nov. Females deposit eggs under leaf litter and logs and brood them until winter rains fill the pond. Small numbers of *A. opacum* have been observed on roads during Dec-Feb, possibly indicating when adults leave mating areas and nests. Metamorphic individuals have been found along TNF pond margins Apr-May, and seen on roads migrating away from ponds in May. Marbled Salamanders are reliably observed in numbers near the Horseshoe Oxbow, at Tsinia Wildlife Viewing Area, near the beaver ponds S of the terminus of FS 937, and in Opacum Pond. This distribution suggests that this species is spread more uniformly across hardwood habitats than any other TNF ambystomatid.

Ambystoma talpoideum (Mole Salamander*). Uncommon. Mole Salamanders (Fig 19, pg. 20) occupy subterranean retreats in hardwood and pine forests, and migrate to woodland pools and grassy depressions Nov-Jan. They are more closely associated with grassy depressions than *A. opacum* and *A. maculatum*. Adult Mole Salamanders were trapped (using minnow traps) from Ornata Pond Feb-Mar 2008. Females deposit small clusters of eggs in ponds, and metamorphic individuals have been found May-Jun under logs near the margins of ponds. Adults were found on roads near Ornata Pond on 4 Apr (2008), possibly as they left the pond after breeding. Paedomorphic individuals (larval adults with functional gonads) are known from other populations but are not known from TNF. Mole Salamanders are reliably encountered as larvae (Apr-May) and metamorphic individuals (May-Jun) near beaver ponds S of the terminus of FS 937, and as adults in and migrating to Ornata Pond just S of TNF boundary. Larvae have also been found by dip netting the shallow arms of the TNF Horseshoe Oxbow, and also the main part of this pond, which is unusual since it has many large predatory fish. Mole Salamanders have only rarely been observed in Opacum Pond.

Ambystoma tigrinum (Tiger Salamander). Rare, and possibly extirpated. Tiger Salamanders (Fig 20, pg.20) are subterranean salamanders that live primarily in upland pine forests or pine flatwoods in the Southeast and breed in grassy depressions. The sole Tiger Salamander specimen

Table 3 Frog call phenology for TNF, 2007-2009. Open circles = calling index 1; few males calling, such that males were countable; grey circles = calling index 2; male calling frequent and overlapping, such that individual males could be distinguished but not counted; black circles = calling index 3; male calls completely overlapped into a large, steady chorus; individual males could not be distinguished. LICL = *Lithobates clamitans*, **LICA =** *L. catesbeianus*; **LISP =** *L. sphenocephalus*; **HYCI =** *Hyla cinerea*; **HYCH =** *H. chrysoscelis*; **HYAV=** *H. avivoca*; **HYFE =** *H. femoralis*; **HYSQ =** *H. squirella*; **HYGR =** *H. gratiosa*; **PSCR =** *Pseudacris crucifer*; **PSFE =** *P. feriarum*; **PSOR =** *P. ornata*; **ACGR =** *Acris gryllus*; **ACCR =** *A. crepitans*; **ANTE =** *A. terrestris*; **ANFO =** *Anaxyrus fowleri*; **GACA =** *Gastrophryne carolina*.

Site	Date			LICL	LICA	LISP	HYCI	HYCH	HYAV	HYFE	HYSQ	HYGR	PSCR	PSFE	PSOR	ACGR	ACCR	ANTE	ANFO	GACA
POND 3	4	3	2007	○	○		●	○	●	○			○			●		●		
POND 1	4	12	2007										●			●				
POND 4	4	19	2007	○	○		○		●				○			●			○	
POND 2	4	24	2007	○	○		◐	○	●	○						●		○	○	
POND 1	4	27	2007				◐		◐			○				●				
POND 3	5	3	2007	○	○		●		◐	○						●				
POND 1	5	10	2007	○	○		◐	○	●							●	○			
POND 4	5	17	2007	○	○		○		○	○						●	●			
POND 2	5	24	2007	○			○	○	○	○						●	○			
POND 2	5	25	2007	○				○	○											
POND 3	5	31	2007	○	○	○	●		●	○						●	●			
POND 1	6	5	2007				○		○							○		○		
POND 4	6	12	2007	○			○		●							●	●		○	
POND 2	6	19	2007			○				○						○				
POND 5	6	19	2007	○			○		●							●	○			
POND 3	6	28	2007	○		○	●		○		○					●	●			
POND 1	7	5	2007	○	○		●	○	○	○	○					○			○	
POND 1	7	6	2007	○			○	○	○	○	○									
POND 1	7	9	2007	○	○		●	○	●	●						●	●			●
POND 5	7	19	2007	○			○	○	○	○						○	○			○
POND 5	7	20	2007	○						○						○				○
POND 4	7	25	2007	○			●	○	●	○						●	●			○
POND 3	7	26	2007	○	○		●	○	○	○						●	○			○
POND 1	7	30	2007	○					○											
POND 2	8	1	2007																	
POND 3	8	1	2007	○																
POND 4	8	6	2007	○			○									●	○			
POND 4	8	13	2007	○				○								○	●			

Taable 3. *continued*

Site	Date			LICL	LICA	LISP	HYCI	HYCH	HYAV	HYFE	HYSQ	HYGR	PSCR	PSFE	PSOR	ACGR	ACCR	ANTE	ANFO	GACA
POND 5	8	15	2007	○												○				
POND 4	8	22	2007	○												○	○			
POND 3	8	23	2007	○			○			○						○				
POND 3	8	27	2007				●	○		●						○				●
POND 1	8	27	2007					○			○									
POND 1	8	30	2007	○	○			○		○	○									
POND 3	8	31	2007	○			●			○	○					○	○			●
POND 4	9	5	2007	○																
POND 5	9	11	2007	○																
POND 3	9	20	2007	○																
POND 1	9	27	2007						○											
POND 4	10	3	2007						○											
POND 5	10	10	2007			○														
POND 1-5	10	29	2007																	
POND 1-5	10	30	2007																	
POND 1	1	17	2008																	
POND 2	1	17	2008																	
POND 3	1	17	2008			○														
POND 4	1	17	2008			○							○							
ORNATA	1	17	2008											○						
POND 1	1	31	2008										○	○						
POND 2	1	31	2008											○						
POND 3	1	31	2008			●														
POND 4	1	31	2008										○							
ORNATA	1	31	2008										○	○	○					
POND 1	2	8	2008			●							●	●						
POND 2	2	8	2008			○							○	○						
POND 3	2	8	2008			○							○	○						
POND 4	2	8	2008			○							○	○						
ORNATA	2	8	2008			○							●	●	●					
POND 1	2	16	2008			●							●	●						

Table 3. *continued*

Site	Date			LICL	LICA	LISP	HYCI	HYCH	HYAV	HYFE	HYSQ	HYGR	PSCR	PSFE	PSOR	ACGR	ACCR	ANTE	ANFO	GACA
POND 2	2	16	2008			○							●	●						
POND 3	2	16	2008			●							●	●						
POND 4	2	16	2008			○							●	○						
ORNATA	2	16	2008			○							●	○	●					
POND 1	2	20	2008			○							●	●						
POND 2	2	20	2008			○							○	○						
POND 3	2	20	2008			○							●							
POND 4	2	20	2008										○							
ORNATA	2	20	2008			○							●	○	●					
POND 1	2	28	2008			○							●	○						
POND 2	2	28	2008										○		●					
POND 3	2	28	2008			○							●							
POND 4	2	28	2008										○		●					
ORNATA	2	28	2008			○							○		●					
POND 1	3	6	2008			●							●	●						
POND 2	3	6	2008										○	○						
POND 3	3	6	2008			○							●	○		○				
POND 4	3	6	2008			○							○	○		○				
ORNATA	3	6	2008			○							○	○	●					
POND 1	3	13	2008			○							●	○						
POND 2	3	13	2008			○							●							
POND 3	3	13	2008			○							●			○				
POND 4	3	13	2008			○							●	○		○				
ORNATA	3	13	2008			○							●	○	○					
POND 3	4	4	2008	○	○		●	○	●				●			●				
ORNATA	4	4	2008							●		○								
POND 1	4	9	2008	○	○	○	●	●	●	○		●	○	○		○	○		○	
POND 4	4	18	2008	○	○	○	○	○	○	○						●	●			
POND 5	4	25	2008	○	○		●	○	●							●	●			
POND 3	4	30	2008	○	○	○	○	○	○							●	●			
POND 1	5	6	2008	○	○		●	○	●	○						○	●			
POND 4	5	14	2008	○			●	○	●							●	●		○	
POND 5	5	21	2008	○	○		●		●							●	○			
POND 3	5	29	2008	○	○		●		○							●	○			

Table 3. ***continued***

Site	Date			LICL	LICA	LISP	HYCI	HYCH	HYAV	HYFE	HYSQ	HYGR	PSCR	PSFE	PSOR	ACGR	ACCR	ANTE	ANFO	GACA
POND 1	6	5	2008	○	○		○	○	○							○	●			
POND 4	6	12	2008				●		●											
POND 5	6	18	2008	○	○				○							○	○			
POND 3	6	26	2008	○	○		●									●	○			
POND 1	7	2	2008	○	○		○	●		○									○	
POND 4	7	14	2008	○	○		●		○							●	●			○
POND 5	7	17	2008	○	○		○		○							○	○			
POND 3	7	21	2008				○									○				
POND 1	7	31	2008	○	○															
POND 4	8	7	2008	○	○											○	○			
POND 5	8	14	2008	○	○		○									○				○
POND 3	8	21	2008	○	○											○				
POND 1	8	28	2008	○	○	○	○	○		○						○				
POND 4	9	4	2008	○												○	○			
POND 5	9	11	2008	○		○														
POND 3	9	18	2008			○														
POND 1	9	25	2008																	
POND 4	10	1	2008																	
POND 5	10	9	2008			●														
POND 3	10	16	2008																	
POND 3	4	15	2009						○							●	●			
POND 1	4	24	2009	○			●	○	●							○	○	○		
POND 4	4	31	2009	○	○		●		●							●	●		○	
POND 5	5	6	2009	○	○		●		●							●	●			
POND 3	5	13	2009	○	○		●	○	●	○						●	●			
POND 1	5	20	2009	○	○		●	○	●			○				●	●		○	
POND 4	5	27	2009	○			●		●							●	●		○	
POND 3	5	28	2009					○			○									○
POND 4	6	24	2009	○			●		○							●			○	
POND 5	6	30	2009	○	○		●		●							○	○			
POND 5	7	8	2009	○	○		●		●							●	○			

Site	Date			LICL	LICA	LISP	HYCI	HYCH	HYAV	HYFE	HYSQ	HYGR	PSCR	PSFE	PSOR	ACGR	ACCR	ANTE	ANFO	GACA
POND 4	7	21	2009	○			●		○							●				
POND 5	7	30	2009	○	○		●		○							○				
POND 5	7	30	2009				●	○		●										○
POND 3	8	6	2009	○	○		●		○	○	○					●	○			○
POND 1	8	13	2009				○													
POND 4	8	26	2009	○												○				
POND 3	9	3	2009	○																
POND 1	9	10	2009																	
POND 5	9	24	2009	○					○											

Table 4. Annual frog calling phenology at TNF summarized; maximum calling rates per month for 2007-2009 combined. Calling indices and frog abbreviation codes are the same as Table 3.

Month	LICL	LICA	LISP	HYCI	HYCH	HYAV	HYFE	HYSQ	HYGR	PSCR	PSFE	PSOR	ACGR	ACCR	ANTE	ANFO	GACA
Jan			●							○	○	○					
Feb			●							●	●	●					
Mar			●							●	●	●	○				
Apr	○	○	○	●	●	●	●		●	●	○		●	●	●	○	○
May	○	○	○	●	○	●	○	○	○				●	●		○	○
Jun	○	○	○	●	○	●	○	○					●	●	○	○	
Jul	○	○		●	●	●	○	○					●	●		○	●
Aug	○	○	○	●	○	○	●	○					●	●			●
Sep	○		○			○					●		○	○			
Oct			●			○											
Nov										○	○	●					
Dec			○							○	●						

Figure 17. ***Amystoma maculatum*, the Spotted Salamander.**

Figure 18. ***Amybstoma opacum*, the Marbled Salamander.**

Figure 19. ***Ambystoma talpoideum*, the Mole Salamander. Photo by Eric Soehren.**

Figure 20. ***Ambystoma tigrinum*, the Tiger Salamander. No Tiger Salamanders were encountered within TNF during the survey; this individual was found in nearby Bullock County.**

Figure 21. ***Desmognathus conanti*, the Spotted Dusky Salamander.**

Figure 22. ***Eurcyea cirrigera*, the Southern Two-lined Salamander.**

Figure 23. ***Eurycea chamberlaini*, the Chamberlain's Dwarf Salamander.**

Figure 24. ***Eurycea chamberlaini*, ventral view showing the all yellow belly and tail typical of this species.**

Figure 25. ***Eurycea guttolineata*, the Three-lined Salamander.**

Figure 26. ***Hemidactylium scutatum*, the Four-toed Salamander.**

Figure 27. ***Plethodon glutinosus*, the Slimy Salamander. Photo by Roger Birkhead.**

Figure 28. ***Pseudotriton montanus*, the Mud Salamander. This is the only adult individual discovered within TNF during the 2007-2010 research, by biologist Steve Samoray. Photo by Steve Samoray.**

Figure 29. ***Pseudotriton montanus*****, ventral view. Photo by Steve Samoray.**

Figure 30. ***Pseudotriton ruber*****, the Red Salamander.**

Figure 31. ***Notophthalmus viridescens*****, the Eastern Newt. Aquatic adult. Photo by Roger Birkhead.**

Figure 32. ***Notophthalmus viridescens*****, terrestrial adults.**

Figure 33. ***Siren intermedia*****, the Lesser Siren.**

Figure 34. ***Anaxyrus fowleri*****, the Fowler's Toad.**

Figure 35. ***Anaxyrus quercicus*****, the Oak Toad. Oak Toads appear to now be extinct in the area; this individual is from Polk County, Florida.**

Figure 36. ***Anaxyrus terrestris*****, the Southern Toad.**

Figure 37. ***Acris crepitans*****, the Northern Cricket Frog.**

Figure 38. ***Acris gryllus*****, the Southern Cricket Frog.**

Figure 39. ***Hyla avivoca*****, the Bird-voiced Treefrog. This is a pair found in amplexus within TNF.**

Figure 40. ***Hyla cinerea*, the Green Treefrog.**

Figure 41. ***Hyla chryscoscelis*, the Cope's Grey Treefrog.**

Figure 42. ***Hyla femoralis*, the Pine Woods Treefrog.**

Figure 43. ***Hyla gratiosa*, the Barking Treefrog.**

Figure 44. ***Hyla squirella*, the Squirrel Treefrog. Squirrel Treefrogs can be brownish and spotted, or green. Photo by Roger Birkhead.**

Figure 45. ***Pseudacris brachyphona*, the Mountain Chorus Frog. This species was not encountered within TNF during the survey, however, this specimen was collected in nearby Lee County. Photo by Roger Birkhead.**

Figure 46. ***Pseudacris crucifer*, the Spring Peeper.**

Figure 47. ***Psuedacris feriarum*, the Upland Chorus Frog.**

Figure 48. ***Pseudacris ornata*, the Ornate Chorus Frog. Although likely extirpated from TNF, this species is still common in grassy depressional ponds just S of the TNF border. Ornate Chorus Frogs can be green, brown, or gray. Photo by Roger Birkhead.**

Figure 49. ***Gastrophyrne carolinensis*, the Eastern Narrowmouth Toad.**

Figure 50. ***Lithobates catesbeianus*, the Bullfrog.**

Figure 51. ***Lithobates clamitans*, the Bronze Frog.**

Figure 52. ***Lithobates sphenocephalus*, the Southern Leopard Frog**

Figure 53. ***Scaphiopus holbrookii*, the Eastern Spadefoot. Photo by Roger Birkhead.**

Figure 54. ***Chelydra serpentina*, the Common Snapping Turtle.**

Figure 55. ***Chrysemys dorsalis*, the Southern Painted Turtle.**

Figure 56. ***Deirochelys reticularia*, the Chicken Turtle. The carapace of this species is heavily textured.**

Figure 57. ***Deirochelys reticularia*, the Chicken Turtle. The plastron has the best identifying feature; notice the heavy black bars along the bridge of the shell.**

Figure 58. ***Graptemys pulchra*, the Alabama Sawback. This hatchling exhibits nicely the "sawback" that gives this turtle its name.**

Figure 59. ***Psuedemys concinna*, the River Cooter.**

Figure 60. ***Terrapene carolina*, the Eastern Box Turtle. Photo by Roger Birkhead.**

Figure 61. ***Trachemys scripta*, the Pond Slider. Frequently, large numbers of Pond Sliders were trapped within TNF.**

Figure 62. ***Kinosternon baurii*, the Striped Mud Turtle. Notice faint dorsal carapace stripe. This is the first Striped Mud Turtle ever found in Alabama.**

Figure 63. ***Kinosternon baurii*, close up. Note complete canthal stripe.**

Figure 64. ***Kinosternon subrubrum*, the Eastern Mud Turtle. Photo by Roger Birkhead.**

Figure 65. ***Sternotherus minor*, the Stripenecked Musk Turtle.**

Figure 66. ***Sternotherus odoratus*, the Stinkpot. Photo by Nicole Freidenfelds.**

Figure 67. ***Apalone spinifera*, the Spiny Softshell.**

Figure 68. ***Ophisaurus attenuatus*, the Slender Glass Lizard. This individual was captured in Bankhead National Forest in northern Alabama; no Slender Glass Lizards were encountered during this research. Photo by Bill Sutton.**

Figure 69. ***Ophisaurus ventralis*, the Eastern Glass Lizard.**

Figure 70. ***Anolis carolinensis*, the Green Anole. Photo by Nicole Freidenfelds.**

Figure 71. ***Sceloporus undulatus*, the Eastern Fence Lizard.**

Figure 72. ***Plestiodon egregius*, the Mole Skink. No mole skinks were encountered within TNF during the 2007-2010 survey, although recent records (1990) exist for nearby areas in Lee County. Photo of a Florida specimen by David Steen.**

Figure 73. ***Plestiodon fasciatus*, the Five-lined Skink. Photo by David Steen.**

