1-1-2017

Habitat Assessment for Gopher Tortoise (Gopherus Polyphemus) and Grassland Birds in South Mississippi

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Habitat assessment for gopher tortoise (Gopherus polyphemus) and grassland birds

in South Mississippi

By

Nathan Andrew Stukey

A Thesis
Submitted to the Faculty of
Mississippi State University
in Partial Fulfillment of the Requirements
for the Degree of Master of Science
in Wildlife and Fisheries Science
in the Department of Wildlife, Fisheries, and Aquaculture

Mississippi State, Mississippi

May 2017

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Title of Study: Habitat assessment for gopher tortoise (Gopherus polyphemus) and grassland birds in South Mississippi

Pages in Study: 309

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I studied eight habitat types of south Mississippi from 2009-2010 to examine habitat conditions and faunal communities associated with the presence of gopher tortoise burrows (*Gopherus polyphemus*). Field methods included burrow surveys, vegetation sampling, mound counts, and point count surveys. Active tortoise burrow presence was influenced by percent coverage of bare ground, native legumes, grass-like plants, basal area, overstory canopy, and woody plants. Fire ant mound densities were influenced by percent coverage of overstory canopy cover, bare ground, grass-like vegetation, and woody plants. Northern bobwhite (*Colinus virginianus*) and Bachman's sparrow (*Peucaea aestivalis*) were detected more frequently in longleaf pine (*Pinus palustris*) dominated habitats supporting gopher tortoises. My findings will be used to address the paucity of information related to gopher tortoise conservation on private and public lands and identify potential areas for inclusion in conservation initiatives supporting longleaf pine restoration or gopher tortoise conservation in the southeastern lower coastal plain.

ACKNOWLEDGEMENTS

I would like to offer my sincere gratitude to the USDA Natural Resources Conservation Service and the U.S. Fish and Wildlife Service for generously funding my study. I would also like to acknowledge the Boy Scouts of America, Camp Shelby Joint Forces Training Center, Mississippi Department of Wildlife, Fisheries, and Parks, the Nature Conservancy, the USDA Forest Service and several private landowners in south Mississippi for providing access to study sites. I would like to thank Mr. Ed

Hackett, Mr. Randy Browning, Mr. Judd Brooke, Mr. Orby Wright, and Dr. Lisa Yager for their interest and involvement in seeing this project to its completion. A special thanks to Dr. Jeanne C. Jones for her guidance as my major advisor, her professional expertise, and her undying commitment to wildlife conservation. I also thank the members of my committee: Dr. W. Daryl Jones and Dr. Jarrod H. Fogarty. I am grateful to Dr. Katherine E. Edwards for her insight and "statistical support" despite a very busy schedule of her own. Also, I am fortunate to have worked with such an outstanding team of field technicians whose enthusiasm and dedication was evident despite often grueling conditions. Evan O'Donnell and Nicole Hodges your plant identification skills are priceless. Hal Mitchell not only am I grateful for your help in completing my avian surveys, but your fellowship made those early mornings and long drives to the study sites much more bearable. I would also like to thank the staff, administrators, and professors of the Department of Wildlife, Fisheries, and Aquaculture for the opportunity to pursue my degree. I also wish to thank my parents Jim and Gail, my brother Jamie, and sisters Andrea and Cheri for their support and encouragement while I have pursued this dream of mine that was a long time in the making. Last but not least, I would like for my wife Jennifer to know that I am grateful for her putting up with my being out of town for weeks at a time during my field season and for bearing the financial burden of our family while I pursued my graduate degree.

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CHAPTER I

INTRODUCTION

The historical longleaf pine (*Pinus palustris*) ecosystem was a fire-dependent habitat characterized by open, park-like "pine barrens" of even and un-even aged mosaics of forests, woodlands, and savannas, with a diverse groundcover of bunch grasses and minimal understory hardwoods and brush (Landers et al. 1995). The longleaf pine ecosystem once dominated over 36 million hectares of the southeastern lower coastal plain from southern Virginia to central Florida and west to eastern Texas (Frost 1993). Today, less than 1.3 million hectares remain representing a 97% loss of the original extent (Kelly and Bechtold 1990, Outcalt and Sheffield 1996). Several factors have contributed to this loss including land clearing for agriculture, urbanization, conversion to industrial tree plantations, and interruption of natural fire regimes (Pyne 1982, Wright and Bailey 1982, Ewel 1990, Frost 1993). Remnants of this once widespread forest type are found through much of the historic range; however, good examples of natural communities on productive soils are virtually non-existent (Walker 2001). Lost with this important biological community are significant components of the southeast's cultural heritage, ecological diversity, timber resources, and essential habitat for many animal and plant communities (Barnett 1999).

Many species of wildlife and plants have adapted to the pyric conditions associated with the longleaf pine ecosystem making it one of the most biologically diverse habitat types in North America (Deberry et al. 2008). Approximately 40% of 1,600 plant species in the Atlantic and Gulf coastal plains are endemic to longleaf pine-dominated landscapes (Walker 1998). Means (2006) reported that approximately 40 species of mammals are common to the longleaf pine ecosystem. Of this number nearly 14% are reported to be of conservation concern (Engstrom et al. 2001). Several species including the fox squirrel (*Sciurus niger*), Florida mouse (*Podomys floridanus*), and the southeastern pocket gopher (*Geomys pinetis*) are considered specialists in longleaf pine forests (Means 2006). Additionally, as many as 88 species of birds are associated with the longleaf pine ecosystem at some time during their annual life cycle (Stevenson and Anderson 1994, Means 2006). Five species including the northern bobwhite (*Colinus virginianus*), Bachman's sparrow (*Peucaea aestivalis*), red-cockaded woodpecker (*Picoides borealis*), white-breasted nuthatch (*Sitta carolinensis*), and brown-headed nuthatch (*Sitta pusilla*) are considered specialists in this forest type (Means 2006). Dodd (1995) reported that 170 of the 290 (59%) species of amphibians and reptiles in the southeastern United States inhabit longleaf pine forests. Several of these species including pine snakes (*Pituophis* spp.), flatwoods salamander (*Ambystoma cingulatum*) and the gopher tortoise (*Gopherus polyphemus*) are currently listed as threatened or endangered (Connor et al. 2006, Glitzenstein et al. 2006).

Anthropogenic impacts on habitat conditions, especially fire suppression, have led to the decline and loss of many wildlife species that thrive in open, park-like conditions of longleaf pine forests (Brennan et al. 1998). While the decline in the longleaf pine forest has negatively impacted many wildlife species, the impacts have been especially damaging to gopher tortoises and pine-grassland birds, such as northern bobwhite and Bachman's sparrow.

Literature Review

Gopher Tortoise

Gopher tortoises are the only species of tortoise in the United States occurring east of the Mississippi River (Auffenberg and Franz 1982). Gopher tortoises are large, terrestrial turtles with elephantine hind limbs and shovel-like front limbs used specifically for burrow excavation (Jensen et al. 2008). The species is easily identified by its square head, flat, blunt nose, stumpy feet and rigid, unhinged plastron (Conant and Collins 1998). Adult gopher tortoises typically exhibit a brown or tan carapace and a dull yellowish plastron; whereas, hatchling and juvenile tortoises exhibit lighter variations of orange and yellow especially on their soft parts, plastron, and marginal scutes (Conant and Collins 1998).

Gopher tortoises are long-lived, and individuals typically reach sexual maturity at a minimum size rather than a specific age with age of maturity varying across the range and between sexes (Diemer and Moore 1994, Mushinsky et al. 1994). Gopher tortoises in Mississippi typically reach sexual maturity between 15 and 20 years of age (Smith et al. 1997), whereas, male and female tortoises in Florida mature between 9-18 and 10-21 years of age, respectively (Diemer and Moore 1994). Aresco and Guyer (1999) suggested that variations in tortoise growth among populations may also reflect differences in habitat conditions, specifically thermal characteristics and the abundance and quality of forage vegetation.

Female tortoises may produce one relatively small clutch of 3-15 eggs annually or less often (Diemer and Moore 1994, Butler and Hull 1996). Eggs are typically deposited in soils of the apron in front of the burrow or in another nearby site that has adequate sunny exposure (Butler and Hull 1996). After oviposition, the female plays no role in nest attendance or parental care (Epperson and Heise 2003). The incubation period varies across the range generally ranging from 80-100 days in duration (Iverson 1980). Hatchlings and juveniles, up to 5 to 7 years, have relatively soft shells making them highly susceptible to predation (Wilson 1991). Numerous predators are known to depredate eggs, hatchlings, and juvenile tortoises including raccoon (*Procyon lotor*), gray fox (*Urocyon cinereoargenteus*), striped skunk (*Mephitis mephitis*), Virginia opossum (*Didelphis virginiana*), red-tailed hawk (*Buteo jamaicensis*), imported red fire ants (*Solenopsis invicta*), and some snakes (Vetter 1970, Douglass and Winegarner 1977, Fitzpatrick and Woolfenden 1978, Landers et al. 1980, Mount 1981, Smith 1995, Butler and Sowell 1996). Although adult gopher tortoises face some threat of depredation, the highest rates of predation occur on both eggs and hatchlings (Alford 1980, Landers et al. 1980, Wilson 1991, Butler and Hull 1996, Smith 1997). One study reported that 87% of gopher tortoise nests were destroyed by mammalian predators within the first few weeks, and survivors were depredated by red fire ants (Landers et al. 1980). Other factors including disease and invasive species may be accelerating the decline in some populations (Epperson and Heise 2003).

The natural range of the gopher tortoise is the Lower Coastal Plain of the southeastern United States from South Carolina through Florida and west to southeastern Louisiana, although most of the remaining population is found in north-central Florida and south Georgia (Auffenberg and Franz 1982, Diemer 1986). While predation may play a significant role in gopher tortoise survival throughout their range, the most influential factor preventing recovery of the species is the loss or fragmentation of suitable habitat across its native range. An 80% decline in gopher tortoise populations over the past 100 years has been linked to a reduction in fire and the conversion of native pine forests to commercial forests, clean agriculture, or urban uses (Auffenberg and Franz 1982, McDonald and Mushinsky 1988). Today, gopher tortoises occur in highly fragmented populations distributed within the southeastern coastal plain (Auffenberg and Franz 1982).

Impacts of gopher tortoise declines are magnified due to their role as keystone species. Their burrows provide habitat and refugia to over 360 faunal species including other state or federally listed species that occupy or opportunistically use gopher tortoise burrows (Jackson and Milstrey 1989). As a result, the western population of the gopher tortoise was listed as threatened under the Endangered Species Act in 1987 protecting tortoises inhabiting lands west of the Tombigbee and Alabama River systems in southwestern Alabama, southern Mississippi, and southeastern Louisiana (USFWS 1990). In this listed portion of the range the U.S. Fish and Wildlife Service Gopher Tortoise Recovery Plan reports that over 18,000 ha of private land may support gopher tortoises (USFWS 1990).

Habitat conditions necessary to sustain gopher tortoise populations have been the subject of numerous investigations (Aresco and Guyer 1999, Jones and Dorr 2004, Yager et al. 2007). Gopher tortoises typically inhabit open, upland habitats characterized by deep sandy soils with abundant herbaceous understory, such as frequently burned longleaf pine and oak (*Quercus* spp.) woodlands. Tortoises also utilize disturbed early successional habitats, such as road and utility rights-of-way, field edges, fence rows and other ruderal areas (McRae et al. 1981, Diemer 1986, Jensen et al. 2008). In Florida, Auffenberg and Franz (1982) reported that primary habitat types utilized by gopher tortoises included the aforementioned types as well as xeric hammocks and sand pine-oak (*Pinus clausa*) ridges. Areas with a dominance of thick shrubby vegetation are less desirable to tortoises due to shade effects on forage plants and lack of basking areas and nest sites (Aresco and Guyer 1999, Jones and Dorr 2004, Jensen et al. 2008). These conditions occur under several circumstances including site conversion of longleaf pine grasslands and sandhill communities to densely stocked pine plantations and exclusion of fire in upland forests allowing advanced development of shrub and midstory cover (Guyer and Hermann 1997, Aresco and Guyer 1999, Jones and Dorr 2004, Yager et al. 2007). As habitat quality degrades, gopher tortoises often move to areas with more open canopy due to better basking and foraging conditions. Prescribed fire and other means of intermediate stand management, including thinning and herbicidal treatment, favor the open habitat requirements of gopher tortoises (Brennan et al. 1998, Jones and Dorr 2004, Ashton et al. 2008). However, Yager et al. (2007) reported that gopher tortoises exhibited fidelity to their home burrows and did not relocate to more desirable adjacent habitats within several years following prescribed burning despite better quality habitat conditions in these adjacent areas. Glitzenstein et al. (2003) also suggested restoration of heavily degraded forest conditions may require multiple dormant-and-growing season burns before the habitat is returned to a condition that is hospitable to tortoises and associated species, such as grassland birds.

Grassland Birds

Gopher tortoises as well as many other species of wildlife benefit from the habitat diversity associated with the longleaf pine ecosystem. Habitat management practices that can benefit gopher tortoise include longleaf pine restoration and management, use of prescribed fire, and control of invasive plant species (Bailey et al. 2006). These management practices also provide good quality habitat conditions for "grassland birds", many of which are of conservation concern due to declining population levels (Deberry et al. 2008).

Grassland birds are defined as avian species that have become adapted to and reliant on some variety of grassland habitat for part or all of its life cycle, including breeding (nesting or feeding), migration, or wintering (Vickery et al. 1999). In the Lower Coastal Plain of the southeastern United States, this suite of birds most often occurs in the pine-grassland habitats associated with the natural range of the longleaf pine. Included in this group are non-game and game birds, such as northern bobwhite and Bachman's sparrow. Other species are favored by the structure offered by the pine forests overstory and the interspersion of habitat types that is often related to topography, hydrology, and mosaic arrangements of recently burned and unburned patches. Non-game birds, such as indigo bunting (*Passerina cyanea*), blue grosbeak (*Passerina caerula*), brown-headed nuthatch, yellow-breasted chat (*Icteria virens*), and at least six species of woodpeckers are often common in longleaf pine forests that exhibit abundant herbaceous ground cover, standing snags, and interspersion of thickets in drainages (Yarrow and Yarrow 1999, Sibley 2001).

Restoration and management for longleaf pine forests and sandhill habitats could potentially increase habitat quality and quantity for grassland birds (Deberry et al. 2008). An essential component of longleaf pine ecosystem management is the inclusion of actions that mimic natural processes and disturbances (Brennan et al. 1998). Both natural and prescribed fire has played an important role in shaping the longleaf pine ecosystem of the southeastern United States (Van Lear and Harlow 2002). Effects of fire include reduction of the density of ground level and mid-story vegetation, recycling of nutrients, and creation of open conditions where native forbs and grasses flourish providing important nesting and foraging habitat for many grassland birds (Browning et al. 2004, Cox and Widener 2008). Frequent fires in pinewood habitats typically maintain an open habitat with abundant ground cover of grasses and forbs (Engstrom et al. 1984). The reduction of human-induced and natural disturbances have led to a decrease in available natural early successional habitat that supports many grassland species. This loss and degradation of habitat is cited as a primary reason for many grassland birds being listed as threatened or endangered or experiencing substantial declines in regional and local populations (Brennan et al. 1998, Askins 2000, Carroll and Cooper 2005). For example, in a 15 year fire-exclusion study on old field pineland at Tall Timbers Research Station, Engstrom et al. (1984) reported a dramatic shift in the bird community from species that utilized open grassland and thicket habitats with abundant herbaceous groundcover to species that were more adapted to maturing hardwood forests with advancing overstory canopy cover, sparse sub-canopy layers, and sparse cover of ground cover vegetation. Masters et al. (2002) reported increases in total community abundance, species richness, and diversity of breeding bird communities with re-establishment of fire regimes and thinning of midstory and overstory trees. Ten pine-grassland obligates including priority species, such as Bachman's sparrow, brown-headed nuthatch, and prairie warbler (*Dendroica discolor*), increased in either density or frequency of occurrence following tree thinning or tree thinning and fire (Masters et al. 2002). Likewise, Wilson et al. (1995) noted that the restoration of pine savannas by hardwood removal and prescribed fire over time resulted in fewer forest-interior birds than unmanaged control sites but greater numbers of northern bobwhite, brown-headed nuthatch, chipping sparrow (*Spizella passerina*) , indigo bunting, prairie warbler, and pine warbler (*Dendroica pinus*).

While frequency of prescribed fire (3-5 years) is important for maintaining habitat conditions for pine-grassland birds, the seasonal timing (dormant or lightning season) may also have varying impacts on plant and animal communities in longleaf pine ecosystems. Historically, prescribed fire has been applied during the dormant season (December to February) where there is minimal impact on nesting habitat for grassland birds and other ground-nesting wildlife. However, growing season fires may stimulate more prolific flowering responses in native forbs and grasses when implementation of burning occurs after late April (Cox and Widener 2008). Some studies have shown the impact of lightning season burning may not have as much of a negative effect on grassland birds as once presumed (Tucker et al. 2004, Cox and Jones 2007). When properly scheduled these burns may effect only a small percentage of nests in a given year, and many birds will re-nest quickly and benefit from the improved late summer and fall brood habitat, improved fall and winter food resources, and improved nesting success in subsequent years (Cox and Widener 2008).

Two grassland birds of the longleaf pine forests that are of high conservation concern are northern bobwhite and Bachman's sparrow. Both species depend on longleaf pine grasslands as important habitats for nesting and brood-rearing (Brennan and Kuvlesky 2005). The northern bobwhite range extends from southeastern New York to southern Ontario, west to south central South Dakota, eastern Wyoming, eastern Colorado, eastern New Mexico, and south through the Gulf States and most of Mexico and Central America (Stewart 2005). In the southeastern United States it is an important part of the cultural heritage providing ecological, social, aesthetic, recreational, and economic values (Burger 2001). However, this species has experienced range-wide population declines over the past 30 years, especially in the southeastern United States (Stewart 2005). Some of the main causes for population declines include loss of habitat associated with advanced natural succession, industrialization of farming and forestry, reduced use of prescribed fire, and extensive conversions of native plant communities to non-native, invasive grasses (Washburn et al. 2002, Hamrick et al. 2007). Other factors including increased depredation, isolation of remaining populations, and overall degradation of the remaining habitat have also contributed to population declines (Browning et al. 2004, Hamrick et al. 2007).

Throughout its range the northern bobwhite typically occupies early successional seral stages and colonizes those plant communities that follow some form of natural or human-induced disturbance, such as fire, tornado, timber harvest, or agriculture (Burger 2001). In the southeastern United States suitable habitat for the northern bobwhite is most often associated with the longleaf pine ecosystem (Frost 1993, Frost 2006). However, studies have shown that suitable habitat conditions for northern bobwhite may be more influenced by overstory canopy coverage and the subsequent effects on the diversity of the vegetation community at ground cover and mid-story levels (Cram et al. 2002, Chamberlain and Burger 2005, White et al. 2005). Cram et al. (2002) found the relative abundance of northern bobwhite was related, in part, to the percent coverage of forb and woody plants and closure of overstory canopy. Because northern bobwhite feed at ground level on hard mast, seeds, invertebrates, and succulent leafy material, they require bare ground interspersed among herbaceous vegetation for optimal food availability and movement while foraging. This type of structure is especially important for nesting and for movement and feeding of quail chicks (White et al. 2005). These conditions are often found in habitats like longleaf pine forests where the canopy is more open allowing sun light to reach the forest floor and herbaceous plant communities of bunch grasses, forbs, and legumes are well developed (DeBerry et al. 2008).

In the longleaf pine forest the herbaceous understory is typically characterized by a variety of native bunch grasses, especially wiregrass (*Aristida spp.*) and bluestem (*Andropogon spp.*) as well as numerous species of legumes and scattered shrubby species (Frost 1993, Folk 2006). Naturally occurring surface fires burn the upper litter layer and small branches that lie on or near the ground and move quickly through an area without consuming the entire organic layer (Stanturf et al. 2002). Ecosystems subjected to these low intensity burns recover quickly as the grasses, forbs and understory wood vegetation resprout vigorously within weeks after burning (Van Lear and Harlow 2000). These fires help maintain the vegetation community at this level providing an abundance of food and ground cover plants for northern bobwhite as well as an interspersion of native bunch grasses, bare soil, and thickets for brooding and escape cover (Yarrow and Yarrow 1999).

The Bachman's sparrow is an important non-game grassland bird that has also experienced population declines over the last several decades as a result of the loss and degradation of open and forested grasslands (Sauer et al. 2011). Because of these population declines and habitat loss, this sparrow is considered a high priority species for conservation and habitat management and restoration programs. The Bachman's sparrow is a ground-nesting, ground-foraging resident of fire-managed mature pine forests and early successional habitats throughout the southeastern United States (Stober and Krementz 2000). Formerly named the pine woods sparrow, Bachman's sparrows are one of the most characteristic birds of longleaf pine grasslands (Hunter et al. 2001, DeBerry et al. 2008). This species depends on an open forest dominated by native grasses and forbs and a sparse woody mid-story for ideal nesting, brooding, and foraging conditions and can do well in fire-maintained pine forests or other grassland situations (Dunning and Watts 1990, Dunning and Watts 1991, Haggerty 1998, Askins 2000, DeBerry et al. 2008). Given its dependency on the condition of herbaceous ground cover, Bachman's sparrows can serve as an indicator species for evaluating influences of management activities on community diversity within longleaf pine forests (Tucker et al. 2004). Although longleaf pine stands can provide the best quality habitats, suitable mature loblolly and shortleaf pines provide the greatest quantity of habitat in the southeastern United States (Hunter et al. 2001). The abundance of these birds in pine forests other than longleaf pine is dictated by the density of pines and also the grass and hardwood component of the stands which may be controlled by the season and frequency of burning (Hunter et al. 2001).

Silvicultural practices including long harvest rotations, frequent fire return intervals, tree thinning, retention of some mature and late-successional pines, and less drastic site preparation can favor Bachman's sparrow populations (Askins 2000, Hunter et al. 2001). Dunning and Watts (1990) reported that pre-planting site preparations, such as roller drum chopping, can adversely affect sparrow populations because these methods remove all hardwoods which may be used as singing perches by male sparrows during establishment of breeding territories. In parts of the southeast where longleaf pine savanna has disappeared, Bachman's sparrow can be found in clear cuts, but information is lacking on rates of nest success, recruitment, and survival in these habitats as compared to pine savanna habitats (Askins 2000). Clear cuts planted in longleaf pine are reported to produce quality habitat for Bachman's Sparrow for up to 8 years; whereas, loblolly and slash pine become unsuitable within 5 years after stand establishment (Dunning and Watts 1990, Landers et al. 1995). A 1988 survey of different habitats in Marion Francis National Forest in South Carolina found higher numbers of Bachman's sparrow in mature longleaf pine stands managed with prescribed fire and only after Hurricane Hugo and subsequent salvage logging operations caused significant stand damage did individuals utilize a nearby clear cut (Dunning and Watts 1990, Dunning and Watts 1991).

The importance of fire as a habitat management tool for Bachman's sparrow is well documented (Engstrom et al. 1984, Dunning and Watts 1990, Stober and Krementz 2000, Conner et al. 2005, Tucker et al. 2006, Cox and Jones 2007). Dunning and Watts (1990) found that fire was essential in reduction of shrubby vegetation and maintaining the herbaceous understory preferred by Bachman's sparrow. In another study, Tucker et al. (1998) found that prescribed burning of pine plantations produced suitable habitat conditions for Bachman's sparrow in stands younger than those previously reported. Furthermore, Tucker et al. (2004) suggested that optimal habitat for sparrows in longleaf pine forests is maintained by burning on a 2 or 3-year rotation and rotations greater than 3 years led to a rapid decline in the density of Bachman's sparrow and those that utilized this habitat experienced lower productivity. Season of burning has been shown to have little influence on Bachman's sparrow densities (Tucker et al. 2006, Cox and Jones 2007, Cox and Jones 2009). While the utilization of fire is important for maintaining suitable breeding and wintering habitat conditions for Bachman's sparrow, fire suppression can cause degradation of habitat conditions. Engstrom et al. (1984) noted that Bachman's sparrow and several other bird species found in open pine habitat were gone within five years following fire suppression and replaced with species that preferred a denser understory habitat. An 8-year fire-exclusion study in Texas found that Bachman's sparrow declined significantly even more so than brown-headed nuthatch and red-cockaded woodpecker, a species for which the treatment stands were originally managed (Conner et al. 2005).

Imported Red Fire Ant

While prescribed fire is an important component in the restoration and management of the longleaf pine ecosystem, the detection and management of invasive non-native species, are also important for restoration and recovery of this ecosystem. One species that has received a significant amount of attention due to its potential impacts on native flora and fauna of longleaf pine ecosystems is the imported red fire ant (*Solenopsis invicta*).

Imported red fire ants were introduced from South America in the mid to late 1930's through the port of Mobile, Alabama and since have infested over 129 million hectares in the southeastern United States, New Mexico, and California (Lard et al. 2006, DeBerry et al. 2008). Fire ants are most easily identified by their behavior and the mounds they build. Mounds can range 25 to 60 centimeters in height, over 20 centimeters in diameter, with one primary entrance but in deep sandy soils, mounds may be smaller and underground channels may be visible (DeBerry et al. 2008). Fire ants are highly aggressive and will attack and sting any animal that disturbs their nest and people may be stung by foraging worker ants even if they are inadvertently disturbed (Lofgren 1986).

These non-native ants cause human health problems as well as economic and ecological damage throughout their infestation range (Adams 1986, Allen et al. 2004, Lard et al. 2006). The negative impacts on the economy and ecology have increased significantly with an increase in the range of infestation of the fire ant. Damage estimates to electrical and farm equipment, crops, pollinating insects, wildlife, and livestock exceeds $1 billion annually in the southern United States (DeBerry et al. 2008).

Many studies have documented the destructive nature of the fire ant and its negative impacts on both native invertebrates and ground-nesting vertebrates in the southeastern United States (Landers et al. 1980, Giuliano et al. 1996, Epperson and Heise 2003, Todd et al. 2008). Several studies have specifically reported this species' negative impacts on native ants and other arthropods (Porter and Savignano 1990, Wojcik 1994, Wojcik et al. 2001). Fire ants can also harm larger animals. One study by Allen et al. (1997) reported a decreased recruitment in white-tailed deer (*Odocoileus virginianus*) fawns in areas infested by the fire ant. They attributed this lower recruitment to debilitating injuries, such as blindness, and visibility to potential predators as a result of increased movement to avoid areas of infestation (Mueller et al. 2001). Fire ants can be especially devastating to populations of ground-nesting animals (Allen et al. 2004, Browning et al. 2004). Animals that give birth to altricial young, such as cottontail rabbit (*Sylvilagus floridanus*), are especially vulnerable to fire ant depredation (Hill 1970). However, fire ant depredation also causes significant mortality and injuries to the precocial young of northern bobwhite as they hatch and prepare to leave the nest with parents (Allen et al. 1995, Giuliano et al. 1996). Similarly, hatchlings of gopher tortoises are especially vulnerable to fire ant depredation as they emerge from the egg (Landers et al. 1980, Epperson and Heise 2003). Epperson and Heise (2003) found that fire ant depredation caused a 27% reduction in survival of tortoise hatchlings. This depredation rate in combination with depredation rates of tortoise eggs and hatchlings (> 75%) by meso-mammals, raptors, and snakes is sufficient to create the reduced number of young tortoises that are characteristic on many areas within the western portion of their distributional range (Epperson and Heise 2003).

Tschinkel (1988) describes the fire ant as a "weedy" species because of its ability to readily invade cleared land and other heavily disturbed areas. Likewise, Tschinkel (1993) noted that fire ants occur mostly in areas of disturbance, such as lawns, pastures, roadsides, and agricultural land. The early successional habitat conditions associated with disturbances, such as grazing, mowing, disking and prescribed fire, can led to increased rates of infestation by imported red fire ants (Tschinkel 1988, Stiles and Jones 1998, Lubertazzi and Tschinkel 2003, Todd et al. 2008, Stuble et al. 2009). Williamson et al. (2002) found that the two habitat management regimes (disking and burning) most frequently prescribed to enhance bobwhite habitat quality increased fire ant mound density and population index. They described the situation as a "management conundrum" given the importance of habitat management as a means of sustaining viable quail populations. Furthermore, concerns about disturbance could have implications for burning in areas occupied by tortoises, because fire disturbances could create conditions under which fire ants colonize more readily.

Because forest restoration and management activities may include ground disturbance and use of prescribed burning, conservation programs that promote the restoration of longleaf pine should consider fire ant infestations and conditions under which they may spread (Browning et al. 2004). Due to large scale infestations, monitoring and timely control of detected mounds is recommended on areas where longleaf pine restoration is planned (DeBerry et al. 2008). However, fire ant control with pesticides in areas occupied by gopher tortoises and other threatened or endangered species warrant special precautions due to the potential negative impacts on wildlife (Lofgren 1986, Williamson et al. 2003). Monitoring and control of fire ants should be integral to recovery of populations of gopher tortoises, northern bobwhite, and other grassland birds. Monitoring and control of fire ants is especially important in areas that are targeted for longleaf pine restoration and gopher tortoise reintroduction (Epperson and Heise 2003).

The restoration and management of longleaf pine forests and sandhill communities on public and private lands are important for the conservation of gopher tortoises and associated species indigenous to pine-grassland ecosystems (Bailey et al.

2006). Although conservation efforts have made great strides on lands in the public domain, efforts to address potential for conservation on privately owned lands has occurred more recently (Knight 1999). Because > 60% of the United States is in private ownership, these lands contribute up to 80% of the available wildlife habitat on a landscape level and are essential to wildlife survival, wildlife recreation, and societal benefits associated with green space and biological diversity (Benson 2001, Alavalapati et al. 2002, DeBerry and Moore 2006). Although habitat management on private lands is critical to the sustainability of all wildlife species, it is especially important for those that are threatened or endangered (Moorman et al. 2002). Nearly half of all endangered species occur on private land and nearly all threatened species have a portion of their distribution on privateland (Knight 1999), Parkhurst and Shogren 2003, Wilcove and Lee 2004). The long-term survival of most endangered species depends not only on our ability to prevent further losses but also our ability to increase their populations by restoring degraded habitats, often on private lands (Wilcove and Lee 2004). Because we require additional information to evaluate and assess the status of private lands in terms of habitat conditions for rare species, additional research was anticipated to benefit professionals and landowners engaged in habitat restoration and management. Topics of interest are numerous, but include habitat characteristics within different habitat management regimes, habitat use by targeted species of interest, and occurrence of invasive species which might impede population recovery of targeted wildlife species and ecosystem diversity.

Justification of Study

Loss of suitable habitat and fragmentation is a major impediment to the survival and population recovery of gopher tortoises and other species associates of longleaf pine ecosystems. Because wildlife populations often transcend ownership boundaries, successful efforts to restore imperiled ecosystems must often occur at landscape levels which encompass both public and private lands. Furthermore, with nearly 90% of southern forest acreage in the private sector, private lands could play a vital role in the conservation of many ecologically and economically important wildlife species endemic to the longleaf pine ecosystem (Smith et al. 2009).

Although the habitat requirements for gopher tortoises are well documented, much of our knowledge has stemmed from research occurring on public land bases. However, this research project should provide a greater understanding of the habitat conditions for gopher tortoises that occur over a spectrum of forest types, management regimes, and age classes on public and private lands. This study provided data on habitat conditions that will be used in the development of habitat suitability models that examine habitat conditions for gopher tortoises on private and public lands. The habitat parameters examined were obtained from lands that were managed and not managed for gopher tortoises. Additionally, study sites on private lands in this research were enrolled in Farm Bill conservation programs, and current evaluation of habitats for rare reptiles is lacking on these land bases. Based on the information from this study, future enrollment of private lands in cost share programs could be accomplished to create habitat corridors between suitable habitats for gopher tortoises based on soil categories for tortoises, proximity to known tortoise populations, and habitat conditions occurring under different restoration and management scenarios. An evaluation of relationships between tortoise burrows and habitat conditions was anticipated to increase information concerning conditions under which tortoises exist on public and private lands in south Mississippi, including lands enrolled in cost share programs that target restoration of longleaf pine forests. Therefore, information provided by this study can be valuable to natural resource managers with the U.S. Fish and Wildlife Service, Natural Resources Conservation Service, and conservation organizations in assessment and potentially prediction of habitat quality for gopher tortoises under different mitigation and reforestation programs. This information can enhance the ability of natural resource managers to implement longleaf pine restoration and habitat management for gopher tortoises and grassland bird species that inhabit the longleaf pine-bluestem ecosystem. Also, more information on habitat conditions and mound densities of fire ants can help managers understand the level of infestation of this invasive species that limits recruitment in tortoises and many bird species. This type of information can facilitate a greater understanding of approaches for designation and restoration of conservation areas and future enrollment of lands in conservation and restoration programs and practices many of which have cost share incentives for wildlife habitat management on private lands.

Study Objectives

1. Evaluate habitat conditions at locations of active burrows of gopher tortoises and locations that do not support gopher tortoises within different upland forest habitats on private and public lands in south Mississippi.

2. Estimate and compare vegetation and edaphic conditions within different pine forest types, including longleaf pine restoration areas, loblolly/slash pine plantations, mixed pine-hardwood forests and natural longleaf forests and sandhill communities on private and public lands in south Mississippi.

3. Record and report bird species richness, abundance, and abundance of grassland birds, including northern bobwhite (*Colinus virginianus*) and Bachman's sparrow (*Peucaea aestivalis*) within gopher tortoise study sites.

4. Investigate relationships between fire ant mound densities and habitat conditions at burrow and non-burrow locations within different forest restoration regimes.

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CHAPTER II

STUDY AREA AND FIELD METHODS

Study Area

My study area included 16 study sites on private and public lands located in Forrest, Greene, Hancock, Lamar, Marion, Perry and Wayne counties in south Mississippi (Tables 2.1 and 2.2, Figures 2.1 and 2.2). Land bases where study sites were established were identified and selected for inclusion through cooperative efforts with professionals of the Natural Resources Conservation Service, U. S. Fish and Wildlife Service, Mississippi Department of Wildlife, Fisheries, and Parks, Mississippi Army National Guard, U. S. Forest Service, The Nature Conservancy, and private landowners. Private lands considered for inclusion had been enrolled in reforestation or conservation programs sponsored by U.S.D.A Natural Resources Conservation Service since 2005.

Only study sites on highly suitable, moderately suitable, and less suitable soil categories for gopher tortoises were investigated in my study (USFWS 1990, 2012; Tables 2.3 and 2.4). Therefore, well-drained soil types that could potentially support tortoises were included in the sample population and sites characterized by mesic and clay-soils, such as alluvial floodplains and wetlands, were excluded. I classified selected soil types into sandy, coarse loam, and fine loam categories based on characteristics that would influence suitability for burrowing and nesting, including soil texture, sand depth, drainage, and permeability (Tables 2.3 and 2.4; USFWS 1990, Brady and Weil 2004, USNRCS 2009). I acquired information pertaining to soil classifications from U.S.D.A Natural Resources Conservation Service soil coverages, Mississippi Museum of Natural Science geospatial databases and coverages, Gopher Tortoise Recovery Plan (USFWS 1990), and databases from the Mississippi Natural Heritage Program. Most study sites on public land exhibited a preponderance of moderately to less suitable soils with only two sites being located on highly suitable soils within sandhill communities. All private lands exhibited a dominance of moderately to less suitable soils with some intermixing of highly suitable soils on two private land sites (Tables 2.5 and 2.6).

In addition to soil suitability for tortoises, size of study sites was a criterion based on tortoise home range and burrow use (Wilson et al. 1997, Ashton and Ashton 2008). Size criterion for inclusion of study sites was designated at ≥ 10 hectares. Most land bases < 10 ha in size were excluded as potential study sites; however, the one exception was a private property in Greene County which was approximately 4 ha in size. Inclusion of this property was necessary due to the paucity of available privately owned lands on which gopher tortoises occurred and management of longleaf pine forests was ongoing. Therefore, I included this land base in my investigation to strengthen the inference capabilities of habitat conditions existing on private lands. Selected public and private land bases with multiple habitat types on highly suitable, moderately suitable, and less suitable soils for tortoises were included in my study (Tables 2.5 and 2.6). Habitat types delineated for investigation were as follows:

1. Longleaf pine forests (> 15 years of age) under fire management that supported gopher tortoises on highly suitable, moderately suitable, and less suitable soils
2. Longleaf pine forests on moderately suitable soils (> 5 - ≤ 15 years of age)

3. Planted pine regeneration sites on moderately and less suitable soils (≤ 5 years of age), and
4. Mixed pine-hardwood, mixed pine, planted pine forests on moderately and less suitable soils (> 15 years of age) with limited or no fire management

To address habitat conditions at locations with active gopher tortoise burrows and non-burrow locations, I identified and selected sample points within each of the four habitat or forest stand types. Studies have shown that gopher tortoises will relocate their burrows to marginal areas when more desired habitats become unsuitable (Aresco and Guyer 1999, Jones and Dorr 2004). For this reason gopher tortoise burrows found in openings, rights-of way, or food plots within designated forest or habitat types, were also included in the sample population.

Field Methods

Gopher tortoise burrow surveys

I surveyed for occurrence and activity status of gopher tortoise burrows from May to September 2010. Field surveys were conducted to validate activity status of active burrows and select burrow and non-burrow locations on study sites (Tables 2.5 and 2.6). Gopher tortoise burrows were located by area searches of appropriate soil areas within desired habitat types of each land base. Area searches were conducted by at least two surveyors walking parallel transects from 10-12 m from one another. All burrows detected were marked and locations recorded with GPS units. I ascertained activity status of gopher tortoise burrows according to criteria advanced by Auffenberg and Franz (1982) and Guyer and Hermann (1997). I included burrows in my sample population that exhibited openings similar to the outline of a tortoise carapace, a soil apron of freshly excavated substrate at burrow's entrance, and recent digging, plastron drag, or track sign at the burrow opening or within the tunnel (Guyer and Hermann 1997, Jones and Dorr 2004, Ashton and Ashton 2008, Edwards et al. 2016). I measured the horizontal width of active burrows at 7 to 10 cm inside the burrow's interior using an extended measuring tape (Mushinsky and McCoy 1994, Guyer and Hermann 1997). I originally planned to utilize an extendable scope to inspect the interior of tortoise burrows to ascertain presence of animals in the burrow (Smith et al. 2005, USFWS unpublished data). However, incidence of metabolic bone disease in juvenile tortoises at Camp Shelby, and the lack of knowledge about this disease caused a change in survey protocol that excluded use of the scope to avoid possible adverse effects related to disease transmission.

I used different approaches to identify sample locations of active gopher tortoise burrows depending on existing information of tortoise occurrence and distribution. Several of my study sites on public lands had existing databases that included recent gopher tortoise surveys and forest stand coverage maps. These areas included Camp Shelby Joint Forces Training Center, DeSoto National Forest, Dead Dog Bog, and Marion County Wildlife Management Areas. I obtained this information from professionals with the Mississippi Natural Heritage Program, Department of Defense, The Nature Conservancy, Natural Resources Conservation Service, U.S. Fish and Wildlife Service, Mississippi Department of Wildlife, Fisheries, and Parks, and U.S. Forest Service. Although past burrow surveys were available for several of the public land bases, I conducted surveys in 2010 to verify existing active burrows or determine if new burrows were recently excavated. Land bases with no recent survey records included Camp Tiak, ACUB (Gunthrie-Phillips property), and 7 private properties.

Private landowners cooperated by sharing information concerning tortoise burrow locations. These locations were considered for field inspection and selection if they met afore-listed habitat and distance criteria.

Using available databases and map coverages, I selected active burrow and non-burrow sample points within designated habitat types. Although my goal was to survey habitat structure and vegetation at 15 active burrow and non-burrow sample points within each forest type, my survey intensity varied across study sites and forest stand types depending on the presence of active gopher tortoise burrows and the size of the study site. If a study site did not support gopher tortoises, a maximum of 15 non-burrow sample points was established in each forest stand type. If study sites exhibited > 15 active tortoise burrows, I surveyed a similar number of non-burrow locations and active burrow sample points. I established burrow-to-burrow distance criterion at ≥ 45 m to increase the likelihood of burrows being utilized by different tortoises. Likewise, non-burrow sample points were ≥ 45 m from one another and ≥ 76 m from active burrow locations. This distance regime was established using information provided by Wilson et al. (1997). A greater number of potential burrow and non-burrow locations than needed were selected prior to field assessment due to potential changes in gopher tortoise burrow status and relocations that may have occurred since surveys and database development. I marked sample points in the field with flagging and recorded locations using a GPS unit. I recorded GPS points and downloaded them into Map Source, a software program that comes with Garmin E-trex Venture HC GPS units. I shared information regarding sample point locations, gopher tortoise burrow locations, and sampling methodologies with all private landowners. Also, specific periods of sampling were determined through coordination with landowners, and landowners were contacted prior to me or my technicians visiting their property.

Habitat evaluation

I measured habitat structure and vegetation at sample points using line transects and circular plots from April to September 2010 (Hayes et al. 1981; Figure 2.3). At non-burrow locations, a central point for 40-m diameter circular plots was marked in the field and recorded with a Garmin E-trex Venture HC GPS unit. From this point, a 20-m line intercept was established by randomly selecting one of four cardinal directions. At active burrows, the burrow opening served as the plot center. A 20-meter line intercept was established departing from the burrow opening just beyond the burrow's soil apron (Jones and Dorr 2004). Percent coverage of vegetation, leaf litter, debris, and bare ground were measured along line intercepts (Hayes et al. 1981, Jones and Dorr 2004). Ground and mid-story coverage were measured at three heights: ≤ 0.3 m, > 0.3 m – ≤ 1 m, and > 1 m (Yager et al. 2007). Vegetation recorded within these height classes was identified to genus and species when possible, growth form (herbaceous or woody), plant type (forb, grass, grass-like, legume, shrub, tree, vine), and native or non-native status of each plant species (Miller and Miller 2003). Species identification was accomplished according to Miller and Miller (2003) and the U.S. Department of Agriculture plant database website (USNRCS 2011) and consultation with professional botanists. Belt transects of 0.5 m in width were established along each side of 20-m line intercepts. One of the 0.5 m x 20 m belt transects on each line intercept was randomly selected for assessment of stem density of woody plants (Hayes et al. 1981). All woody plants occurring within belt transects were totaled and identified to genus and species when possible. Canopy closure was measured with a spherical densitometer at point centers and end points and readings were averaged to determine a canopy coverage reading for each transect (Hayes et al. 1981). Basal area was assessed using a 10-factor prism at the initiation point of each non-burrow and burrow line intercept (Hayes et al. 1981, Avery and Burkhart 2001).

Topographic elevation and slope were ascertained from GPS units and map coverages. Soil categories were assessed through field inspection and from existing databases and soil survey maps from the Natural Resources Conservation Service, Mississippi Army National Guard, Mississippi Natural Heritage Program, The Nature Conservancy, U.S. Forest Service, and U.S. Fish and Wildlife Service.

Grassland Breeding Bird Surveys

I monitored 10 study sites (6 public, 4 private) using the point count method to assess avian community characteristics from May to July 2010 (Ralph et al. 1995, Rosenstock et al. 2002, Braun 2005). Study sites were located in Forrest, Greene, Hancock, Lamar, Marion, and Perry counties in south Mississippi (Figure 2.2). I omitted selected stands on study sites from inclusion in my study due to close proximity of study sites to one another (< 200 m) and stand sizes of < 4 ha as per recommendations advanced by Hanowski and Niemi (1995).

Bird surveys were designed to assess bird species richness and abundance in study sites included in the tortoise habitat component of my study (n = 15). I reported species richness, mean abundance and range for all bird species detected during point count surveys (Zar 1999). Point count stations were established at random locations within specified habitat types at each study site (Tables 2.5 and 2.6). All point count stations were located at least 50 m from habitat edges and 250 m from one another (Braun 2005). Although size of areas varied, I attempted to select forest stands that were a minimum of 6 ha so that bird counts could be conducted within 5 distance bands encircling the center point of observation. The distance bands used were as follows: 0 - 25 m, 25 - 50 m, 50 - 100 m, 100 - 250 m, and > 250 m. The same 2 observers, me and a field technician, conducted all breeding bird surveys to reduce biases associated with observer experience and variation. Surveys began at approximately 6 a.m. and were completed by 9:30 a.m. (Hamel et al. 1996). Observers arrived at point count stations and allowed 5 to 10 minutes to elapse prior to initiation of counts to allow birds to adjust to disturbance caused by human entrance into the survey area (Sliwa and Sherry 1992, Marsden 1999). Each point count survey was conducted for 10 minutes with all birds heard or seen recorded according to distance band and minute of detection during the survey period. Each point count station was monitored 3 times during the 2010 sampling season (Farnsworth et al. 2002, Rosenstock et al. 2002). The point count methodology adhered to bird sampling approaches as recommended by the U.S. Fish and Wildlife Service land bird monitoring protocol (Knutson et al. 2008).

Fire Ant Mound Surveys

Surveys of mounds of fire ants (*Solenopsis invicta*) were conducted simultaneously with habitat and vegetation structure surveys at each burrow and non-burrow sample point from April to September 2010 (Tables 2.5 and 2.6). I used 40-m circular plots to estimate the number of mounds at active burrow points and random non-burrow sample points within each forest type (Hayes et al. 1981). Fire ant mounds were identified based on mound characteristics, appearance, and behavior of ants within the mound (DeBerry et al. 2008). Runs or channels in which fire ants were active were not enumerated despite tendency for fire ants to construct these structures. To estimate mounds as an index for fire ant activity across all study sites, I recorded mound distances from the center point using 5-m intervals with 4 distance bands (0 - ≤ 5 m, > 5 - ≤ 10 m, > 10 - ≤ 15 m, and > 15 - ≤ 20 m). Mounds were classified as active or inactive depending on the presence or absence of fire ants following mound disturbance. I recorded the number of mounds within circular plots to provide an estimate of mound density at active burrows of gopher tortoises and locations without gopher tortoise burrows on private and public forestlands in south Mississippi. Mound densities were reported according to occurrence on highly suitable, moderately suitable, and less suitable soils for gopher tortoises and within different forest stand conditions on private and public lands in south Mississippi.

Statistical Analysis

The following hypotheses were tested at the 5% level of significance:

1. H_0: Vegetation characteristics will not differ between active tortoise burrows and non-burrow locations in different habitat types.

   H_1: Vegetation characteristics will differ between active tortoise burrows and non-burrow locations in different habitat types.

   Statistical analysis: Two-way Analysis of Variance (ANOVA), Least Square Means Procedure

2. H_0: Vegetation characteristics will not differ among different habitat types.

   H_1: Vegetation characteristics will differ among different habitat types.

Statistical analysis: Two-way Analysis of Variance (ANOVA), Fisher's Least Significant Difference Test (LSD)

3. H_0: Presence or absence of active tortoise burrows is not related to vegetation characteristics or habitat type.

   H_1: Presence or absence of active tortoise burrows is related to vegetation characteristics or habitat type.

   Statistical analysis: Logistic Regression Analysis

4. H_0: Fire ant mound density is not related to vegetation characteristics in different habitat types.

   H_1: Fire ant mound density is related to vegetation characteristics in different habitat types.

   Statistical analysis: Stepwise Multiple Linear Regression

Normality Testing

Prior to analysis, all variables were examined for normality using the Shapiro-Wilk test (PROC UNIVARIATE, SAS 9.2). All tests for normality were considered significant at $p \leq 0.05$. If significant results were found, data was transformed using square-root transformations for count data and arcsine square-root transformations for percentage data (McDonald 2009).

Correlation Analysis

All habitat variables were examined for collinearity using Pearson correlation coefficients (PROC CORR, SAS 9.2). Pearson correlation coefficients evaluate relationships among explanatory variables (Myers 1990). If two explanatory variables had a coefficient > 0.65, they were evaluated as candidates for exclusion from the data set used in regression modeling. Based upon current knowledge and literature, the variable with the greatest biological significance for gopher tortoises, or other targeted species, was retained for inclusion in regression analysis.

Two-way Analysis of Variance (ANOVA)

I used two-way ANOVA (PROC GLM, SAS 9.2) to test for significant differences in habitat characteristics between burrow and non-burrow sample points and among habitat types (Zar 1999). Explanatory variables that were significantly different between burrow and non-burrow sample points were considered for inclusion in stepwise logistic regression analysis (Myers 1990). I used the least square means procedure (PROC GLM, SAS 9.2) to ascertain whether selected habitat variables differed between burrow and non-burrow sample points and magnitude of difference in variables that exhibited differences between burrow and non-burrow sample points (Johnson 1998, Palaniswamy 2006, SAS 2009). For explanatory habitat variables that differed between habitat types, I used a Fisher's least significant difference test (LSD; PROC GLM, SAS 9.2) to ascertain which habitat types differed in relation to a specific explanatory habitat variable (Johnson 1998, Palaniswamy 2006). Explanatory variables that were significantly different between burrow and non-burrow sample points were considered for inclusion in stepwise multilinear regression analysis for fire ant habitat conditions (Myers 1990, McDonald 2009).

Logistic Regression

I used stepwise logistic regression (PROC LOGISTIC, SAS 9.2) to test the binary response variable of presence or absence of active gopher tortoise burrows relative to explanatory variables of vegetation composition and structure (Myers 1990). For the binary response, a general model was developed identifying habitat conditions that influenced occurrence of active gopher tortoise burrows. Explanatory variables included percent coverage of herbaceous and woody vegetation, percent coverage by growth form (grass, grass-like, forb, legume, vine, shrub, tree), basal area (total, pine, and hardwood), soil type category, and percent coverage of bare ground, leaf litter, and overstory canopy. First, I used data reduction techniques to eliminate environmental variables exhibiting little variance among study sites and variables that were correlated (Johnson 1998). Next, I used a 2-way ANOVA to eliminate from the dataset those variables that did not differ between active tortoise burrow and non-burrow sample points and habitat types (PROC GLM, SAS 9.2; Ott and Longnecker 2008). The total number of explanatory variables was reduced further by examining collinearity using Pearson correlation coefficients (PROC CORR, SAS 9.2, Myers 1990). I investigated two logistic regression models in my study. The first model included all sample points at burrow locations and non-burrow sample points. The second model utilized a reduced sample to alleviate concerns related to known sampling and observer error during basal area sampling.

Multiple Linear Regression

I used multiple linear regression to investigate potential relationships between the number of fire ant mounds at burrow and non-burrow sample points and vegetation conditions in selected habitat types. For linear regression modeling analyses, I used forest stand as the experimental unit. My faunal response variable was the number of fire ant mounds at burrow and non-burrow sample points. Determination of potential relationships between habitat conditions and the number of mounds was a multistep process. Data was examined for normality using the Shapiro-Wilk Test (PROC UNIVARIATE, SAS 9.2) and transformed when necessary using square-root transformations for count data and arcsine square-root transformations for percentage data (McDonald 2009). Variables were examined for collinearity using Pearson correlation coefficients which evaluated relationships among explanatory variables (Myers 1990). I used data reduction techniques to eliminate environmental variables exhibiting little variance among forest stand types and variables that were correlated (Johnson 1998). Additionally, the total number of explanatory variables was reduced further by examining collinearity using Pearson correlation coefficients (PROC CORR, SAS 9.2, Myers 1990). I investigated two stepwise multiple linear regression models in my study. The first model included all sample points at burrow locations and non-burrow sample points. The second model utilized a reduced sample to alleviate concerns related to known sampling and observer error during basal area sampling.