Figure 74. ***Plestiodon laticeps*, the Broadhead Skink. Photo by David Steen.**

Figure 75. ***Scincella lateralis*, the Little Brown Skink. Photo by Roger Birkhead.**

Figure 76. ***Aspidoscelis sexlineatus*, the Six-lined Racerunner. The striped pattern provides excellent camouflage.**

Figure 77. ***Cemophora coccinea*, the Scarlet Snake.**

Figure 78. ***Coluber constrictor*, the Black Racer. Photo by Nicole Freidenfelds.**

Figure 79. ***Lampropeltis getula*, the Eastern Kingsnake. Only one Eastern Kingsnake was encountered during the 2007-2010 research, despite how common they once were within TNF. This specimen was found in Georgia.**

Figure 80. ***Masticophis flagellum*, the Coachwhip.**

Figure 81. ***Opheodrys aestivus*, the Rough Greensnake.**

Figure 82. ***Pantherophis guttatus*, the Cornsnake. Photo by David Steen.**

Figure 83. ***Pantherophis spiloides*, the Gray Ratsnake. Photo by David Steen.**

Figure 84. ***Tantilla coronata*, the Southeastern Crowned Snake. No Crowned Snakes were encountered within TNF during the 2007-2010 research, however, this specimen was found only 1 km away from the proclamation boundary on private land.**

Figure 85. ***Diadophis punctatus*, the Ringneck Snake. Photo by Roger Birkhead.**

Figure 86. ***Farancia abacura*, the Mud Snake.**

Figure 87. ***Heterodon platyrhinos*, the Eastern Hognose Snake.**

Figure 88. ***Nerodia sipedon* basking in shrub along a wetland edge. Such behavior is exceptionally rare in the venomous Cottonmouth. Photo by Kerry Nelson.**

Figure 89. ***Nerodia erythrogaster*, the Plainbelly Watersnake. Photo by Kerry Nelson.**

Figure 90. ***Nerodia sipedon*, the Midland Watersnake. Photo by Kerry Nelson.**

Figure 91. ***Regina rigida*, the Glossy Crayfish Snake.**

Figure 92. ***Regina septemvitatta*, the Queen Snake. Although no Queen Snakes were encountered within TNF during this research, there is a specimen from TNF, and an individual was collected on Wire Road in the vicinity of TNF in 2007. Photo of a Bibb County specimen by Andrew Durso.**

Figure 93. ***Storeria dekayi*, the DeKay's Brownsnake. Photo by Roger Birkhead.**

Figure 94. ***Storeria occipitomaculata*, the Redbelly Snake. This snake was not encountered within TNF during the 2007-2010 research, however, an individual was encountered just outside the proclamation boundary on Wire Road. Photo by Roger Birkhead.**

Figure 95. ***Thamnophis sauritus*, the Eastern Ribbonsnake.**

Figure 96. ***Thamnophis sirtalis*, the Eastern Gartersnake.**

Figure 97. ***Virginia striatula*, the Rough Earthsnake. Although collection records indicate this is a common TNF species, none were encountered 2007-2010. However, our recent surveys did not target TNF uplands where this snake may still be common. Photo by John Jensen.**

Figure 98. ***Virginia valeriae*, the Smooth Earthsnake.**

Figure 99. ***Agkistrodon contortrix*, the Copperhead. Photo by David Steen.**

Figure 100. ***Agkistrodon piscivorus*, the Cottonmouth. Photo by David Steen.**

Figure 101. ***Crotalus horridus*, the Canebrake Rattlesnake. Photo by David Steen.**

found within TNF was collected near Uphapee Creek at Wire Road (Macon County Road 53) by George Folkerts in Apr 1978. Warriorstand Pond, a grassy depression 10 km S of TNF, once supported a large population of breeding adults (Fig. 8). Most adults migrated to this wetland Nov-Dec (Botts, 1978). Tiger Salamanders breed explosively, and females lay small egg masses. Egg masses at Warriorstand Pond were recorded on 8 Dec (1975), and on 1 and 4 Jan (1976) (Botts, 1978). No larvae emerged from Warriorstand pond during Botts' (1978) study, possibly due to the failure of egg development. In other areas of Alabama, metamorphosis and pond egress occurs in May (T. Yarbrough, unpubl. field notes). Mark Bailey (Conservation Southeast, pers. comm.) did not encounter *A. tigrinum* at TNF or Warriorstand Pond during his time as a graduate student at Auburn University (1984-1988). However, Tiger Salamanders were still present at Warriorstand Pond during 1990-1991 (John Jensen, Georgia DNR, pers. comm.), but were not encountered there as adults or larvae during attempts to document their persistence by trapping or dip netting during 2007-2010. Warriorstand Pond has undergone considerable pond succession since the 1975-76 study of Botts (1978), and now exhibits a closed canopy overstory of Sweetgum, black water with leaf litter accumulation, and lacks grass cover (Fig 8-9). It is presumed that these changes, including colonization of this pond by Marbled Salamanders (which have predaceous larvae), have led to the abandonment of this breeding pond by Tiger Salamanders. This transformation of a pond from being open and dominated by Tiger Salamanders to being closed and dominated by Marbled Salamanders is similar to long-term data from the Savannah River Ecology Laboratory in South Carolina, where fire exclusion caused Rainbow Bay to become invaded by Sweetgum (Pechmann et al., 1991). Attempts to locate other Tiger Salamander populations or breeding ponds in the TNF area have been unsuccessful; the only individual found near TNF during the study period was a single male was found on 11 Dec (2009) crossing a road on a rainy night in adjacent Bullock County (Graham et al., 2009; Fig 20, pg.20).

Amphiumidae (Amphiumas). Amphiumas are giant, fully aquatic, eel-like salamanders with four pathetically small legs. Amphiumas spend most of their existence in the muddy bottoms of permanent ponds and creeks or in aquatic vegetation along the margins of these wetlands. They are occasionally encountered moving across roads at night while migrating between wetlands during rain storms. Most amphiuma activity occurs at night, when they forage for macroinvertebrates and probably also small vertebrates. The breeding activity of amphiumas presumably occurs underwater, but exact details are lacking (Petranka, 1998). Females have been discovered brooding large clusters of eggs in dry pond bottoms in Florida (Gunzburger, 2003). Amphiumas have the capacity to aestivate during dry periods in the bottom of ponds in cocoons derived from their skin. Amphiumas may be more abundant in TNF ponds than our encounter rates indicate, and may make up a substantial amount of biomass in aquatic habitats of the Southeast (Sorensen, 2004). They are fed upon by specialist snake predators (mud snakes), generalist snake predators (Cottonmouths), and possibly wading birds.

Amphiuma tridactylum (Three-toed Amphiuma*). Uncommon. Three-toed Amphiumas (no illustration) were found occasionally in and around large permanent ponds such as beaver or oxbow ponds. They were first reported from Macon County at TNF by Birkhead et al. (2004); a considerable range extension (~ 100 km) from the nearest known population in Dallas County, Alabama. Since this time, three additional specimens have been documented from TNF, one of which was found on 27 Mar (2007) at the edge of a beaver pond as it was being consumed by a Cottonmouth. Three-toed Amphiumas are most often found in beaver ponds S of FS 937.

Plethodontidae (Lungless Salamanders). Plethodontids are relatively small, slim bodied, semi-aquatic to fully terrestrial salamanders. Adult plethodontids can be found under cover objects in most moist situations near small creeks or hardwood forests, and can be found on the forest floor, along streams, adjacent to ponds, and crossing roads on rainy nights. Worldwide, most plethodontids lack a larval stage and hatch directly from eggs as miniature replicas of adults, however, most TNF species breed in small streams; females lay eggs under cover objects, larvae have stream-type morphology (slender, with short tail fins), and develop in leaf litter accumulations. The larvae and adults feed on invertebrates in leaf litter, and are probably fed upon by a variety of invertebrates and vertebrates. Maximum species richness of plethodontid salamanders within TNF is found along first order streams and seepages. A particularly productive seepage area (and associated floodplain bottomlands) along FS 900 near Opacum Pond contains all eight plethodontid species known to occur within TNF.

Desmognathus conanti (Spotted Dusky Salamander*). Common. Spotted Dusky Salamanders (Fig 21, pg.20) are most often found under coarse woody debris along the margins of seepages and small creeks. They are occasionally found in low areas where these streams meet mucky margins of woodland pools, floodplain pools, and permanent ponds. No breeding information is available for TNF populations. Eggs of this species have been found elsewhere (with accompanying females) Jul-Oct (Mount, 1975), however, no nests were found during the study at TNF. Larvae develop in seepages and leaf litter accumulations and transform in the fall. Spotted Dusky Salamanders are reliably observed in the first order stream just E of Horseshoe Oxbow, in seepages near Opacum Pond, in the first order stream feeding beaver ponds S of FS 937, and as larvae in leaf packs at the Choctafaula Creek bridge at Macon County Road 54.

Note:

Folkerts (1971) hypothesized that morphological variation exhibited by *Desmognatus fuscus* (= *conanti*) is due to ecotypic selection (i.e., rapid natural selection due to a local environmental influence), and suggested populations of these salamanders in streams differ morphologically (color pattern, body and limb proportions) from those found in swamp or spring habitats. This viewpoint influenced Folkerts' (1968) analysis of Alabama *Desmognathus*, and Macon County *D. conanti* populations were included within a very wide zone of presumed intergradation between *Desmognathus fuscus* (= *conanti*) and *D. auriculatus* (the Southern Dusky Salamander). Tyler (Auburn University, unpubl. MS thesis, 1989) tested this ecotypic selection hypothesis by examining morphological and protein elctrophoretic variation between Dusky Salamander populations at the headwaters of Choctafaula Creek in Lee County, and Macon County populations along the swampy flood plain of Choctafaula Creek just north of TNF. She found little evidence of genetic variation between these populations (supporting the ecotype hypothesis), but her morphological analysis also failed to identify substantial differences between the populations (contradicting the ecotype hypothesis). Most differences noted were attributed to a difference in the size and age of males in the swamp populations near TNF; Tyler (1989) hypothesized that these habitats are more permanent and allow Dusky Salamanders to live longer. Tyler's (1989) study therefore demonstrates that apparent morphological differences among populations in *D. conanti*—if actually present—are not due to ecotypic selection but are instead due to habitat factors influencing local population demography. Therefore, we consider TNF to be populated by *D. conanti* and restrict *D. auriculatus* to sites further south in the Lower Coastal Plain.

Eurycea cirrigera (Southern Two-lined Salamander*). Uncommon. Southern Two-Lined Salamanders (Fig 22, pg. 20) are found under coarse woody debris along the margins of seepages and small creeks. The adults appear to migrate to breeding areas; males with elongate cirri and gravid females can be found crossing area roads Oct-Apr, with peak numbers recorded in Nov and Feb. Where exactly breeding of *E. cirrigera* takes place in TNF is unknown. But, based on observations of five nests with attending females found in similar Fall Line Hills seepage habitat of Bibb County on 3 Apr (2009), we infer that females oviposit under logs and rocks in seepages and small streams on TNF. Larval Two-lined Salamanders transform during summer or fall after developing in these habitats for one-two years. Two-lined Salamanders are reliably observed at the first order stream E of Horseshoe Oxbow and the stream draining beaver ponds S of FS 937.

Eurycea chamberlaini (Chamberlain's Dwarf Salamander*). Common. Chamberlain's Dwarf Salamanders (Fig 23-24, pg.20) are found under leaf litter, coarse woody debris, in sphagnum moss accumulations, in shallow sheet flow downstream from beaver ponds, around woodland pools, wetlands, and in small creeks and seepages. One individual was discovered under a pine log in a xeric upland habitat. The adults apparently migrate to and from these sites Oct-Mar; males with elongate cirri and gravid females can be found crossing area roads at this time. Their movements appear to be bimodal, with peak numbers found in Nov and again in Feb-Mar. Gravid females have been found crossing roads on 21 Nov and 28 Dec (2007). The details of mating and oviposition for this species are undocumented at TNF. Transforming larvae (1.38 cm SVL) have been found under woody debris around a beaver pond margin on 24 and 31 May (2007). Transforming larvae lack the bright yellow belly of adults; their belly appears cream-grayish. The Ringneck Snake is a known predator of this species at TNF. Chamberlain's Dwarf Salamanders are reliably encountered—especially in sphagnum moss accumulations—downstream from beaver dams S of FS 937, around the margin of Opacum Pond, and along the banks of Hodnett Creek on private lands just NW of TNF.

Note:

Dwarf salamanders in this area were once treated as *Eurycea quadridigitata*, which was considered a single species with yellow and grey-bellied color morphs (Mount, 1975). These color morphs have since been recognized to represent different species (Harrison and Guttman, 2003). The yellow bellied form (Fig 24, pg.20), *E. chamberlaini*, is the only species in this complex known to occur in this region (Graham et al., 2008) and is the accepted name for most dwarf salamanders in Alabama. Dwarf salamanders (*Eurycea chamberlaini* and *E. quadridigitata*) are currently undergoing taxonomic revision, and preliminary genetic information (David Beamer, Eastern Carolina University, pers. comm.) suggests western populations of *E. chamberlaini*, including specimens collected at TNF, may represent yet another undescribed species.

Eurycea guttolineata (Three-lined Salamander*). Abundant. Three-lined Salamanders (Fig 25, pg. 20) are found under leaf litter around margins of permanent ponds, in floodplain woods, and small creeks. Peak numbers of adults in breeding condition (males with elongate cirri and gravid females) have been found on rainy nights crossing area roads during rains in Oct, and possibly moving away from breeding sites during rains in Apr. Smaller numbers have been found moving across roads in Dec-Jan. Marshall (1999) described mating from Jul-Jan, and oviposition Nov-Dec in a Mississippi population. Mount (1975) discovered some nests with attending adults in a spring cistern in Shelby County, Alabama, in early Dec. Larval Three-lined Salamanders develop in leaf litter accumulations in small to large streams, and metamorphose Jul-Sep. Adults have been found in large numbers on humid summer nights on lowland hardwood forest floor (dry gum pond S of FS 937), where they were possibly foraging. Three-lined Salamanders are reliably found along the margin of gum swamps associated with beaver ponds S of FS 937, and along Hodnett Creek.

Hemidactylium scutatum (Four-toed Salamander*).Rare. Four-toed Salamanders (Fig 26, pg.20) are infrequently encountered during winter and early spring along margins of woodland pools and seepage areas, especially those with sphagnum moss accumulations. Details of mating, oviposition, and larval development from TNF are undocumented, although in nearby areas they migrate to ponds in winter and females are found brooding eggs in sphagnum moss in late winter. Gravid females were found crossing area roads on 17 Jan and 13 Feb (2006). Six females brooding eggs were found on 17 Feb (2008) in nearby Harris County, Georgia. The larvae develop in ponds, but the timing of metamorphosis at TNF is undocumented. Four-toed Salamanders are possibly more common in the area than encounter rates indicate; recent research has revealed they are more common and broadly distributed than once thought (Herman, 2009). An adult male Four-toed Salamander was found on 24 Jan (2010) under a log at Opacum Pond.

Plethodon glutinosus (Slimy Salamander* complex). Common. Slimy Salamanders (Fig 27, pg. 20) are found under coarse woody debris and leaf litter of forests throughout TNF, although they are more common in moister, lowland hardwood forests. The details of mating and oviposition in this species are undocumented for the TNF area. Female Slimy Salamanders lay eggs and brood them in subterranean cavities. There is no larval period; juveniles hatch directly out of eggs. Adult Slimy Salamanders are occasionally encountered crossing area roads on rainy nights, and can be found foraging on forest floor on humid nights. Large numbers of Slimy Salamanders are reliably encountered in the Choctafaula Creek floodplain near Opacum Pond.

Note:

Three distinct evolutionary lineages of slimy salamanders are known from Alabama based on protein electrophoresis data (Highton et al., 1989). If these are treated as separate species, then the scientific name of specimens in TNF should be *P. grobmani*.

Pseudotriton montanus (Mud Salamander*). Uncommon. Mud Salamanders (Fig. 28-29, pg. 20 & 21) have been found under leaf litter and coarse woody debris in lowland seepages and floodplains. The larvae are more commonly encountered than adults, and can be found in mucky leaf litter in these areas. Most Lee and Macon County specimens (75%) were collected Mar-Apr. Natural history information for this species is largely undocumented throughout its range (Petranka, 1998). They may be more common than encounter rates indicate; this species possibly leads a more subterranean existence than its congener (see below). An adult Mud Salamander (Fig. 28-29, pg. 20 & 21) was found in fall 2007 under a log along the Bartram Trail near the State Road 186/FS 900 intersection. A larva approaching metamorphosis was found on 24 Jan (2010) under a submerged log at Opacum Pond.

Pseudotriton ruber (Red Salamander*). Uncommon. Red Salamanders (Fig 30, pg. 21) are found in and under leaf litter and coarse woody debris in and around seepages or small creeks. The details of breeding, oviposition, and larval development in this area are undocumented. Adults are occasionally encountered on rainy nights crossing roads. Red Salamanders of the Coastal Plain appear to be more closely tied to seepage and stream habitats, and usually do not stray very far into terrestrial habitats of woodlands like they do in other areas of Alabama. Larvae and adults are reliably encountered at the first order stream E of the Horseshoe Oxbow.

Salamandridae (Newts). Newts have a Northern Hemisphere distribution, and this family includes fully aquatic species, and terrestrial, stream or pond-breeding species. Many newts have a life history stage that is terrestrial, with rough, dry skin. Eastern newt species have complicated life cycles, with a terrestrial juvenile stage, and occasional paedomorphism. Adults, larvae, and juvenile newts feed on small invertebrates. The predators of these toxic salamanders are unknown in this area, but probably include small snakes.

Notophthalmus viridescens (Eastern Newt*). Uncommon. Eastern Newts (Fig 31-32, pg. 21) were encountered occasionally during surveys of TNF permanent ponds. Adult Eastern Newts are usually fully aquatic; adults and larvae are found in most pond habitats in TNF. However, pond drying can cause adults to transform into to a rough-skinned, dark terrestrial form (Fig 32, pg. 21); we encountered such a terrestrial adult individual found on 25 Jun (2009), under a log at the Horseshoe Oxbow. Terrestrial juveniles ("red efts") and adults were occasionally encountered under cover objects on the forest floor or migrating to or from wetlands on area roads during rains year round. Most movements occur in winter, and large numbers of efts (estimated ~ 100 individuals per 20 km of road/h) were found crossing roads in Lowndes County, Alabama, on 18 and 21 Nov (2007). Several amplectant pairs were observed in a pond bordering TNF on 4 Jan (2007). The details of oviposition and larval development in the TNF area are undocumented. No paedomorphic individuals have been documented in the TNF area. Adults are reliably encountered by dip netting the TNF Horseshoe Oxbow Pond, and efts are consistently found in the vicinity of Opacum Pond.

Sirenidae (Sirens). Sirens are large-to-giant, eel-like, aquatic salamanders, with external gills, two, well-developed front legs, and no hind legs. Sirens are found in permanent wetlands and leaf litter accumulations in streams. Along with amphiumas, sirens may be far more common than they appear to be (Sorensen, 2004), since they are mostly active at night in heavy submerged vegetation and mud of pond bottoms. Evidence suggests these salamanders may make up a substantial amount of biomass in aquatic habitats of the Southeast (Sorensen, 2004). The details of reproduction for sirens are largely unknown, although adults accompanying egg masses have been found in pond bottoms (Lannoo, 2005). Like amphiumas, these salamanders can also estivate in pond bottoms during dry periods by cocooning. Siren prey includes macroinvertebrates and small vertebrates, and they are in turn fed upon by specialist snakes (e.g., Mud Snakes), other snakes (e.g., Cottonmouths), and wading birds.

Siren intermedia (Lesser Siren*). Common. Adult and juvenile Lesser Sirens (Fig 33, pg. 21) were frequently encountered in minnow traps in permanent ponds with abundant emergent and submerged vegetation. Juveniles were trapped using minnow traps in midsummer and captured by searching grass mats along beaver ponds during summer periods of drying. Adults were observed in the water column of ponds at night in late summer, where they quickly darted into the mud bottom of the pond and disappeared when illuminated by a flashlight beam. One adult was observed being consumed by a Cottonmouth, and one was regurgitated by a Mud Snake. A Lesser Siren was found to be a host for a leech in TNF; this was the first incidence of leech parasitism reported in this family of salamanders (Graham and Borda, 2010). Lesser Sirens are reliably encountered at beaver ponds S of FS 937 and in the Horseshoe Oxbow, and dozens were collected from a slough at U.S. Hwy 80 at Chewacla Creek, just E of TNF.

Anura (Frogs)

For summaries of TNF frog calling activity from 2007-2010, see Tables 2-3.

Bufonidae (True Toads). Toads are small terrestrial frogs with warty skin, paired paratoid glands, and cranial adornments. Toads can often be found hopping about at night or occasionally during the day. Breeding may be prolonged or explosive, and occurs with the onset of warm spring rains. Most female toads lay eggs in long gelatinous strings, one produced by each ovary. Toads feed on a variety of small insects and are fed upon frequently by snakes (especially Hognose Snakes). Toads are found reliably by driving slowly on TNF roads at night.

Anaxyrus fowleri (Fowler's Toad*). Abundant. Fowler's Toads (Fig 34, pg. 21) were found near most wetlands of TNF, as well as hardwood forests and on roads. Movements of adults on roads—presumably toward breeding sites—peaks in Apr. Prolonged breeding (Apr-Jul) occurs in permanent wetlands such as beaver ponds and the Horseshoe Oxbow. Males call from pond edges. Two amplectant pairs were observed at TNF on 27 May (2009). They were heard to call as early as 9 Apr (2008) and as late as 5 Jul (2007). Fowler's Toads are reliably encountered at Horseshoe Oxbow and beaver ponds S of FS 937.

Anaxyrus quercicus (Oak Toad). Rare, and probably extirpated. These small toads (Fig 35, pg. 21) can be found in upland sandy habitats, even during the day. They breed in shallow grassy depressions, similar to those used by Pine Woods Treefrogs and Ornate Chorus Frogs. Where present, Oak Toads are easy to detect due to their characteristic peeping call, which is similar to the sound of chicks, but much louder. This species has not been collected in Macon County since 1969, although they were noted at Warriorstand Pond by Botts (1978) in the late 1970's. Since no breeding was detected during the 2007-2010 field season, it is presumed that this species no longer occurs in the area.

Anaxyrus terrestris (Southern Toad*). Common. Southern Toads (Fig 36, pg. 21) were found near wetlands (beaver ponds), open areas, and roads. They breed somewhat explosively and earlier than *A. fowleri*, mostly Mar-Apr, associated with warm, early spring rains. Calling male Southern Toads were occasionally also heard later after heavy summer rains. Southern Toad egg strings were found on 26 Apr (2008) in ditches at the southern terminus of FS 937. The species was heard to call as early as 3 Apr (2007) and as late as 5 Jun (2007). Southern Toads are reliably encountered at beaver ponds S of FS 937.

Hylidae (Treefrogs and their allies). Hylids include treefrogs, chorus frogs, and cricket frogs. Treefrogs are small, attractive frogs with toe webbing and sticky toe pads used for climbing. Many likely spend most of their time in trees and descend to ponds for breeding, which can occur explosively or over a prolonged period. Chorus frogs have reduced toe pads, are more terrestrial, and are winter breeders. Cricket frogs are semi-aquatic to terrestrial, have no toe pads, and are prolonged summer breeders. Most hylids lay small numbers of eggs that are attached to aquatic vegetation. Little is known about the habits of hylids outside the mating season, but they likely feed on small insects and are fed upon by snakes, small mammals, and birds. Most species can be found at any time of the year after a large rain event, although more typically, rains will trigger movements to ponds prior to their respective breeding seasons. The maximum species richness of hylids at TNF (ten species; all hylids known from TNF except *Pseudacris ornata* and *P. brachyphona*) was observed at a beaver pond ("pond 1"; Fig. 2) that routinely dried during the study period; a mixture of both temporary and permanent pond species was observed at this pond, which is found just SE of FS 937.

Acris crepitans (Northern Cricket Frog*). Abundant. Northern Cricket Frogs (Fig 37, pg. 21) were found near the edge of most wetlands (both ponds and streams) and in hardwood habitats throughout TNF. At night, calling males were found in emergent vegetation in ponds. They are prolonged breeders (Apr-Sep) in permanent ponds. In TNF, *Acris crepitans* appears to be somewhat less common than *A. gryllus*, although on some nights, males of the two species appeared to call in equal numbers. This species was heard as early as 9 Apr (2008) and as late as 4 Sep (2008). Northern Cricket Frogs are reliably observed at the Horseshoe Oxbow and beaver ponds S of FS 937.

Acris gryllus (Southern Cricket Frog*). Abundant. Southern Cricket Fogs (Fig 38, pg. 21) were found near the edge of most permanent ponds and in adjacent hardwood forests throughout TNF. At night, calling males are found in emergent vegetation, often perched on lily pads. They are prolonged breeders (Mar-Sep). Four amplectant pairs were observed on 14 May (2008), and additional amplectant pairs were encountered Apr-Jul. The maximum encounter rate observed (≥ 100/h) during Jun-Jul was associated with emerging metamorphic individuals. Adults feed throughout their extended mating season, mainly on small dipterans (excluding mosquitoes), hymenopterans, coleopterans, and collembolans at TNF (Adam Turmin, Auburn University, unpubl. honors thesis). One was observed to fall prey to a spider at TNF (Graham and Sorrell, 2008), and this species likely falls prey to a plethora of additional predators. This species was heard to call as early as 6 Mar (2008) and as late as 4 Sep (2008). Southern Cricket Frogs are possibly TNF's most abundant vertebrate; hundreds can be observed at the Horseshoe Oxbow and beaver ponds S of FS 937.

Hyla avivoca (Bird-voiced Treefrog*). Abundant. Bird-voiced Treefrogs (Fig 39, pg. 21) were found in shrubs and trees around permanent ponds during their breeding season. They are prolonged breeders (Apr-Jul). Sporadic calling by males during the fall is probably not associated with breeding. Males call from height of 1-2 m in trees and shrubs (often alders) along pond margins. Amplectant pairs were found 31 Apr (2009) and 6 May (2008) and metamorphic individuals were observed in May and Aug. Individuals can be found under logs near seepages during winter. Typically, this is the first member of the genus *Hyla* to call during spring activity. This species was heard to call as early as 3 Apr (2007) and as late as 3 Oct (2007). Bird-voiced Treefrogs are reliably encountered at the Horseshoe Oxbow and beaver ponds S of FS 937, and Tsinia Wildlife Viewing Area.

Hyla cinerea (Green Treefrog*). Abundant. Green Treefrogs (Fig 40, pg. 22) were found in grasses, shrubs, and trees around permanent ponds, and in emergent vegetation and open water during prolonged (Apr-Aug) breeding. An amplectant pair was observed on 6 May (2009), and two were found on 21 Jul (2009). Egg masses were observed on 10 Jul (2009). Egg masses are placed underwater and attached to submerged vegetation. Most metamorphic individuals emerge Jun-Jul, but some have been seen emerging as late as 14 Oct (2008). Large numbers of juveniles and some adults have been observed on roads Oct-Nov. This species was heard to call as early as 3 Apr (2007) and as late as 31 Aug (2007). Green Treefrogs are reliably encountered at Horseshoe Oxbow and beaver ponds S of FS 937.

Hyla chrysoscelis (Cope's Grey Treefrog*). Abundant. Cope's Grey Treefrogs (Fig 41, pg. 22) were found in shrubs and trees around permanent ponds, grassy depressions, and roadside ditches. Breeding was usually associated with abundant rain (Apr-Aug). Two amplectant pairs were found on 9 Apr and 6 May (2008). Egg masses are laid as surface films, and several (~ 30-40) were found on 27 Apr (2009) and 8 May (2008) at the ditch at the S terminus of FS 937. Metamorphic individuals were observed on 1 Jun (2007). This species was heard to call as early as 3 Apr (2007) and as late as 30 Aug (2007). Cope's Grey Treefrogs are reliably encountered at shallow arms of beaver ponds S of FS 937, and at roadside ditches at the S terminus of FS 937.

Note:

A possible hybrid between *H. chrysoscelis* and *H. avivoca* was heard calling at a pond S of FS 937 on 24 Apr (2009). This individual had the sonic quality of both species combined; somewhat like the call of *H. versicolor*.

Hyla femoralis (Pine Woods Treefrog*). Common. Pine Woods Treefrogs (Fig 42, pg. 22; cover image) are found in mixed pine-hardwood forests and breed in temporary ponds and shallow areas of permanent ponds. Males call at dusk each day during the early summer (May-Jun) around beaver ponds and temporary ponds, and appear to be evenly spaced around them. We have located males 3-4 m up the trunks of pine trees during these dusk calling bouts. The function or adaptive significance of this non-breeding call is unknown. Breeding takes place after significant rains Apr-Aug, when males and females meet in grassy depressions in or near beaver ponds, or in grassy, isolated depressional wetlands. Amplectant pairs were observed 4 Apr (2008) and 9 Jul (2007). This species was heard to call as early as 3 Apr (2007) and as late as 31 Aug (2007). Pine Woods Treefrogs are reliably encountered near beaver ponds S of FS 937, and large choruses have been observed at Ornata Pond.

Hyla gratiosa (Barking Treefrog*). Uncommon. Barking Treefrogs (Fig 43, pg. 22) are usually found calling in grassy depressions or larger, semi-permanent ponds. At TNF, these treefrogs made intermittent appearances at the surveyed wetlands during 2007-2010. Small choruses (3-15 individuals) were heard on one night each in 2007, 2008, and 2009 at the same pond ("pond 1"; Fig. 2). During the day, individuals can be found perched in buttonbush shrubs at ponds. Sometimes they call during the day—a distinctive and explosive bark that sounds very different from the breeding call. Breeding (Apr-May) was associated with heavy, warm spring rains. Males call while floating in emergent vegetation. Barking Treefrogs nearly always breed in fishless ponds, and these habitats are rare in TNF; interestingly, the beaver pond where small choruses are heard each year typically dries every year, indicating that this species appears to be able to detect that this pond has become fish-free. This species was heard to call as early as 4 Apr (2008) and as late as 20 May (2009). Small borrow pits or farm ponds with no fish make excellent breeding sites, and one such site on private property just outside the TNF boundary on Wire Road supports a large population that breeds late Mar-May.

Hyla squirella (Squirrel Treefrog*). Uncommon. Squirrel Treefrogs (Fig 44, pg. 22) are found in thickets and breed in grassy depressional wetlands and ditches. They were heard calling during the day (Jun) in thickets near beaver ponds, and breeding choruses were encountered sparingly after heavy rains. Breeding is sporadic; this species was encountered breeding in ditches at the southern terminus of FS 937 only once in Aug 2007, was not encountered at all in 2008, and another chorus was heard at the same site in May 2009. Metamorphic Squirrel Treefrogs were found at a TNF beaver pond on 18 Sep (2008). Juvenile Squirrel Treefrogs have been found in numbers crossing roads on rainy nights during fall in areas adjacent to TNF. This species is the most likely treefrog visitor to windows in the TNF area at night to feed on insects. It was heard to call as early as 28 May (2009) and as late as 31 Aug (2007). The ditch at the terminus of FS 937 is the most reliable breeding site for this species within TNF.

Pseudacris brachyphona (Mountain Chorus Frog). Rare. Mountain Chorus Frogs (Fig 45, pg. 22) are mostly confined to hardwood forests in rugged upland terrain much further to the north in Alabama, and populations below the Fall Line are unusual and unique. The exact collection localities of the TNF specimens are unknown, and attempts to locate breeding choruses during 2007-2010 research were unsuccessful. One specimen collected by Tom Jones in Apr 1979 was cataloged as "1 mile W of Hwy 186 on FS 900," which is probably erroneous, since Hwy 186 runs E-W and FS 900 runs largely N-S before paralleling 186 to the north. If this locality was intended to be listed as along FS 900 1 mi *north* of Hwy 186, the site could have been near Opacum Pond. This pond and others in this vicinity are utilized by several other winter breeding amphibians and appear suitable for Mountain Chorus Frogs. In addition, an unusual *Pseudacris* specimen found here during a class field trip in fall 2007 (AUM 37584) may be *P. brachyphona*, however, it has dorsal stripes resembling *actual* parentheses, and not the usual 'reverse parentheses' exhibited by typical *P. brachyphona*. Only *Pseudacris feriarum* was heard calling in this area during several visits in winter and early spring 2007-2010. A small series of Mountain Chorus Frogs collected by Bob Mount in Dec 1967 is cataloged as from "North Uphapee Creek Bridge." Mount has indicated to us (pers. comm.) that this site is the FS 910 Bridge at Hodnett Creek. John Jensen (Georgia DNR, pers. comm.) recalled hearing *P. brachyphona* choruses in this area (along FS 910, 1km NE of intersection with FS 906) associated with seepages and roadside ditches when he was a zoology student at Auburn University 1990-1991. Mount (pers. comm.) also indicated these as potential sites for *P. brachyphona*. Elsewhere, choruses of these frogs are heard mostly Feb-Apr. We have observed a small chorus below the Fall Line in Bibb County near a hillside seep on 4 Apr (2009). Details of reproduction for this species are undocumented for this area. Adults can be captured by thoroughly dip netting the small ponds or seepages where they are heard calling.

Pseudacris crucifer (Spring Peeper*). Abundant. Spring Peepers (Fig 46, pg. 22) are found in hardwood forests and breed in temporary and permanent ponds. Movement to ponds occurs Dec-Apr, with peak numbers found on roads in Dec and Feb. Single gravid females were recorded crossing roads 15 Nov (2006), 8 Dec (2005), and four gravid females were found 7 Feb (2006). Choruses were heard Jan-Apr, and occasionally, small choruses were heard after heavy fall rains. Males call from emergent vegetation and are difficult to approach except on rare nights when calling is very intense. Amplectant pairs were observed 26 Apr (2004). Metamorphic individuals, sometimes in large numbers, were found in beaver ponds May-Jun. Spring Peepers are occasionally encountered during the non-breeding season in low vegetation of hardwood forests and ponds. This species was heard to call as early as early as 17 Jan (2008) and as late as 9 Apr (2008). Spring Peepers are reliably encountered at the Horseshoe Oxbow, beaver ponds S of FS 937, and the Macon County Road 54 Bridge over Hodnett Creek.

Pseudacris feriarum (Upland Chorus Frog*). Common. Upland Chorus Frogs (Fig 47, pg. 22) are found in hardwood forests and breed in temporary ponds and ditches. Movement to ponds occurs Dec-Feb, with less movement in Jan. Gravid females were found crossing roads on 2 Feb (2006). Choruses were heard Jan-Mar, and egg masses (~ 5) have been found in Macon County on 24 Jan (2010). Occasionally, heavy fall rains initiate choruses and possibly breeding. One such breeding event took place Sep 2008. A single metamorphic individual was found at TNF in May 2008. Upland Chorus Frogs are very difficult to approach and capture, however, adults can occasionally be captured by dip netting shallow pools where males are heard calling. This species was heard calling as early as 17 Jan (2008) and as late as 9 Apr (2008). Upland Chorus Frogs are reliably encountered in low woods near beaver ponds S and along FS 937, in woodland pools near Opacum Pond, and at the Macon County Road 54 Bridge over Hodnett Creek.

Pseudacris ornata (Ornate Chorus Frog*). Rare, and possibly extirpated. Ornate Chorus Frogs (Fig 48, pg. 22) are found in upland pine forests and pine flatwoods, and breed in grassy depressional wetlands. TNF Ornate Chorus Frog specimens were collected at the intersection of Wire Road (County Road 53) and U.S. Hwy 80 in Jan 1959, however, they were not encountered in this area during the 2007-2010 survey, even though this site is along the route to our major study areas and was passed dozens of times. A large population still breeds at Ornata Pond just S of TNF. Choruses were heard Jan-Mar 2007 and 2008 at this pond. An unusual fall chorus was heard at Ornata Pond on 28 Oct (2009) after a heavy rain. Choruses were also heard 10 Nov (2009) associated with rains from Tropical Storm Ida. A gravid female was encountered crossing Macon County Road 22 on 28 Oct (2009) moving toward Ornata Pond, and an amplectant pair was found there by Jimmy and Sierra Stiles (Auburn University) the following week; it is assumed that the frogs bred during this time. Interestingly, no winter breeding was observed in 2010 at this site, indicating that this species occasionally successfully breeds in the fall and subsequently omits the typical breeding event in the spring. Males call from emergent grasses, but are usually difficult to approach or observe. These frogs may eventually be located again in TNF; prescribed burning may be crucial to maintaining the open grassy ponds needed for breeding. These frogs are apparently fossorial during the non-breeding season, but little else is known of their terrestrial ecology. This species was heard calling as early as 31 Jan (2008) and as late as 13 Mar (2008). In Macon County, they are most reliably encountered at Ornata Pond.