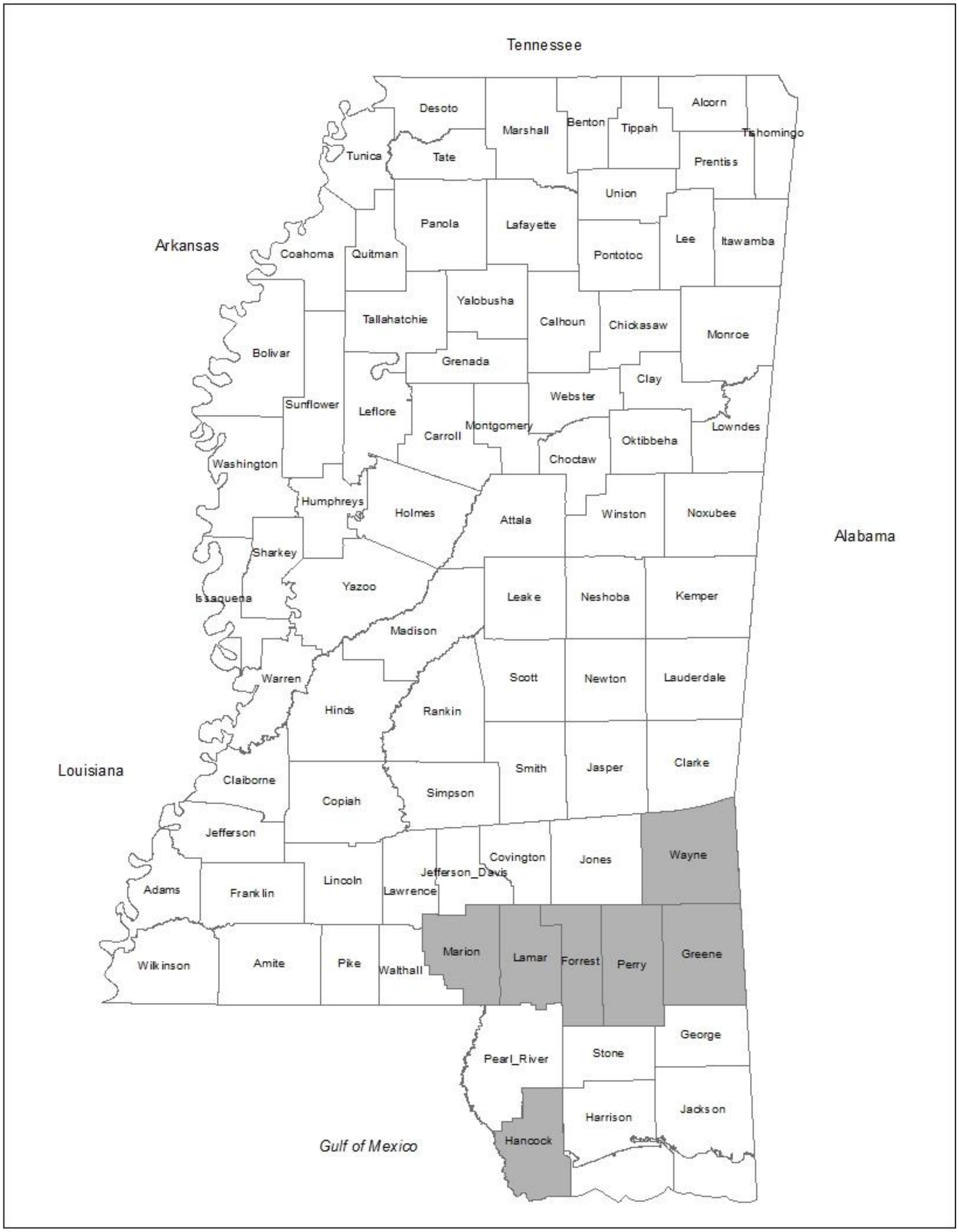

Figure 2.1 Study sites for the gopher tortoise (Gopherus polyphemus) and black pine snake (Pituophis melanoleucus lodingi) study located in Forrest, Greene, Hancock, Lamar, Marion, Perry, and Wayne counties in south Mississippi in 2009 - 2010

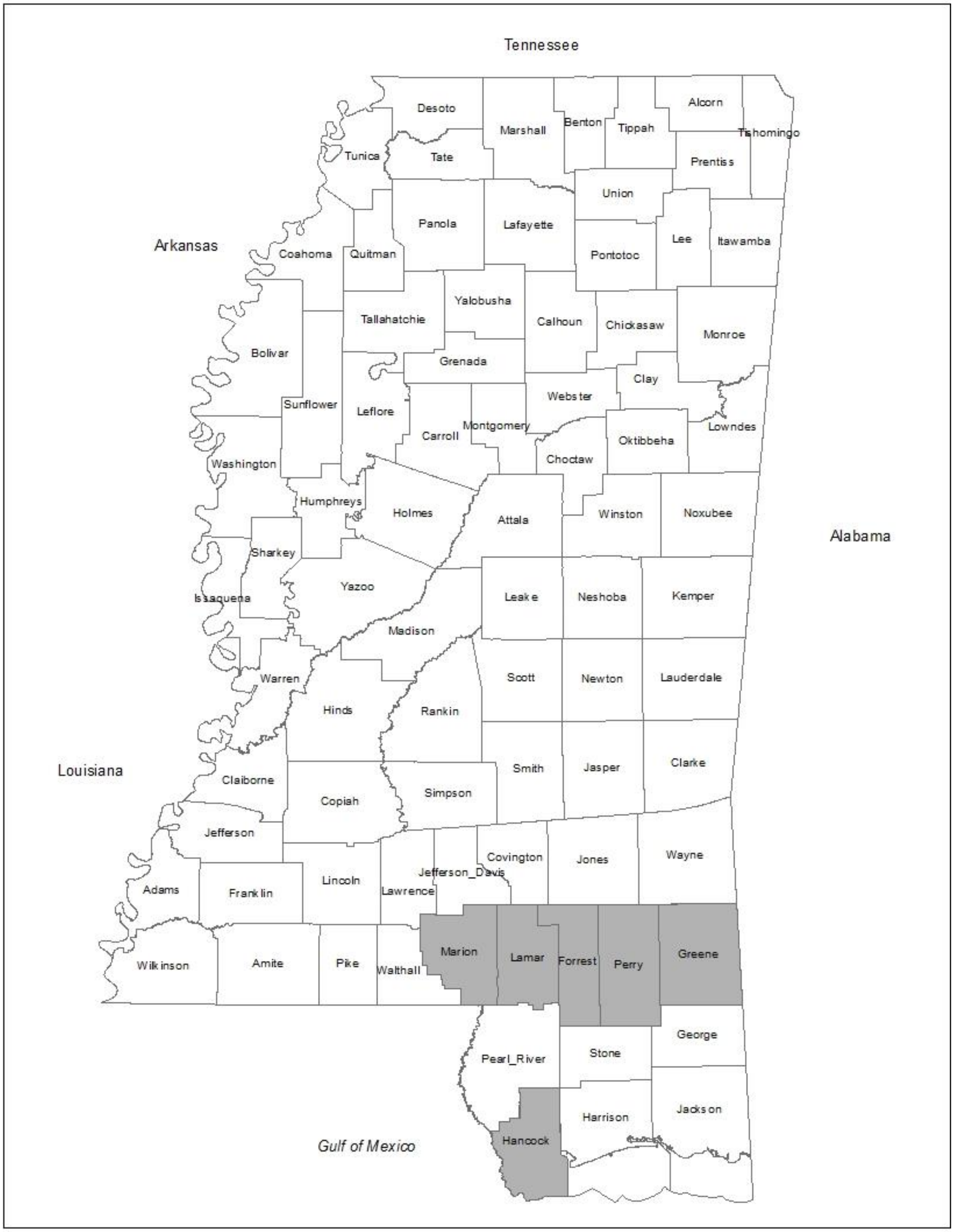

Figure 2.2 Study sites for breeding bird point count surveys in the gopher tortoise (*Gopherus polyphemus*) and black pine snake (*Pituophis melanoleucus lodingi*) study located in Forrest, Greene, Hancock, Lamar, Marion, and Perry counties in south Mississippi in 2009 - 2010

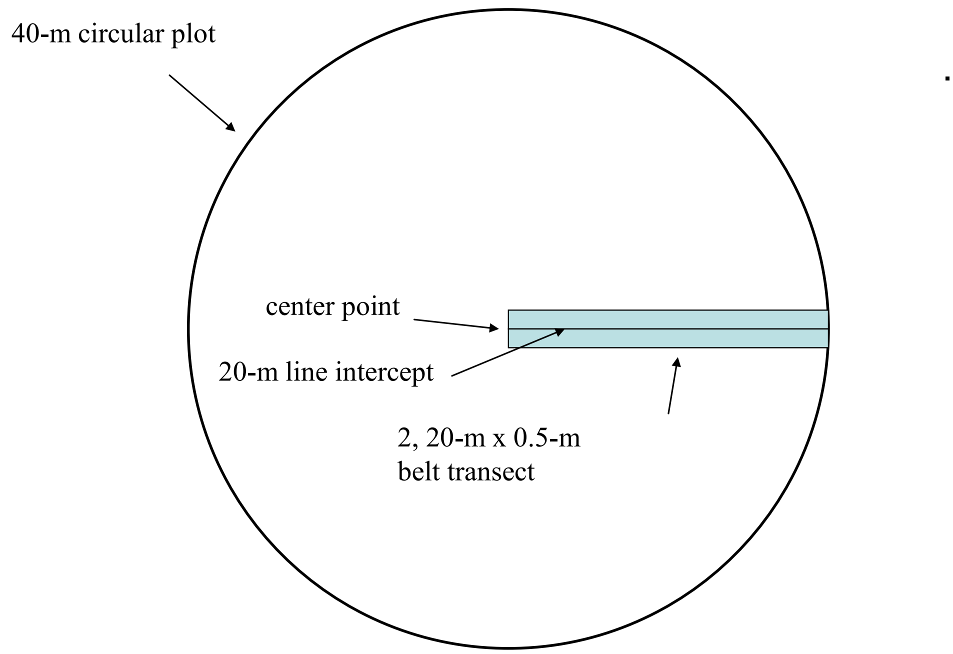

Figure 2.3 Line transect and circular plot design for the gopher tortoise (*Gopherus polyphemus*) and black pine snake (*Pituophis melanoleucus lodingi*) study in Forrest, Greene, Lamar, Marion, Perry, and Wayne counties in south Mississippi in 2009 - 2010

Table 2.1 Study sites, estimated size of sites (ha), and public land survey information for private lands in south Mississippi for the gopher tortoise (*Gopherus polyphemus*) and black pine snake (*Pituophis melanoleucus lodingi*) study in 2009 - 2010

Study Site, County	**Size (ha)**	**Section**	**Township**	**Range**
Box Property, Greene	4	23	1 North	6 West
Brooke Property, Hancock	1740	11, 14-16, 21-24, 26-28	5 South	15 West
Browning Property, Lamar	10	9	1 North	15 West
Hensarling Property, Perry	202	15, 22	4 North	11 West
Wright Property, Lamar	850	3-5, 10, 27-28, 32-34	1-2 North	14 West
Yager Property, Marion	47	22-23	3 North	17 West

Table 2.2 Study sites, estimated size of sites (ha), and public land survey information for public lands in south Mississippi for the gopher tortoise (*Gopherus polyphemus*) and black pine snake (*Pituophis melanoleucus lodingi*) study in 2009 – 2010

Study Site, County	Size (ha)	Section	Township	Range
Camp Tiak Boy Scout Camp, Forrest	344	26, 35	1 South	12 West
Chickasawhay Tortoise Area, Wayne	142	26	6 North	8 West
Dead Dog Bog State Area, Greene	97	33-34	5 North	5 West
Marion County Wildlife Management Area, Marion	2914	2-5, 19-22, 26-35	2-3 North	17 West
ACUB Guthrie-Phillips, Forrest	113	2	1 North	12 West
Camp Shelby Joint Forces Training Center – Mars Hill, Perry	364	28-33	1 South	9 West
Camp Shelby Joint Forces Training Center – Site 7, Perry	42	15	1 North	10 West
Camp Shelby Joint Forces Training Center – T-44, Perry	708	3-9, 31-34	1-2 North	11 West
Camp Shelby Joint Forces Training Center, Forrest	97	20	3 North	12 West
Desoto National Forest, Forrest and Perry	153,189	1-36	1-3 North 1 South	9-13 West

Table 2.3 Soil classifications for the gopher tortoise (*Gopherus polyphemus*) for Mississippi in order of decreasing habitat quality as reported by the U.S. Fish and Wildlife Service (2009).

Priority Soils	
Series	**Class**
Lakeland	Thermic, coated Typic Quartzipsamments
Alaga	Thermic, coated Typic Quartzipsamments
Eustis	Siliceous, thermic Psammentic Paleudults
Wadley	Loamy, siliceous, subactive, thermic Grossarenic Paleudults
Bigbee[1]	Thermic, coated Typic Quartzipsamments
Suitable Soils	
Series	**Class**
McLaurin	Coarse-loamy, siliceous, subactive, thermic Typic Paleudults
Benndale	Coarse-loamy, siliceous, semiactive, thermic Typic Paleudults
Heidel	Coarse-loamy, siliceous, subactive, thermic Typic Paleudults
Bama	Fine-loamy, siliceous, subactive, thermic Typic Paleudults
Smithdale	Fine-loamy, siliceous, subactive, thermic Typic Hapludults
Ruston	Fine-loamy, siliceous, semiactive, thermic Typic Paleudults
Lucedale	Fine-loamy, siliceous, subactive, thermic Rhodic Paleudults
Lucy	Loamy, kaolinitic, thermic Arenic Kandiudults
Shubuta[1]	Fine, mixed, semiactive, thermic, Typic Paleudults
Marginal Soils	
Series	**Class**
Baxterville	Fine-loamy, siliceous, subactive, thermic Plinthic Paleudults
Malbis	Fine-loamy, siliceous, subactive, thermic Plinthic Paleudults
Poarch[2]	Coarse-loamy, siliceous, semiactive, thermic Plinthic Paleudults
Saucier	Fine-loamy, siliceous, subactive, thermic Plinthaquic Paleudults
Susquehanna	Fine, smectic, thermic Vertic Paleudalfs
Boswell	Fine, mixed, active, thermic, Vertic Paleudalfs
Lorman	Fine, smetitic, thermic Chromic Vertic Hapludalfs
Freestone	Fine-loamy, siliceous, semiactive, thermic Glossaquic Paleudalfs
Freest	Fine-loamy, siliceous, active, thermic Aquic Paleudalfs
Prentiss	Coarse-loamy, siliceous, semiactive, thermic Glossic Fragiudults
Savannah	Fine-loamy, siliceous, semiactive, thermic Typic Fragiudults
Basin[2]	Coarse-loamy, siliceous, semiactive, thermic Fragiaquic Paleudults
Petal[2]	Fine-loamy, siliceous, active, thermic Aquic Paleudalfs
[1]Provisional inclusion.	
[2]Some poarch soils may be considered suitable by the U.S. Fish and Wildlife Service	

Table 2.4 Updated soil classifications for the gopher tortoise (*Gopherus polyphemus*) for Mississippi in order of decreasing habitat quality as reported by the U.S. Fish and Wildlife Service (2012).

ESA Section 7 Consultation	Survey Required if suitable habitat exists					No Survey Required			
Stocking Rate	Tortoise Bank (1.5 acres per tortoise)	Tortoise Bank (2.5 acres per tortoise)		No credits allowed		No credits allowed			
Old USFWS soil system	*Priority*	*Suitable*		*Marginal*		*Unsuitable*			
2011 USFWS soil system	**Highly Suitable**	**Moderately Suitable**	**Less Suitable**	**Marginal**		**Unsuitable**			
NRCS Soil Series	Alaga	Benndale	Bama	Angie	Kirkville	Adaton	Falaya	Mantachie	Prentiss
	Bassfield	Boykin Heidel	Baxterville	Annemaine	Lorman	Arat	Fluvaquents	Marietta	Prim
	Darco	Jena	Bigbee	Ariel	Luverne	Arkabuta	Frost	Mashulaville	Providence
	Eustis	McLaurin	Brantley	Beauregard	Malbis	Atmore	Gillsburg	Mathiston	Quitman
	Lakeland	Newhan St. Lucie	Bruno	Borrow Pit	Maubila	Axis	Grenada	Maurepas	Rock outcrop
	Latonia		Cahaba	Boswell	Oaklimeter	Basin	Griffith	Maytag	Rosebloom
	Rattlesnake Forks		Cascilla	Cadeville	Ora	Bayou	Guin	McCrory	Saffell
	Rumford		Iuka	Collins	Petal	Beaches	Guyton	Myatt	Savannah
	Troup		Lucedale	Columbus	Pits	Bibb	Handsboro	Nahunta	Smithton
	Wadley		Lucy	Corolla	Poarch	Bohicket	Henry	Ochlockonee	Stough
			Nugent	Dogue	Sandy alluvial land	Bude	Houlka	Ocilla	Suggsville
			Okeelala	Escambia	Saucier	Chastain	Hyde	Okolona	Sulfaquepts
			Olla	Falkner	Shubuta	Chenneby	Johnston	Oktibbeha	Trebloc
			Ruston	Freest	Sumter	Coastal beach	Kinston	Osier	Una
			Shubuta	Freestone	Susquehanna	Croatan	Lauderdale	Ouachita	Urbo
			Smithdale	Gravel Pit	Sweatman	Daleville	Leaf	Paden	Vaiden
			Suffolk	Harleston	Udorthents	Dam	Leeper	Pamlico	Water
				Ichusa	Urban land	Deerford	Lenoir	Paxville	Watsonia
				Irvington	Vancleave	Dorovan	Leon	Pheba	Wehadkee
				Izagora		Duckston	Louin	Plummer	
				Johns		Eutaw	Luverne	Ponzer	

Table 2.5 Sampling intensity of gopher tortoise (*Gopherus polyphemus*) burrow, non-burrow vegetation points, breeding bird surveys, and fire ant (*Solenopsis invicta*) mound surveys on private lands for the gopher tortoise and black pine snake (*Pituophis melanoleucus lodingi*) study in south Mississippi during 2010.

Study Site, County Forest Stand Type (Age)	Tortoises Present	Vegetation Conditions and Fire ant Mound Count Transects/Plots[a]		Breeding Bird Surveys	Total No. Active Tortoise Burrows	Dominant Soil Category[b]
		Burrows	Non-burrow	Number of point count stations		
Box Property, Greene	Yes			**0**	6	Moderately/Highly Suitable
Planted Longleaf Pine (≤ 5 years)		5	0	0		
Brooke Property, Hancock	Yes			**7**	19	Less/Moderately Suitable
Mixed Loblolly, Longleaf Pine (≤ 5 years)		3	0	0		
Natural Longleaf Pine (> 15 years, Uneven ages)		4	10	4		
Planted Longleaf Pine (> 5 - ≤ 15 years)		5	10	3		
Early Successional Habitat: Road Right-of-way and food plot		2	0	0		
Mixed Pine Hardwoods		1	0	0		
Browning Property, Lamar	Yes			**0**	17	Moderately/Highly Suitable
Natural Longleaf Pine (> 15 years, Uneven ages)		12	0	0		
Hensarling Property, Perry	No			**2**	0	Less/Moderately Suitable
Loblolly Pine Regeneration (≤ 5 years)		0	15	2		
Wright Property, Lamar	Yes			**9**	29	Moderately Suitable
Longleaf Pine Regeneration (≤ 5 years)		3	15	1		
Planted Loblolly Pine (> 15 years)		0	10	3		
Planted Longleaf Pine (> 15 years)		6	13	4		
Natural Longleaf Pine (> 15 years) hardwood understory		6	0	1		
Early Successional Habitat: Field or Pipeline Right-of-Way		6	0	0		
Yager Property, Marion	No			**2**	0	Less/Moderately Suitable
Planted Loblolly Pine (> 15 years)		0	15	2		
Totals Across All Sites		**53**	**88**	**20**	**71**	

Table 2.6 Sampling intensity of gopher tortoise (*Gopherus polyphemus*) burrow, non-burrow vegetation points, breeding bird surveys, and fire ant (*Solenopsis invicta*) mound surveys on public lands for the gopher tortoise and black pine snake (*Pituophis melanoleucus lodingi*) study in south Mississippi during 2010.

Study Site, County Forest Stand Type (Age)	**Tortoises Present**	**Vegetation Conditions Fire ant Mound Counts Transects/Plots**		**Breeding Bird Surveys**	**Total No. Active Tortoise Burrows**	**Dominant Soil Category[b]**
		Burrows	Non-burrow	Number of point count stations		
Camp Tiak Boy Scout Camp, Forrest	Yes			**4**	12	Moderately Suitable
Natural Longleaf Pine (> 15 years)		0	6	2		
Planted Longleaf Pine (> 15 years)		0	6	2		
Mixed Loblolly, Longleaf Pine (> 15 years)		0	3	0		
Early Successional Habitats: Fields, Rights-of-Way		8	0	0		
Chickasawhay Tortoise Area, Wayne	Yes			**0**	33	Less/Moderately/ Highly Suitable
Mixed Longleaf Pine-Scrub Oak – Sandhill Communities (> 15 years)		15	11	0		
Dead Dog Bog State Area, Greene	Yes			**4**	37	Moderately/Highly Suitable
Mixed Pine-Hardwood, Scrub Oak (> 15 years)		3	15	2		
Natural Longleaf Pine (> 15 years)		12	0	2		
Marion County Wildlife Management Area, Marion	Yes			**5**	40	Less/Moderately Suitable
Natural Longleaf Pine (> 15 years)		15	15	5		
ACUB Gunthrie-Phillips, Forrest	No			**4**	0	Moderately Suitable
Planted Loblolly Pine//Hardwoods (> 15 years)		0	15	4		
Camp Shelby Joint Forces Training Site - Mars Hill, Perry	Yes			**0**	12	Less/Moderately Suitable
Natural Longleaf Pine (>15 years, Uneven ages)		12	15	0		
Camp Shelby Joint Forces Training Site - Site 7, Perry	Yes			**0**	16	Moderately Suitable
Natural Longleaf Pine (> 15 years, Uneven ages)		10	15	0		
Camp Shelby Joint Forces Training Site – T-44, Perry	Yes			**5**	15	Moderately Suitable
Natural Longleaf Pine (> 15 years, Uneven ages)		15	16	5		
Camp Shelby Joint Forces Training Site, Forrest	Yes			**3**	2	Moderately Suitable
Regeneration Loblolly Pine (≤ 5 years)		0	5	2		
Natural Longleaf Pine (> 5 – 8 years)		0	10	1		
Early Successional Habitats: Fields, Rights-of-Way		2	0	0		
DeSoto National Forest, Forrest and Perry	Yes			**4**	3	Moderately Suitable
Mixed Pine-Hardwood (> 15 years)		3	14	4		
Totals Across All Sites		**95**	**146**	**29**	**170**	

CHAPTER III

HABITAT ASSESSMENT FOR GOPHER TORTOISE ON PUBLIC AND PRIVATE FORESTLANDS IN SOUTH MISSISSIPPI

Introduction

The historical range of the longleaf pine (*Pinus palustris*) ecosystem covered a large portion of the Atlantic and Gulf Coastal Plains from southeastern Virginia to eastern Texas, south through the northern two-thirds of Florida, with extensions also in the Piedmont and mountains of north Alabama and Georgia (Landers et al. 1995). The longleaf pine ecosystem was characterized by open, park-like "pine barrens" composed of even and multi-aged mosaics of forests, woodlands, and savannas (Landers et al. 1995, Moser and Wade 2005). The abundant and diverse groundcover while dominated by bunch grasses also included a variety of other herbaceous plants and was free of understory hardwoods and shrubs (Landers et al. 1995, Moser and Wade 2005). Although upland pine-grassland communities were most typical of this expansive ecosystem, communities of numerous rare habitats, such as sinks and other depressional wetlands, hammocks, and upland/wetland ecotones were also important components (Van Lear et al. 2005). Fire was a dominant ecological process across the landscape and originated from both natural ignitions by lightning and human ignitions by Native Americans and European settlers (McIntyre et al. 2008). Frequent fires were critical in reducing the abundance of competing hardwoods and maintaining a two-layered forest ecosystem with an open canopy dominated by longleaf pine and a herbaceous understory of grasses and forbs, particularly wiregrass (*Aristida* spp.), bluestem (*Andropogon* spp., *Schizachyrium* spp.), and a variety of legumes (Johnson and Gjerstad 1998, Kirkman 2005).

At the time of European settlement, the full extent of the longleaf pine ecosystem was approximately 36 million hectares of the southeastern United States (Frost 1993). Fragmentation, unsustainable harvest, conversion to other land uses and vegetative types, invasive species, and exclusion of natural fire cumulatively resulted in alarming declines in the extent, condition, and future sustainability of this ecosystem (America's Longleaf Initiative 2009). Current estimates indicate the longleaf pine ecosystem is limited to approximately 850,000 hectares in scattered fragments across the southeastern United States, a reduction of almost 98% of its original extent (Frost 2006).

The open, park-like structure of frequently burned longleaf pine woodlands provided habitat conditions for a unique biotic community making it one of the most biologically diverse ecosystems in the world (Peet and Allard 1993, Landers et al. 1995, Outcalt and Sheffield 1996, McIntyre et al. 2008). One of the most important endemic species of the longleaf pine ecosystem is the gopher tortoise (*Gopherus polyphemus*). This tortoise is a medium-sized terrestrial turtle that was once abundant throughout the southeastern United States from South Carolina into Louisiana (Yager et al. 2006). Historically, gopher tortoises were found in a wide variety of xeric, upland habitats with its distribution being closely associated with that of the longleaf pine vegetation community (Auffenberg and Franz 1982, Macdonald 1996, Tuberville et al. 2007, Styrsky et al. 2010). Several life history characteristics of gopher tortoises, including limited home-range size, high site fidelity, high longevity, delayed age at maturity, and high degree of habitat specialization rendered its populations vulnerable to rapid environmental change (Bendor et al. 2009, Richter et al. 2011). It is estimated that gopher tortoise populations have declined by as much as 80% over the past 100 years (Auffenberg and Franz 1982). Much of this decline is attributed to habitat loss, fragmentation, and degradation related to human land use, spread of invasive species, and fire suppression, and other factors, such as depredation from native and non-native predators and disease outbreaks (Auffenberg and Franz 1982, Epperson and Heise 2003, Yager et al. 2006, Yager et al. 2007). In 1987, the western population was listed as threatened under the Endangered Species Act which protected gopher tortoises inhabiting lands west of the Tombigbee and Alabama River systems in southwestern Alabama, southern Mississippi, and southeastern Louisiana (United States Fish and Wildlife Service 1990, Jones and Dorr 2004).

The specific habitat requirements for the gopher tortoise have been the subject of numerous investigations (Auffenberg and Iverson 1979, Diemer 1986, Wilson et al. 1997, Aresco and Guyer 1999b, Jones and Dorr 2004). Although optimal tortoise habitat conditions are typically associated with upland habitats within the longleaf pine ecosystems some studies have suggested tortoises may respond more to a suite of physical environmental features rather than a specific plant assemblage (Campbell and Christman 1982, Cox et al. 1987). The gopher tortoise is most commonly found in upland habitats characterized by deep, well-drained sandy soils suitable for construction of their extensive burrows (Mushinsky et al. 2006). These habitats and their associated vegetation are usually referred to as sandhills (Diemer 1989). Gopher tortoises have been reported to prefer well-drained, sandy soils of greater elevational topography due to easier digging conditions for nesting and burrow construction and less chance of burrow flooding (Garner and Landers 1981, Auffenberg and Franz 1982, Carthy et al. 2005, Enge et al. 2006). Although tortoises typically avoid more mesic conditions, on rare occasion active tortoise burrows have been found on other soil types including denser clay and loamy soils and topographic positions such as mid-slopes and level flats (Lohoefener 1982, Guyer and Hermann 1997, Wester 2003, Gregory et al. 2006, Evans et al. 2010, Wigley et al. 2012).

Because tortoises are grazing herbivores they tend to inhabit areas that support a wide variety of herbaceous ground cover vegetation (Mushinsky et al. 2006). Open canopy, longleaf pine forests and sandhill scrub oak habitats are often favored, but planted stands are also occupied when the canopy is sufficiently open to allow growth of abundant herbs and provide nest sites with almost full sunlight (Diemer 1989). Tortoises consume a variety of grasses, forbs, and other herbaceous plants (Garner and Landers 1981). One study on central Florida sandhill scrub reported as many as 26 families of plants in 68 genera in the diet of gopher tortoises (Macdonald and Mushinsky 1988). Garner and Landers (1981) reported that gopher tortoises in southwestern Georgia consumed up to 90% grasses and grass-like species during growing season months. They also reported the dietary importance of legumes and forbs to juvenile tortoises during summer due to nutrient and protein content (Garner and Landers 1981). Studies have indicated the percent coverage of understory legumes is often significantly greater at active burrows than at non-burrow locations in the same area (Boglioli et al. 2000, Tuberville et al. 2007, Evans et al. 2010).