Microhylidae. (Narrowmouth Toads). Narrowmouth Toads are small terrestrial/fossorial frogs with smooth skin, and tiny heads. Narrowmouth Toads are arid-adapted and fossorial, and are explosive breeders that take advantage of heavy rains for rapid reproduction. They live in loose soil and within or under logs, where they feed on a specialized diet of ants and termites. They are probably consumed by snakes and small mammals. Only one species, treated below, occurs in the eastern U.S.

Gastrophryne carolinensis (Narrowmouth Toad*). Common. Adult Narrowmouth Toads (Fig 49, pg. 22) were found under logs in lowlands in vicinity of permanent ponds. They breed in permanent ponds and in grassy depressions. Large choruses and explosive breeding was associated with heavy summer rains May-Aug. Calling males are very difficult to locate, since they call from underneath cover objects. An amplectant pair was observed on 28 May (2009). Egg masses (small surface films) were observed on 10 and 27 Jul (2007), and four metamorphic Eastern Narrowmouth Toads were found at a TNF beaver pond on 19 Sep (2008). The species was heard calling as early as 28 May (2009) and as late as 31 Aug (2007). Eastern Narrowmouth Toads are reliably encountered at the Horseshoe Oxbow, beaver ponds S of FS 937, beaver ponds E of Choctafaula Creek/FS 906 bridge, and most roadside ditches.

Ranidae (True Frogs). True frogs are large, long-legged, semi-aquatic frogs. Most true frogs are prolonged breeders with male dominance social systems. Most species lay eggs as large surface films or as clumps attached to vegetation under water. The tadpoles of TNF species can be found in permanent ponds, temporary ponds, and also small streams, and some take more than one year to develop. Adults feed on insects, other invertebrates, and small vertebrates, and are fed upon by carnivorous mammals, birds, turtles, and snakes. All three TNF ranids can be easily detected at beaver ponds S of FS 937.

Lithobates catesbeianus (Bullfrog*). Abundant. Bullfrogs (Fig 50, pg. 22) were found in and around permanent ponds and large or small creeks, where calling males were heard calling sporadically Apr-Aug. Large choruses were not heard during study period. Metamorphic individuals emerge Jul-Sep. This species was heard calling as early as 3 Apr (2007) and as late as 30 Aug (2007). Bullfrogs are reliably observed at Horseshoe Oxbow and Beaver Ponds S of FS 937.

Lithobates clamitans (Bronze Frog, Green Frog, Banjo Frog*). Abundant. Adult Bronze Frogs (Fig 51, pg. 22) were found in and around permanent ponds and large or small creeks, where males were heard sporadically through the night Apr-Sep. An egg mass, laid as a large surface film, was observed on 1 Aug (2008). Metamorphic individuals emerge Jul-Sep. This species also apparently breeds in small streams; calling males, tadpoles, and metamorphic individuals were observed in the stream draining beaver pond 150 m E of FS 937/938 intersection. This species was heard calling as early as 3 Apr (2007) and as late as 24 Sep (2009). Bronze Frogs are reliably observed at TNF beaver ponds, at the Horseshoe Oxbow, and Tsinia Wildlife Viewing Area.

Lithobates sphenocephalus (Southern Leopard Frog*). Abundant. Southern Leopard Frogs (Fig 52, pg. 23) were found in and around permanent ponds and creeks. This species is apparently more terrestrial than most true frogs; they can be found in hardwood forests well away from ponds and are often found crossing roads on rainy nights year round. The largest numbers of Southern Leopard Frogs observed crossing roads were found Jan-Feb, probably indicating migration to breeding ponds. Large choruses were mostly heard Feb-Apr, however, sporadic calling associated with heavy rains can be heard year round. Significant choruses, possibly associated with fall breeding, were recorded 9 Oct (2008). Southern Leopard Frog eggs are laid as round, partially submerged masses, and were found 24 Jan (2010). Metamorphic individuals emerge Jun-Jul; a large number (32) was observed 6 Jun 2008. We documented calling in this species for every month of the year except Jul and Nov. Southern Leopard Frogs are reliably encountered at the Horseshoe Oxbow, beaver ponds S of FS 937, and Tsinia Wildlife Viewing Area.

Scaphiopodidae (Spadefoots). Spadefoots are bizarre, fossorial frogs that emerge only rarely to breed explosively after very heavy rains. They have vertically elliptical pupils, and two dark, keratinized 'spades' on their heels for digging rapidly under the sand. Spadefoots occasionally emerge from their burrows to feed on rainy nights, and feed voraciously on insects and other invertebrates after breeding events. During this time they may fall prey to snakes and small mammals, and specialized toad-eating snakes (e.g., Hognose Snakes) may dig them out of their burrows.

Scaphiopus holbrookii (Eastern Spadefoot*). Uncommon. All 13 TNF specimens were collected Mar 1960 at the intersection of Wire Road (Macon County Road 53) and U.S. Hwy 80 in 1959. Eastern Spadefoots (Fig 53, pg. 23) can occasionally be found on roads at night after rains, but breeding is triggered by very significant rain events. We have no data on calling phenology for this species because it was not present at the ponds that we surveyed consistently. Small numbers were found on Macon County Road 53, 100-300 m N of U.S. Hwy 80 after a heavy, warm rain 4-5 Apr (2008). Despite the fact that this rain caused a small emergence of Eastern Spadefoots, and filled the low grassy pine woods in this vicinity, no calling or breeding was observed.

Testudines (Turtles)

Note:

Several dead turtles, mostly empty shells, were found during the routine surveys. The numbers of each per year for each species are noted in the following species accounts, and the phenomenon is mentioned below in the results and discussion section.

Chelydridae (Snapping Turtles). Snapping Turtles are large, omnivorous freshwater turtles with a legendary propensity to bite. They pose no threat to swimmers, but will defend themselves vigorously from those who would study or otherwise attempt to handle them. These turtles are characterized by a shell that is exceptionally rough in appearance on the top and markedly reduced and cross-shaped on the bottom. These animals also have unusually long tails for turtles, which are about as long as the rest of the body. At first glance, the tail would appear to be a convenient place to grasp these turtles when handling them. However, large animals are so heavy that this method can lead to damage to the bones and muscles of the tail if this is the only support for the animal when lifted off the ground. Snapping turtles are predatory and also scavengers. Only eggs and juveniles are vulnerable to most predators, but these are probably fed upon by many TNF vertebrates.

Chelydra serpentina (Common Snapper*). Uncommon. Common Snapping Turtles (Fig 54, pg. 23) are ubiquitous denizens of permanent ponds throughout Alabama, but for unknown reasons they are not common within TNF. Elsewhere, mating behavior has been observed in spring (Ernst and Lovich, 2009). Females nest May-Jun and eggs hatch Aug-Sep (Ernst and Lovich, 2009). Common Snappers are mostly scavenging omnivores, and are not known to feed on live adult game fish, contrary to local lore. A handful of individuals were trapped in the beaver ponds south of FS 937 in 2008 and 2009, and one of these represented the first Macon County record of this species (Graham et al., 2009).

Emydidae (Pond Turtles). Despite the name, this family of turtles contains terrestrial, pond dwelling, and stream dwelling species. Pond turtles are the familiar, semiaquatic turtles with low, smooth, hydrodynamic shells on top and a broad flat covering below that are often seen basking on logs in ponds or rivers. Most species are omnivores or herbivores. Most species also bite and scratch when captured. Eggs and hatchlings are prized food items of snakes, small mammals, and birds.

Chrysemys dorsalis (Southern Painted Turtle*). Common. Southern Painted Turtles (Fig 55, pg. 23) are attractive pond turtles found in most of the TNF beaver ponds. This species is easy to distinguish from other basking turtles because the top of the shell is noticeably flat and extremely smooth and shiny. Small numbers of individuals (1-5/trap night) were trapped May-Sep. One individual was captured in a drift fence adjacent to a pond, indicating some overland movement occurs. Reproductive information specific to *C. dorsalis* is lacking. Southern Painted Turtles are aquatic omnivores. Single dead specimens were found in 2007 and 2009. They are most reliably encountered by trapping the ponds S of FS 937.

Deirochelys reticularia (Chicken Turtle*). Common. Chicken Turtles (Fig 56-57, pg. 23) are long-necked turtles that prefer ponds with relatively short hydroperiods; most TNF beaver ponds and the Horseshoe Oxbow are occupied by this species. Small numbers (1-2/trap night) were trapped Apr-Jul. Nesting occurs in fall and early spring in this species, a very unusual characteristic for a North American turtle (Ernst and Lovich, 2009). They overwinter underground some distance from ponds, and can therefore be expected to be found crossing roads in spring and fall. Chicken Turtles use suction feeding to capture insect larvae, crayfish, and tadpoles (Ernst and Lovich, 2009). Single dead specimens were found 2007 and 2009. They are called Chicken Turtles presumably because they taste like chicken. They are most reliably encountered by trapping the ponds S of FS 937.

Graptemys pulchra (Alabama Sawback*). Uncommon. Alabama Sawbacks (Fig 58, pg. 23) are river turtles, but can also be found in the larger TNF creeks (Uphapee Creek). Females nest in Jun on sand bars of meandering large streams, like Uphapee Creek; eggs hatch Sep-Oct (Ernst and Lovich, 2009). Seasonal timing of mating has not been reported. Males are small and insectivorous, while females are three to four times bigger, and have grotesquely enlarged heads used for eating mollusks. Although native mussels have declined, the invasive Asian mussel *Corbicula* has replaced the native fauna in the diet of this species. Float trips down Uphapee Creek during cooler weather may produce additional observations of basking Alabama Sawbacks, but these turtles are remarkably skittish and, therefore, difficult to observe. Only two individuals were encountered during summer in the 2007-2010 surveys, and both were captured by hand while wading in Uphapee Creek.

Note:

We advocate the use of the historical common name "Sawback" as the more appropriate common name for *Graptemys* turtles with knobs or spines on their carapace (e.g., *G. barbouri*, *G. nigrinoda*, *G. ernsti*, etc.), rather than the name "Map Turtle."

Pseudemys concinna (River Cooter*). Uncommon. As their name implies, River Cooters (Fig 59, pg. 23) are river turtles that can be found in the larger TNF creeks (Uphapee Creek), and also the Horseshoe Oxbow. Only four individuals were encountered during the 2007-2010 survey. Two were captured while wading Uphapee Creek, and two were captured by hand at the Horseshoe Oxbow. Nearly 60 individuals of this species were captured from the Horseshoe Oxbow in one trapping event in the late 1980s. This site has been trapped annually since then during herpetology field trips, but this never resulted in more than 10 captures of this species, and none were captured using hoop traps during the 2007-2010 survey. Mating occurs in spring, nesting May-Jun, and eggs hatch Aug-Sept (Ernst and Lovich, 2009). These turtles are herbivores, and feed on aquatic algae and macrophytes. They are most reliably captured by trapping or snorkeling the larger creeks within TNF.

Terapene carolina (Eastern Box Turtle*). Common. Box turtles (Fig 60, pg. 23) are terrestrial, and can be found in forests throughout TNF, although population densities are highest in hardwood forests. On nearby private land, 64 Box Turtles were marked on 34 acres between 2003 and 2010 as part of an ongoing population study (R.D. Birkhead, unpubl. data). Therefore, densities can be quite high, and home ranges apparently overlap considerably. Peak Eastern Box Turtle activity occurs May-Jun. During the hotter, drier part of the year (Aug-Oct), they confine their activity to seeps, springs, and riparian habitats and can occasionally be found wallowing in mud. The earliest activity recorded for the area was 15 Mar (2008) and the latest encounter was 26 Oct (2008; 10 Nov 2009 for a Lee County road killed specimen). A male was found emerging from its hibernaculum 31 Mar (2010), and a female was discovered in its hibernaculum 21 Oct (2007). Mating has been observed on 15 May (2008), 21 Jun (2008), and 8 Oct (2008), indicating there may be a bimodal mating pattern for this southern population. A nesting female was observed in TNF on 12 Jun (2008). Hatchlings appear Sep-Oct (Ernst and Lovich, 2009), and a hatchling with egg tooth still present (indicating a very recent hatching) was found in Auburn, Alabama in Oct (2010). Eastern Box Turtles are terrestrial omnivores, feeding on low fruit, fungi, insects, snails and worms. Single dead specimens were found in 2008 and 2009. Eastern Box Turtles are most reliably encountered by driving or hiking through TNF after summer rains.

Trachemys scripta (Pond Slider*). Abundant. Pond Sliders (Fig 61, pg. 23) are found in permanent ponds and large creeks throughout TNF. Sliders were trapped Apr-Oct, with peak numbers in late Jul-Aug. Up to 52 individuals were captured in one night by trapping. Mating is prolonged, and occurs May-Oct (Ernst and Lovich, 2009). Nesting occurs May-Jun, and eggs hatch Aug-Sep (Ernst and Lovich, 2009). Sliders are aquatic omnivores, and do not feed on game fish. Four dead specimens were found 2007, seven in 2008, and three in 2009. They are reliably encountered by trapping the ponds S of FS 937.

Kinosternidae (Mud and Musk Turtles). Mud and musk turtles are small, aquatic turtles with oval shells that are drab in color. The family is characterized by a hinge mechanism on the ventral portion of the shell and that allows some species to close the shell in a fashion that is similar to Box Turtles. They often bite voraciously when handled, and their long, flexible necks equip them with a generous reach. They are omnivorous, and their eggs and all but the largest individuals probably frequently fall prey to a variety of TNF vertebrates.

Kinosternon c.f."baurii" (Striped Mud Turtle*). Uncommon. Elsewhere, Striped Mud Turtles are common residents of floodplains, ditches, and ponds. The biggest surprise of the 2007-2010 herpetofaunal census was the discovery of a turtle that was morphologically consistent with *K. baurii* (Fig 62, pg. 23) within TNF. The specimen was captured in a hoop trap 11 May (2007) at a beaver pond S of FS 937. A hatchling specimen of the same taxon was captured at the same pond in Jul (2007). Historically, Striped Mud Turtles were considered to be endemic to Florida and southernmost Georgia. However, the known range of *K. baurii* has been growing steadily as additional populations have become recognized in the Atlantic Coastal Plain, central Georgia, and Florida Panhandle (Lamb and Lovich, 1990; Ewert et al., 2004; Jensen et al., 2008). Our specimen represents the first documentation of the form in Alabama. Specimens outside of Florida lack the bold carapace stripes characteristic of peninsular *K. baurii*, making them more difficult to recognize (Lamb and Lovich, 1990), and the two individuals encountered from TNF are no exception. However, both TNF specimens had bold facial stripes that continue past the orbit along the rostrum (Fig 63, pg. 23), unlike TNF *K. subrubrum* (see below). The adult specimen also exhibits evidence of a mid-dorsal carapace stripe (Fig. 62-63, pg. 23). Additional specimens with these morphological features have since been procured in Lowndes and Henry County, Alabama as well. Due to the similarity of these turtles with a recognized subspecies of *Kinosternon subrubrum* (*K. s. hippocrepis*; which occurs in extreme southwestern Mobile County, Alabama; Mount, 1975), and the species *K. baurii*, the taxonomic assignment of these turtles is unresolved. Genetic and morphological studies are underway to resolve this issue (Graham and Guyer, unpubl. data), and initial results indicate that these turtles are more closely related to Georgia striped *K. baurii* specimens than to *K. subrubrum* collected from TNF. Mating occurs in spring (Mar) and nesting in the fall; eggs may enter a phase of diapause and hatch the following spring (Ernst and Lovich, 2009). Searches within TNF floodplain swamps may be a more reliable detection method for this species than trapping ponds.

Kinosternon subrubrum (Eastern Mud Turtle*). Abundant. Eastern Mud Turtles (Fig 64, pg. 24) are found in most permanent TNF ponds, and have a habit of travelling overland during rains. One to five individuals per night were trapped Apr-Jun. Mating occurs Mar-May, nesting May-Jun, and eggs hatch Aug-Sep (Ernst and Lovich, 2009). Mud turtles are aquatic omnivores. One dead specimen contained the seeds of *Nuphar advena* (Graham and Sorrell, 2008). Two dead specimens were found in 2007, one in 2008, and one in 2009. Eastern Mud Turtles are found most reliably at the Horseshoe Oxbow.

Sternotherus minor (Stripenecked Musk Turtle*). Rare. Stripenecked Musk Turtles (Fig 65, pg. 24) are river turtles and can be expected in the large TNF creeks. Mating in this species is bimodal in spring and fall, nesting occurs in Mar, and eggs hatch May-Jun (Ernst and Lovich, 2009). Stripenecked Musk Turtles are molluscivorous, feeding mostly on snails. Only one individual was encountered during the 2007-2010 survey, and it was captured while snorkeling Opintlocco Creek just S of its confluence with Chewacla Creek at the TNF boundary.

Note:

TNF specimens are currently recognized as *Sternotherus minor peltifer*, the Stripenecked Musk Turtle. *S. m. peltifer* is confined to Alabama River drainages, and differs considerably in appearance from *S. m. minor*, which is found only a few dozen km to the east in Apalachicola River drainages. Genetically, it appears to be unique (Walker et al., 1998), and in the future it will likely be recognized as a separate species, *Sternotherus peltifer*.

Sternotherus odoratus (Stinkpot*). Abundant. Stinkpots (Fig 66, pg. 24) were reliably captured in permanent ponds using crayfish traps, and the maximum number caught in one night (99) corresponded with the drying of a pond on 6 Jun (2007). Smaller numbers were trapped consistently from Apr-Sep. Mating occurs sporadically through the active season, but peaks spring and fall. Nesting occurs Mar-Jul, and hatchlings emerge Aug-Sep (Ernst and Lovich, 2009). Stinkpots are scavenging omnivores. Nine dead specimens were found in 2007, and one was found in 2009. Stinkpots are easily detected by trapping the ponds S of FS 937.

Trionychidae (Softshells). Softshells are large turtles with a shell reduced to a leathery, pancake covering. They have long necks and a good reach for their vicious bite, and must therefore be handled carefully. The soft shell allows these turtles to exchange respiratory gases with the aquatic medium, allowing them to dive for prolonged periods of time relative to turtles with hard shells. Softshells are carnivorous, but probably do not take game fish. As eggs and hatchlings they are probably fed upon by many TNF vertebrates, however, as adults, they are formidably equipped to escape or fight most would-be predators.

Apalone spinifera (Spiny Softshell*). Uncommon. Spiny Softshells (Fig 67, pg. 24) were occasionally encountered in Uphapee and Choctafaula Creek during the 2007-2010 survey. They are river turtles that spend much of their time buried partially in the sand. Overland movement is possible, and they have invaded areas of stagnant water such as the Horseshoe Oxbow. They are extremely fast swimmers and are difficult to capture. Mating occurs Apr-May, nesting Jun-Jul, and hatchlings appear Aug-Sep (Ernst and Lovich, 2009). Softshells are predaceous, and feed on small fish, crayfish, and dragonfly larvae, which they capture by ambush (Ernst and Lovich, 2009). One Spiny Softshell was captured by hand while wading Uphapee Creek, and one was trapped during a class field trip.

Squamata (Lizards and Snakes)

Anguidae (Glass and Alligator Lizards). Glass lizards are limbless, insectivorous squamates with a ventrolateral groove that runs the length of both sides of the body. Since they lack limbs, they resemble snakes, however, unlike snakes, Glass Lizards have eyelids, ear openings, and their tail makes up a majority of their length. The tail is also very fragile and breaks easily, and most specimens have evidence of tail regeneration. Since they are fossorial and difficult to find, very little is known of their natural history and ecology; encounter rates below may not be a good indication of their abundance. Female Glass Lizards brood their eggs. Fitch (1989) published the only detailed study of a glass lizard species. Glass Lizards are insectivorous and probably fall prey to snakes, birds, and small mammals. However, due to their fragile tails, predatory attempts may be more frequent than successful predation.

Ophisaurus attenuatus (Slender Glass Lizard). Rare. Alabama Slender Glass Lizard (Fig 68, pg. 24) specimens have been collected in dry, upland, rocky habitats, so these lizards might be expected in the open longleaf pine stands of TNF. The exact collection locality of the 1968 TNF Slender Glass Lizard specimen is unknown.

Ophisaurus ventralis (Eastern Glass Lizard*). Uncommon. Eastern Glass Lizards (Fig 69, pg. 24) are found in mixed pine-hardwood forests and open ruderal habitats. Interestingly, this species is rather common in neighborhoods just a few blocks from Auburn University, 15 km from TNF. Several individuals were encountered there during 2007-2010. Most Lee and Macon County specimens have been collected Apr-May. This species is fossorial, and individuals have been observed with their head and neck protruding out of underground burrows, a behavior we term "periscoping." An Eastern Glass Lizard was collected "2.09 km N of the FS 908/916 intersection along FS 916" on 27 Jun (1997). An additional specimen was collected recently on the shoulder of U.S. 29, 500 m N of the State Road 186 intersection at the TNF boundary on 25 Oct (2010).

Dactyloidae (Anoles). Anoles are a species-rich family of small to large, arboreal, acrobatic lizards, the males of which have colorful throat fans ('dewlaps') used for display. Anoles have toe lamellae that make them excellent climbers. Most anoles range from Central and South America through the Caribbean, with only one species native to the United States. Anoles feed on insects and are probably fed upon by numerous snakes, birds, and mammals within TNF.

Anolis carolinensis (Green Anole*). Abundant. Anoles (Fig 70, pg. 24) are found in all TNF habitats, and were encountered in the reeds, shrubs, and downed trees of TNF permanent ponds. Most individuals were found Apr-May, with smaller numbers occasionally seen during summer and a lesser peak of abundance in Sep-Oct. Small numbers of anoles can be found during winter on warm days, and this species hibernates under small logs or in shallow leaf litter. Many individuals were found during winter under sticks along the bank of the Horseshoe Oxbow, and two individuals were found under logs 19 Jan 2009 near Opacum Pond. Females lay one egg at a time in shallow soil intermittently throughout the active season, usually Jun-Jul (Smith, 1946), and hatchlings appear in early Aug. One adult male was found hosting a botfly; this individual was hanging upside down in a shrub by its toes, and was barely alive. The botfly was ~10% of the body mass of its host. Anoles are most reliably observed in the shrubbery and vegetation ringing beaver ponds S of FS 937.

Phrynosomatidae (Spiny Lizards). Fence lizards, spiny lizards, and horned lizards have spiny scales and usually a somewhat flattened appearance. This family has a mostly southwestern U.S./Mexico distribution, and only one representative is found in Alabama. Many phrynosomatids have multiple clutches of small eggs that are buried in soil. They are visually oriented insectivores, and in TNF they are probably eaten by snakes and predatory birds.

Sceloporus undulatus (Eastern Fence Lizard*). Uncommon. Fence Lizards (Fig 71, pg. 24) are most often found in open, sunny situations, and probably are found more frequently near open longleaf pine stands in the TNF uplands. They usually prefer areas with abundant coarse woody debris along open forest edges. They were occasionally observed during 2007-2010 survey, usually in pine-oak woods near ponds among fallen trees. Eggs are laid in Apr-May (Smith, 1946), and TNF hatchlings appear during Aug-Sep. Fence Lizards are consistently seen in open areas on ridges near the TNF firing range.

Scincidae (Skinks). Distributed worldwide, skinks are smooth-scaled lizards that are often confused for salamanders in Alabama. In Alabama, three species (*Plestiodon fasciatus*, *P. inexpectatus*, and *P. laticeps*) have blue tails at hatching and five bold yellow stripes on the dorsum. Subtle scale differences are used to tell the three species apart. The blue tail color eventually fades as the lizard ages, but can remain in adult females. All three species are referred to as 'blue tailed skinks' or 'salamanders' by locals, who treat them as a single species. Males of all three have large, red heads during the spring breeding season (Mar-Apr), which they use during biting matches to gain access to females. Females of all three species brood eggs in rotting logs during the summer, and hatchlings appear in late summer/fall. *Plestiodon* females attend their nests by wrapping their bodies around the clutch until hatching. During the hot months of summer, most skink activity takes place early in the morning. Skinks are taste-oriented insectivores, and in TNF are probably eaten by snakes and predatory birds. The upland pine forests of TNF probably support the greatest diversity of skinks.

Plestiodon egregius (Mole Skink). Rare. Elsewhere, Mole Skinks (Fig 72, pg. 24) are found in sandy longleaf pine forests and open scrub habitats, and are the most fossorial of the four *Plestiodon* skinks known from TNF. The exact collection locality of the sole TNF specimen of this elusive species is unknown, but it was probably in the sandy uplands where open longleaf pine stands now occur. It was collected 28 Sep 1967. Two specimens were collected in Jul 1990, just N of TNF off Neal Road in Lee County. The area where these specimens were collected is an interesting sandhill (bisected by the appropriately named Sandhill Road) composed of fragmented longleaf pine-turkey oak forest, and is at the razor's edge of the Fall Line. Elsewhere, these lizards have been found in the loose soil of pocket gopher mounds in early spring, and under boards during warm winter and early spring days. Searches or drift fence sampling of the ridges and slopes of sandhills may eventually determine if this species is still present within TNF.

Plestiodon inexpectatus (Southeastern Five-lined Skink). Rare. Southeastern Five-lined Skinks (not illustrated) are usually found in open hardwood or pine forests. They are the most terrestrial of the four *Plestidon* species, preferring open, sunny situations, where they crawl across the ground. We are uncertain where most TNF Southeastern Five-lined Skink specimens were collected, however, two were collected within TNF—along with three *Virginia striatula*—at "Choctafaula Creek" in Apr 1969. Southeastern Five-lined Skinks may be more common in the open areas of longleaf pine sandhills, which were not systematically sampled during our study. None were observed during 2007-2010 fieldwork. Southeastern Five-lined skinks have recently become a species of conservation concern, and may be on the decline.

Plestiodon fasciatus (Five-lined Skink*). Abundant. Most Five-lined Skinks (Fig 73, pg. 24) were observed in the standing dead timber of beaver ponds and hardwood forests in Apr, with smaller numbers found during the summer and fall. They are usually found in areas with standing dead trees, and therefore beaver ponds are excellent habitat. Five-lined Skinks are terrestrial to semi-arboreal, and often hide under loose bark, where they find insects to eat. They have the greatest preference for moist conditions of the four TNF *Plestiodon* skinks; occasionally, individuals evaded capture by diving into and swimming under water. Five-lined Skinks are reliably encountered near dead trees and course woody debris at beaver ponds S of FS 937.

Plestiodon laticeps (Broadhead Skink*). Uncommon. Broadhead Skinks (Fig 74, pg. 25) occupy hardwood and upland pine forests. They are the most arboreal of the four TNF *Plestiodon* species, and are often detected by the scratching sounds they make while quickly climbing trees. They are also the largest of the four *Plestiodon* skinks, and adult males are unmistakable with their large red heads. Only a few Broadhead skinks were observed during the 2007-2010 research. They may be more common and widespread in upland habitats in TNF, which were not sampled consistently during our research. Most Broadhead Skinks we found were in the mixed pine-hardwood forests adjacent to beaver ponds S of FS 937.

Scincella lateralis (Ground Skink*). Uncommon. Ground Skinks (Fig 75, pg. 25) are probably found in forests throughout TNF, and were encountered crawling through leaf litter of mixed pine-hardwood forests during the day near beaver ponds and were most reliably captured using drift fences with bucket traps. Eggs are laid Jun-Aug and hatch in late Aug-Sep (Smith, 1946). They feed on tiny insects, and probably fall prey to small mammals (e.g., shrews), birds, and fossorial snakes. Ground Skinks are reliably encountered in the leaf litter of mixed pine-hardwood forests near FS 937.

Teiidae (Whiptails and Ameivas). Teids are New World lizards with granular dorsal scales and enlarged, rectangular belly scales. Most are very quick runners and nearly impossible to capture by hand, have yellow stripes along a dark brown dorsum, and likely originated in the desert southwest of North America. A single species is found in the Southeast. American Teiids are insectivorous, and are frequently consumed by very swift snakes, such as Racers and Coachwhips.

Aspidoscelis sexlineatus (Six-lined Racerunner*). Common. Six-lined Racerunners (Fig 76, pg. 25) are swift, terrestrial lizards found in open ruderal areas and upland pine forests. They probably reach maximum abundance in open pine habitats within TNF. Only two were actually captured during the 2007-2010 survey; one was fortuitously grabbed from under a board, and one was stalked in a wood pile and was finally cornered after nearly thirty minutes of pursuit. Racerunners breed shortly after spring emergence, and eggs are laid Jun-Jul. Hatchlings appear in early Aug (Smith, 1946). They are most easily encountered on sunny, hot days in open grassy areas near the Horseshoe Oxbow, and large sandbars along Uphapee Creek.

Colubridae (Harmless Egg-Laying Snakes). TNF colubrids are generally long and skinny snakes with round pupils, and they are harmless to humans. Most Alabama colubrids mate in spring (probably Mar-May), but some may mate in both spring and fall (Sep-Oct; e.g., *Opheodrys aestivus* and *Tantilla coronata*; Ernst and Ernst, 2004). Colubrids lay clutches of eggs in early summer that develop in the ground or rotting logs and hatch in late summer/fall. Colubrids exhibit a wide range of generalist and specialist feeding patterns, with some feeding on a variety of prey (e.g., Eastern Kingsnakes) and others specializing on only one prey type (e.g., Scarlet Snakes, Crowned Snakes). Most use either constriction or direct swallowing to subdue their prey. However, at least one TNF species has enlarged rear fangs that conduct venom into prey, but this species is harmless to humans. Colubrids probably fall prey to most vertebrate predators found within TNF. Historically, TNF colubrids probably reached their highest diversity in upland pine forests.

Cemophora coccinea (Scarlet Snake*). Uncommon. Scarlet Snakes (Fig 77, pg. 25) inhabit upland habitats of TNF, and can most often be found crossing roads on warm summer nights. A few were encountered on Wire Road during the 2007 field season, and one was found by N. Burkett-Cadena (University of South Florida, pers. comm.) while conducting a VES at TNF on the forest floor of a mixed pine hardwood forest. Most Lee and Macon county specimens were collected in May. Many individuals were captured on roads after night VES, indicating they may be active quite late at night. Scarlet Snakes eat mostly lizard and turtle eggs. Scarlet Snakes are most reliably observed crossing County Road 53 at night.

Coluber constrictor (Black Racer*). Common. Black Racers (Fig 78, pg. 25) are found in all TNF habitats, and were occasionally observed during VES, especially in thickets near open areas. They are active during hot weather when other amphibians and reptiles are scarce. Racers probably eat mostly lizards at TNF, but they probably also feed heavily on metamorphic frogs during the late summer. Many were found dead on Wire Road during the 2007-2010 survey. Recent hatchlings have been found dead on roads in Sep. Black Racers are reliably encountered in the large open area adjacent to the Horseshoe Oxbow.

Lampropeltis getula (Eastern Kingsnake*). Rare. Eastern Kingsnakes (Fig. 79, pg. 25) are found in upland pine, mixed pine hardwood, and lowland hardwood forests. They were once common at TNF, and could be reliably encountered during class field trips in past decades (R.H. Mount, Auburn University, pers. comm.). However, this species has undergone a mysterious and massive decline in parts of its range (Krysko and Smith, 2005; Winne et al., 2007; Stapleton et al., 2008), and TNF populations appear not to have been spared. Most Lee and Macon County museum specimens were collected Apr-May and Oct. Kingsnakes feed on a variety of prey, including reptile and bird eggs, small mammals, lizards, amphibians, and other snakes, especially Copperheads. Only one Eastern Kingsnake individual was encountered during the 2007 field season. It was found dead on County Road 53 just north of the U.S. Hwy 80 intersection.

Note:

A recent molecular phylogeny (Pyron and Burbrink, 2009a) provides support for taxonomic rearrangement of the formerly recognized subspecies of *L. getula* found in Alabama: the Eastern Kingsnake (*L. g. getula*), Black Kingsnake (*L. g. nigra*), and Speckled Kingsnake (*L. g. holbrooki*). According to this hypothesis, Alabama Black and Speckled Kingsnakes share similar genetic structure and should be considered one species, and the Eastern Kingsnake is a separate evolutionary lineage and should be considered a separate species. Specimens with intermediate phenotypes have been found in Macon County, and Mount (1975) considered the area a region of intergradation between the subspecies *L.g. holbrooki* and *L. g. getula*. The recently observed TNF specimen appeared to be *L. g. getula*, with a chain pattern, however, other recent Macon County specimens found just south of TNF have a speckled appearance along with distinct chain-like patterns. According to Pyron and Burbrink (2009b), these color patterns are not always concordant with Kingsnake genetic lineages and should not be used as indicators of gene exchange. Therefore, it is possible that both lineages of Kingsnakes that Pyron and Burbrink (2009b) recognize as present in Alabama (*L. getula* and *L. nigra*) may be present in the TNF area.

Masticophis flagellum (Coachwhip*). Rare. Coachwhips (Fig 80, pg. 25) are found in open longleaf pine forests and agricultural habitat. The only individual encountered during the 2007-2010 survey was found dead on Macon County Road 53, just 50-100 m outside the forest boundary. Several more were documented and collected dead on Wire Road during the survey period outside of TNF. Most Lee and Macon County museum specimens were collected Apr-May. This species may be expected to become quite common in longleaf pine uplands if application of prescribed fire continues. Lizards, including racerunners, are a favored prey item of this species. During the preparation of the manuscript in May 2011, we confirmed the presence of this species within TNF in an open Longleaf Pine-Turkey Oak stand.

Opheodrys aestivus (Rough Greensnake*). Rare. Rough Greensnakes (Fig 81, pg. 25) occupy a broad array of wetland and forested habitats. We are unsure why only one Rough Greensnake was encountered during the 2007-2010 survey, despite the availability of seemingly optimal habitat (mixed pine-hardwood forests and the thick vegetation along shores of permanent ponds). Rough Greensnakes are arboreal but occasionally descend to the ground. Females lay eggs, sometimes in communal nests, in tree cavities. Rough Greensnakes feed on insects and spiders. A single individual was encountered by Auburn University graduate student Brian Fox in the fall of 2010 near the TNF shooting range. Another individual was found dead on Wire Road in 2009 just 1 km from the forest boundary.

Pantherophis guttatus (Cornsnake). Rare. Cornsnakes (Fig 82, pg. 25) appear to prefer upland pine and open, ruderal habitats, including old buildings. They are more terrestrial than Gray Ratsnakes, and are most active at night, and can sometimes be seen crossing roads at this time. Cornsnakes eat a variety of small vertebrates but prefer small mammals. A Cornsnake was collected in 1984 at State Road 186, E of Choctafaula Creek, by Mark Bailey. Another specimen was collected just outside TNF on Macon County Road 89 in 2003. Cornsnakes have apparently declined in this region (R.H. Mount, pers. comm.), and none were encountered during the survey.

Pantherophis spiloides (Gray Ratsnake*). Uncommon. Gray Ratsnakes (Fig 83, pg. 25) probably occupy most forested habitats within TNF and were encountered rarely during the VES in mixed pine hardwood forests near ponds. However, they were frequently found dead on Wire Road. Most Lee and Macon County museum specimens were collected in May. Gray Ratsnakes probably lay their eggs in cavities in trees. Recent hatchlings are often found dead on area roads in Sep. Locals refer to this snake as the 'Chicken Snake', and this is perhaps a more fitting moniker; this species is a confirmed nest robber, and probably feeds mostly on birds and their offspring at TNF. They deftly scale the vertical trunks of large trees to do so. A large individual was captured in a chicken coop feeding on eggs on private land near TNF. They are also a frequent pest for Bluebird researchers in the Auburn area. Gray Ratsnakes are most reliably encountered by searching for them crossing TNF roads during the evening.

Tantilla coronata (Southeastern Crowned Snake). Uncommon. Southeastern Crowed Snakes (Fig 84, pg. 25) are small and secretive, and are possibly more common in the upland longleaf pine habitats of TNF than collection records indicate. The best search time is during warm weather in early spring (Mar) when they can occasionally be found under cover objects. This interesting snake is a centipede specialist, and kills its dangerous prey with venom from its rear fangs. However, its venom is harmless to humans. None were found during our research within TNF, however, a Southeastern Crowned Snake was recently documented (Mar 2010) on private property just 1 km from the TNF boundary.