Several studies have reported the importance of food plant distribution and availability to gopher tortoises. For example, Diemer (1989) reported that gopher tortoise density and movements are affected by the availability of forbs and grasses. Although most foraging occurs within 100 m of burrow openings, tortoises will often shift their daily and seasonal movements or even their entire home range in response to a decline in available food sources (McRae et al 1981). Auffenberg and Iverson (1979) also reported an inverse relationship between home range and the amount of herbaceous vegetation. Furthermore, areas with > 40% ground cover often supported 20 times more tortoises than areas characterized by more sparse ground cover conditions (Auffenberg and Iverson 1979, Rostal and Jones 2002).

Management that is required to provide adequate food availability for gopher tortoises includes maintenance of open overstory conditions and stimulation of herbaceous and fruiting food plants through prescribed burning (Yager et al. 2007). In many southeastern pine forests, overstory canopy closure, shrub encroachment, herbaceous decline due to fire suppression, dormant-season burning, and other forestry practices have resulted in degraded habitat conditions for gopher tortoises (Yager et al. 2007). Habitat degradation as a result of fire suppression can result in burrow abandonment, and Diemer (1989) reported that if fire is excluded for > 8 years tortoise numbers may be reduced by as much as 60 - 80%. Furthermore, Auffenberg and Franz (1982) suggested that fire suppression in excess of 16 years could be adequate enough to cause local extirpation of gopher tortoises.

Fire suppression alone is sufficient to negatively impact the quality of tortoise habitat conditions over time. However, when combined with other intensive forest management practices, such as conversion of longleaf pine grasslands to densely stocked pine plantations, the resulting canopy closure and advanced development of shrub and midstory cover can lead to higher occurrences of burrow abandonment (Guyer and Hermann 1997, Aresco and Guyer 1999a, Jones and Dorr 2004, Yager et al. 2007). On a slash pine (*Pinus elliottii*) plantation in south-central Alabama, the canopy cover associated with onsite tree density and basal area was sufficient to contribute to significant tortoise burrow abandonment over a five-year period (Aresco and Guyer 1999a). Similarly, other studies have reported a higher occurrence of active tortoise burrows in habitats with a significantly lower canopy cover and basal area than surrounding available habitat (Boglioli 2000, Rostal and Jones 2002, Tuberville et al. 2007, Evans et al. 2010).

Tortoises may abandon areas with dense midstory and overstory canopies for several reasons (Mushinsky and McCoy 1994). Canopy closure reduces the amount of sunlight at ground level and may hamper tortoises from reaching minimum thermal requirements for their normal daily activities or hinder the development of eggs (Mushinsky and McCoy 1994, Mushinsky et al. 2006). Canopy closure also reduces the abundance and quality of herbaceous forage which is essential for normal growth, development, and reproduction (Auffenberg and Franz 1982, Mushinsky et al. 1994, Aresco and Guyer 1999b, Rostal and Jones 2002). As habitat quality degrades, gopher tortoises often move to areas with open canopy characteristics due to better basking and foraging conditions. In many cases, tortoises may relocate to ruderal areas such as fence rows, old fields, berms, forest stand edges, logging decks, wildlife food plots, and roadsides. Tortoises that relocate to these areas often do not survive due to negative impacts of vehicle and equipment traffic, poaching by humans, and depredation by native and non-native predators (Auffenberg and Franz 1982, Diemer 1986, Diemer 1989).

Due to the status of gopher tortoises, the continued population declines within the listed portion of the range, and limited recruitment of young tortoises into the population, research and conservation initiatives have been planned and implemented in the past two decades to restore and manage habitat for gopher tortoises. Although research has thoroughly documented the habitat requirements for gopher tortoises, much of the information found in the literature is based on studies that were conducted on public land. However, limited numbers of studies have investigated tortoise habitat conditions on private land despite the fact almost 90% of southern forest acreage is under private ownership (Smith et al. 2009). For this reason, the decisions that private landowners make regarding management of their land are highly important in the conservation of gopher tortoises at a landscape level (Underwood et al. 2012). Furthermore, programs developed by organizations and federal agencies, such as the Natural Resource Conservation Service and U.S. Fish and Wildlife Service, often target restoration and management of longleaf pine and sandhill habitats to conserve these imperiled ecosystems and their endemic species, such as gopher tortoises.

This research focused on evaluation of plant community conditions occurring at burrow and non-burrow locations within different pine forests, sandhill communities, and regeneration sites on public and private lands. This research should provide a greater understanding of gopher tortoise habitat conditions on public and private lands under a variety of management regimes, forest types, and age classes. The assessment of habitat conditions at active burrows in a variety of habitat types could better elucidate conditions that gopher tortoises are selecting in relation to surrounding available habitat. This study can also be valuable to natural resource managers with the U.S. Fish and Wildlife Service and the Natural Resources Conservation Service in assessment of habitat quality for gopher tortoises under different mitigation and reforestation programs. This information can enhance the ability of natural resource managers to implement longleaf pine restoration and habitat management for gopher tortoises and grassland bird species endemic to the longleaf pine-bluestem ecosystem.

Study Objectives

My objectives for this portion of my study include the following:

1. Evaluate habitat conditions at locations of active burrows of gopher tortoises and locations that do not support gopher tortoises within different upland forest habitats.

2. Estimate and compare vegetation and edaphic conditions within different pine forest types, including longleaf pine restoration areas, loblolly/slash pine plantations, mixed pine-hardwood forests and natural longleaf forests and sandhill communities.

Study Area

I conducted field experiments on 16 study sites on public and private lands in the Lower Gulf Coastal Plain of Mississippi. Habitat types delineated for investigation included longleaf pine forests (> 15 years of age) under fire management that supported gopher tortoises on highly suitable, moderately, and less suitable soils, longleaf pine forests (> 5 - ≤ 15 years of age), planted pine regeneration sites (≤ 5 years of age), and mixed pine-hardwood, mixed pine, or planted pine forests (> 15 years of age) with limited or no fire management. At least two of my private land study sites were enrolled in cost-share or other conservation programs. Public lands used for assessing habitat conditions at burrow and non-burrow sample points were located in Forrest, Greene, Marion, Perry, and Wayne counties in south Mississippi (Figure 2.1, Table 2.2). Private lands were located in Greene, Hancock, Lamar, Marion, and Perry counties in south Mississippi (Figure 2.1, Table 2.1).

Methods

Field Methods

Field data were collected from May to September 2010. Several study methods were used to investigate faunal and vegetation communities. Habitat evaluation included measurement of overstory, midstory, and understory vegetative conditions, basal area of trees, and percent canopy coverage using methods described by Hayes et al. (1991). Gopher tortoise burrow evaluations were conducted according to methods described by Jones and Dorr (2004), Guyer and Hermann (1997), and Auffenberg and Franz (1982). One-hundred forty-eight transects (39%) originated from active gopher tortoise burrows whereas the remaining 234 transects (61%) occurred at non-burrow sample points. Specific details of field survey methods are provided in Chapter II.

Statistical analysis

The following hypotheses were investigated at the 5% level of significance:

1. H_0: Vegetation characteristics will not differ between active tortoise burrows and non-burrow locations in different habitat types.

   H_1: Vegetation characteristics will differ between active tortoise burrows and non-burrow locations in different habitat types.

2. H_0: Vegetation characteristics will not differ among different habitat types.

H_1: Vegetation characteristics will differ among different habitat types.

3. H_0: Presence or absence of active tortoise burrows is not related to vegetation characteristics or habitat type.

   H_1: Presence or absence of active tortoise burrows is related to vegetation characteristics or habitat type.

My hypotheses were tested using several approaches as follows:

Normality Testing

Prior to analysis, all variables were examined for normality using the Shapiro-Wilk test (PROC UNIVARIATE, SAS 9.2). All tests for normality were considered significant at $p \leq 0.05$. If significant results were found, data were transformed using square-root transformations for count data and arcsine square-root transformations for percentage data (McDonald 2009).

Correlation Analysis

All habitat variables were examined for collinearity using Pearson correlation coefficients (PROC CORR, SAS 9.2). Pearson correlation coefficients evaluate relationships among explanatory variables (Myers 1990). If two explanatory variables had a coefficient > 0.65, one of the variables was evaluated as a candidate for exclusion from the data set used in regression modeling. Based upon current knowledge and literature, the variable with the greatest biological significance for gopher tortoises, or other targeted species, was retained for inclusion in regression analysis.

Two-way Analysis of Variance (ANOVA)

I used two-way ANOVA (PROC GLM, SAS 9.2) to test for significant differences in habitat characteristics between burrow and non-burrow sample points and among habitat types (Zar 1999). Explanatory variables that were significantly different between burrow and non-burrow sample points were considered for inclusion in stepwise logistic regression analysis (Myers 1990). I used the least square means procedure (PROC GLM, SAS 9.2) to ascertain whether selected habitat variables differed between burrow and non-burrow sample points and magnitude of differences in variables that exhibited differences (Johnson 1998, Palansiwamy 2006, SAS 2009). For explanatory habitat variables that differed between habitat types, I used a Fisher's least significant difference test (LSD; PROC GLM, SAS 9.2) according to methods described by Johnson (1998) and Palaniswamy (2006) to ascertain which habitat types differed in relation to a specific explanatory habitat variable (Johnson 1998, Palaniswamy 2006).

Logistic Regression

I used stepwise logistic regression (PROC LOGISTIC, SAS 9.2) to test the binary response variable of presence or absence of active gopher tortoise burrows relative to explanatory variables of vegetation composition and structure (Myers 1990). For the binary response, a general model was developed identifying habitat conditions that influenced occurrence of active gopher tortoise burrows. Potential explanatory variables included coverage of herbaceous and woody vegetation, percent coverage by growth form (grass, grass-like, forb, legume, vine, shrub, tree), basal area (total, pine, and hardwood), soil type category, and percent coverage of bare ground, leaf litter, and overstory canopy. First, I used data reduction techniques to eliminate environmental variables exhibiting little variance among study sites and variables that were correlated (Johnson 1998). Next, I used a 2-way ANOVA to eliminate those variables that did not differ between active tortoise burrows and non-burrow sample points and habitat types (PROC GLM, SAS 9.2; Ott and Longnecker 2008). The total number of explanatory variables was reduced further by examining collinearity using Pearson correlation coefficients (PROC CORR, SAS 9.2; Myers 1990). I investigated two logistic regression models in my study. The first model (n = 382) included all sample points at burrow locations and non-burrow sample points. The second model (n = 277) included a reduced sample to alleviate concerns related to known sampling and observer error during basal area sampling.

Results

Gopher Tortoise Burrow Surveys

I surveyed a total of 382 vegetation transects on 16 gopher tortoise study sites on public and private lands in south Mississippi (Tables 2.5 and 2.6). Of the total transects surveyed 141 (53 burrow, 88 non-burrow) occurred on private lands, whereas, 241 (95 burrow, 146 non-burrow) were located on public lands. The greatest number of vegetation transects at active tortoise burrows (n = 101; 22 private land, 79 public land) were sampled in forest stands categorized as natural longleaf pine > 15 years; whereas, three burrow transects occurred in one stand each of mixed pine-hardwood > 15 years and unmanaged mixed pine-hardwood > 15 years in the sand hills on public lands (Tables 2.5 and 2.6). Tortoise burrows were not detected in stands of pine regeneration ≤ 5 years and planted longleaf pine > 15 years or one stand each of mixed pine-hardwood > 15 years and natural longleaf pine > 15 years on public land (Table 2.6). Similarly, burrows were not detected in one stand of pine regeneration ≤ 5 years and two stands of densely planted loblolly pine > 15 years on private land (Table 2.5).

Habitat Conditions

Vegetation conditions, including overstory canopy, basal area, and percent cover of plants, varied among habitat types and study sites at active tortoise burrows and non-burrow sample points (Tables 3.1 - 3.5; Figures 3.1 - 3.24). Overstory canopy coverage ($F_{1,372} = 21.52$, $P < 0.01$) and total basal area ($F_{1,284} = 71.55$, $P < 0.01$) were greater at non-burrow sample points (Tables 3.1-3.3, 3.5; Figures 3.23 and 3.24). Active burrows were more often associated with habitats that exhibited less overstory canopy coverage than non-burrow locations. Longleaf pine habitats that were managed with prescribed fire typically exhibited open canopies of 0% (± 0.0) to 64% (± 7.49) cover (Table 3.5). Mean overstory canopy coverage at active tortoise burrows ranged from 0% (± 0.0) to 83.3% (± 16.67) whereas non-burrow sample points exhibited canopy coverage ranging from 2.2% (± 1.55) to 98.0% (± 2.0) (Table 3.5; Figure 3.24). Mean total basal area at active burrows ranged from 0.0 m^2/ha (± 0.0) to 11.48 m^2/ha (± 1.33); whereas, basal area ranged from 0.0 m^2/ha (± 0.0) to 21.09 m^2/ha (± 1.36) at non-burrow sample points (Table 3.5; Figure 3.23). Percent exposure of bare ground was also greater at burrow locations than non-burrow locations ($F_{1,372} = 24.57$, $P < 0.01$) (Tables 3.3 and 3.6).

Herbaceous Plants

The greatest percent coverage of herbaceous plants at active burrow and non-burrow sample points was recorded in habitats classified as planted longleaf pine of > 5 – ≤ 15 years of age (Tables 3.1, 3.2, 3.7 and 3.8). Gopher tortoise burrows typically occurred in more open canopy conditions across all forested types that exhibited a greater percent coverage of herbaceous plants ranging from 0.0% (± 0.0) to 125.62% (± 9.37) coverage (Tables 3.5, 3.7, and 3.8). Percent coverage of herbaceous ($F_{1,372}$ = 5.29, P = 0.02) plants ≤ 0.3 m in height at all study sites was greater (69.20%; ± 34.45 to 125.62%; ± 9.37) at gopher tortoise burrows when compared to coverage detected at non-burrow sample points (13.88%; ± 3.1 to 128.34%; ± 7.25) (Table 3.3). Burrow points occurring in longleaf pine habitats (planted > 5 – ≤ 15 years, natural > 15 years, planted > 15 years) exhibited mean percent coverage of herbaceous plants of 125.62% (± 9.37), 103.05% (± 8.27), and 88.23% (± 5.13) at the ≤ 0.3 m in height; whereas, non-burrow sample points in these same habitats exhibited coverage of 128.34% (± 7.25), 103.03% (± 8.74), and 81.28% (± 7.16), respectively (Tables 3.7 and 3.8).

When evaluated within growth form or taxonomic families, percent coverage of herbaceous plants was typically greater at burrow locations than at non-burrow locations in all habitat types (Tables 3.7-3.10). Percent coverage of native legumes ≤ 0.3 m in height ($F_{1,372}$ = 7.56, P = 0.01) was greater (0.21%; ± 0.15 to 8.33%; ± 3.28) at burrow locations than non-burrow locations (0.03%; ± 0.03 to 1.87%; ± 0.32) (Tables 3.3, 3.9-3.10; Figure 3.18). Native grasses and forbs at burrow sample points across all habitat types exhibited mean coverages ranging from 49.50 % (± 27.62) to 88.38% (± 8.37) and 3.53% (± 0.27) to 25.44% (± 9.45), respectively (Table 3.9; Figures 3.3, 3.12). Whereas, mean coverage at non-burrow sample points for non-native grasses and forbs ranged from 0.55% (± 0.33) to 91.51% (± 16.56) and 1.80% (± 0.57) to 29.09% (± 6.23), respectively (Table 3.10)

Native Herbaceous Plants

A variety of herbaceous plant species were detected along transects originating at active tortoise burrows and non-burrow sample points (Figures 3.25 - 3.30; Appendices A and B). Native grass genera included bluestem (*Andropogon* spp., *Schizachyrium* spp.), panicgrass (*Panicum* spp., *Dichanthelium* spp.), bullgrass (*Paspalum* spp.), and wiregrass (*Aristida* spp.; Appendices A and B). Bluestems exhibited a mean percent coverage ranging from 3.0% (± 2.67) to 47.7% (± 15.53) at burrow sample points and 0.5% (± 0.32) to 36.9% (± 7.01) at non-burrow locations (Appendices A and B). Active tortoise burrows located in unmanaged mixed forest in sandhill communities exhibited the greatest percent coverage of bluestem grasses; whereas, the greatest percent coverage at non-burrow sample points was detected in planted longleaf pine > 15 years of age (Appendices A and B). Species that were detected included big bluestem (*Andropogon gerardii*) and broomsedge bluestem (*A. virginicus*; Appendices A and B). Little bluestem (*Schizachyrium scoparium*) exhibited a mean percent coverage ranging from 0.0% (± 0.0) to 30.8% (± 8.24) at burrow sample points and 0.0% (± 0.0) to 37.5% (± 11.05) at non-burrow locations. The percent coverage of little bluestem at burrow and non-burrow locations was greatest in planted longleaf pine > 5 - ≤ 15 years of age (Appendices A and B).

Panicgrasses, particularly *Dichanthelium* spp., exhibited a mean percent coverage ranging from 6.6% (± 5.47) to 33.3% (± 5.77) along active burrow transects and 0.06% (± 0.04) to 27.9% (± 4.09) at non-burrow sample points (Appendices A and B). The greatest percent coverage of panicgrasses at burrow sample points was detected in pine regeneration ≤ 5 years of age; whereas, the greatest percent coverage of these grasses at non-burrow locations was detected in planted longleaf pine > 15 years of age (Appendices A and B). Species detected at burrow and non-burrow locations included needleleaf rosette grass (*Dichanthelium aciculare*), tapered rosette grass (*D. acuminatum*), variable panicgrass (*D. commutatum*), and velvet panicum (*D. scoparium*; Appendices A and B). Other panicgrasses, including switchgrass (*Panicum virgatum*), typically exhibited < 3% coverage along transects at either burrow or non-burrow sample points (Appendices A and B).

Wiregrass (*Aristida* spp.) exhibited a mean percent coverage ranging from 0.0% (± 0.0) to 17.2% (± 8.03) at burrow sample points and 0.0% (± 0.0) to 19.1% (± 6.28) at non-burrow locations (Appendices A and B). The greatest percent coverage of wiregrass at burrow sample points was detected in natural longleaf pine > 15 years of age; whereas, the percent coverage at non-burrow locations was greatest in planted longleaf pine > 5 - ≤ 15 years of age (Appendices A and B). Species detected at burrow and non-burrow sample points included Beyrich threeawn (*Aristida beyrichiana*) and pineland threeawn (*A. stricta*) (Appendices A and B).

The native bullgrass, Florida paspalum (*Paspalum floridanum*), exhibited a mean percent coverage ranging from 0.0% (± 0.0) to 16.0% (± 7.11) at burrow sample points and 0.0% (± 0.0) to 0.62% (± 0.38) at non-burrow locations (Appendices A and B). The greatest percent coverage of Florida paspalum along burrow transects was detected in early successional habitat; whereas, the greatest coverage at non-burrow locations occurred in planted longleaf pine > 15 years of age (Appendices A and B).

The mean percent coverage of native forbs was typically greater in the ≤ 0.3 m and > 0.3 m – ≤ 1 m height regimes along transects at burrow sample points and non-burrow locations (Tables 3.7-3.10, Figures 3.12-3.14). Native forbs included members of the family Asteraceae, such as aster (*Aster* spp.), boneset/thoroughwort (*Eupatorium* spp.), goldentop (*Euthamia* spp.), goldenrod (*Solidago* spp.), and silkgrass (*Pityopsis* spp.) (Appendices A and B). *Aster* spp. exhibited a mean percent coverage ranging from 0.0% (± 0.0) to 4.0% (± 1.46) at burrow sample points and 0.0% (± 0.0) to 5.4% (± 1.62) at non-burrow sample points (Appendices A and B). The greatest percent coverage at burrow sample points was detected in planted longleaf > 15 years of age; whereas, the greatest coverage at non-burrow locations occurred in planted longleaf > 5 - ≤ 15 years of age (Appendices A and B). Species that were detected included clasping aster (*Aster adnatus*), late purple aster (*A. patens*), bushy aster (*A. dumosus*), and stiff aster (*A. linariifolius*) (Appendices A and B).

The mean percent coverage of *Eupatorium* spp. ranged from 0.0% (± 0.0) to 1.4% (± 0.5) at burrow sample points and 0.03% (± 0.03) to 5.9% (± 1.89) at non-burrow locations (Appendices A and B). The greatest percent coverage at burrow sample points was detected in pine regeneration ≤ 5 years of age; whereas, the greatest coverage at non-burrow locations occurred in planted longleaf pine > 5 - ≤ 15 years of age (Appendices A and B). Species that were detected included dogfennel (*Eupatorium capillifolium*), roundleaf thoroughwort (*E. rotundifolium*), and hyssopleaf thoroughwort (*E. hyssopifolium*) (Appendices A and B).

Solidago spp. exhibited a mean percent coverage ranging from 0.51% (± 0.51) to 5.99% (± 3.03) at burrow sample points and 0.09% (± 0.09) to 7.1% (± 2.29) along non-burrow sample points (Appendices A and B). The greatest percent coverage of goldenrod at burrow sample points was detected in pine regeneration ≤ 5 years of age; whereas, the greatest coverage along non-burrow sample points was detected in planted longleaf pine > 5 - ≤ 15 years of age (Appendices A and B). Species that were detected included wrinkleleaf goldenrod (*Solidago rugosa*) and fragrant goldenrod (*S. odora*) (Appendices A and B).

The mean percent coverage of slender goldentop (*Euthamia tenuifolia*) ranged from 0.0% (± 0.0) to 1.7% (± 1.65) at burrow sample points and 0.0% (± 0.0) to 5.3% (± 3.69) at non-burrow sample points (Appendices A and B). The greatest percent coverage of slender goldentop at burrow sample points occurred in pine regeneration ≤ 5 years of age; whereas, the greatest coverage at non-burrow locations was detected in planted longleaf pine > 5 - ≤ 15 years of age (Appendices A and B).

Narrowleaf silkgrass (*Pityopsis graminifolia*) exhibited a mean percent coverage ranging from 0.0% (± 0.0) to 8.8% (± 3.77) at burrow sample points; whereas, the coverage at non-burrow locations ranged from 0.0% (± 0.0) to 3.1% (± 0.71) (Appendices A and B). The greatest percent coverage along burrow transects occurred in early successional habitat; whereas, the greatest coverage along non-burrow transects was detected in natural longleaf pine > 15 years of age (Appendices A and B).

Other forbs that were detected at burrow sample points and non-burrow locations included rustweed (*Polypremum procumbens*), pineweed (*Hypericum gentianoides*), buttonweed (*Diodia* spp.), spurge (*Euphorbia* spp.), and noseburn (*Tragia* spp.) (Appendices A and B). The mean percent coverage of pineweed, spurge, and noseburn was < 1.5% along all transects of burrow and non-burrow locations (Appendices A and B). The greatest percent coverage typically occurred in stands of planted or natural longleaf pine > 15 years of age that were managed with prescribed fire (Appendices A and B). However, rustweed exhibited a mean percent coverage ranging from 0.0% (± 0.0) to 14.6% (± 9.47) at burrow sample points and 0.0% (± 0.0) to 3.7% (± 2.11) at non-burrow locations (Appendices A and B). The percent coverage of rustweed along burrow transects was greatest in planted longleaf pine > 5 - ≤ 15 years of age; whereas, the coverage at non-burrow locations was greatest in pine regeneration ≤ 5 years of age (Appendices A and B).

Along burrow transects, the mean percent coverage of buttonweed ranged from 0.0% (± 0.0) to 5.4% (± 2.28) in the ≤ 0.3 m height regime and 0.0% (± 0.0) to 11.2% (± 7.58) in the > 0.3 m – ≤ 1 m height regime (Appendices A and B). The percent coverage at non-burrow locations ranged from 0.0% (± 0.0) to 17.6% (± 4.81) (Appendices A and B). The greatest percent coverage of buttonweed at burrow sample points occurred in pine regeneration ≤ 5 years of age and early successional habitat; whereas, the greatest coverage at non-burrow location was detected in pine regeneration ≤ 5 years of age (Appendices A and B). Species that were detected included poorjoe (*Diodia teres*) and Virginia buttonweed (*D. virginiana*) (Appendices A and B).

The percent coverage of legumes ≤ 0.3 m in height ($F_{1,372} = 13.11$, P = 0.0003) and native legumes species richness ($F_{1,372} = 5.80$, P = 0.02) was greater at burrow sample points than non-burrow locations in my study (Table 3.3, Figure 3.15 and 3.31). The highest species richness of native legumes for burrow sample points and non-burrow locations was detected in natural longleaf pine stands > 15 years of age with a total of 16 species; whereas, the lowest species richness occurred in densely planted pine plantations > 15 years of age with only a single species detected (Figure 3.31).

Although a variety of native legume genera were detected in my study, on average many represented < 1% of the coverage in all three height levels along transects originating at burrow and non-burrow locations. Native legume species that exhibited < 1% of the coverage at burrow and non-burrow sample points included Eastern milkpea (*Galactia regularis*), sensitive brier (*Mimosa microphylla*), spurred butterfly pea (*Centrosema virginianum*), Atlantic pigeonwings (*Clitoria mariana*), and Pursh's rattlebox (*Crotalaria purshii*) (Appendices A and B). Trailing fuzzybean (*Strophostyles umbellata*), and wild indigo (*Baptisia* spp.) were detected at non-burrow sample points; whereas, bladderpod (*Sesbania* spp.) was only detected at burrow sample points (Appendices A and B).

Other genera at burrow and non-burrow sample points included *Tephrosia* spp., *Lespedeza* spp., *Desmodium* spp., partridge pea (*Chamaecrista fasciculata*), and sidebeak pencilflower (*Stylosanthes biflora*). The mean percent coverage of partridge pea ranged from 0.0% (± 0.0) to 8.2% (± 2.98) in the > 0.3 m - ≤ 1 m height regime at burrow sample points; whereas, the coverage at non-burrow locations ranged from 0.0% (± 0.0) to 0.08% (± 0.06) (Appendices A and B). The greatest percent coverage of partridge pea at tortoise burrows was detected in early successional habitat; whereas, the greatest coverage at non-burrow locations occurred in pine regeneration ≤ 5 years of age (Appendices A and B).

In the ≤ 0.3 m height regime, sidebeak pencilflower exhibited a mean percent coverage ranging from 0.0% (± 0.0) to 5.1% (± 2.24) at burrow sample points but only 0.0% (± 0.0) to 0.44% (± 0.13) at non-burrow sample points (Appendices A and B). The greatest percent coverage of sidebeak pencilflower at active burrows sample points was detected in mixed pine hardwood > 15 years of age; whereas, the greatest coverage at non-burrow locations occurred in natural longleaf pine > 15 years of age (Appendices A and B).

The percent coverage of *Tephrosia* spp. ≤ 0.3 m in height ranged from 0.14% (± 0.14) to 1.01% (± 1.01) at active burrows; whereas, the coverage at non-burrow locations ranged from 0.0% (± 0.0) to 0.8% (± 0.17) (Appendices A and B). The greatest percent coverage at burrow sample points and non-burrow locations was detected in planted longleaf pine > 15 years of age and natural longleaf pine > 15 years of age, respectively. Species that were detected included spiked hoarypea (*Tephrosia spicata*) and goat's rue (*T. virginiana*) (Appendices A and B).