Dipsadidae (Rear-fanged Snakes). Dipsadids typically have smooth scales and possess an enlarged posterior maxillary tooth that is grooved. This allows these snakes to inject venom from glands at the back of the mouth. As a group, these snakes are surprisingly docile and rarely bite, and their venom is not dangerous to humans. However, bites from tropical members of this family may cause intense, searing pain. The tail has a pointed tip in most species. TNF dipsadids are oviparous and have very specialized diets. TNF dipsadids probably reach their greatest species richness in bottomland hardwood forests.

Diadophis punctatus (Ringneck Snake*). Common. Several Ringneck Snakes (Fig 85, pg. 26) were encountered on lowland hardwood forest floors at night during VES. Mating takes place in spring and fall, and nesting occurs Jun-Jul (Ernst and Ernst, 2004). Most Lee and Macon County museum specimens were collected Mar-Apr and Oct. They are rear-fanged, venomous snakes that are harmless to humans but deadly to their prey. Salamanders are the primary prey items of Ringneck Snakes at TNF, and one was documented as a predator of Chamberlain's Dwarf Salamander. Ringneck Snakes are most reliably encountered at night crawling on the surface of leaf litter in TNF lowland forests.

Farancia abacura (Mud Snake*). Uncommon. Mud Snakes (Fig 86, pg. 26) were infrequently encountered at TNF, and were usually found at night crawling near permanent ponds. Mating occurs in spring, and nesting occurs Jul-Sep (Ernst and Ernst, 2004). One was found in shallow water under pine bark during the day in Apr 2009. This individual regurgitated a large Lesser Siren and was probably basking in the warm water under the bark. Sirens and Amphiumas are the primary prey of this specialist snake. Mud Snakes are encountered near the beaver ponds S of FS 937.

Heterodon platyrhinos (Hognose Snake*). Rare. Hognose Snakes (Fig 87, pg. 26) occupy open pine, mixed pine-hardwood, and hardwood forests, especially those on sandy soils. They mate mostly in spring but possibly also in fall, and nesting occurs Jun-Jul (Ernst and Ernst, 2004). Hognose Snakes are toad-eating, specialist snakes, and may be more common in the area, but spend most of their time out of sight burrowed in loose sand. One Hognose Snake was captured by drift fence in mixed pine hardwood forest S of the FS 937 terminus.

Natricidae (Harmless Live-bearing Snakes). These snakes are usually found near water or in areas of moist leaf litter. Most have heavily keeled scales and therefore have a rough appearance. Natricids typically exhibit a scramble competition breeding system in which multiple males court much larger females during the early spring. However, mating can take place in the spring, fall, or at both times, depending on the species. They are live bearers that gestate embryos over the summer and give birth during late summer/fall. Natricids exhibit both generalized (*Nerodia sipedon, Thamnophis sirtalis*) and specialized (*Regina septemvitatta*) feeding patterns. Natricids are probably common prey items for a variety of TNF vertebrates. Along with *Diadophis punctatus* and *Tantilla coronata*, the natricid species *Storeria occipitomaculata*, *S. dekayi*, *Virginia striatula*, and *V. valeriae* represent a small leaf litter snake guild in eastern deciduous forests, and although they are secretive, they may in fact be quite abundant in TNF forests (Willson and Dorcas, 2004; Todd et al., 2008).

Watersnakes, especially the genus *Nerodia*, are often confused for the venomous Cottonmouth, and in Alabama they pay the price for this confusion at the hands of humans. Mating in both TNF watersnake species takes place in spring, and their mating system consists of 'mating balls' of multiple males courting large females. Locals observing such behavior may have given rise to the myth of dreaded Cottonmouth 'nests.' Cottonmouths do not mate in 'nests' (see species account for Cottonmouth). The habit of nonvenomous watersnakes to bask in low hanging branches (Fig 88, pg. 26) has also led to the belief that Cottonmouths drop from trees onto hapless boaters. Basking in trees or shrubs is exceedingly rare in Cottonmouths; we have only seen two instances of aerial basking in the Cottonmouth during > 800 observations of this species. Finally, a foraging behavior of *Nerodia erythrogaster*, in which individuals cruise rhythmically along the banks of wetlands searching for frogs, may have led to the myth that Cottonmouths attack boats. We have observed an individual *N. erythrogaster* foraging in this manner while canoeing. By placing the canoe parallel with the river bank, we were able to observe the snake swim directly toward the boat from downstream, and continue its course to swim along the side of the canoe instead of the bank. A person unfamiliar with snakes and their behavior would have perhaps found this to be a disconcerting experience. Natricids within TNF probably reach their greatest diversity in large creeks and their associated floodplains.

Nerodia erythrogaster (Plainbelly Watersnake*). Common. Plainbelly Watersnakes (Fig 89, pg. 26) were encountered most often at night submerged in permanent ponds, with only their heads out of the water. They were also found occasionally crawling along pond edges during the day. This species is more terrestrial than other watersnakes and makes extensive overland movements. Most Lee and Macon County specimens were collected Apr-May and Oct. Plainbelly Watersnakes are confirmed frog feeders, consuming fish less often than other watersnakes. Plainbelly Watersnakes are reliably encountered at night in the beaver ponds S of FS 937.

Nerodia sipedon (Midland Watersnake*). Uncommon. Midland Watersnakes (Fig 88, 90, pg. 26) are aquatic snakes usually associated with flowing-water habitats, and are probably found in most TNF small and large creeks. They were found basking in low hanging branches during occasional surveys of Uphapee Creek, where this species is possibly more common than our records suggest. Most Lee and Macon County specimens were collected Apr-May. Midland Watersnakes are generalist feeders on amphibians and fish. They were encountered infrequently at the Horseshoe Oxbow, and were not encountered at the beaver ponds S of FS 937 at TNF.

Regina rigida (Glossy Crayfish Snake*). Uncommon. Glossy Crayfish Snakes (Fig 91, pg. 26) are fully aquatic and occupy creeks and ponds. As the name implies, the Glossy Crayfish Snake is a crayfish specialist. Only one Glossy Crayfish Snake was encountered during the 2007-2010 survey, and it was captured with a minnow trap in the small creek draining the beaver ponds S of FS 937.

Regina septemvitatta (Queen Snake). Rare. Queen Snakes (Fig 92, pg. 26) probably occur in small or large creeks of TNF. Spring basking is a typical behavior in this species, and searches for this snake could be conducted Mar-Apr in shrubs along stream banks to locate them. Like Glossy Crayfish Snakes, Queen Snakes are also crayfish specialists, and only eat recently molted crayfish. A Queen Snake was found dead on Wire Road near TNF Sep 2007, but none were countered within the forest during our research.

Note:
A recent phylogenetic analysis that incorporated both genetic and morphological data concluded that the genus *Regina* is polyphyletic (Alfaro and Arnold, 2001); that is, small, olive, crayfish-eating snakes apparently evolved more than once within the Natricidae, and some species may essentially be specialized watersnakes. *Regina septemvitatta* may eventually be placed within the genus *Nerodia*. However, this taxonomy has not been completely accepted, and even the authors of the analysis stopped short of revising the natricidae until a more thorough study is conducted.

Storeria dekayi (Dekay's Brownsnake*). Uncommon. Dekay's Brownsnakes (Fig 93, pg. 26) are small terrestrial snakes that are probably found in most TNF habitats, but possibly more commonly in hardwood forests. They were encountered occasionally during night surveys along the edge of beaver ponds in coarse woody debris. They feed on small, soft bodied invertebrates, such as worms and slugs. Dekay's Brownsnakes were rarely seen during night surveys of the beaver ponds S of FS 937.

Storeria occipitomaculata (Redbelly Snake). Uncommon. Redbelly Snakes (Fig 94, pg. 26) are small terrestrial snakes found in leaf litter of hardwood and mixed pine-hardwood forests. These snakes exhibit interesting color variation; dorsal color varies from charcoal gray to khaki tan, and the ventral color can be pink, red, orange, or tan. Individuals that are completely tan also occur, and these can be confused for Earth Snakes (*Virginia*). Redbelly Snakes feed on slugs and snails, which they extract with elongate teeth and an interesting jaw mechanism (Rossman and Myer, 1990). None were encountered within TNF during our study, however one was encountered at night alive on Wire Road, just 1 km from the TNF boundary.

Thamnophis sauritus (Eastern Ribbonsnake*). Uncommon. Eastern Ribbonsnakes (Fig 95, pg. 27) are small, semiaquatic to terrestrial, and probably occupy most TNF wetlands. They are occasionally found on roads at dusk. They were most often encountered in beaver ponds in emergent vegetation in marshy areas. Most Lee and Macon County specimens were collected Apr-May and Oct.

Eastern Ribbonsnakes feed mostly on small frogs and salamanders, and are known predators of *Ambystoma opcaum* and *A. talpoideum* at TNF. Eastern Ribbonsnakes are reliably observed in the beaver ponds S of FS 937.

Thamnophis sirtalis (Eastern Gartersnake*). Uncommon. Eastern Gartersnakes (Fig 96, pg. 27) are small, terrestrial, or semi-aquatic, and probably occupy most TNF habitats. They were occasionally encountered during surveys of TNF wetlands, mostly in marshy areas adjacent to permanent ponds. They are named for their striped appearance, like a garter belt, although locals often mistakenly call these snakes 'garden snakes' or 'gardener snakes.' Eastern Gartersnakes feed on a variety of small invertebrates and vertebrates. Eastern Gartersnakes are reliably observed at the beaver ponds S of FS 937.

Virginia striatula (Rough Earth Snake). Uncommon. Rough Earth Snakes (Fig 97, pg. 27) are small and fossorial, and occupy upland pine, mixed pine-hardwood, and hardwood forests. Most Lee and Macon County specimens were collected in Apr and Sep-Oct, an observation similar to long-term data from the Savannah River Site (Todd et al., 2008). Rough Earth Snakes feed primarily on earthworms and insect pupae (Ernst and Ernst, 2004). They were not encountered during 2007-2010 survey, however, several specimens have been collected from TNF, including a series of three collected in Apr 1969 from the "Choctafaula Creek area."

Virginia valeriae (Smooth Earth Snake*). Uncommon. Smooth Earth Snakes (Fig 98, pg. 27) are small and fossorial, and are probably confined to hardwood forests and associated wetlands within TNF. One individual was observed prior to this research swimming across a beaver pond at night. Most Lee and Macon County specimens were collected Mar-Apr and Sep-Nov, an observation similar to long-term data from the Savannah River Site (Todd et al., 2008). Smooth Earth Snakes primarily feed on soft-bodied invertebrates, such as earthworms, insect larvae, and slugs (Ernst and Ernst, 2004). One individual was found during excavation of drift fence in mixed pine-hardwood forest surrounding a beaver pond S of FS 937.

Crotalidae (Pitvipers). Pitvipers are large, heavy-bodied snakes with distinct necks, vertically-elliptical pupils, and heat sensitive pits between the eyes and nostrils. Most species exhibit a mating system characterized by males searching widely for females during the breeding season. Male-male combat is performed in these snakes to achieve access to females. Diets of TNF species range from extremely generalized (e.g., Cottonmouth) to fairly specialized (e.g., Canebrake Rattlesnake). Pitvipers have large, flexible fangs which conduct dangerous venom into prey and enemies. They are the only dangerously venomous snakes at TNF, and they should never be approached or handled. Young pitvipers are probably consumed by a number of TNF vertebrates, however, adults are probably considerably less vulnerable to predation. However, adult pitvipers are frequently consumed by Eastern Kingsnakes. Floodplain forests of TNF probably contain the highest diversity of pitvipers.

Agkistrodon contortrix (Copperhead*). Common. Copperheads (Fig 99, pg. 27) were usually found at night in mixed pine hardwood forests, and crossing roads near such habitats. They were encountered rarely during the day. Copperhead breeding occurs in spring and fall, and females gestate embryos over the summer and give birth during the late summer/fall after breeding. Copperheads feed on invertebrates (e.g., cicadas, caterpillars) and small vertebrates (e.g., lizards, rodents). Copperheads are reliably observed on FS 937 and in woods adjacent to this road at night.

Agkistrodon piscivorus (Cottonmouth*). Abundant. Cottonmouths (Fig 100, pg. 27) are by far the most common snake in TNF wetlands, and they can be found in and around all habitats with water. They are particularly abundant in permanent ponds, but can also be found along large or small streams. Cottonmouths are decidedly nocturnal at TNF, although they can be found basking in grass clumps or at the base of shrub hummocks during the day, especially during the cooler weather of spring and fall. The activity period for TNF cottonmouths is prolonged, with surface activity from Feb-Oct. They may also be found above ground during the winter during warm spells. Mating takes place summer through fall. The mating behavior of Cottomouths and other pitvipers includes male-male combat 'dances' in which two males lift their heads off the substrate, wrap their necks around each other, and try to topple one another. Courtship between single males and females includes male neck jerking, chin rubbing, and mounting. A bizarre instance of male-female combat was documented at TNF (Graham and Sorrell, 2010). Females gestate embryos during the summer and give birth during the fall a full year after mating. Neonates are born late Aug-Sep. Cottonmouths usually select ambush sites along the water's edge to take advantage of the water-land interface and the variety of prey items that dwell there. The Cottonmouth may have the most catholic diet of any snake; almost every vertebrate within their distribution of a remotely swallowable size has fallen prey to this snake. Dietary items recorded from TNF cottonmouths include sunfish, catfish, frogs, amphiumas, sirens, and a Copperhead (Graham et al., 2010a). Cottonmouths are also scavengers, and a TNF Cottonmouth ate the wing of a Blue-winged Teal, which it presumably scavenged (Williams et al., 2004). A thorough study of the demography of TNF Cottonmouths was published by Koons et al. (2009). Cottonmouths are reliably encountered at the Tsinia Wildlife Viewing Area and beaver ponds S of FS 937.

Crotalus horridus (Canebrake Rattlesnake*). Uncommon. Canebrake Rattlesnakes (Fig 101, pg. 27) are typically found in hardwood habitats, but were infrequently found during the survey period. Only one individual was encountered during a VES during the day in a dry gum pond, but several more were encountered on area roads at dusk. Alabama Canebrakes likely mate in the fall, and give birth to neonates the following fall. Canebrakes are small mammal specialists, and probably feed mostly on TNF Cotton Rats, Chipmunks, and Gray Squirrels (Ernst and Ernst, 2004). Canebrake Rattlesnakes are most frequently observed crossing County Road 53 or FS 937 at dusk.

Species possibly present

Twelve species have been documented immediately adjacent to TNF, and some of these very likely occur within its boundaries. They are not included on the TNF species list because they were not encountered during the 2007-2010 survey and are not represented by vouchered specimens.

Amphiuma means (Two-toed Amphiuma). Macon County records exist, but no specimens have been collected from TNF and none were encountered during the 2007-2010 survey. Previous TNF researchers who have seen this species at TNF possibly encountered these salamanders, however, it is possible the amphiumas they encountered were *Amphiuma tridactylum*.

Necturus beyeri (Gulf Coast Waterdog). Three Gulf Coast Waterdogs were collected Nov 1967 at U.S. Hwy 80 at Chewacla Creek, only a few km E of TNF. They possibly occur in Choctafaula and Uphapee Creeks in TNF. Waterdogs are most commonly encountered in winter and early spring in large accumulations of leaf litter in clear running Coastal Plain streams where they feed on aquatic invertebrates. They are occasionally caught by fishermen on hook and line, but are most effectively sampled using a heavy-duty D frame dipnet. Nevertheless, targeted efforts to document this salamander within TNF have failed to yield any specimens.

Apalone mutica (Smooth Softshell). This is a turtle that prefers large rivers, and has been collected in Macon County just downstream from TNF in Uphapee Creek, and it possibly occurs within TNF in this stream as well. Attempts to document this species by trapping and float trips 2007-2009 in TNF's large creeks were unsuccessful, but future efforts may eventually add this species to the TNF herpetofauna list.

Macrochelys temminckii (Alligator Snapping Turtle). An Alligator Snapper was collected at U.S. Hwy 80 at Chewacla Creek, a site upstream from TNF portions of this stream, just 2 km east of TNF. M. Gangloff (Appalachian State University), a malacologist, observed this species in Choctafaula Creek within TNF. Follow up searches at this site failed to confirm this observation (J. Godwin, pers. comm.). Alligator Snappers occur in other large streams in Macon County and they likely occur in TNF.

Plestiodon anthracinus (Coal Skink). Coal Skinks have been collected on the hardwood slopes of sand ridges in adjacent Russell County, and this secretive lizard could be present and awaiting documentation in TNF. Drift fence sampling and searches focused on slopes near streams in Feb-Mar may prove successful at documenting this species.

Carphophis amoenus (Worm Snake). Worm Snakes are common, fossorial residents of Alabama hardwood forests north of TNF, and can also be found below the Fall Line in smaller numbers, especially in the Red Hills. Two records for this species exist for Macon County, and they will probably be found under cover objects on TNF hardwood slope forests.

Lampropeltis calligaster (Mole Kingsnake). Mole Kingsnakes are secretive and fossorial, and records exist for adjacent Lee and Russell counties. It is possible that this species will eventually be documented within TNF, and most likely they will be found on roads at night in spring, or captured using drift fence sampling.

Lampropeltis elapsoides (Scarlet Kingsnake). This is also a secretive species that can be difficult to document, and may eventually found within TNF. Records are not available for any nearby county, but habitat in the area appears suitable for this species. Drift fence sampling, night road cruising during summer, and targeted searching under debris and under exfoliating pine bark in the TNF uplands may eventually succeed in finding this species in the area.

Pituophis melanoleucus (Pinesnake). This is a large, burrowing species that we originally placed in the next category until a specimen turned up in Macon County during the preparation of this manuscript in Apr 2011 (AUM 39504; Graham, 2011). Mount (1975) did not include Macon County within the potential range of this species, but thought it possible that they would eventually be found there. Despite their size, Pinesnakes can be quite difficult to locate (Conant and Collins, 1991). Populations are also still extant in nearby Russell, Bullock, and Barbour counties, and the recent Macon County discovery certainly raises the possibility that they may eventually be found within TNF. The TNF prescribed fire management program has greatly improved the upland pine habitat that Pinesnakes prefer, and this area may be an excellent site for future repatriation efforts that could benefit this rare snake. Such an effort should be conducted in concert with repatriation of Eastern Pocket Gophers (*Geomys pinetis*), a prized prey of

Pinesnakes and a species that became extirpated from TNF in the late 1980's.

Nerodia rhombifer (Diamondback Watersnake). Diamondback Watersnakes have been documented in streams on both sides of TNF, but no records exist within the forest. One was recently collected dead on U.S. Hwy 80, 3 mi. NE of Little Texas, near Chewacla Creek. They have also been documented W of TNF in borrow pits near I-85. A locality illustrated in Mount (1975) appears to be at the confluence of Chewacla and Opintlocco Creeks, and may be erroneous; we are aware of no specimens that have been collected there. We targeted this large and easily-detectable species during float trips through TNF in Chewacla and Uphapee Creek and were unsuccessful in finding them, but we expect that Diamondback Watersnakes will eventually be found in TNF creeks and sloughs.

Sistrurus miliarius (Pygmy Rattlesnake). Records exist for this species in adjacent areas of Lee and Russell Counties, and suitable habitat appears to be present in TNF. A sight record exists near Choctafaula Creek and FS 906 (G. Sorrell, pers. comm.), but a voucher specimen or photo is lacking.

Alligator mississippiensis (American Alligator). TNF was possibly within the historic range of this species. A partially decomposing individual was found just S of TNF in an impoundment, and individuals are occasionally reported from nearby Lake Tuskegee. Alligators are also reported from Saugahatchee Creek and impoundments near Opelika, Alabama. These reports are probably due to releases of captive individuals or intentional, unsanctioned translocations, and it is possible that Alligators will eventually be encountered or even become established in TNF from such releases.

Species Possibly Formerly Present

Heterodon simus (Southern Hognose Snake). This small, rare snake has not been encountered in Alabama in decades and is probably extinct in the state. Mount (1975) included the TNF area as potentially within the range of this species, so upland pine management at TNF could be beneficial for future repatriation efforts for Southern Hognose Snakes, and TNF could serve as a potential repatriation site.

Gopherus polyphemus (Gopher Tortoise). Gopher Tortoises are a protected species usually found further south in Alabama, where they dig extensive burrows in the deep sands of longleaf pine forests. Relict populations are still extant in nearby Russell County, and it is possible that Gopher Tortoises once occurred in Lee and Macon County sandhills as well (Mount, 1975). Waif colonies have been established in Lee and Macon Counties by Auburn University biologists with some success. Therefore, TNF is an excellent candidate site for Gopher Tortoise repatriation efforts, and the current fire management of longleaf pine forests will greatly benefit this species.

Survey Results, Discussion, and Synthesis

One hundred fifty visual encounter surveys totaling 340 search hours (not including time spent capturing and processing individuals) were conducted at TNF wetlands 2007-2009, including 211 frog call surveys. During the same period, 569 crayfish trap nights and 252 hoop trap nights were employed. The relative abundance of each of these species estimated from encounter rates are presented in Table 1. The total number of amphibian and reptile species present at TNF currently stands at 81, assuming future analyses confirm that striped TNF mud turtles are *Kinosternon baurii*. Twelve of these (15%) are represented by museum specimens and were not encountered during the survey (Table 1). However, of these, three species were snakes that were encountered 2007-2010 very near TNF (*Storeria occipitomaculata*, *Tantilla coronata*, and *Regina septemvitatta*), and one was a frog species that is apparently no longer present in TNF (*Pseudacris ornata*) but still occurs just south of the TNF border. Eleven species (14 %) were documented during the 2007-2010 research and were not represented previously by museum specimens (Table 1). The balance between specimens not seen during the recent survey but known from TNF, and those documented during the recent survey but not by previous work suggests that TNF has maintained most of its historical fauna. Most species were represented by museum records in about the same proportion as they were detected during the 2007-2010 survey, although about half the species moved up or down at least one abundance category (Table 1). Again, this suggests some stability to the herpetofaunal assemblage. Eighteen of 81 species (22%) were considered significantly over or underrepresented by museum records (i.e., they shifted two or more categories); fifteen were underrepresented by museum records, and three were overrepresented (Table 1). These trends probably reflect collection biases and not real population fluctuations of the fauna.

Many species known from museum records that were not encountered during the recent study are upland-associated species (*Plestiodon inexpectatus*, *Pantherophis gutattus*), and/or fossorial (*Plestiodon egregius*, *Storeria occipitomaculata*, *Virginia striatula*, *Tantilla coronata*, and *Ophisaurus attenuatus*). These species can be difficult to detect unless using drift fence arrays (e.g., Heyer et al., 1994), and would not have been expected to be found in the wetlands surveyed. Several of these species were nonetheless encountered incidentally on private lands or roads very near TNF (*Storeria occipitomaculata* and *Tantilla coronata* ~ 1km northwest of the TNF boundary, and *Regina septemvitatta* ~

2km north of the TNF boundary—all on Macon County Road 53 or Wire Road) during the study period.

Most species that were significantly underrepresented by museum records were widespread, common species that are usually well represented in museum collections and were therefore unlikely to be collected again at TNF. *Anaxyrus fowleri, A. terrestris, Acris crepitans, Pseudacris crucifer, Trachemys scripta, Sternotherus odoratus, Plestiodon fasciatus, Coluber constrictor, Thamnophis sauritus, Agkistrodon contortrix,* and *A. piscivorus* are common, ubiquitous Alabama species that were represented by few, if any, museum specimens from TNF. The abundance of some species appeared to be overrepresented by museum collections, and represented rare or unusual species that would not have been ignored by collectors. These included the frogs *Pseudacris ornata* and *P. brachyphona*, which were represented by several specimens, but were not documented at TNF during the survey. *Virginia striatula* appeared to be significantly overrepresented by museum records, however, it is a small upland snake which may be quite common in the TNF uplands that were not targeted by the surveys. In general, our comparison between museum records and population estimates from our survey support the use of museum records to estimate population trends in amphibians and reptiles (Boundy, 2005), especially for those which occur in Alabama.

A handful of species once collected from TNF no longer appear to be present; these include frogs with characteristic breeding calls that are easy to detect if present. *Pseudacris ornata* still occurs in ponds just south of the TNF boundary, however, we did not detect this frog during winter calling surveys and therefore the TNF population appears to have been extirpated. *Anaxyrus quercicus* was also not encountered during the present survey, and we are aware of no extant local population. They have not been observed in the area since 1975-1976 (Botts, 1978) and have inexplicably disappeared. A single *Ambystoma tigrinum* was collected at TNF and this species once bred at a few sites in the Auburn-Tuskegee area, but they have not been seen since 1990-1991. However, Tiger Salamanders are long-lived species that can breed sporadically (Pechmann et al., 1991), so they may be expected to eventually turn up in the area again. Interestingly, all three of these species which we suspect no longer occur in TNF breed in the same wetland type (temporary, grassy depressions). This wetland type should be targeted for restoration and management efforts.

These apparent local population declines generally corroborate other long-term monitoring data from sites in the Southeast (Pechmann et al., 1991; Daszak et al., 2005), and suggest a regional decline in an amphibian assemblage. Declines of *A. tigrinum* and *P. ornata* at the Savannah River Site (SRS) in South Carolina have been linked to increasing numbers of drought years in the past several decades, which reduces pond hydroperiod and successful reproduction (Daszak et al., 2005). Pond succession at the SRS, during which ponds suitable for Tiger Salamanders were invaded by hardwoods and Marbled Salamanders (Pechmann et al., 1991), is a phenomenon we suspect is occurring in the TNF area. TNF area grassy depressions once supported *A. tigrinum, P. ornata,* and *A. quercicus*, and many of these are now woodland ponds supporting only *A. opacum, L. sphenocephalus, P. crucifer,* and *P. feriarum*. A combination of fire suppression, increasing drought, and habitat loss in the area have probably led to local extirpation of certain species that require grassy, open ponds to breed. Active fire management at TNF may reverse this trend, and these species should possibly be considered for repatriation at TNF and other sites before they become regionally imperiled.

Pseudacris brachyphona was apparently very locally distributed in TNF, and confusion about the location of its former breeding sites prohibited appropriate follow-up surveys. However, targeted surveys at likely sites were attempted during the preparation of this manuscript in winter-spring 2010-2011, and none were located. It is therefore possible that this species has also disappeared from TNF. However, this is a peripheral population of a taxon with more northern affinities. Since this species is still common elsewhere, it probably does not need special conservation attention.

Other species appear to have declined in the area (Mount, 1981; Mount, 1990), but unfortunately, lack of more quantitative baseline data prevents firm conclusions. Mount (1990) indicated that several lizards and snakes known from TNF, including *Ophisaurus attenuatus, O. ventralis, Aspidoscelis sexlineatus, Pantherophis gutattus, Heterodon platyrhinos,* and *Regina septemvitatta*, have declined throughout Alabama. With the exception of *A. sexlineatus*—which we conclude is still common at TNF—our data support Mount's (1990) assertion that these species are currently uncommon or rare. Mount (1981) hypothesized that fire ants have played a key role in the decimation of certain snake and lizard species by destroying their nests. As an example, Mount (1981) predicted that the ecological associations exhibited by *Plestiodon* species (*P. inexpectatus* is ground dwelling, living in open, well-drained habitats favored by fire ants, while *P. laticeps* is arboreal, living in a variety of habitats) correlate well with their apparent changes in abundance. Our data support these trends in part, and at least suggest that *P. inexpectatus* is currently rare. Mount has also suggested (pers. comm.) the nesting associations of the currently rare *P. guttatus* (terrestrial nests) and still common *P. spiloides* (arboreal nests) is circumstantial evidence of fire ant-associated declines. Numerous effects of fire ants on small vertebrates have been demonstrated (Langkilde, 2009).

Although large creeks were not the target of intensive surveys, we noticed relatively low numbers of turtles (*Apalone, Graptemys and Psuedemys* spp.) in these habitats, which may be attributable to increases in off road vehicle (ATV/truck) traffic. Although it is currently illegal to operate motorized wheeled vehicles within a navigable creek channel (e.g., Uphapee, Chewacla, or Choctafaula Creek), it has become an increasingly popular form of recreation in TNF and the surrounding areas for both locals and Auburn University students. These activities destabilize the banks and sandbars (needed for nesting), destroy stabilizing vegetation (needed to prevent erosion and also provide shade for nests) and greatly increase the sediment load entering the creeks (which can impact prey populations, especially sensitive species such as fresh water mollusks; Broadbeck, 2005). Because this activity occurs during low water periods when breeding and nesting of these turtles also occurs, it may have a significant long-term impact on the population dynamics of these species. Finally, over collection for the international food and pet trade (Gibbons et al., 2000) may have also contributed to declines of local turtle populations. Studies to investigate the impact of these human activities on turtle populations should be conducted and greater law enforcement efforts are certainly warranted.

During 2007-2009, we observed 34 individual dead turtles (usually empty shells) of six species while conducting surveys near study ponds. Because we collected the shells or recorded the position of all shells, we did not count shells twice. We do not know the significance or cause of this mortality; however, the exceptional drought of 2008 and/or predation by small mammals (e.g., Raccoons) are potential explanations.

Any consideration of amphibian and reptile declines at TNF should take into account the definite changes in land use patterns that have occurred since the establishment of the property. At the time of initial herpetofaunal collections at TNF, the site was largely old fields, exhausted agricultural lands, and regenerating second growth pine forests (Pasquill, 2008). These open, ruderal habitats possibly supported lower numbers of hardwood -associated species, and may have been excellent habitat for such species as *Ambystoma tigrinum, P. guttatus, Masticophis flagellum*, and *A. sexlineatus*. Over the last several decades, forests have regenerated, so a more natural herpetofauna may be replacing what may have been an unnatural predominance of species that prefer very open habitats. Historically, TNF probably once contained a diverse admixture of Coastal Plain upland and lowland species, and future restoration efforts should perhaps strive to restore it to this aspect. The fact that so many species still remain at TNF—among the most heavily exploited properties to be set aside as a national forest (Pasquill, 2008)—is testament to the resilience of amphibian and reptile populations, and should be taken as an indication that even marginal habitat can be successfully set aside as reserves for wildlife.

Seasonal Trends

Frog calling phenology supports categorization of TNF frogs into two major groups: winter breeding frogs, (*Pseudacris crucifer, P. feriarum*, and *P. ornata*), which breed Jan through Mar, and summer breeding frogs, (*Acris gryllus, Anaxyrus fowleri, H. chrysoscelis, H. cinerea, H. squirrella*, and *Gastrophryne carolinensis*), which breed Apr through Aug. Only a few species might be considered spring breeders; these include *Hyla avivoca* (which calls through the summer but with less intensity than in Apr-May), *Hyla gratiosa*, and *Anaxyrus terrestris* (which breed mostly in Apr). One species, *Lithobates sphenocephalus*, fits no pattern, with calling activities differing extensively among years, yielding an accumulate calling period that covered essentially all months of the year (Table 4). The most species-rich frog chorus we detected (thirteen species; Table 3) occurred in a single pond in early Apr 2008, after a warm spring rain. During this time there was overlap between the calling of winter and summer breeding species. This is a remarkably high number, and is comparable to the maximum species richness of calling frogs recorded at a tropical field station in Costa Rica (Donnelly and Guyer, 1994).

Species richness declined over the summer months to a low of two species known to call during Oct (Fig 102), a period when summer breeders cease reproduction and winter breeders have not yet begun calling (Table 3-4). In addition, the calling assemblage at TNF showed a steady decrease in calling activity when ranked from the greatest proportion of nights a species was heard heard calling (*Lithobates clamitans*), to the species with the least calling activity (*Anaxyrus terrestris*; Table 3-4; Fig 103). This pattern emerged because some species called only on nights of summer rain events when all other species also called, while others of the assemblage called in a nested pattern of species willing to continue calling on nights increasingly distant from the rain event. This pattern appears to mirror call structure described for Neotropical anurans (Donnelly and Guyer, 1994).

Monthly variation in encounter rates for species groups revealed interesting activity patterns. Not surprisingly, adult frogs were encountered with about the same fre-

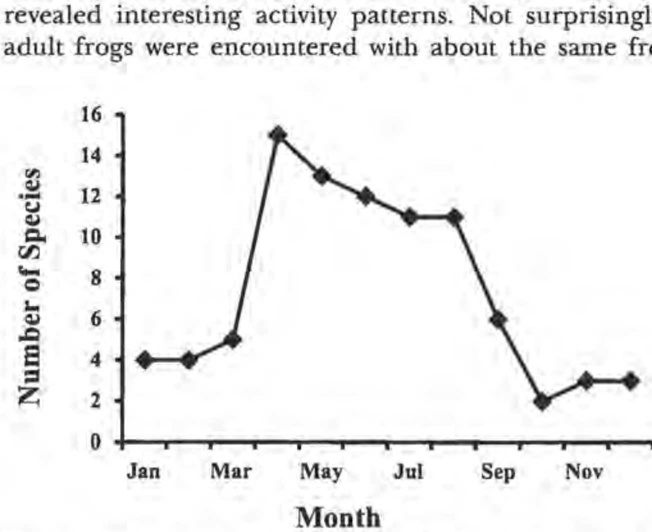

Figure 102. Number of species of calling anurans during an annual cycle of activity.

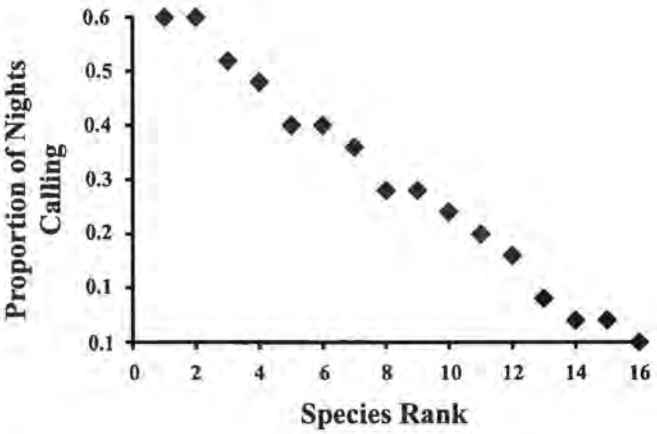

Figure 103. Calling curve for anurans at TNF. Species are ranked along x-axis from species with most extensive record of calling activity (*Lithobates clamitans*) to species with least extensive record of calling activity (*Anaxyrus terrestris*).

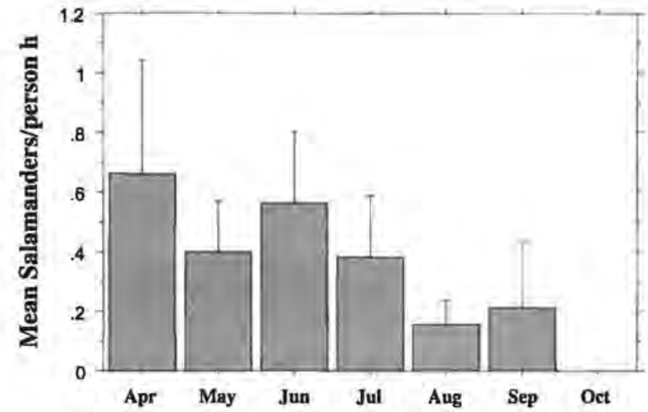

Figure 105. Seasonal variation of the mean encounter rate for salamanders during VES within TNF during the 2007-2010 research.

quency as their calling rates would predict; most frogs were encountered Apr-May and they were encountered least frequently in late summer when ponds were drying (Fig 104). Encounter rates with salamanders declined over the summer as well (Fig 105). Metamorphic frogs were seen most frequently Jun-Jul. Turtles were trapped most frequently in Jul (Fig 106-107), and we believe this may also be associated with pond drying and the subsequent concentration of turtles in the deeper parts of beaver ponds. Lizards appeared to have a bimodal activity period, with most observations occurring in Apr-May and then later in Sep-Oct; the lizard species at TNF are apparently less active during the hottest months of the year (Fig 108). Snakes did not appear to be influenced similarly, and there were no obvious differences in snake encounter rates during the months we surveyed.