The mean percent coverage of *Lespedeza* spp. > 0.3 m - ≤ 1 m in height at burrow sample points ranged from 0.0% (± 0.0) to 7.6% (± 3.12); whereas the coverage at non-burrow locations ranged from 0.0% (± 0.0) to 0.2% (± 0.09) (Appendices A and B). The greatest percent coverage at active burrows was detected in early successional habitat; whereas, coverage at non-burrow locations was greatest in pine regeneration ≤ 5 years of age. Species that were detected included narrowleaf lespedeza (*L. angustifolia*), hairy lespedeza (*L. hirta*), creeping lespedeza (*L. repens*), trailing lespedeza (*L. procumbens*), and slender lespedeza (*L. virginica*) (Appendices A and B).

Desmodium spp. ≤ 0.3 m in height exhibited a percent coverage ranging from 0.0% (± 0.0) to 2.02% (± 1.61) at burrow sample points and 0.0% (± 0.0) to 0.28% (± 0.08) at non-burrow locations (Appendices A and B). The greatest percent coverage at burrow sample points was detected in planted longleaf pine > 15 years of age; whereas, the greatest coverage at non-burrow locations occurred in natural longleaf pine > 15 years of age. Species that were detected included stiff ticktrefoil (*D. obtusum*), prostrate ticktrefoil (*D. rotundifolium*), hairy small-leaf ticktrefoil (*D. ciliare*), smooth ticktrefoil (*D. laevigatum*), and sand ticktrefoil (*D. lineatum*) (Appendices A and B).

Non-native Herbaceous Plants

Non-native herbaceous species exhibited a percent coverage of $\leq$ 27% over all my study sites at burrow sample points and non-burrow locations (Tables 3.1, 3.2, 3.7-3.10, and 3.11). Of the eight habitat types surveyed in my study, the greatest percent coverage of non-native herbaceous plants at tortoise burrows was recorded in early successional habitats; whereas, the greatest coverage at non-burrow sample points was detected in planted longleaf stands > 5 – $\leq$ 15 years of age (Tables 3.7 and 3.8). Percent coverage of non-native herbaceous plants at tortoise burrows in early successional habitats ranged from 0.0% to 113.6% with a mean of 20.03% ($\pm$8.22) (Tables 3.1 and 3.7). Non-burrow locations in planted longleaf pine 5 – 15 years of age exhibited coverage ranging from 0.0% to 100.0% with a mean of 26.43% ($\pm$13.24) (Tables 3.2 and 3.8).

Non-native grass species detected along line transects included agronomic bullgrasses, such as bahiagrass (*Paspalum notatum*), dallis grass (*Paspalum dilatatum*), and vaseygrass (*Paspalum urvillei*) as well as browntop (*Microstegium* spp.), Bermuda grass (*Cynodon dactylon*), crabgrass (*Digitaria ciliaris* and *D. sanguinalis*), Johnsongrass (*Sorghum halepense*), and cogongrass (*Imperata cylindrica*; Appendices A and B). Non-native grasses exhibited mean percent coverages ranging from 0.0% ($\pm$ 0.0) to 17.42% ($\pm$ 17.42) at burrow sample points and 0.0% ($\pm$ 0.0) to 26.43% ($\pm$ 13.24) coverage at non-burrow sample points (Tables 3.9 and 3.10). When evaluated at the species level, non-native grass species typically represented < 2% of the total coverage at burrow and non-burrow sample points (Appendices A and B). However, in the ≤ 0.3 m height category, bahiagrass exhibited a coverage ranging from 0.0% (± 0.0) to 9.3% (± 4.24) at burrow sample points and 0.0% (± 0.0) to 2.5% (± 2.46) at non-burrow locations (Appendices A and B). Along burrow transects, crabgrass exhibited a coverage ranging from 0.0% (± 0.0) to 15.3% (± 15.3); whereas, coverage ranged from 0.0% (± 0.0) to 2.04% (± 0.9) at non-burrow sample points (Appendices A and B).

Across all study sites, the mean coverage of cogongrass ($F_{1,372} = 2.26$, P = 0.13) was greater at non-burrow sample points than burrow locations (Table 3.11). The mean coverage of cogongrass at non-burrow sample points and burrow locations exhibited ranges of 0.0% (± 0.0) to 25.5% (± 13.08) and 0.37% (± 0.24) to 3.5% (± 3.16), respectively, and did not differ between burrow and non-burrow locations (Tables 3.3 and 3.11). However, mean percent coverage of cogongrass ($F_{7,\,372} = 9.01$, P < 0.01) differed among habitat types (Table 3.4). The greatest percent coverage of cogongrass was detected on a private land base along non-burrow sample points in stands of planted longleaf pine > 5 – ≤ 15 years of age (Table 3.11).

Non-native forbs and legumes each comprised < 2% of the total herbaceous coverage along line transects at active burrow locations and non-burrow sample points across all habitat types (Tables 3.9, 3.10, and 3.11). Non-native forb and legume species including horseweed (*Conyza canadensis*), Japanese clover (*Kummerowia striata*), sericea lespedeza (*Lespedeza cuneata*), Asiatic dayflower (*Commelina communis*), cockroach berry (*Solanum capsicoides*), coffeeweed (*Senna obtusifolia*), and white clover

(*Trifolium repens*) each represented < 1% of the herbaceous coverage along line intercepts at burrow and non-burrow locations (Appendices A and B).

Woody Plants

The percent coverage of woody plants varied among habitat types and between active burrow and non-burrow sample points in my study (Table 3.3). Percent coverage of all woody vegetation in the ≤ 0.3 m ($F_{1,372}$ = 4.19, P = 0.04), > 0.3 m – ≤ 1 m ($F_{1,372}$ = 7.55, P = 0.01), and > 1 m ($F_{1,372}$ = 17.84, P < 0.01) height categories was greater at non-burrow sample points across all habitat types (Table 3.3). Along line transects originating at tortoise burrows, the percent coverage of all woody plants in the > 1 m height category ranged from 14.3% (± 5.8) to 89.9% (± 11.52); whereas, the coverage along non-burrow line intercepts ranged from 16.8% (± 4.28) to 197.1% (± 13.57) (Tables 3.1, 3.2, 3.7, and 3.8). For burrow sample points and non-burrow locations the greatest coverage in the > 1 m height regime was detected in mixed pine hardwood forests > 15 years of age; whereas, the least coverage was detected in pine regeneration ≤ 5 years of age (Tables 3.1, 3.2, 3.7, and 3.8). At burrow locations, the percent coverage of woody plants in the < 0.3 m height category ranged from 8.3% (± 1.84) to 55.3% (± 21.3) and 9.2% (± 2.46) to 50.0% (± 7.23) at non-burrow locations (Tables 3.1, 3.2, 3.7, and 3.8). The percent coverage of woody plants > 0.3 m – ≤ 1 m in height ranged from 16.2% (± 8.45) to 81.1% (± 48.88) at burrow sample points; whereas, coverage at non-burrow locations ranged from 31.2% (± 8.17) to 59.4% (± 17.94) (Tables 3.1, 3.2, 3.7, and 3.8). Sample points at tortoise burrows typically exhibited less percent coverage of woody plants and some habitat types exhibited less percent coverage at burrow and non-burrow locations because of recent management with prescribed fire. In sandhill habitat types managed with prescribed fire, percent coverage of woody plants at ≤ 0.3 m, > 0.3 m – ≤ 1 m, and > 1 m exhibited means of 23.4% (± 2.71), 27.6% (± 2.47), and 52.5% (± 4.64), respectively (Tables 3.1 and 3.7). Whereas, at non-burrow locations in unmanaged sandhill habitats, woody plant coverage was typically 2 to 3 times that of active burrows, averaging 14.7% (± 3.12), 59.4% (± 17.94), and 147.23% (± 22.74) (Tables 3.2 and 3.8).

The percent coverage of woody plants at all burrow sample points and non-burrow locations consisted of species of shrubs, vines, and trees (Figures 3.32 - 3.37) (Appendices A and B). Across all habitat types, the percent coverage of shrubs was typically greater in the > 0.3 m – ≤ 1 m height category in comparison to the other height categories along line intercepts originating at burrow and non-burrow locations (Tables 3.1-3.2 and 3.12-3.13). Furthermore, shrub coverage ($F_{1,372}$ = 24.21, P < 0.01) in the > 0.3 m – ≤ 1 m height category was greater at non-burrow locations across all habitat types (Tables 3.3, 3.12, and 3.13). The percent coverage of vines was typically greater in the ≤ 0.3 m height category; whereas, the coverage of trees was greater in the > 1 m height category (Tables 3.12 and 3.13). The percent coverage of vines ≤ 0.3 m in height ($F_{1,372}$ = 4.52, P = 0.03) and trees > 1 m in height ($F_{1,372}$ = 24.59, P < 0.01) was greater at non-burrow locations across all habitat types (Table 3.3).

Native shrub genera that were detected at burrow and non-burrow locations included hollies (*Ilex* spp.), waxmyrtle (*Myrica cerifera*), winged sumac (*Rhus copallinum*), American beautyberry (*Callicarpa americana*), and blueberry/huckleberry (*Vaccinium* spp., *Gaylussacia* spp.) (Appendices A and B). At burrow sample points, the percent coverage of *Ilex* spp. ranged from 0.8% (± 0.63) to 11.9% (± 4.97); whereas, at non-burrow locations the coverage ranged from 3.1% (± 1.13) to 37.3% (± 8.27)

(Appendices A and B). *Ilex* spp. percent coverage at burrow and non-burrow locations was greatest in unmanaged mixed forest in the sandhills. Species that were detected at burrow and non-burrow locations included gallberry (*I. glabra*) and yaupon (*I. vomitoria*) (Appendices A and B).

The percent coverage of waxmyrtle ranged from 0.0% (± 0.0) to 14.1% (± 11.94) at burrow sample points and 0.0% (± 0.0) to 3.1% (± 1.48) at non-burrow locations (Appendices A and B). Waxmyrtle coverage at burrow sample points was greatest in mixed pine hardwood forests > 15 years but was greatest in planted longleaf pine > 15 years of age at non-burrow locations.

The percent coverage of winged sumac at burrow sample points ranged from 0.0% (± 0.0) to 11.1% (± 6.34); whereas, the coverage at non-burrow locations ranged from 0.0% (± 0.0) to 3.5% (± 1.75) (Appendices A and B). Regardless of burrow or non-burrow locations, the greatest coverage of winged sumac was detected in mixed pine hardwood forests > 15 years of age.

At burrow sample points, the percent coverage of soft mast producers such as American beautyberry ranged from 0.0% (± 0.0) to 2.8% (± 2.79); whereas, the coverage at non-burrow locations ranged from 0.0% (± 0.0) to 10.0% (± 2.95) (Appendices A and B). The greatest coverage at burrow and non-burrow locations was detected in mixed pine hardwood forests > 15 years of age and densely planted pine > 15 years of age, respectively.

Other soft mast-producing shrub genera including dwarf huckleberry (*Gaylussacia dumosa*) exhibited a percent coverage that ranged from 0.0% (± 0.0) to 1.7% (± 1.49) at burrow sample points; whereas, coverage at non-burrow locations ranged from 0.0% (± 0.0) to 4.02% (± 1.16) (Appendices A and B). The greatest coverage at burrow and non-burrow locations was detected in habitats managed with prescribed fire with greatest coverage recorded in planted longleaf pine > 5 – ≤ 15 years of age and natural longleaf pine > 15 years of age. However, blueberry (*Vaccinium* spp.) exhibited a percent coverage ranging from 1.5% (± 0.44) to 7.1% (± 4.68) at burrow sample points and 0.0% (± 0.0) to 6.9% (± 2.37) at non-burrow locations (Appendices A and B). Species that were detected at burrow and non-burrow locations included shiny blueberry (*V. myrsinites*), Elliott's blueberry (*V. elliottii*), deerberry (*V. stamineum*), and sparkleberry (*V. arboreum*) (Appendices A and B).

Native vine genera including blackberry/dewberry (*Rubus* spp.), wild grape (*Vitis* spp.), yellow jessamine (*Gelsemium sempervirens*), greenbrier (*Smilax* spp.), and poison ivy (*Toxicodendron radicans*) were detected at burrow sample points and non-burrow locations. The percent coverage of blackberry/dewberry ranged from 0.0% (± 0.0) to 32.3% (± 16.71) at burrow sample points and 0.4% (± 0.22) to 23.9% (± 6.07) at non-burrow locations (Appendices A and B). The greatest percent coverage at burrows was detected in mixed pine hardwood forest > 15 years of age; whereas, the greatest coverage at non-burrow locations occurred in densely planted pine > 15 years of age.

At tortoise burrows, the percent coverage of wild grape ranged from 0.0% (± 0.0) to 19.4% (± 12.75); whereas, the coverage at non-burrow locations ranged from 0.0% (± 0.0) to 13.0% (± 4.81) (Appendices A and B). The percent coverage at burrow sample points was greatest in mixed pine hardwood forests > 15 years of age; whereas, the coverage at non-burrow locations was greatest in densely planted pine > 15 years of age.

The species that were detected included muscadine grape (*V. rotundifolia*) and summer grape (*V. aestivalis*) (Appendices A and B).

The percent coverage of greenbrier at burrow sample points ranged from 0.3% (± 0.25) to 10.1% (± 10.1); whereas, the coverage at non-burrow locations ranged from 0.2% (± 0.08) to 4.6% (± 4.19) (Appendices A and B). At burrow sample points, the greatest percent coverage was detected in unmanaged mixed forests in the sandhills; whereas, the greatest coverage at non-burrow locations occurred in natural longleaf pine > 15 years of age. Species that were detected at burrow and non-burrow locations included saw greenbrier (*Smilax bona-nox*), cat greenbrier (*S. glauca*), sarsaparilla vine (*S. pumila*), and roundleaf greenbrier (*S. rotundifolia*) (Appendices A and B).

At burrow sample points, yellow jessamine and poison ivy exhibited percent coverages that ranged from 0.0% (± 0.0) to 4.4% (± 2.54) and 0.0% (± 0.0) to 3.8% (± 2.00), respectively (Appendices A and B). Their percent coverage at non-burrow sample points ranged from 0.2% (± 0.21) to 10.9% (± 4.89) and 0.1% (± 0.05) to 2.6% (± 1.55), respectively (Appendices A and B). The percent coverage of yellow jessamine along burrow sample points was greatest in pine regeneration ≤ 5 years of age; whereas, the coverage at non-burrow locations was greatest in mixed pine hardwood forests > 15 years of age. Poison ivy coverage was greatest in mixed pine hardwood forests > 15 years of age regardless of burrow or non-burrow status.

Native tree genera, including pines (*Pinus* spp.) and oaks (*Quercus* spp.), represented the greatest percent coverage of all trees at burrow sample points and non-burrow locations regardless of habitat type (Appendices A and B). At burrow sample points, pine exhibited a percent coverage ranging from 0.0% (± 0.0) to 63.0% (± 8.66) with the greatest coverage occurring in planted longleaf pine > 15 years of age (Appendices A and B). Percent coverage at non-burrow locations ranged from 7.1% (± 1.36) to 91.6% (± 2.63) with the greatest coverage being detected in densely planted pine > 15 years of age (Appendices A and B). Species that were detected included longleaf pine (*P. palustris*) and loblolly pine (*P. taeda*).

The percent coverage of oaks at burrow sample points ranged from 0.8% (± 0.76) to 40.7% (± 17.41); whereas, the coverage at non-burrow locations ranged from 0.03% (± 0.03) to 41.2% (± 6.98) (Appendices A and B). The coverage at tortoise burrows was greatest in unmanaged mixed forests in the sandhills; whereas, coverage at non-burrow locations was greatest in mixed pine hardwood forests > 15 years of age. Oak species that were detected included white (*Q. alba*), southern red (*Q. falcata*), water (*Q. nigra*), bluejack (*Q. incana*), turkey (*Q. laevis*), post (*Q. stellata*), and blackjack (*Q. margaretta*).

Other tree species, including black cherry (*Prunus serotina*), common persimmon (*Diospyros virginiana*), sweetgum (*Liquidambar styraciflua*) and sweetleaf (*Symplocos tinctoria*), typically represented < 10% of the total coverage along line transects at burrow sample points and non-burrow locations (Appendices A and B). Furthermore, their percent coverages were typically greater at non-burrow locations occurring in habitat types that experienced limited management with prescribed fire such as mixed pine hardwood forests > 15 years of age. One exception was red maple (*Acer rubrum*) which exhibited a percent coverage that ranged from 0.0% (± 0.0) to 7.4% (± 2.16) at burrow sample points and 0.0% (± 0.0) to 20.3% (± 4.86) at non-burrow locations (Appendices A and B). Red maple percent coverage at burrow sample points was greatest in natural longleaf pine > 15 years of age; whereas, the coverage at non-burrow locations was greatest in mixed pine hardwood forests > 15 years of age.

Non-native woody plants represented < 18% of the total percent coverage of woody plants along line transects of burrow and non-burrow locations (Tables 3.1, 3.2, 3.7 and 3.8). Non-native woody species detected at burrow sample points and non-burrow locations included bicolor lespedeza (*Lespedeza bicolor*), Japanese honeysuckle (*Lonicera japonica*), Japanese climbing fern (*Lygodium japonicum*) and Chinese tallow (*Triadica sebifera*) (Appendices A and B). The detection of Chinese privet (*Ligustrum sinense*) was restricted to non-burrow locations. The percent coverage of non-native woody plants was typically greater at non-burrow locations than burrow sample points and in habitats that were not managed with prescribed fire, particularly densely planted pine > 15 years of age and mixed pine hardwood forests > 15 years of age (Tables 3.1, 3.2, 3.7, 3.8, and Appendices A and B). On average the coverage of non-native woody plants at the taxonomic level was typically < 5% in all habitat types; however, Chinese privet exhibited a percent coverage ranging from 0.0% (± 0.0) to 16.2% (± 5.88) at non-burrrow locations in densely planted pine > 15 years of age (Appendices A and B).

Comparisons of Habitat Conditions at Burrow and Non-burrow Locations

A total of 107 habitat parameters were measured along line intercepts and belt transects at active tortoise burrows and non-burrow sample points. A two-way analysis of variance identified 34 habitat parameters that were significantly different ($p < 0.05$) between burrow and non-burrow sample points (Table 3.3). Of these variables, the least-square means procedure recognized 17 parameters (50%) that were significantly greater at active tortoise burrows and the remaining 17 parameters (50%) that were significantly greater at non-burrow locations (Table 3.3). Habitat parameters that were significantly greater at burrow sample points included percent coverage of bare ground ($F_{1,372}$ = 24.57, P < 0.01), percent coverage of all herbaceous vegetation at ≤ 0.3 m ($F_{1,372}$ = 5.29, P = 0.02), percent coverage of native legumes at ≤ 0.3 m ($F_{1,372}$ = 7.56, P = 0.01; Figure 3.42), and percent coverage of all legumes at ≤ 0.3 m ($F_{1,372}$ = 13.11, P = 0.0003; Table 3.3). Habitat parameters that were significantly greater at non-burrow locations included percent overstory canopy closure ($F_{1,372}$ = 21.52, P < 0.01), total basal area ($F_{1,284}$ = 71.55, P < 0.01), percent coverage of all woody vegetation at > 0.3 m – ≤ 1 m ($F_{1,372}$ = 7.55, P = 0.01), and percent coverage of all woody vegetation at > 1 m ($F_{1,372}$ = 17.84, P < 0.01; Table 3.3).

Comparison of Habitat Conditions between Habitat Types

Of the 107 habitat parameters that were measured along line intercepts originating at burrow and non-burrow sample points, a two-way analysis of variance identified 77 (72%) that were significantly different (P < 0.05) among habitat types (Tables 3.3 and 3.4). These habitat parameters included 27 (35%) that were also significantly different between burrow and non-burrow sample points (Table 3.3). Habitat parameters that were significantly different among habitat types included percent overstory canopy closure ($F_{7,372}$ = 32.99, P < 0.01; Figure 3.39), total basal area ($F_{7,284}$ = 85.21, P < 0.01; Figure 3.38), percent coverage of bareground ($F_{7,372}$ = 5.82, P < 0.01; Figure 3.40), percent coverage of all herbaceous vegetation at ≤ 0.3 m ($F_{7,372}$ = 26.37, P < 0.01; Figure 3.41), percent coverage of all legumes at ≤ 0.3 m ($F_{7,372}$ = 3.61, P = 0.0009), percent coverage of all herbaceous vegetation at > 0.3 m – ≤ 1 m ($F_{7,372}$ = 17.28, P < 0.01), percent coverage of all woody vegetation at > 0.3 m – ≤ 1 m ($F_{7,372}$ = 2.45, P = 0.02), and percent coverage of all woody vegetation at > 1 m ($F_{7,372}$ = 41.84, P < 0.01) (Table 3.4, Figure 3.43).

Stepwise logistic regression modeling

I used two stepwise logistic regression models to evaluate potential relationships among forest stand characteristics and the presence or absence of gopher tortoise burrows. My complete stepwise logistic regression for model 1 had the following form: Logit (p) = a $\pm$ B_1 (Percent Coverage of Overstory) $\pm$ B_2 (Percent Coverage of Bare Ground) $\pm$ B_3 (Percent Coverage of Herbaceous Plants $\leq$ 0.3 m) $\pm$ B_4 (Percent Coverage of Woody Plants $\leq$ 0.3 m) $\pm$ B_5 (Percent Coverage of Native Legumes $\leq$ 0.3 m) $\pm$ B_6 (Percent Coverage of Non-native Legumes $\leq$ 0.3 m) $\pm$ B_7 (Percent Coverage of Grass-like Plants $\leq$ 0.3 m) $\pm$ B_8 (Percent Coverage of Woody Plants > 0.3 m - $\leq$ 1 m) $\pm$ B_9 (Percent Coverage of Leguminous Plants > 0.3 m - $\leq$ 1 m). Where: Logit (p) = probability of presence or absence of tortoise burrow, a = intercept, and B_i = parameter estimate. Logistic regression analysis revealed that 6 explanatory variables were related to the presence or absence of tortoise burrows. Gopher tortoise burrows were associated positively with greater percent coverage of bare ground (χ^2 = 43.47, df = 1, P < 0.01), percent coverage of native legume $\leq$ 0.3 m in height (χ^2 = 21.92, df = 1, P < 0.01), percent coverage of grass-like vegetation $\leq$ 0.3 m in height (χ^2 = 4.16, df = 1, P = 0.04), and percent coverage of all leguminous vegetation > 0.3 m - $\leq$ 1 m in height (χ^2 = 15.46, df = 1, P < 0.01). Tortoise burrow presence was associated negatively with an increase in percentage canopy closure (χ^2 = 5.8584, df = 1, P = 0.02) and woody vegetation > 0.3 m – $\leq$ 1 m in height (χ^2 = 12.01, df = 1, P = 0.0005). The reduced logistic model for tortoise burrow presence was as follows: Logit (presence of tortoise burrows) = - 0.44 – 0.42

[Percent Coverage of Overstory] + 46.17 [Percent Coverage of Bare Ground] + 49.29 [Percent Coverage of Native Legumes $\leq$ 0.3 m] + 24.44 [Percent Coverage of Grass-like Plants $\leq$ 0.3] – 16.26 [Percent Coverage of Woody Plants > 0.3 m - $\leq$ 1 m] + 30.45 [Percent Coverage of Leguminous Plants > 0.3 m - $\leq$ 1 m]. The logistic model $R^2 = 0.24$.

My complete stepwise logistic regression for model 2 had the following form: Logit (p) = a $\pm$ B_1 (Percent Coverage of Overstory) $\pm$ B_2 (Total Basal Area) $\pm$ B_3 (Percent Coverage of Bare Ground) $\pm$ B_4 (Percent Coverage of Herbaceous Plants $\leq$ 0.3 m) $\pm$ B_5 (Percent Coverage of Woody Plants $\leq$ 0.3 m) + B_6 (Percent Coverage of Native Legumes $\leq$ 0.3 m) + B_7 (Percent Coverage of Non-native Legumes $\leq$ 0.3 m) + B_8 (Percent Coverage of Grass-like Plants $\leq$ 0.3 m) + B_9 (Percent Coverage of Woody Plants > 0.3 m - $\leq$ 1 m) + B_{10} (Percent Coverage of Leguminous Plants > 0.3 m - $\leq$ 1 m). Where: Logit (p) = probability of presence or absence of tortoise burrow, a = intercept, and B_i = parameter estimate. Logistic regression analysis revealed that 4 explanatory variables were related to the presence or absence of tortoise burrows. Gopher tortoise burrows were associated positively with an in increase in percent coverage of bare ground (χ^2 = 28.99, df = 1, P < 0.01), percent coverage of native legume $\leq$ 0.3 m in height (χ^2 = 21.29, df = 1, P < 0.01), and percent coverage of all leguminous vegetation > 0.3 m – $\leq$ 1 m in height (χ^2 = 17.81, df = 1, P < 0.01). Tortoise burrow presence was associated negatively with an increase in total basal area (χ^2 = 5.36, df = 1, P = 0.02). The reduced logistic model for tortoise burrow presence was as follows: Logit (presence of tortoise burrows) = - 1.10 – 0.10 [Total Basal Area] + 44.79 [Percent Coverage of Bare Ground] + 52.11 [Percent Coverage of Native Legumes $\leq$ 0.3 m] + 36.1932 [Percent Coverage of Leguminous Plants > 0.3 m - $\leq$ 1 m]. The logistic model $R^2 = 0.23$.

Discussion

In my study, longleaf pine forests were associated with greater occurrence of gopher tortoise burrows. Active tortoise burrows were more frequently detected in forest stands classified as natural longleaf pine > 15 years of age. Habitat conditions within these stands included an open canopy, sparse mid-story, greater coverage of bare ground, and an abundant and diverse ground cover of grasses and other herbaceous plants. Other studies have reported similar associations between gopher tortoise burrows and habitat conditions (Guyer and Hermann 1997, Jones and Dorr 2004, Edwards et al. 2016). Many of the longleaf pine habitats supporting tortoises also had a history of prescribed fire as a primary means of managing habitat conditions for gopher tortoises and other species associates endemic to longleaf pine forests (Browning et al. 2004, Cox and Widener 2008).

Although most active tortoise burrows were associated with longleaf pine dominated habitats, burrows were also located in early successional habitats including rights-of-way, old fields, and wildlife food plots. Tortoise burrow presence in these habitats could be attributed to habitat degradation in surrounding forest stands or simply tortoises utilizing an available source of nutritional forage (Garner and Landers 1981, Auffenberg and Franz 1982, Mushinsky et al. 2006, Yager et al. 2007). For example, tortoise burrows at Camp Tiak were located exclusively in a pipeline right-of-way adjacent to dense forested habitats which appeared mostly uninhabitable to tortoises, whereas, several burrows on the Brooke property were located in food plots completely surrounded by mature longleaf pine stands under prescribed fire management.