Detectability

Most frogs called either continuously for fairly long durations (three or more months; e.g., *Pseudacris crucifer, Hyla cinerea, Lithobates* spp., *Acris* spp.) or very briefly and sporadically (*Hyla gratiosa, Hyla femoralis, Hyla squirella, Gastrophryne carolina*). Calling in the latter species corresponded with significant summer rain events, and the infrequency with which some species called should be considered a caveat for those interested in amphibian monitoring surveys based on male calling. Most of the species we categorize as sporadic breeders are otherwise fairly common and widespread in Alabama, and would not be expected to be particularly rare in this area. However, *Hyla gratiosa* was not detected during our once-per-week surveys conducted during 2007; we visited this pond incidentally in Apr 2007, and fortuitously heard the small chorus there at that time. *Hyla squirella* was either missed or did not call during the 2008 survey. The fact that meta-

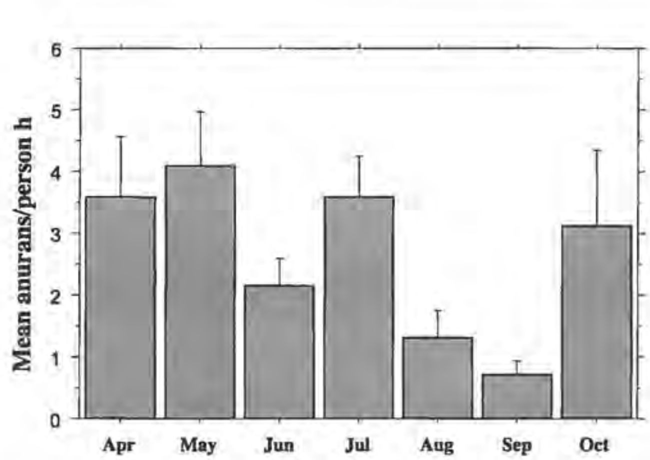

Figure 104. Mean encounter rate for frogs during VES within TNF during the 2007-2010 research.

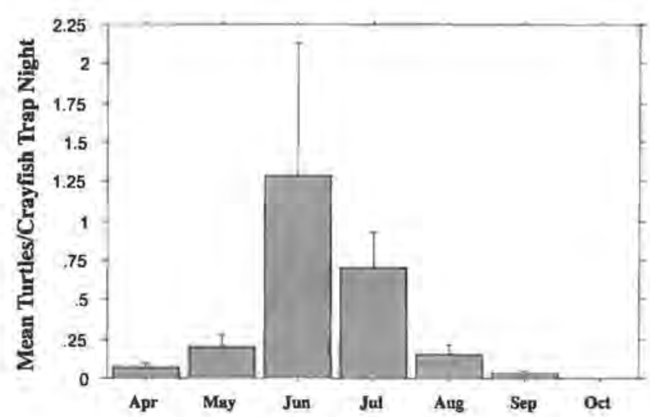

Figure 106. Seasonal variation of the mean encounter trap rate for turtles (in crayfish traps) during during the 2007-2010 research.

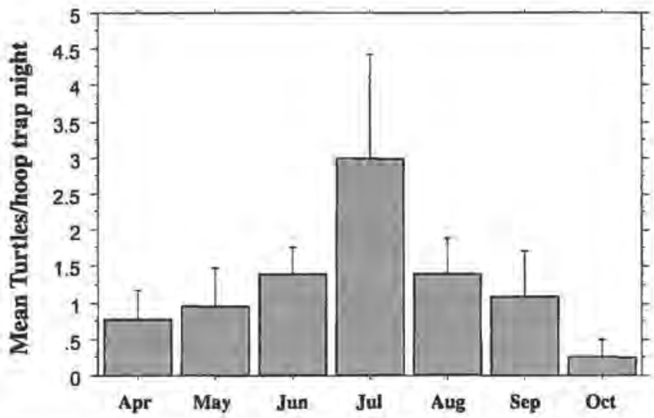

Figure 107. Seasonal variation of the mean encounter trap rate for turtles (in hoop traps) during the 2007-2010 research.

morphic *H. squirella* were observed in 2008 indicates the former is more likely.

Other examples of sporadic detection also are noteworthy. Trapping failed to detect the Common Snapping Turtle, *Chelydra serpentina*, in 2007, and we trapped this species subsequently during only two trapping events; once each in 2008 and 2009. In our previous experience, this species is very easy to detect by trapping, and we have no explanation for the apparent rarity of this species in what we consider optimal habitat. Possibly if we had used baited traps we would have had more success. Because we trapped this species in the most permanent beaver pond that we surveyed, we infer that ponds at TNF may dry too frequently to maintain Common Snapping Turtles at densities that we observe elsewhere in Alabama.

Drift fence arrays near TNF ponds were erected in hopes of documenting secretive species with more precision. However, our drift fence effort was not particularly successful, with the exception of documentation of *Heterodon platyrhinos*, which we did not encounter by any other method. Additionally, several *Cemophora coccinea* individuals were observed in the first year of the study alive or dead on roads and during a VES; however, we did not observe this species during 2008-2010. These observations support the use of intensive and long-term monitoring, using diverse methods, to ensure detection even of common species.

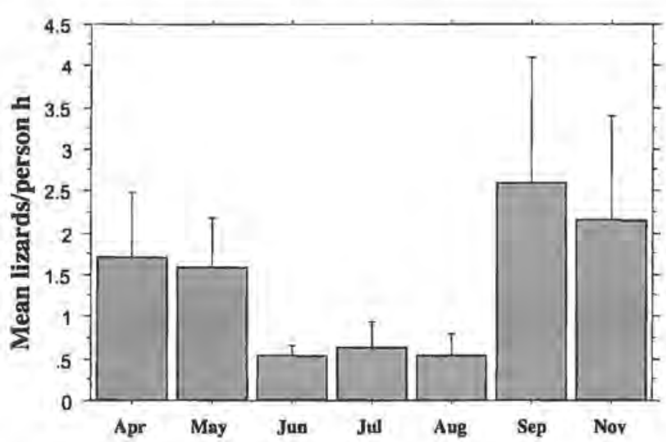

Figure 108. Seasonal variation of the mean encounter rate for lizards during VES within TNF during the 2007-2010 research.

The varied detection rates we generated for several TNF species (Table 2) corroborate these observations and other studies which demonstrate variability in the probability of detecting a species (Mazerolle et al., 2007). The low detection probabilities we generated may be due to our inability to find a species. However, detection probability and abundance may correlate with one another (Royle and Nichols, 2003). For example, a common species is likely to be detected more often than a rare species, assuming our ability to sample for both is equal. Simply calculating detection probabilities does not allow one to distinguish between truly rare species and species that are common but infrequently detected (Steen, 2010). Furthermore, the values we calculated identify the probability of detecting a *species* in a given sample when it is present, and as a consequence this may be of limited utility for estimating abundance values, which are calculated at the level of individuals.

Sophisticated analyses exist for using detection probability to generate abundance estimates (e.g. Royle and Nichols, 2003, Royle, 2004), but these models may be of limited use for secretive species, such as snakes (Steen et al., 2011). Recent research has suggested that estimates of capture probability may be refined by incorporating information on sex-specific movements, species-specific habitat preferences, individual responses to traps, and temporary emigration patterns (Durso et al., 2011; Willson et al., 2011). However, determining this information was not the goal of this study. Rather, our goal was to provide baseline data which future researchers could use to determine population trends with more certainty. Therefore, the detection probability estimates we present may be considered relatively coarse, since we assumed no individual-level variation in detection.

Although the detection probabilities we generated for turtles varied (e.g. ranging from 11% for *Chelydra serpentina* to 51% for *Trachemys scripta* via the same trapping method, Table 2), our estimated occupancy rates tended to be relatively similar to observed values. For example, *Chelydra serpentina* was observed at only one pond (20% of trapped sites) and were estimated to be present in 27% of sites. Given these general trends, we have high confidence in our ability to trap and detect this group of animals.

Only three species of snakes were observed in sufficient numbers to generate detection probabilities. For two (*Nerodia erythrogaster* and *Thamnophis sauritus*), these values were extremely low (Table 2). This may suggest we have a limited ability to find these animals and our observed values likely greatly underestimate the number of individuals present. Conversely, as suggested above, it is also possible these species are truly rare, or that due to interactions between detectability and low abundance, these snakes were simultaneously less detectable and generally less common than other species. Intensive mark-recapture study may distinguish between these potential scenarios. In either case, the low detection probabilities are reflected in the dichotomy between our observed and estimated occupancy rates for *Thamnophis sauritus* (60% vs. 100%, respectively). On the other hand, *Agkistrodon piscivorus* was highly detectable, and this species is likely well suited for mark-recapture and demographic studies (e.g. Koons et al. 2009).

The three ranid frogs observed within this survey were observed at all sites during both visual encounter surveys and calling surveys. Except for *Lithobates clamitans*, detection probabilities between the two survey types tended to be very similar (Table 2). However, we suspect that detection rates for visual encounter surveys are underestimates for this group, as there were numerous instances where we observed a ranid frog but were unable to identify it to species level. These observations were excluded from detection probability analyses. For other frog groups, differences in detection probabilities and perceived absences within a particular survey type suggest that appropriate survey methodology is likely to vary by species. A suite of detection methods, as was used within this study, is likely the most effective method of surveying the herpetofauna.

Biogeography of the Tuskegee National Forest Herpetofauna

The Fall Line is the most significant biogeographic barrier to amphibians and reptiles in Alabama (Mount, 1975). However, the Fall Line of Alabama does not appear to be as rigid a barrier to herpetofaunal dispersal as it is in other regions. For example, Georgia, *Hyla gratiosa, Hyla squirella, Agkistrodon piscivorus, Ambystoma tigrinum* and many other species are rarely found above the Fall Line, (Jensen et al., 2008); yet in Alabama, numerous populations of these species occur far above it (Mount 1975). *Ambystoma maculatum, Desmognathus conanti, Pseudacris brachyphona*, and *Desmognathus aeneus* are almost always found above the Fall Line in Georgia (Jensen et al., 2008); however, populations of these species are known below the Fall Line in Alabama (Mount, 1975). These observations suggest that the Fall Line in Alabama is more porous, from a biogeographic standpoint, than it is in other areas. Perhaps since Alabama's Fall Line region includes boundaries with other physiographic regions (e.g., the Ridge and Valley and Cumberland Plateau), it exhibits different biogeographic patterns than the rest of the Gulf/Atlantic Coastal Plain Fall Line, which is strictly a Piedmont/Coastal Plain boundary.

No part of TNF is above the Fall Line, but it does approach it closely (Fig. 1), and creeks that originate above the Fall Line traverse the National Forest. The following species found in the Piedmont generally reach their southernmost boundary at the Fall Line in Alabama: *Anaxyrus americanus, Pseudacris brachyphona, Gyrinophilus porphyriticus, Desmognathus monticola, Desmognathus aeneus*, and *Plethodon websteri*. Of these, only *Pseudacris brachyphona* appears within TNF, and this species has an extremely spotty distribution at the northern edge of the proclamation boundary. Additionally, several species of northern origin appear to become rarer below the Fall Line: *Ambystoma maculatum, Pseudotriton ruber, Desmognathus conanti, Eurycea cirrigera, Anaxyrus fowleri, Acris crepitans, Pseudacris feriarum, Carphophis ameonus, Diadophis punctatus, Storeria dekayi, Regina septemvitatta*, and *Nerodia sipedon* (Mount, 1975). This pattern of reduced population density is supported by the patterns of abundance observed in the TNF. In addition, *Sternotherus minor* appears to be much more common immediately north of the Fall Line in the same creeks that flow into TNF. For example, 18 *S. minor* have been collected from Lee County, versus only three from Macon County. In general, the herpetofauna of TNF supports the view that the Fall Line is a dispersal barrier for herpetofauna of Appalachian origin.

Because of this barrier, the herpetofauna of TNF is populated with species that either are widespread in Alabama or are of Coastal Plain origin. The overall pattern suggests that the herpetofauna of TNF is most strongly associated with amphibians and reptiles of a southern origin. However, TNF lacks the following species from the Lower Coastal Plain: *Demognathus apalachicolae, D. auriculatus, Siren lacertina, Pseudacris nigrita, Pseudacris ocularis, Lithobates capito, Gopherus polyphemus, Pseudemys floridana, Apalone ferox, Heterodon simus, Seminatrix pygaea, Pituophis melanoleucus, Drymarchon couperi, Nerodia fasciata, Micrurus fulvius*, and *Crotalus adamanteus*. Nearby sandhills in Russell County have more representatives of this lower Coastal Plain fauna, and sandhills at the same latitude in Georgia contain almost all of these species (Graham et al., 2010b). Many of the species that reach the northern or southernmost edge of their range at TNF (*Ambystoma tigrinum, P. brachyphona, Pseudacris ornata, Anaxyrus quercicus*) have not been documented recently and are apparently extirpated, suggesting that species at the edges of their ranges may experience local extirpations first. Interestingly, many lower Coastal Plain species can be found in direct contact with the Fall Line in other areas of the Southeast (e.g., Gibbons and Semlitch, 1991; Jensen et al., 2008; Graham et al., 2010b), and it is unclear why the upper Alabama Coastal Plain is simultaneously "leaky" biogeographically, and also less representative of the total Coastal Plain fauna.

Conservation

No species of amphibian or reptile protected by the Endangered Species Act are present on the property. Nevertheless, the TNF contains significant conservation value for the state of Alabama. The following species are known from the site and are considered a conservation priority for the state: *Graptemys pulchra, Lampropeltis getula, Hemidactylium scutatum, Ambystoma tigrinum,* and *Plestiodon egregius.* Additionally, TNF has extensive upland areas dominated by deep sandy soils and a longleaf pine overstory. This habitat is similar to that of the Lower Coastal Plain and appears appropriate for several taxa of strong conservation concern, including those currently protected by the Endangered Species Act (e.g., *Drymarchon couperi, Gopherus polyphemus*). Current management activities that implement frequent, low-intensity fire will restore these uplands into habitat that is suitable for several taxa not currently known for the TNF. This will provide the state of Alabama with potential opportunities, through translocation, to conserve these threatened taxa.

Suggestions for Future Research

Tuskegee National Forest would make an excellent study site for several species that have high local population densities but have otherwise not been the subject of numerous studies. Details of the reproduction and life history of *Eurycea guttolineata* and *E. chamberlaini* are in need of study, and both species are found in high numbers at TNF. Both species appear to undergo breeding migrations, and both species can also be found during the non breeding season; exactly where they go to breed and oviposit, and from where they migrate, are interesting questions. Little is known about the mating behavior of either species. *Hyla femoralis* can be found in high numbers locally (it is most common and breeds predictably at Ornata Pond), and comparatively little is known about this common frog (Lannoo, 2005). Its non-breeding, crepuscular calling behavior appears to be unique for TNF hylids and may indicate some type of territoriality. *Acris crepitans* and *A. gryllus* occur in roughly equal numbers at TNF, and therefore students of interspecific competitive interactions could use TNF to study the species in sympatry. Since it was once considered a subspecies of the well-studied Painted Turtle, *Chysemys picta, C. dorsalis* has not been the target of intensive studies, and the TNF population could be studied if trapping effort was sufficient. The amount of information available for its northern relative would make a comparative study between *C. dorsalis* and *C. picta* possible. TNF beaver ponds would make excellent replicate wetlands to study this species and other pond turtles (e.g., *Deirochelys reticularia*) as well; responses to pond drying is an especially promising topic. Besides the Cottonmouth, snakes are surprisingly uncommon at TNF, but this species is abundant and interesting enough to make up for this lack of diversity. Cottonmouth foraging behavior is overt and easy to observe, and studies on the foraging behavior and ecology of this species would be fruitful at TNF. If *Virginia striatula* is as common at TNF as collection records indicate, this small snake could be studied here, since little is known about its life history and reproduction (Ernst and Ernst, 2004). Finally, it is our hope that this thorough synopsis of the current herpetofauna will be useful for students of TNF amphibians and reptiles in the future; we provide quantitative census data including encounter rates and detectability estimates, so herpetofaunal declines or changes will be identifiable with greater certainty.

Addendum

While this manuscript was under review, S.P. Graham and R.D. Birkhead made important observations relative to the status of two rare TNF species while road cruising on a rainy night in Macon County (18 Feb 2012). First, a gravid female Tiger Salamander (*Ambystoma tigrinum*) was found crossing Macon County Road 5, about 100 m south of its intersection with County Road 10, at Warriorstand, Alabama. This site is less than 200 m from this species' historical breeding pond (Warriorstand Pond; Botts, 1978; see species account for *A. tigrinum*). This is the first confirmation of this species' existence in Macon County in over 20 years. The salamander was heading west; apparently this population has found a new breeding pond. A photo voucher of this individual was deposited in the Auburn Herpetological Collections (AUM AHAP-D 497).

On the same night, we detected a small chorus (~ 6 males) of Mountain Chorus Frogs (*Pseudacris brachyphona*) within TNF. These were found about 25-50 m N of the intersection of FS 905 with State Road 186 in a small ditch along FS 905. We attempted to secure a voucher specimen but failed. However, the next night we obtained a digital recording of the chorus and this was deposited in the Auburn Herpetological Collections (AUM AHAP-C 10). We attempted to locate choruses of this species at the historical localities pointed out to us by Bob Mount, but none were heard in that area (see species account for *P. brachyphona*).

These observations support the view that long term data are needed to fully document herpetofaunal population trends, and provide additional evidence of the sometimes surprising perseverance of herpetofaunal assemblages.

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Appendix 1 Precise locality data for study areas and places of interest mentioned frequently in the text.

Site	nickname	type	°N lat	°W long
Pond 1	*Core Pond*	beaver pond	32.43328	85.64391
Pond 2	*Cottonmouth Pond*	beaver pond	32.43098	85.64697
Pond 3	*Rookery Pond*	beaver pond	32.42982	85.64686
Pond 4	*Horseshoe Oxbow*	oxbow pond	32.43931	85.63529
Pond 5	*Shin-knocker Pond*	beaver pond	32.42857	85.64826
Tsinia Wildlife Viewing Area		impoundments	32.44152	85.65655
ditch (S terminus of FS 937)		ditch	32.43648	85.64624
Ornata Pond		grassy depression	32.40942	85.60119
Warriorstand Pond		grassy depression	32.2993	85.53989
pond on private land	*Roger's Pond*	borrow pit	32.51558	85.61194
seepage on FS 900		seepage	32.48144	87.61563
relict Longleaf Pine-Turkey Oak stand		upland pine	32.46569	85.61791

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