Tortoise burrows were detected very infrequently in mixed pine hardwood forests and tortoises were not present at all in densely-stocked loblolly pine stands. These forest stands provided very little in the way of tortoise habitat due to almost complete canopy closure, dense mid-story hardwoods, and minimal herbaceous groundcover (Aresco and Guyer 1999a). However, it is possible forest conditions may have also limited the surveyor's ability to locate burrows across the landscape resulting in fewer burrows detected in these habitat types. Although only a few burrows were detected in mixed pine hardwood forests, both the densely planted loblolly and mixed forests were included in my study due to their proximity to other habitats currently being managed for gopher tortoises, the presence of moderately to highly suitable soils for tortoises, and their potential inclusion in future conservation initiatives (USFWS 1990). Gopher tortoises are reported to abandon burrow sites in heavily degraded forests but these habitats could be restored to more suitable conditions for tortoises through a long term commitment to management with prescribed fire (Aresco and Guyer 1999a, Yager et al. 2007).

Logistic regression analyses indicated 7 habitat characteristics that influenced burrow presence across 8 habitat types in south Mississippi. Active gopher tortoise burrows were associated with habitats exhibiting greater coverage of bare ground, native legumes ≤ 0.3 m in height, leguminous plants > 0.3 m - ≤ 1 m in height, and percent coverage of grass-like plants ≤ 0.3 m in height. However, active gopher tortoise burrow presence was negatively associated with an increase in over story canopy cover, total basal area, and coverage of woody vegetation > 0.3 m – ≤ 1 m in height. These findings are similar to other studies that have reported tortoise presence in relation to adequate foraging, basking, and nesting conditions (McDonald and Mushinsky 1988, Guyer and Hermann 1997, Jones and Dorr 2004, Yager et al. 2007, Ashton and Ashton 2008).

For the purposes of my study, bare ground was defined as any area of sandy substrate along transects that were void of leaves, pine straw, woody debris, or herbaceous vegetation. The availability of bare ground is widely reported as an important component of suitable gopher tortoise habitat because these areas are often associated with burrow and nesting sites (Auffenberg and Franz 1982, Diemer 1986, Mushinsky et al. 2006). My results suggest differences in percent coverage of bare ground among habitat types are associated with the presence of gopher tortoise burrows. Greater percent coverage of bare ground often occurred in habitats with some previous history of habitat disturbance but not necessarily the greatest detection of active tortoise burrows. The mean percent coverage of bare ground was greater at tortoise burrows than non-burrow points, yet did not exceed 9% in any habitat in my study. The habitat conditions at burrows also included less canopy cover and greater coverage of herbaceous vegetation (Jones and Dorr 2004, Evans et al. 2008). A similar study in Florida shrub and sandhill habitats reported an increase in burrow densities associated with an increase in bare ground, yet no relationship between burrow densities and canopy cover (Ashton et al. 2008).

My results suggest active burrows were more often associated with habitats exhibiting more open canopies, a diverse understory of herbaceous plants, and at least minimal amounts of bare ground. However, bare ground did not appear to be a prerequisite for burrow locations in stands of mixed pine hardwood and longleaf pine > 5 - ≤ 15 years of age, as it was not recorded along transects originating at burrow or non-burrow points in these habitats. In mixed pine hardwood forests, tortoises may be exhibiting burrow site fidelity in habitat conditions that have significantly degraded since burrow establishment (Mushinsky et al. 2006, Yager et al. 2007). Circumstances surrounding burrow association with conditions in one privately-owned stand of longleaf pine > 5 - ≤ 15 years of age may be related to the presence of open conditions and a continuous herbaceous understory associated with habitats that are managed with prescribed fire.

An important habitat requirement for gopher tortoises is the presence of an abundant herbaceous understory (DeBerry et al. 2008). In my study, the percent coverage of all herbaceous vegetation ≤ 0.3 m in height was greater at active tortoise burrow sample points which concurred with the findings of other studies (Aresco and Guyer 1999a,b, Evans et al. 2008). However, my logistic regression analyses indicated it was not influential in predicting the presence of tortoise burrows across habitats in my study. Nevertheless, a variety of common tortoise food plants including bluestems (*Andropogon* spp, *Schizachyrium* spp.), wiregrass (*Aristida* spp.), panic grasses (*Panicum* spp. and *Dichanthelium* spp.), legumes (*Centrosema* sp., *Lespedeza* spp., *Desmodium* spp., *Tephrosia* spp., *Chamaecrista* spp.), and forbs (*Solidago* spp., *Aster* spp., *Pityopsis* spp.) were detected throughout habitats in my study (Garner and Landers 1981, MacDonald and Mushinsky 1988, Mushinsky et al. 2006, Edwards et al 2016).

Bluestem and wiregrass are considered important understory vegetation throughout the range of the longleaf pine ecosystem. As bunchgrasses, not only do they provide food and nesting habitat for many wildlife species in longleaf pine forests, they also function to facilitate the ignition and spread of frequent surface fires across the landscape (Landers 1991, Browning et al. 2004, Brockway et al. 2006). Bluestem grasses were the dominate grass genera at burrow and non-burrow sample points in my study. The percent coverage of bluestem grasses was twice that of wiregrass at burrow and non-burrow sample points across all habitat types. Although my research was limited to study sites in south Mississippi, my results concur with other studies reporting a transition from a wiregrass-dominated understory in the east to a more bluestem-dominated understory in western portions of the Gulf Coastal Plain (Peet and Allard 1993, Turner 2001, Brockway et al. 2005). These subtle changes in understory vegetation dominance have been associated with regional variations in fire frequency, soil condition, and topography (Turner 2001).

Differences in percent coverage of native legumes ≤ 0.3 m in height, leguminous plants > 0.3 m - ≤ 1 m, and grass-like plants ≤ 0.3 m in height were positively associated with the presence of active tortoise burrows. The percent coverage of native legumes ≤ 0.3 m in height and leguminous plants > 0.3 m - ≤ 1 m was greater at tortoise burrow than non-burrow locations in my study. However, across all study sites native legumes represented a relatively small percentage (≤ 8.3% burrow; ≤ 1.9% non-burrow) of the coverage of herbaceous vegetation ≤ 0.3 m in height. These results are higher than those reported by Aresco and Guyer (1999b; 2.1% burrow; 1.2% non-burrow) but still low relative to overall coverage of understory vegetation. Percent coverage of native legumes were greater in forested habitats that were managed with prescribed fire, whereas coverage of leguminous plants > 0.3 m - ≤ 1 m in height was greater at burrow points in early successional habitats.

Numerous studies have documented legumes as a valued food plant for gopher tortoises (Garner and Landers 1981, MacDonald and Mushinsky 1988, Mushinsky et al. 2006). A study in southern Georgia reported higher palatability and greater nutritional value associated with legumes than selected grasses and forbs of known forage value to gopher tortoises (Garner and Landers 1981). Leguminous plants that were detected on my study sites and previously reported as important food plants for tortoises included beggarticks (*Desmodium* spp.), partridge pea (*Chamaecrista* spp.), butterfly pea (*Centrosema* sp.), lespedeza (*Lespedeza* spp.), milkpea (*Galactia* spp.), and hoarypea (*Tephrosia* spp.; Norden and Kirkman 2006, Evans et al. 2008).

The degree to which the percent coverages of native legumes ≤ 0.3 m in height and leguminous plants > 0.3 m - ≤ 1 m are associated with presence in my study is not entirely clear. Leguminous plants and gopher tortoises both respond favorably to habitat disturbance associated with pyric ecosystems, yet on average the coverage of native legumes was low relative to overall coverage of herbaceous plants in habitats under prescribed fire management and greater occurrence of tortoise burrows. One explanation could be that frequent disturbance (i.e. prescribed fire) in longleaf pine habitats has contributed to overall higher quality habitat condition, specifically a more abundant and diverse forage base, and tortoises occurred more often in these conditions despite the low percent coverage of native legumes across the landscape. Another explanation could be that tortoises are selectively foraging for more highly preferred leguminous plants resulting in a native legume coverage that is much lower relative to the coverage of all herbaceous understory vegetation at tortoise burrow sample points (Garner and Landers 1981, MacDonald and Mushinsky 1988, Boglioli et al. 2000). Active tortoise burrow counts were greater in habitats managed with prescribed fire, therefore, I submit the positive association between burrow presence and increased coverage of mid-story leguminous vegetation may be related to tortoises selecting burrow sites based on the overall quality of habitat within proximity of a potential burrow site rather than the presence of leguminous plants in that height category.

In my study, the percent coverage of grass-like plants ≤ 0.3 m in height was greater at burrow points than non-burrow points, yet as with native legumes, they still represented a small percentage of the total coverage of herbaceous plants at all sample points. I followed growth-form classifications as described by Miller and Miller (2005), which led to some unanticipated challenges in cross-referencing my results with other tortoise habitat studies. Nevertheless, grass-like genera detected at burrows were limited to sedges (*Carex* spp. and *Cyperus* spp.), whereas non-burrow points included sedges as well as rushes (*Juncus* spp.), beaksedge (*Rhynchospora* spp.), and nutrush (*Scleria* spp.). My results concur with other studies reporting habitat conditions at burrow and non-burrow sample points; however, one study also reported nutrush around tortoise burrow points (Garner and Landers 1981).

Other studies have reported grass-like plants as being frequently consumed by gopher tortoises (Garner and Landers 1981, MacDonald and Mushinsky 1988). Although foraging ecology was not the focus of my study, it is reasonable to assume tortoises are consuming grass-like plants even though as a growth form they represent < 5% of the mean percent coverage along burrow transects. Species of sedges are common in open forest, prairies, and along forest edges, and right-of-ways and, depending on the species and disturbance levels, seeds may remain viable in the seed bank for up to 30 years

(Miller and Miller 2005). Forested ecosystems that experience frequent fire or other disturbance exhibit open conditions that are more conducive to understory plant growth and provide the necessary habitat requirements for gopher tortoises. This could explain the positive association between burrow presence and the percent cover of grass-like plants $\leq$ 0.3 m in height.

Total basal area and percent coverage of overstory canopy were greater at non-burrow sample points than active burrows (Boglioli et al. 2000, Tuberville et al. 2007). Across all habitat types, mean estimates for total basal area and percent overstory canopy at non-burrow points were generally twice that of active tortoise burrows. An Alabama study noted similar results for basal area but the authors did not report estimates for percent canopy cover but instead made inferences regarding percent canopy cover based on their basal area estimates (Aresco and Guyer 1999a). A tortoise habitat study in Georgia reported canopy cover estimates at burrows (30%) and non-burrow sites (60%) that were lower than the estimates for burrow ($\leq$ 58%) and non-burrow ($\leq$ 98%) sample points in my study (Boglioli et al. 2000). However, the percent canopy cover in my study and the Georgia study was within the recommend range of 0 - 80%, as reported by Cox et al. (1987).

The presence of active burrows was negatively associated with increasing basal area and percent overstory canopy, suggesting tortoises on my study sites may be abandoning or completely avoiding habitats exhibiting closed canopy conditions. Tortoise burrows were more frequently detected in natural longleaf pine habitats with sparse canopies and low basal area, yet on at least one public land site tortoises were excavating burrows on roadsides adjacent to natural stands of longleaf pine specifically managed for tortoises and species associates. Although tortoises frequently utilize roadside habitats, they have been reported as less than ideal locations given their potential for vehicle strikes and increased predation (Auffenberg and Franz 1982, Epperson and Heise 2003). Tortoises may avoid or abandon densely canopied habitats because inadequate sunlight at ground level can prevent them from reaching their thermal requirements for daily activity, impede egg development, and reduce the availability of herbaceous vegetation that is important for growth, development, and reproduction (Auffenberg and Franz 1982, Mushinsky and McCoy 1994, Mushinsky et al. 1994). According to my results, longleaf pine > 15 years of age, with basal areas ≤ 10m^2/ha and percent coverage of overstory canopy ≤ 58% provide habitat conditions more suitable to tortoises than other habitat types in my study. Furthermore, the detection of juvenile burrows and evidence of nesting activity in four stands of longleaf pine > 15 years indicates there is at least some potential for reproduction and recruitment in these gopher tortoise populations.

The mean percent coverage of woody plants > 0.3 m - ≤ 1 m in height was greater at non-burrow points than active burrows. However, other studies have reported greater coverage at burrow points than non-burrow which may be related to differences in sampling design (Evans et al. 2008, Edwards et al. 2016). My results indicated that burrow presence was negatively associated with increased coverage of woody plants > 0.3 m - ≤ 1 m in height. Increased midstory coverage of trees, shrubs, and vines may have a negative impact on the growth of understory herbaceous plants by preventing sunlight exposure at the forest floor. As herbivorous grazers, tortoises require an abundant herbaceous understory of grasses, forbs, legumes, and grass-like species and may even abandon habitats that lack herbaceous ground cover and relocate to more open conditions (Garner and Landers 1981, Mushinsky et al. 2006). Habitats that are characterized by > 40% herbaceous ground cover often have 20 times as many active burrows as habitats with sparse understory conditions (Auffenberg and Iverson 1979, Rostal and Jones 2009). Although I did not report burrow densities in my study, natural longleaf pine habitats had greater numbers of burrows and coverage of herabaceous understory plants at burrows averaging 88%, whereas, midstory woody plant coverage averaged nearly 28%.

Similarly, dense coverage of woody plants in this height category may also have a negative impact on tortoises by limiting their ability to meet thermoregulatory needs related to survival and reproduction (Diemer 1986, Diemer 1989, Landers and Speake 1980). Areas with dense coverage of midstory woody plants are more likely to be avoided by tortoises due to the inability of sunlight to penetrate to the soil surface which may result in reduced basking efficiency and provide less suitable burrowing and nesting habitat conditions (Boglioli et al. 2000). My results concur with the findings of Boglioli et al. (2000), however, one difference occurred in mixed pine hardwoods > 15 years of age where the percent coverage of woody plants > 0.3 m - ≤ 1 m at burrows exceeded that of non-burrow points. An herbaceous groundcover (near 70% coverage), in response to a recent prescribed burn, may have influenced tortoises to remain in this habitat despite greater coverage of woody plants > 0.3 m - ≤ 1.0 m in height (Edwards et al. 2016).

My findings were similar to other studies investigating habitat conditions at tortoise burrow and non-burrow locations; however, my logistic regression analysis indicated models that were weak predictors of burrow presence across habitats in my study. Variability in habitat conditions could be one possible explanation for weak regression modeling. Several studies that included two of my study sites (T-44, Mars Hill) reported similar challenges related to habitat conditions models, however, their models were much stronger predictors of burrow presence than mine (Evans et al. 2008, Evans et al. 2010, Edwards et al. 2016). Their studies differed from mine in that they analyzed burrow habitat conditions between study sites of similar forest stand type instead of burrow conditions across multiple habitat types. The authors reported similar burrow densities on both sites, despite differences in coverage of herbaceous understory plants, mid-story trees and shrubs, and burrow site selection (Edwards et al. 2016). They attributed these differences to variations in past management practices on each site, the presence of highly suitable burrowing habitat on Mars Hill, and burrow fidelity despite greater coverage of midstory woody plants (Yager et al. 2007, USFWS 2012). In my study, variability in habitat conditions was observed across all study sites in every habitat type and was particularly evident in the reported means and ranges of percent coverage of habitat variables across all habitat types.

The sampling design of my study may also have had an impact on the strength of my regression models. I estimated habitat conditions in three height categories along a single line transect originating at burrow and non-burrow sample points (Hayes et al. 1981). Increasing the sampling effort at each burrow and non-burrow location and over multiple growing seasons might have provided a better estimate of the overall conditions at each sample point and improved the predictive capabilities of my regression models. In addition, the height categories ($\leq$ 0.3 m, > 0.3 m - $\leq$ 1 m, and > 1 m) differed from other studies that have used line transects to measure tortoise habitat conditions (Edward et al. 2016). Other methods that have been used to estimate tortoise habitat conditions include fixed-width line transects and 1-m^2 quadrats at fixed distances along line transects (Jones and Dorr 2004, Yager et al. 2007).

A more intensive sampling of all tortoise burrows with an equal number of non-burrow points could have yielded greater inference abilities with logistic regression. Several of my study sites were limited to non-burrow points because tortoises were not present. On other sites with tortoises, sampling intensity was often restricted due to distance requirements between sampling points and size and availability of habitat areas. For these reasons, it was often difficult to sample an equal number of burrow and non-burrow sample points. Also, only burrows that met the active status as described by Auffenberg and Franz (1982) were candidates for inclusion in my study. I did not scope burrows to ensure occupancy due to recent concerns regarding the spread of contagious diseases between local populations. The threatened status of gopher tortoises in Mississippi may also have added to the difficulty of sampling a sufficient number of tortoise burrows across all habitat types in my study. Public forest lands that were actively managed as gopher tortoise conservation areas often exhibited lower numbers of active tortoise burrows relative to the amount of available suitable habitat. Future research efforts should consider the inclusion of additional public and privately owned forest lands across multiple habitat types, sampling across multiple seasons, and scoping of burrows to better ascertain habitat conditions for gopher tortoises throughout the western Gulf Coastal Plain (Edwards et al. 2016).

Conclusions

My study documented tortoise habitat conditions on public and private forestlands in south Mississippi during summer 2010. Habitat conditions and the number of active burrows varied across study sites; however, the greatest numbers of active burrows were detected in areas exhibiting more open overstory canopy and midstory conditions and greater coverage of bare ground and herbaceous understory vegetation. Many of the forested habitats associated with greater burrow presence were also dominated by longleaf pine and actively managed with prescribed fire or other silviculture measures. Early successional and pine regeneration areas supported several burrows due in part to the open conditions and plant communities associated with these habitats. Conversely, forested habitats lacking frequent prescribed fire supported very few active tortoise burrows and were more often characterized by greater canopy closure, a dense hardwood midstory, and insufficient coverage of bare ground and understory herbaceous plants.

Greater coverage of bare ground and understory herbaceous vegetation, especially grass-likes and native legumes, were important indicators of active burrow presence in my study. Although my findings indicated the coverage of all herbaceous vegetation $\leq$ 0.3 m in height was not a significant predictor of burrow presence, this does not negate the importance of an abundant and diverse herbaceous understory to the growth, survival, and reproduction of gopher tortoises (Landers and Speake 1980, Auffenberg and Franz 1982, Mushinsky et al. 2006). In fact, regardless of habitat, the coverage of herbaceous vegetation $\leq$ 0.3 m in height exceeded the recommendations for understory conditions in the western Gulf Coastal Plain (USFWS 2009). Frequent prescribed burning in longleaf pine dominated habitats may have influenced burrow presence by exposing bare mineral soil which is crucial for burrow excavation and the germination and growth of a variety of important food plants for tortoises (Means 1985). Management with prescribed fire may also have contributed to overstory canopy and midstory habitat characteristics that influenced burrow presence. Burrow locations in longleaf pine forests were associated with much lower basal area than non-burrow points and the overstory canopy and midstory exhibited more open conditions than non-burrow locations.

I detected very few burrows in mixed pine hardwood forests and the overall habitat conditions suggested that prescribed fire was used very infrequently in these habitats. Long term fire suppression can lead to closed canopy conditions and dense midstory coverage which are associated with unsuitable habitat conditions for gopher tortoises (Aresco and Guyer 1999a). Burrows were present in areas where the canopy and midstory woody plant coverage exceeded 80%, yet tortoises managed to exist in isolated open areas of abundant herbaceous vegetation (> 60% cover) interspersed throughout otherwise unsuitable conditions. The long term impact of these conditions may include tortoises migrating to other locations with more suitable conditions or in some cases local extinction depending on the degree of habitat degradation. Managing mixed pine hardwood forest with prescribed fire on a 3 - 5 year rotation and promoting forest openings through selective thinning could improve habitat conditions for resident tortoises and migrants as well as those that are being relocated from more ruderal habitat areas through tortoise conservation initiatives (Bailey et al. 2006, Ashton et al. 2008).

Burrows were not detected in stands of densely planted loblolly pine on private lands likely due to conditions that were uninhabitable for gopher tortoise. These stands provided very little in the way of burrow habitat and foraging conditions for tortoises due to nearly complete canopy closure and a dense coverage of woody plants > 0.3 m - ≤ 1 m in height. Although tortoises were not currently present on these sites, intensive vegetation management, including herbicidal application and prescribed fire, should be considered to restore them to more suitable conditions for tortoises. However, restoration efforts often require a long term commitment as it may take repeated prescribed burns over multiple dormant and growing seasons before the habitat returns to conditions more favorable to gopher tortoises (Yager et al. 2007).

Table 3.1 Percent coverage of herbaceous and woody plants in 3 height categories along line transects originating at active burrows of gopher tortoise (Gopherus polyphemus) in habitat types of south Mississippi in summer 2010

Habitat Variable	Forest Stand Type (Age Class): Regeneration Areas (< 5 yrs)	Early Successional Habitat	Mixed Pine Hardwood Forest (> 15 yrs)	Unmanaged Mixed Forest in Sandhills (> 15 yrs)	Planted Longleaf Pine (> 5 – ≤ 15 yrs)	Planted Longleaf Pine (> 15 yrs)	Natural Longleaf Pine (> 15 yrs)
	Burrow (n = 3)	Burrow (n = 4)	Burrow (n = 1)	Burrow (n = 1)	Burrow (n = 1)	Burrow (n = 1)	Burrow (n = 9)
	Percent Coverage	Percent Coverage	Percent Coverage	Percent Coverage	Percent Coverage	Percent Coverage	Percent Coverage
	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)
	Range	Range	Range	Range	Range	Range	Range
Understory (≤ 0.3 m in height)							
Total Herbaceous Plants	93.94 (10.59)	119.11 (5.55)	69.20 (34.45)	70.70 (23.35)	125.62 (9.37)	103.05 (8.27)	88.23 (5.13)
	29.5 – 144.70	75.8 – 168.9	16.7 – 134.1	24.2 – 97.7	103.8 – 157.6	73.5 – 130.3	1.5 – 197.7
Native Herbaceous Plants	82.91 (11.21)	96.46 (7.80)	68.97 (34.50)	70.47 (23.58)	96.96 (21.42)	99.12 (7.80)	76.40 (4.60)
	9.1 – 134.8	38.6 – 168.9	16.7 – 134.1	23.5 – 97.7	14.4 – 131.1	69.7 – 123.5	0.8 – 181.1
Non-native Herbaceous Plants	2.35 (2.35)	20.03 (8.22)	----	----	17.42 (17.42)	----	5.93 (1.88)
	0.0 – 25.8	0.0 – 113.6	----	----	0.0 – 87.1	----	0.0 – 99.2
Unidentified Herbaceous Plants	8.67 (3.04)	2.60 (1.09)	0.27 (0.27)	0.27 (0.27)	11.22 (6.01)	3.90 (1.29)	6.20 (1.28)
	0.0 – 28.8	0.0 – 17.4	0.0 – 0.8	0.0 – 0.8	0.0 – 28.0	0.0 – 8.3	0.0 – 88.6
Total Legumes	0.21 (0.15)	4.13 (2.00)	8.33 (3.28)	0.5 (0.5)	3.04 (1.20)	4.80 (2.36)	4.45 (0.76)
	0.0 – 1.5	0.0 – 36.4	2.3 – 13.6	0.0 – 1.5	0.8 – 7.6	0.0 – 13.6	0.0 – 46.2
Native Legumes	0.21 (0.15)	4.04 (2.00)	8.33 (3.28)	0.5 (0.5)	3.04 (1.20)	3.53(1.89)	3.55 (0.67)
	0.0 – 1.5	0.0 – 36.4	2.3 – 13.6	0.0 – 1.5	0.8 – 7.6	0.0 – 9.8	0.0 – 44.7
Non-native Legumes	----	----	----	----	----	----	0.46 (0.35)
	----	----	----	----	----	----	0.0 – 34.8
Unidentified Legumes	----	0.09 (0.6)	----	----	----	1.27 (0.74)	0.41 (0.12)
	----	0.0 – 0.8	----	----	----	0.0 – 4.5	0.0 – 8.3
	9.1 – 131.8	55.3 – 124.2	13.6 – 103.8	20.5 – 91.7	76.5 – 115.2	68.9 – 124.2	0.0 – 187.1

Table 3.1 (Continued)

Native Grasses	75.20 (10.61)	73.92 (7.88)	49.50 (27.62)	66.17 (23.27)	68.48 (18.69)	88.38 (8.37)	59.69 (4.14)
	9.1 – 123.5	11.4 – 124.2	13.6 – 103.8	19.7 – 91.7	3.0 – 115.2	67.4 – 117.4	0.0 – 149.2
Non-native Grasses	2.35 (2.35)	15.78 (6.47)	----	----	17.42 (17.42)	----	5.42 (1.76)
	0.0 – 25.8	0.0 – 92.4	----	----	0.0 – 87.1	----	0.0 – 95.5
Unidentified Grasses	5.30 (2.65)	1.47 (0.66)	0.27 (0.27)	0.27 (0.27)	4.54 (3.66)	2.27 (0.96)	3.37 (1.02)
	0.0 – 28.8	0.0 – 9.8	0.0 – 0.8	0.0 – 0.8	0.0 – 18.9	0.0 – 6.8	0.0 – 88.6
Total Grass-like	4.68 (1.84)	1.30 (0.83)	----	0.27 (0.27)	----	0.52 (0.25)	1.41 (0.30)
	0.0 – 20.5	0.0 – 13.5	----	0.0 – 0.8	----	0.0 – 1.5	0.0 – 17.4
Native Grass-like	2.82 (0.99)	0.55 (0.42)	----	0.27 (0.27)	----	0.52 (0.25)	1.26 (0.30)
	0.0 – 9.1	0.0 – 7.6	----	0.0 – 0.8	----	0.0 – 1.5	0.0 – 17.4
Unidentified Grass-like	1.86 (1.86)	0.76 (0.76)	----	----	----	----	0.15 (0.05)
	0.0 – 20.5	0.0 – 13.6	----	----	----	----	0.0 – 3.0
Total Forb	6.20 (2.05)	19.46 (4.56)	11.13 (5.17)	3.53 (0.27)	32.10 (10.32)	7.08 (3.76)	11.10 (1.50)
	0.0 – 17.4	0.0 – 62.1	0.8 – 16.7	3.0 – 3.8	13.6 – 71.2	2.3 – 25.8	0.0 – 87.9
Native Forb	4.68 (1.70)	17.97 (4.38)	11.13 (5.17)	3.53 (0.27)	25.44 (9.45)	6.70 (3.38)	9.19 (1.37)
	0.0 – 14.4	0.0 – 62.1	0.8 – 16.7	3.0 – 3.8	9.8 – 62.1	2.3 – 23.5	0.0 – 86.4
Non-native Forb	----	1.18 (1.18)	----	----	----	----	0.02 (0.01)
	----	0.0 – 21.2	----	----	----	----	0.0 – 1.5
Unidentified Forb	1.51 (0.76)	0.30 (0.15)	----	----	6.68 (4.54)	0.38 (0.38)	1.89 (0.45)
	0.0 – 7.6	0.0 – 2.3	----	----	0.0 – 23.5	0.0 – 2.3	0.0 – 29.5
Total Woody Plants	22.66 (8.78)	18.57 (5.35)	55.33 (21.30)	14.43 (8.33)	17.60 (3.84)	8.33 (1.84)	23.44 (2.71)
	0.0 – 92.4	0.0 – 87.1	16.7 – 90.2	6.1 – 31.1	10.6 – 31.1	2.3 – 13.6	0.0 – 109.8
Native Woody Plants	22.66 (8.78)	17.98 (5.16)	55.07 (21.08)	14.43 (8.33)	17.44 (3.91)	8.33 (1.84)	21.79 (2.53)
	0.0 – 92.4	0.0 – 87.1	16.7 – 89.4	6.1 – 31.1	9.8 – 31.1	2.3 – 13.6	0.0 – 106.1
Non-native Woody Plants	----	----	----	----	0.16 (0.16)	----	0.10 (0.10)

Table 3.1 (Continued)

	----	----	----	----	0.0 – 0.8	----	0.0 – 9.8
Unidentified Woody	----	0.59 (0.44)	0.27 (0.27)	----	----	----	1.55 (0.51)
	----	0.0 – 7.6	0.0 – 0.8	----	----	----	0.0 – 33.3
Total Vine	12.87 (3.90)	13.14 (4.69)	44.67 (19.89)	11.60 (9.44)	9.68 (0.98)	2.53 (1.15)	9.08 (1.32)
	0.0 – 36.4	0.0 – 80.3	10.6 – 79.5	0.0 – 30.3	6.8 – 12.1	0.0 – 6.8	0.0 – 59.1
Native Vine	12.87 (3.90)	13.14 (4.69)	44.43 (19.69)	11.60 (9.44)	9.54 (0.98)	2.53 (1.15)	8.81 (1.29)
	0.0 – 36.4	0.0 – 80.3	10.6 – 78.8	0.0 – 30.3	6.8 – 12.1	0.0 – 6.8	0.0 –59.1
Non-native Vine	----	----	----	----	0.16 (0.16)	----	0.10 (0.10)
	----	----	----	----	0.0 – 0.8	----	0.0 – 9.8
Unidentified Vine	----	----	0.27 (0.27)	----	----	----	0.17 (0.09)
	----	----	0.0 – 0.8	----	----	----	0.0 – 7.6
Total Shrub	8.13 (4.76)	3.66 (1.55)	5.57 (0.53)	2.80 (1.66)	6.98 (3.73)	1.78 (0.94)	10.87 (1.75)
	0.0 – 50.0	0.0 – 23.5	4.5 – 6.1	0.8 – 6.1	0.8 – 21.2	0.0 – 6.1	0.0 – 97.0
Native Shrub	8.13 (4.76)	3.66 (1.55)	5.57 (0.53)	2.80 (1.66)	6.98 (3.73)	1.78 (0.94)	9.65 (1.58)
	0.0 – 50.0	0.0 – 23.5	4.5 – 6.1	0.8 – 6.1	0.8 – 21.2	0.0 – 6.1	0.0 – 93.2
Unidentified Shrub	----	----	----	----	----	----	1.22 (0.49)
	----	----	----	----	----	----	0.0 – 33.3
Total Tree	1.66 (0.87)	1.34 (0.51)	5.07 (2.68)	----	0.92 (0.55)	4.03 (1.44)	3.34 (0.52)
	0.0 – 9.1	0.0 – 6.1	0.0 – 9.1	----	0.0 – 3.0	0.0 – 9.8	0.0 – 34.8
Native Tree	1.66 (0.87)	1.18 (0.47)	5.07 (2.68)	----	0.92 (0.55)	4.03 (1.44)	3.34 (0.52)
	0.0 – 9.1	0.0 – 6.1	0.0 – 9.1	----	0.0 – 3.0	0.0 – 9.8	0.0 – 34.8
Unidentified Tree	----	0.17 (0.17)	----	----	----	----	----
	----	0.0 – 3.0	----	----	----	----	----
Understory (> 0.3 m – ≤ 1 m in height)							
Total Herbaceous Plants	32.24 (10.11)	29.21 (9.94)	2.80 (1.32)	2.03 (0.91)	4.70 (2.04)	29.42 (6.35)	15.18 (2.39)

Table 3.1 (Continued)

	1.5 – 107.6	0.0 – 133.3	0.8 – 5.3	0.8 – 3.8	0.0 – 9.8	9.1 – 51.5	0.0 – 109.1
Native Herbaceous Plants	31.00 (9.90)	26.39 (9.19)	2.80 (1.32)	2.03 (0.91)	4.70 (2.04)	24.37 (4.01)	12.10 (2.19)
	1.5 – 107.6	0.0 – 127.3	0.8 – 5.3	0.8 – 3.8	0.0 – 9.8	9.1 – 36.4	0.0 – 104.5
Non-native Herbaceous Plants	0.07 (0.07)	0.38 (0.38)	----	----	----	----	1.14 (0.53)
	0.0 – 0.8	0.0 – 6.8	----	----	----	----	0.0 – 31.8
Unidentified Herbaceous Plants	1.17 (0.61)	2.45 (1.33)	----	----	----	5.05 (3.62)	1.94 (0.46)
	0.0 – 6.8	0.0 – 23.5	----	----	----	0.0 – 22.7	0.0 – 32.6
Total Legumes	2.00 (1.10)	14.44 (5.88)	0.27 (0.27)	0.27 (0.27)	0.16 (0.16)	6.05 (3.39)	4.71 (1.28)
	0.0 – 12.1	0.0 – 74.2	0.0 – 0.8	0.0 – 0.8	0.0 – 0.8	0.8 – 22.7	0.0 – 87.9
Native Legumes	1.32 (0.56)	13.39 (5.32)	0.27 (0.27)	0.27 (0.27)	0.16 (0.16)	3.28 (1.42)	3.55 (1.17)
	0.0 – 5.3	0.0 – 55.3	0.0 – 0.8	0.0 – 0.8	0.0 – 0.8	0.8 – 9.8	0.0 – 87.9
Non-native Legumes	----	----	----	----	----	----	1.05 (0.49)
	----	----	----	----	----	----	0.0 – 28.0
Unidentified Legumes	0.69 (0.62)	1.05 (1.05)	----	----	----	2.78 (2.12)	0.11 (0.05)
	0.0 – 6.8	0.0 – 18.9	----	----	----	0.0 – 12.9	0.0 – 3.0
Total Grasses	----	0.13 (0.13)	----	----	----	----	0.90 (0.45)
	----	0.0 – 2.3	----	----	----	----	0.0 – 39.4
Native Grasses	----	0.13 (0.13)	----	----	----	----	0.43 (0.23)
	----	0.0 – 2.3	----	----	----	----	0.0 – 15.9
Non-native Grasses	----	----	----	----	----	----	0.08 (0.07)
	----	----	----	----	----	----	0.0 – 6.8
Unidentified Grasses	----	----	----	----	----	----	0.40 (0.33)
	----	----	----	----	----	----	0.0 – 32.6
Total Forb	30.24 (9.58)	14.41 (4.84)	2.53 (1.53)	1.77 (1.11)	4.56 (1.96)	23.37 (4.56)	9.56 (1.63)
	1.5 – 106.8	0.0 – 81.1	0.0 – 5.3	0.0 – 3.8	0.0 – 9.1	7.6 – 37.1	0.0 – 78.0

Table 3.1 (Continued)

Native Forb	29.69 (9.64)	12.88 (4.48)	2.53 (1.53)	1.77 (1.11)	4.56 (1.96)	21.08 (4.23)	8.12 (1.50)
	1.5 – 106.8	0.0 – 75.0	0.0 – 5.3	0.0 – 3.8	0.0 – 9.1	7.6 – 35.6	0.0 – 78.0
Non-native Forb	0.07 (0.07)	0.38 (0.38)	----	----	----	----	0.02 (0.01)
	0.0 – 0.8	0.0 – 6.8	----	----	----	----	0.0 – 1.5
Unidentified Forb	0.49 (0.24)	1.14 (0.44)	----	----	----	2.27 (1.53)	1.43 (0.31)
	0.0 – 2.3	0.0 – 6.1	----	----	----	0.0 – 9.8	0.0 – 18.2
Total Woody Plants	43.10 (8.08)	21.81 (5.56)	81.07 (48.88)	19.97 (9.18)	16.22 (8.45)	28.78 (2.33)	27.63 (2.47)
	5.3 – 87.9	0.0 – 69.7	30.3 – 178.8	3.8 – 35.6	0.0 – 47.0	21.2 – 34.8	0.0 – 134.8
Native Woody Plants	40.90 (7.60)	21.05 (5.33)	80.57 (48.38)	17.70 (7.35)	16.22 (8.45)	27.78 (2.29)	26.97 (2.43)
	5.3 – 87.9	0.0 – 69.7	30.3 – 177.3	3.8 – 28.8	0.0 – 47.0	21.2 – 34.8	0.0 – 134.8
Non-native Woody Plants	1.24 (1.24)	0.76 (0.55)	0.50 (0.50)	----	----	1.02 (1.02)	0.19 (0.10)
	0.0 – 13.6	0.0 – 9.8	0.0 – 1.5	----	----	0.0 – 6.1	0.0 – 8.3
Unidentified Woody Plants	0.96 (0.96)	----	----	2.27 (2.27)	----	----	0.47 (0.19)
	0.0 – 10.6	----	----	0.0 – 6.8	----	----	0.0 – 15.9
Total Vine	23.83 (5.38)	8.46 (2.96)	29.80 (21.88)	----	2.56 (1.84)	3.30 (1.28)	2.76 (0.55)
	1.5 – 48.5	0.0 – 35.6	6.1 – 73.5	----	0.0 – 9.8	0.0 – 7.6	0.0 – 38.6
Native Vine	22.58 (5.14)	8.46 (2.96)	29.80 (21.88)	----	2.56 (1.84)	3.30 (1.28)	2.67 (0.51)
	1.5 – 48.5	0.0 – 35.6	6.1 – 73.5	----	0.0 – 9.8	0.0 – 7.6	0.0 – 31.1
Non-native Vine	----	----	----	----	----	----	0.08 (0.08)
	----	----	----	----	----	----	0.0 – 7.6
Unidentified Vine	1.24 (1.24)	----	----	----	----	----	0.01 (0.01)
	0.0 – 13.6	----	----	----	----	----	0.0 – 0.8
Total Shrub	11.78 (2.82)	9.26 (3.15)	32.33 (17.46)	16.43 (6.89)	8.18 (5.17)	15.52 (2.63)	15.60 (1.63)
	0.0 – 25.0	0.0 – 47.0	9.8 – 66.7	3.0 – 25.8	0.0 – 28.0	9.8 – 26.5	0.0 – 89.4
Native Shrub	10.82 (2.94)	8.50 (2.95)	32.33 (17.46)	14.13 (5.59)	8.18 (5.17)	14.52 (3.05)	15.43 (1.64)

Table 3.1 (Continued)

	0.0 – 25.0	0.0 – 47.0	9.8 – 66.7	3.0 – 20.5	0.0 – 28.0	6.1 – 26.5	0.0 – 89.4
Non-native Shrub	----	0.76 (0.55)	----	----	----	1.02 (1.02)	0.11 (0.06)
	----	0.0 – 9.8	----	----	----	0.0 – 6.1	0.0 – 3.8
Unidentified Shrub	0.96 (0.96)	----	----	2.27 (2.27)	----	----	0..07 (0.05)
	0.0 – 10.6	----	----	0.0 – 6.8	----	----	0.0 – 5.3
Total Tree	7.51 (2.87)	4.09 (1.04)	18.93 (11.15)	3.53 (3.14)	5.46 (2.28)	9.98 (3.02)	9.28 (1.24)
	0.0 – 32.6	0.0 – 15.2	0.0 – 38.6	0.0 – 9.8	0.0 – 10.6	0.0 – 17.4	0.0 – 68.2
Native Tree	6.83 (3.00)	4.09 (1.04)	18.43 (10.71)	3.53 (3.14)	5.46 (2.28)	9.98 (3.02)	9.14 (1.23)
	0.0 – 32.6	0.0 – 15.2	0.0 – 37.1	0.0 – 9.8	0.0 – 10.6	0.0 – 17.4	0.0 – 68.2
Non-native Tree	0.68 (0.47)	----	0.50 (0.50)	----	----	----	----
	0.0 – 4.5	----	0.0 – 1.5	----	----	----	----
Unidentified Tree	----	----	----	----	----	----	0.14 (0.10)
	----	----	----	----	----	----	0.0 – 9.1
Midstory and Overstory (> 1 m in height)							
Total Herbaceous Plants	0.14 (0.14)	0.08 (0.08)	----	----	----	----	0.04 (0.03)
	0.0 – 1.5	0.0 – 1.5	----	----	----	----	0.0 – 2.3
Native Herbaceous Plants	0.14 (0.14)	0.08 (0.08)	----	----	----	----	0.02 (0.01)
	0.0 – 1.5	0.0 – 1.5	----	----	----	----	0.0 – 1.5
Unidentified Herbaceous Plants	----	----	----	----	----	----	0.02 (0.02)
	----	----	----	----	----	----	0.0 – 2.3
Total Forb	0.14 (0.14)	0.08 (0.08)	----	----	----	----	0.02 (0.01)
	0.0 – 1.5	0.0 – 1.5	----	----	----	----	0.0 – 1.5
Native Forb	0.14 (0.14)	0.08 (0.08)	----	----	----	----	0.02 (0.01)
	0.0 – 1.5	0.0 – 1.5	----	----	----	----	0.0 – 1.5
Total Woody Plants	14.33 (5.80)	25.67 (7.34)	89.90 (11.52)	53.03 (22.42)	30.00 (9.52)	65.03 (8.94)	52.45 (4.64)

Table 3.1 (Continued)

	0.0 – 56.1	0.0 – 103.0	77.3 – 112.9	27.3 – 97.7	5.3 – 55.3	30.3 – 95.5	0.0 – 246.2
Native Woody Plants	14.33 (5.80)	25.29 (7.23)	89.90 (11.52)	53.03 (22.42)	29.10 (8.95)	63.77 (8.83)	52.02 (4.59)
	0.0 – 56.1	0.0 – 103.0	77.3 – 112.9	27.3 – 97.7	5.3 – 50.8	30.3 – 95.5	0.0 – 246.2
Non-native Woody Plants	----	0.38 (0.38)	----	----	0.90 (0.90)	1.27 (1.27)	0.06 (0.06)
	----	0.0 – 6.8	----	----	0.0 – 4.5	0.0 – 7.6	0.0 – 6.1
Unidentified Woody Plants	----	----	----	----	----	----	0.38 (0.25)
	----	----	----	----	----	----	0.0 – 22.7
Total Vine	1.30 (0.79)	----	9.10 (8.36)	----	0.46 (0.30)	----	1.28 (0.42)
	0.0 – 8.3	----	0.0 – 25.8	----	0.0 – 1.5	----	0.0 – 27.3
Native Vine	1.30 (0.79)	----	9.10 (8.36)	----	0.46 (0.30)	----	1.28 (0.42)
	0.0 – 8.3	----	0.0 – 25.8	----	0.0 – 1.5	----	0.0 – 27.3
Total Shrub	3.57 (1.57)	1.72 (0.83)	19.70 (11.37)	8.60 (7.48)	7.12 (2.27)	1.27 (1.27)	7.53 (2.01)
	0.0 – 13.6	0.0 – 11.4	0.0 – 39.4	0.0 – 23.5	0.0 – 12.9	0.0 – 7.6	0.0 – 115.2
Native Shrub	3.57 (1.57)	1.34 (0.78)	19.70 (11.37)	8.60 (7.48)	7.12 (2.27)	----	7.26 (1.93)
	0.0 – 13.6	0.0 – 11.4	0.0 – 39.4	0.0 – 23.5	0.0 – 12.9	----	0.0 – 109.1
Non-native Shrub	----	0.38 (0.38)	----	----	----	1.27 (1.27)	0.06 (0.06)
	----	0.0 – 6.8	----	----	----	0.0 – 7.6	0.0 – 6.1
Unidentified Shrub	----	----	----	----	----	----	0.21 (0.16)
	----	----	----	----	----	----	0.0 – 15.2
Total Tree	9.44 (4.42)	23.96 (6.71)	61.10 (8.66)	44.43 (14.94)	22.44 (7.87)	63.77 (8.83)	43.57 (3.42)
	0.0 – 37.1	0.0 – 91.7	47.7 – 77.3	27.3 – 74.2	5.3 – 42.4	30.3 – 95.5	0.0 – 183.3
Native Tree	9.44 (4.42)	23.96 (6.71)	61.10 (8.66)	44.43 (14.94)	21.54 (7.33)	63.77 (8.83)	43.48 (3.43)
	0.0 – 37.1	0.0 – 91.7	47.7 – 77.3	27.3 – 74.2	5.3 – 40.2	30.3 – 95.5	0.0 – 183.3
Non-native Tree	----	----	----	----	0.90 (0.90)	----	----
	----	----	----	----	0.0 – 4.5	----	----

Table 3.1 (Continued)

Unidentified Tree	----	----	----	----	----	----	0.09 (0.09)
	----	----	----	----	----	----	0.0 – 9.1
Percent Closed Canopy	0.00 (0.00)	22.22 (7.26)	83.33 (16.67)	33.33 (16.67)	50.0 (22.36)	58.33 (8.33)	33.17 (3.25)
	----	0.0 – 100.0	50.0 – 100.0	0.0 – 50.0	0.0 – 100.0	50.0 – 100.0	0.0 – 100.0
Woody Stem Count (stems/10 m^2)	117.50 (29.07)	67.18 (15.99)	151.0 (55.72)	59.50 (8.50)	96.80 (31.47)	70.83 (8.77)	115.85 (10.06)
	13.0 – 232.0	0.0 – 193.0	54.0 – 247.0	51.0 – 68.0	31.0 – 203.0	41.0 – 89.0	0.0 – 374.0
Basal Area (m^2/ha)							
Pine	0.00 (0.00)	0.68 (0.38)	9.95 (2.76)	2.30 (2.30)	0.92 (0.56)	9.95 (2.76)	4.33 (0.45)
Hardwood	0.00 (0.00)	0.27 (0.27)	1.53 (1.53)	0.00 (0.00)	0.92 (0.56)	0.00 (0.00)	0.72 (0.17)
Total	0.00 (0.00)	0.95 (0.59)	11.48 (1.33)	2.30 (2.30)	1.84 (0.86)	9.95 (2.76)	5.02(0.45)

Table 3.2 Percent coverage of herbaceous and woody plants in 3 height categories along line transects originating at ample points unoccupied by gopher tortoise (*Gopherus polyphemus*) in habitat types of south Mississippi in summer 2010

Habitat Variable	Forest Stand Type (Age Class)						
	Regeneration Areas (< 5 yrs)	Dense Planted Pine Forest (> 15 yrs)	Mixed Pine Hardwood Forest (> 15 yrs)	Unmanaged Mixed Forest in Sandhills (> 15 yrs)	Planted Longleaf Pine (> 5 – ≤ 15 yrs)	Planted Longleaf Pine (> 15 yrs)	Natural Longleaf Pine (> 15 yrs)
	Non-burrow (n = 3)	Non-burrow (n = 2)	Non-burrow (n = 2)	Non-burrow (n = 1)	Non-burrow (n = 1)	Non-burrow (n = 2)	Non-burrow (n = 7)
	Percent Coverage	Percent Coverage	Percent Coverage	Percent Coverage	Percent Coverage	Percent Coverage	Percent Coverage
	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)
	Range	Range	Range	Range	Range	Range	Range
Understory (≤0.3 m in height)							
Total Herbaceous Plants	114.70 (5.36)	13.88 (3.10)	20.50 (4.28)	30.16 (9.55)	128.34 (7.25)	103.03 (8.74)	81.28 (7.16)
	25.8 – 213.6	0.0 – 52.3	0.0 – 71.2	0.0 – 109.1	104.5 – 171.2	22.0 – 170.5	0.0 – 222.7
Native Herbaceous Plants	104.38 (5.41)	4.24 (1.00)	18.42 (4.05)	29.50 (9.40)	100.83 (17.96)	95.28 (9.11)	78.63 (7.06)
	25.8 – 195.5	0.0 – 18.9	0.0 – 71.2	0.0 – 107.6	1.5 – 161.4	4.5 – 169.7	0.0 – 215.9
Non-native Herbaceous Plants	2.22 (0.90)	----	0.86 (0.57)	0.05 (0.05)	26.43 (13.24)	0.48 (0.48)	1.09 (0.52)
	0.0 – 32.6	----	0.0 – 13.6	0.0 – 0.8	0.0 – 100.0	0.0 – 10.6	0.0 – 37.9
Unidentified Herbaceous Plants	7.98 (2.02)	9.64 (3.15)	1.23 (0.41)	0.61 (0.30)	1.07 (0.66)	7.23 (2.05)	1.72 (0.51)
	0.0 – 70.5	0.0 – 52.3	0.0 – 9.8	0.0 – 3.8	0.0 – 6.8	0.0 – 40.2	0.0 – 34.8
Total Legumes	1.02 (0.36)	0.03 (0.03)	1.33 (0.45)	0.21 (0.12)	0.85 (0.40)	1.32 (0.54)	1.97 (0.33)
	0.0 – 12.9	0.0 – 0.8	0.0 – 10.6	0.0 – 1.5	0.0 – 3.8	0.0 – 12.1	0.0 – 16.7
Native Legumes	0.88 (0.34)	0.03 (0.03)	1.18 (0.37)	0.21 (0.12)	0.85 (0.40)	1.04 (0.55)	1.87 (0.32)
	0.0 – 12.9	0.0 – 0.8	0.0 – 6.8	0.0 – 1.5	0.0 – 3.8	0.0 – 12.1	0.0 – 16.7
Unidentified Legumes	0.14 (0.14)	----	0.16 (0.13)	----	----	0.28 (0.13)	0.10 (0.03)
	0.0 – 6.1	----	0.0 – 3.8	----	----	0.0 – 2.3	0.0 – 1.5
Total Grasses	82.62 (5.73)	0.55 (0.33)	16.15 (3.79)	24.24 (7.79)	118.10 (5.81)	98.42 (8.95)	66.91 (6.25)

Table 3.2 (Continued)

	6.1 – 146.2	0.0 – 7.6	0.0 – 71.2	0.0 – 88.6	100.0 – 161.4	16.7 – 168.2	0.0 – 188.6
Native Grasses	74.15 (5.84)	0.55 (0.33)	14.45 (3.63)	23.93 (7.76)	91.51 (16.56)	91.32 (9.23)	65.25 (6.23)
	3.0 – 143.9	0 – 7.6	0.0 – 71.2	0.0 – 88.6	0.0 – 151.5	0.8 – 168.2	0.0 – 188.6
Non-native Grasses	2.16 (0.90)	----	0.86 (0.57)	0.05 (0.05)	26.43 (13.24)	----	0.90 (0.49)
	0.0 – 32.6	----	0.0 – 13.6	0.00 – 0.80	0.0 – 100.0	----	0.0 – 37.9
Unidentified Grasses	6.32 (1.97)	----	0.84 (0.38)	0.25 (0.18)	0.15 (0.15)	6.60 (1.92)	0.60 (0.28)
	0.0 – 70.5	----	0.0 – 9.1	0.0 – 2.3	0.0 – 1.5	0.0 – 34.8	0.0 – 18.2
Total Grass-like	0.37 (0.23)	0.58 (0.31)	0.84 (0.63)	2.37 (1.43)	1.14 (0.63)	0.52 (0.21)	1.52 (0.82)
	0.0 – 9.8	0.0 – 6.1	0.0 – 17.4	0.0 – 18.9	0.0 – 6.1	0.0 – 3.8	0.0 – 68.9
Native Grass-like	0.37 (0.23)	0.54 (0.31)	0.84 (0.63)	2.37 (1.43)	1.14 (0.63)	0.52 (0.21)	1.50 (0.82)
	0.0 – 9.8	0.0 – 6.1	0.0 – 17.4	0.0 – 18.9	0.0 – 6.1	0.0 – 3.8	0.0 – 68.9
Unidentified Grass-like	----	0.03 (0.03)	----	----	----	----	0.02 (0.02)
	----	0.0 – 0.8	----	----	----	----	0.0 – 1.5
Total Forb	30.49 (6.31)	12.74 (3.01)	2.14 (0.56)	2.79 (1.31)	8.24 (2.58)	2.80 (0.45)	9.86 (1.36)
	0.0 – 167.4	0.0 – 52.3	0.0 – 12.9	0.0 – 18.9	1.5 – 26.5	0.0 – 8.3	0.0 – 72.7
Native Forb	29.09 (6.23)	3.13 (0.94)	1.80 (0.57)	2.54 (1.20)	7.34 (2.62)	2.46 (0.36)	8.83 (1.18)
	0.0 – 167.4	0.0 – 18.9	0.0 – 12.9	0.0 – 17.4	0.0 – 25.8	0.0 – 6.1	0.0 – 51.5
Non-native Forb	0.07 (0.07)	----	----	----	----	----	0.03 (0.02)
	0.0 – 3.0	----	----	----	----	----	0.0 – 1.5
Unidentified Forb	1.53 (0.64)	9.61 (3.15)	0.35 (0.14)	0.25 (0.14)	0.92 (0.66)	0.35 (0.25)	1.01 (0.43)
	0.0 – 18.9	0.0 – 52.3	0.0 – 2.3	0.0 – 1.5	0.0 – 6.8	0.0 – 5.3	0.0 – 34.8
Total Woody Plants	27.71 (4.59)	49.25 (11.98)	50.00 (7.23)	14.69 (3.12)	13.79 (4.45)	9.17 (2.46)	33.46 (3.81)
	0.0 – 139.4	0.0 – 208.3	7.6 – 152.3	2.3 – 40.9	2.3 – 51.5	0.0 – 43.9	0.0 – 162.1
Native Woody Plants	27.49 (4.59)	42.34 (10.48)	45.03 (6.55)	13.97 (3.24)	13.71 (4.46)	9.13 (2.44)	32.85 (3.73)
	0.0 – 139.4	0.0 – 199.2	7.6 – 147.0	1.5 – 40.9	2.3 – 51.5	0.0 – 43.9	0.0 – 156.1
Non-native Woody Plants	0.07 (0.04)	6.91 (3.71)	4.70 (3.26)	----	----	----	0.01 (0.01)

Table 3.2 (Continued)

	0.0 – 1.5	0.0 – 93.2	0.0 – 90.2	----	----	----	0.0 – 0.8
Unidentified Woody	0.15 (0.11)	----	0.26 (0.10)	0.71 (0.51)	0.08 (0.08)	0.04 (0.04)	0.37 (0.14)
	0.0 – 4.5	----	0.0 – 1.5	0.0 – 7.6	0.0 – 0.8	0.0 – 0.8	0.0 – 6.8
Total Vine	11.88 (2.18)	47.0 (11.70)	30.98 (7.90)	8.04 (1.82)	11.51 (4.12)	6.31 (2.25)	17.77 (2.58)
	0.0 – 78.0	0.0 – 208.3	0.0 – 137.1	0.8 – 20.5	1.5 – 46.2	0.0 – 40.9	0.0 – 104.5
Native Vine	11.70 (2.18)	40.70 (10.26)	26.41 (6.95)	7.34 (1.87)	11.43 (4.12)	6.31 (2.25)	18.66 (2.67)
	0.0 – 78.0	0.0 – 199.2	0.0 – 131.8	0.8 – 20.5	1.5 – 46.2	0.0 – 40.9	0.0 – 104.5
Non-native Vine	0.07 (0.04)	6.30 (3.65)	4.55 (3.26)	----	----	----	0.01 (0.01)
	0.0 – 1.5	0.0 – 91.7	0.0 – 90.2	----	----	----	0.0 – 0.8
Unidentified Vine	0.12 (0.10)	----	0.03 (0.03)	0.71 (0.51)	0.08 (0.08)	----	0.01 (0.01)
	0.0 – 4.5	----	0.0 – 0.8	0.0 – 7.6	0.0 – 0.8	----	0.0 – 0.8
Total Shrub	12.94 (3.45)	1.70 (0.48)	12.77 (2.63)	5.80 (1.66)	2.29 (0.93)	1.48 (0.56)	12.28 (1.91)
	0.0 – 82.6	0.0 – 9.1	0.0 – 54.5	0.0 – 20.5	0.0 – 7.6	0.0 – 10.6	0.0 – 99.2
Native Shrub	12.94 (3.45)	1.09 (0.36)	12.61 (2.64)	5.80 (1.66)	2.29 (0.93)	1.48 (0.56)	11.94 (1.88)
	0.0 – 82.6	0.0 – 7.6	0.0 – 54.5	0.0 – 20.5	0.0 – 7.6	0.0 – 10.6	0.0 – 95.5
Non-native Shrub	----	0.61 (0.31)	0.16 (0.16)	----	----	----	----
	----	0.0 – 7.6	0.0 – 4.5	----	----	----	----
Unidentified Shrub	----	----	----	----	----	----	0.34 (0.13)
	----	----	----	----	----	----	0.0 – 6.8
Total Tree	2.87 (1.11)	0.44 (0.27)	6.01 (0.94)	0.87 (0.55)	----	1.39 (0.39)	3.39 (0.70)
	0.0 – 50.0	0.0 – 6.1	0.0 – 21.2	0.0 – 8.3	----	0.0 – 6.1	0.0 – 46.2
Native Tree	2.87 (1.11)	0.44 (0.27)	6.01 (0.94)	0.87 (0.55)	----	1.35 (0.39)	3.39 (0.70)
	0.0 – 50.0	0.0 – 6.1	0.0 – 21.2	0.0 – 8.3	----	0.0 – 6.1	0.0 – 46.2
Unidentified Tree	----	----	----	----	----	0.04 (0.04)	----
	----	----	----	----	----	0.0 – 0.8	----
Understory (> 0.3 m – ≤ 1 m in height)							

Table 3.2 (Continued)

Total Herbaceous Plants	36.26 (4.74)	7.68 (1.76)	0.68 (0.33)	2.69 (1.19)	27.87 (6.12)	20.90 (3.70)	11.48 (1.69)
	0.0 – 147.0	0.0 – 31.8	0.0 – 7.6	0.0 – 15.2	0.8 – 50.8	1.5 – 81.8	0.0 – 81.1
Native Herbaceous Plants	33.47 (4.46)	4.12 (1.29)	0.60 (0.33)	2.63 (1.17)	25.07 (5.52)	19.94 (3.72)	11.12 (1.67)
	0.0 – 144.7	0.0 – 30.3	0.0 – 7.6	0.0 – 15.2	0.8 – 46.2	1.5 – 81.8	0.0 – 81.1
Non-native Herbaceous Plants	0.59 (0.33)	----	----	----	0.30 (0.30)	----	----
	0.0 – 14.4	----	----	----	0.0 – 3.0	----	----
Unidentified Herbaceous Plants	2.21 (0.63)	2.48 (1.35)	0.05 (0.05)	0.05 (0.05)	2.49 (0.83)	0.97 (0.25)	0.36 (0.11)
	0.0 – 22.7	0.0 – 31.8	0.0 – 1.5	0.0 – 0.8	0.0 – 7.6	0.0 – 4.5	0.0 – 5.3
Total Legumes	1.58 (0.51)	----	0.29 (0.26)	0.05 (0.05)	0.16 (0.11)	1.45 (0.53)	1.91 (0.45)
	0.0 – 20.5	----	0.0 – 7.6	0.0 – 0.8	0.0 – 0.8	0.0 – 8.3	0.0 – 25.0
Native Legumes	1.35 (0.39)	----	0.29 (0.26)	0.05 (0.05)	0.16 (0.11)	1.31 (0.49)	1.90 (0.45)
	0.0 – 15.2	----	0.0 – 7.6	0.0 – 0.8	0.0 – 0.8	0.0 – 8.3	0.0 – 25.0
Unidentified Legumes	0.24 (0.13)	----	----	----	----	0.14 (0.08)	0.01 (0.01)
	0.0 – 5.3	----	----	----	----	0.0 – 1.5	0.0 – 0.8
Total Grasses	2.59 (1.30)	----	----	0.10 (0.10)	0.30 (0.30)	----	0.43 (0.19)
	0.0 – 47.7	----	----	0.0 – 1.5	0.0 – 3.0	----	0.0 – 10.6
Native Grasses	2.59 (1.30)	----	----	0.10 (0.10)	----	----	0.43 (0.19)
	0.0 – 47.7	----	----	0.0 – 1.5	----	----	0.0 – 10.6
Non-native Grasses	----	----	----	----	0.30 (0.30)	----	----
	----	----	----	----	0.0 – 3.0	----	----
Total Grass-like	----	----	----	0.05 (0.05)	----	----	0.01 (0.01)
	----	----	----	0.0 – 0.8	----	----	0.0 – 0.8
Native Grass-like	----	----	----	0.05 (0.05)	----	----	0.01 (0.01)
	----	----	----	0.0 – 0.8	----	----	0.0 – 0.8
Total Forb	32.09 (4.46)	6.60 (1.78)	0.37 (0.20)	2.48 (1.18)	27.43 (6.03)	19.36 (3.70)	9.18 (1.55)
	0.0 – 145.5	0.0 – 31.8	0.0 – 4.5	0.0 – 15.2	0.8 – 50.8	1.5 – 81.8	0.0 – 81.1

Table 3.2 (Continued)

Native Forb	29.53 (4.24)	4.12 (1.29)	0.31 (0.20)	2.43 (1.16)	24.92 (5.54)	18.54 (3.74)	8.78 (1.54)
	0.0 – 143.2	0.0 – 30.3	0.0 – 4.5	0.0 – 15.2	0.8 – 46.2	1.5 – 81.8	0.0 – 81.1
Non-native Forb	0.59 (0.33)	----	----	----	----	----	----
	0.0 – 14.4	----	----	----	----	----	----
Unidentified Forb	1.98 (0.62)	2.48 (1.35)	0.05 (0.05)	0.05 (0.05)	2.49 (0.83)	0.84 (0.24)	0.39 (0.12)
	0.0 – 22.7	0.0 – 31.8	0.0 – 1.5	0.0 – 0.8	0.0 – 7.6	0.0 – 4.5	0.0 – 5.3
Total Woody Plants	34.58 (3.55)	40.68 (10.06)	51.24 (7.29)	59.44 (17.94)	31.21 (8.17)	55.75 (7.47)	41.85 (3.74)
	0.0 – 90.9	0.0 – 206.8	6.1 – 139.4	0.0 – 271.2	0.0 – 68.9	9.8 – 110.6	0.0 – 148.5
Native Woody Plants	34.51 (3.56)	36.15 (9.58)	49.65 (6.87)	59.44 (17.94)	30.99 (8.08)	55.68 (7.45)	41.52 (3.75)
	0.0 – 90.9	0.0 – 197.7	6.1 – 139.4	0.0 – 271.2	0.0 – 68.9	9.8 – 110.6	0.0 – 148.5
Non-native Woody Plants	0.03 (0.03)	4.42 (1.78)	1.43 (1.21)	----	----	0.04 (0.04)	0.02 (0.01)
	0.0 – 1.5	0.0 – 38.6	0.0 – 34.8	----	----	0.0 – 0.8	0.0 – 0.8
Unidentified Woody Plants	0.03 (0.03)	0.21 (0.16)	0.22 (0.14)	----	0.23 (0.23)	0.04 (0.04)	0.30 (0.14)
	0.0 – 1.5	0.0 – 3.8	0.0 – 3.8	----	0.0 – 2.3	0.0 – 0.8	0.0 – 10.6
Total Vine	10.31 (2.38)	31.46 (9.00)	8.88 (2.63)	1.31 (0.65)	10.31 (5.60)	11.88 (2.61)	2.28 (0.48)
	0.0 – 65.2	0.0 – 193.2	0.0 – 53.0	0.0 – 8.3	0.0 – 59.1	0.0 – 40.9	0.0 – 28.0
Native Vine	10.31 (2.38)	28.81 (8.70)	7.68 (2.14)	1.31 (0.65)	10.23 (5.53)	11.88 (2.61)	2.27 (0.47)
	0.0 – 65.2	0.0 – 185.6	0.0 – 36.4	0.0 – 8.3	0.0 – 58.3	0.0 – 40.9	0.0 – 28.0
Non-native Vine	----	2.64 (1.09)	1.20 (1.20)	----	----	----	0.01 (0.01)
	----	0.0 – 21.2	0.0 – 34.8	----	----	----	0.0 – 0.8
Unidentified Vine	----	----	----	----	0.08 (0.08)	----	----
	----	----	----	----	0.0 – 0.8	----	----
Total Shrub	19.03 (3.10)	8.18 (2.13)	28.02 (4.22)	44.81 (9.87)	18.85 (6.93)	38.40 (6.62)	30.56 (2.89)
	0.0 – 79.5	0.0 – 31.1	0.0 – 85.6	0.0 – 122.7	0.0 – 59.8	2.3 – 97.0	0.0 – 113.6
Native Shrub	18.97 (3.11)	6.37 (1.86)	27.79 (4.21)	44.81 (9.87)	18.70 (6.97)	38.36 (6.60)	30.37 (2.89)
	0.0 – 79.5	0.0 – 31.1	0.0 – 85.6	0.0 – 122.7	0.0 – 59.8	2.3 – 97.0	0.0 – 113.6

Table 3.2 (Continued)

Non-native Shrub	0.03 (0.03)	1.67 (0.87)	0.23 (0.23)	----	----	0.04 (0.04)	0.01 (0.01)
	0.0 – 1.5	0.0 – 20.5	0.0 – 6.8	----	----	0.0 – 0.8	0.0 – 0.8
Unidentified Shrub	0.03 (0.03)	0.15 (0.15)	----	----	0.15 (0.15)	----	0.19 (0.13)
	0.0 – 1.5	0.0 – 3.8	----	----	0.0 – 1.5	----	0.0 – 10.6
Total Tree	5.24 (0.90)	1.15 (0.73)	16.92 (3.89)	13.34 (10.54)	2.04 (0.65)	5.47 (1.91)	8.99 (1.50)
	0.0 – 28.8	0.0 – 18.2	0.0 – 80.0	0.0 – 159.8	0.0 – 5.3	0.0 – 31.8	0.0 – 66.7
Native Tree	5.24 (0.90)	0.97 (0.73)	16.89 (3.88)	13.34 (10.54)	2.04 (0.65)	5.47 (1.91)	8.99 (1.50)
	0.0 – 28.8	0.0 – 18.2	0.0 – 80.0	0.0 – 159.8	0.0 – 5.3	0.0 – 31.8	0.0 – 66.7
Non-native Tree	----	0.12 (0.12)	----	----	----	----	----
	----	0.0 – 3.0	----	----	----	----	----
Unidentified Tree	----	0.06 (0.06)	----	----	----	----	----
	----	0.0 – 1.5	----	----	----	----	----
Midstory and Overstory (> 1 m in height)							
Total Herbaceous Plants	4.41 (3.47)	2.03 (1.14)	----	----	----	----	----
	0.0 – 155.3	0.0 – 21.2	----	----	----	----	----
Native Herbaceous Plants	2.22 (1.85)	2.03 (1.14)	----	----	----	----	----
	0.0 – 83.3	0.0 – 21.2	----	----	----	----	----
Non-native Herbaceous Plants	2.17 (1.65)	----	----	----	----	----	----
	0.0 – 71.2	----	----	----	----	----	----
Unidentified Herbaceous Plants	0.02 (0.02)	0.12 (0.12)	----	----	----	----	----
	0.0 – 0.80	0.0 – 3.0	----	----	----	----	----
Total Legumes	0.02 (0.02)	----	----	----	----	----	----
	0.0 – 0.8	----	----	----	----	----	----
Unidentified Legumes	0.02 (0.02)	----	----	----	----	----	----
	0.0 – 0.8	----	----	----	----	----	----
Total Forb	4.39 (3.45)	2.03 (1.14)	----	----	----	----	----

Table 3.2 (Continued)

	0.0 – 154.5	0.0 – 21.2	----	----	----	----	----
Native Forb	2.22 (1.85)	2.03 (1.14)	----	----	----	----	----
	0.0 – 83.3	0.0 – 21.2	----	----	----	----	----
Non-native Forb	2.17 (1.65)	----	----	----	----	----	----
	0.0 – 71.2	----	----	----	----	----	----
Total Woody Plants	16.84 (4.28)	145.18 (12.11)	197.06 (13.57)	147.23 (22.74)	31.66 (7.05)	68.63 (6.49)	83.31 (6.75)
	0.0 – 128.8	72.0 – 282.6	51.5 – 337.9	31.8 – 309.1	0.0 – 73.5	22.7 – 164.4	0.0 – 307.6
Native Woody Plants	16.37 (4.30)	127.57 (9.14)	193.42 (13.79)	147.23 (22.74)	31.66 (7.05)	68.63 (6.49)	83.31 (6.75)
	0.0 – 128.8	53.8 – 238.6	43.9 – 337.9	31.8 – 309.1	0.0 – 73.5	22.7 – 164.4	0.0 – 307.6
Non-native Woody Plants	0.47 (0.38)	17.61 (6.34)	2.43 (1.49)	----	----	----	----
	0.0 – 16.7	0.0 – 100.0	0.0 – 34.1	----	----	----	----
Unidentified Woody Plants	----	----	1.15 (0.71)	----	----	----	----
	----	----	0.0 – 16.7	----	----	----	----
Total Vine	1.60 (0.84)	13.28 (3.28)	5.80 (1.90)	1.27 (0.78)	2.20 (1.70)	1.48 (0.95)	1.99 (1.08)
	0.0 – 33.3	0.0 – 48.5	0.0 – 34.8	0.0 – 9.1	0.0 – 16.7	0.0 – 20.5	0.0 – 89.4
Native Vine	1.60 (0.84)	11.86 (3.20)	4.70 (1.64)	1.27 (0.78)	2.20 (1.70)	1.48 (0.95)	1.99 (1.08)
	0.0 – 33.3	0.0 – 48.5	0.0 – 34.8	0.0 – 9.1	0.0 – 16.7	0.0 – 20.5	0.0 – 89.4
Non-native Vine	----	1.43 (0.94)	1.10 (0.94)	----	----	----	----
	----	0.0 – 22.7	0.0 – 27.3	----	----	----	----
Total Shrub	5.32 (1.76)	38.51 (9.66)	17.03 (5.09)	35.20 (8.31)	6.29 (4.26)	----	7.50 (1.87)
	0.0 – 48.5	0.0 – 165.9	0.0 – 85.6	0.0 – 83.3	0.0 – 36.4	----	0.0 – 75.8
Native Shrub	4.85 (1.74)	22.33 (5.98)	42.97 (6.99)	35.20 (8.31)	6.29 (4.26)	----	7.50 (1.87)
	0.0 – 48.5	0.0 – 100.8	0.0 – 132.6	0.0 – 83.3	0.0 – 36.4	----	0.0 – 75.8
Non-native Shrub	0.47 (0.38)	16.18 (5.88)	1.33 (1.18)	----	----	----	----
	0.0 – 16.7	0.0 – 100.0	0.0 – 34.1	----	----	----	----
Total Tree	9.92 (2.22)	93.39 (2.85)	145.79 (11.78)	110.75 (15.80)	23.18 (4.50)	67.15 (5.99)	73.87 (5.42)

Table 3.2 (Continued)

	0.0 – 67.4	53.0 – 122.7	12.1 – 240.9	9.1 – 219.7	0.0 – 40.9	22.0 – 143.9	0.0 – 210.6
Native Tree	9.92 (2.22)	93.39 (2.85)	145.79 (11.78)	110.75 (15.80)	23.18 (4.50)	67.15 (5.99)	73.87 (5.42)
	0.0 – 67.4	53.0 – 122.7	12.1 – 240.9	9.1 – 219.7	0.0 – 40.9	22.0 – 143.9	0.0 – 210.6
Percent Closed Canopy	2.22 (1.55)	98.0 (2.00)	87.9 (4.74)	80.0 (6.55)	20.00 (11.06)	63.64 (7.49)	57.95 (4.56)
	0.0 – 50.0	50 - 100	0.0 – 100.0	50.0 – 100.0	0.0 – 100.0	0.0 – 100.0	0.0 – 100.0
Woody Stem Count (stems/10^2m)	110.40 (14.25)	55.13 (16.30)	137.80 (13.44)	64.25 (7.80)	47.60 (21.81)	181.42 (29.93)	139.81 (14.40)
	4.0 – 339.0	0.0 – 214.0	33.3 – 224.0	29.0 – 96.0	0.0 – 109.0	33.0 – 503.0	9.0 – 643.0
Basal Area							
Pine	0.00 (0.00)	20.95 (1.37)	6.77 (1.22)	7.75 (1.73)	3.67 (0.56)	12.93 (0.85)	9.93 (0.69)
Hardwood	0.00 (0.00)	0.14 (0.14)	4.82 (1.16)	1.43 (0.74)	0.46 (0.46)	0.00 (0.00)	1.88 (0.48)
Total	0.00 (0.00)	21.09 (1.36)	11.59 (1.51)	9.18 (1.56)	4.13 (0.46)	12.93 (0.85)	11.82 (0.76)

Table 3.3 Habitat parameters that differed among eight habitat types and between gopher tortoise (*Gopherus polyphemus*) burrow locatons and sample points unoccupied by gopher tortoises in south Mississippi in summer 2010

Habitat Variable (Height)	Burrow Status	Habitat	Comparisons based on Burrow Status And Habitat		Significantly Greater (Burrow or Non-burrow)	Variables Highly Associated (Height)	Correlation Coefficient (r^2)
	P-value	P-value	Test Statistic (F) Degrees of Freedom				
Woody Stem Count	0.009	0.0009	6.90 1, 372	3.61 7, 372	Non-burrow	Native Woody (≤ 0.3 m) All Woody (≤ 0.3 m) Native Woody (> 0.3 m - ≤ 1 m) All Woody (> 0.3 m - ≤ 1 m) Native Shrub (> 0.3 m - ≤ 1 m) All Shrub (> 0.3 m - ≤ 1 m)	0.56 0.56 0.62 0.62 0.61 0.62
Percent Closed Canopy	< 0.01	< 0.01	21.52 1, 372	32.99 7, 372	Non-burrow	All Herbaceous (≤ 0.3 m) Native Woody (> 1 m) All Woody (> 1 m) Native Tree (> 1 m) All Tree (> 1 m) Total Basal Area Pine Basal Area	-0.58 0.74 0.74 0.75 0.75 0.65 0.56
Total Basal Area [a]	< 0.01	< 0.01	71.55 1, 284	85.21 7, 284	Non-burrow	Native Woody (> 1 m) All Woody (> 1 m) Native Tree (> 1 m) All Tree (> 1 m) Percent Closed Canopy Pine Basal Area	0.64 0.64 0.71 0.71 0.65 0.94
Pine Basal Area [a]	< 0.01	< 0.01	54.10 1, 284	68.11 7, 284	Non-burrow	Native Woody (> 1 m) All Woody (> 1 m) Native Tree (> 1 m) All Tree (> 1 m) Percent Closed Canopy Total Basal Area	0.52 0.52 0.58 0.59 0.56 0.94
Hardwood Basal Area [a]	0.03	< 0.01	4.76 1, 284	9.96 7, 284	Non-burrow	All Herbaceous (≤ 0.3 m)	-0.50
Bare Ground	< 0.01	< 0.01	24.57 1, 372	5.82 7, 372	Burrow	n/a	n/a
Native Legume Species Richness	0.02	< 0.01	5.80 1, 372	5.13 7, 372	Burrow	n/a	n/a
Moss (≤ 0.3 m)	0.0022	----	9.48 1, 372	----	Burrow	n/a	n/a
Unidentified Herbaceous (≤ 0.3 m)	0.0002	< 0.01	13.91 1, 372	6.20 7,372	Burrow	Unidentified Grass (≤ 0.3 m)	0.75

Table 3.3 (Continued)

All Herbaceous (≤ 0.3 m)	0.02	< 0.01	5.29 1, 372	26.37 7, 372	Burrow	Native Woody (> 1 m) All Woody (> 1 m) Native Tree (> 1 m) All Tree (> 1 m) Percent Closed Canopy Hardwood Basal Area	-0.73 -0.73 -0.67 -0.67 -0.58 -0.50
Native Woody (≤ 0.3 m)	0.03	< 0.01	5.01 1, 372	4.52 7, 372	Non-burrow	All Woody (≤ 0.3 m) Native Vine (≤ 0.3 m) All Vine (≤ 0.3 m) Woody Stem Count	0.99 0.81 0.79 0.56
All Woody (≤ 0.3 m)	0.04	< 0.01	4.19 1, 372	5.12 7, 372	Non-burrow	Native Woody (≤ 0.3 m) Native Vine (≤ 0.3 m) All Vine (≤ 0.3 m) Woody Stem Count	0.99 0.80 0.81 0.56
Unidentified Grass (≤ 0.3 m)	0.0008	< 0.01	11.43 1, 372	8.09 7, 372	Burrow	Unidentified Herbaceous (≤ 0.3 m)	0.75
Native Legume (≤ 0.3 m)	0.01	0.004	7.56 1, 372	3.04 7, 372	Burrow	All Legume (≤ 0.3 m)	0.93
Non-native Legume (≤ 0.3 m)	0.05	----	3.98 1, 372	----	Burrow	Non-native Legume (> 0.3 m - ≤ 1 m)	0.75
Lespedeza Sericea (≤ 0.3 m)	0.04	----	4.43 1, 372	----	Burrow	Non-native Legume (> 0.3 m - ≤ 1 m) Lespedeza Sericea (> 0.3 m - ≤ 1 m)	0.69 0.78
Unidentified Legume (≤ 0.3 m)	0.03	0.03	4.51 1, 372	2.28 7, 372	Burrow	n/a	n/a
All Legume (≤ 0.3 m)	0.0003	0.0009	13.11 1, 372	3.61 7, 372	Burrow	Native Legume (≤ 0.3 m)	0.93
Unidentified Grass-like (≤ 0.3 m)	0.0047	----	8.09 1, 372	----	Burrow	n/a	n/a
All Grass-like (≤ 0.3 m)	0.03	----	4.65 1, 372	----	Burrow	n/a	n/a
Native Vine (≤ 0.3 m)	0.02	0.0003	5.81 1, 372	4.07 7, 372	Non-burrow	Native Woody (≤ 0.3 m) All Woody (≤ 0.3 m) All Vine (≤ 0.3 m)	0.81 0.80 0.98
All Vine (≤ 0.3 m)	0.03	< 0.01	4.52 1, 372	5.22 7, 372	Non-burrow	Native Woody (≤ 0.3 m) All Woody (≤ 0.3 m) Native Vine (≤ 0.3 m)	0.79 0.81 0.98
Unidentified Herbaceous (> 0.3 m - ≤ 1 m)	0.01	0.0008	6.14 1, 372	3.64 7, 372	Burrow	n/a	n/a
Native Woody (> 0.3 m - ≤ 1 m)	0.0038	0.0074	8.49 1, 372	2.80 7, 372	Non-burrow	All Woody (> 0.3 m - ≤ 1 m) Native Shrub (> 0.3 m - ≤ 1 m) All Shrub (> 0.3 m - ≤ 1 m) Woody Stem Count	0.99 0.83 0.84 0.62
All Woody (> 0.3 m - ≤ 1 m)	0.01	0.02	7.55 1, 372	2.45 7, 372	Non-burrow	Native Woody (> 0.3 m - ≤ 1 m) Native Shrub (> 0.3 m - ≤ 1 m) All Shrub (> 0.3 m - ≤ 1 m) Woody Stem Count	0.99 0.83 0.84 0.62

Table 3.3 (Continued)

Non-native Legume (> 0.3 m - ≤ 1 m)	0.01	----	6.72 1, 372	----	Burrow	Non-native Legume (≤ 0.3 m) Lespedeza Sericea (≤ 0.3 m) Lespedeza Sericea (> 0.3 m - ≤ 1 m)	0.75 0.69 0.88
Lespedeza Sericea (> 0.3 m - ≤ 1 m)	0.03	----	4.85 1, 372	----	Burrow	Lespedeza Sericea (≤ 0.3 m) Non-native Legume (> 0.3 m - ≤ 1 m)	0.78 0.88
Unidentified Legume (> 0.3 m - ≤ 1 m)	0.01	0.0031	6.47 1, 372	3.14 7, 372	Burrow	n/a	n/a
All Legume (> 0.3 m - ≤ 1 m)	0.02	0.0034	5.09 1, 372	3.11 7, 372	Burrow	n/a	n/a
Native Shrub (> 0.3 m - ≤ 1 m)	< 0.01	< 0.01	26.01 1, 372	8.77 7, 372	Non-burrow	Native Woody (> 0.3 m - ≤ 1 m) All Woody (> 0.3 m - ≤ 1 m) All Shrub (> 0.3 m - ≤ 1 m) Woody Stem Count	0.83 0.83 0.99 0.61
All Shrub (> 0.3 m - ≤ 1 m)	< 0.01	< 0.01	24.21 1, 372	7.54 7, 372	Non-burrow	Native Woody (> 0.3 m - ≤ 1 m) All Woody (> 0.3 m - ≤ 1 m) Native Shrub (> 0.3 m - ≤ 1 m) Woody Stem Count	0.84 0.84 0.99 0.62
Native Woody (> 1 m)	< 0.01	< 0.01	18.17 1, 372	40.84 7, 372	Non-burrow	All Herbaceous (≤ 0.3 m) All Woody (> 1 m) Native Tree (> 1 m) All Tree (> 1 m) Percent Closed Canopy Total Basal Area Pine Basal Area	-0.73 0.99 0.96 0.96 0.74 0.64 0.52
All Woody (> 1 m)	< 0.01	< 0.01	17.84 1, 372	41.84 7, 372	Non-burrow	All Herbaceous (≤ 0.3 m) Native Woody (> 1 m) Native Tree (> 1 m) All Tree (> 1 m) Percent Closed Canopy Total Basal Area Pine Basal Area	-0.73 0.99 0.95 0.95 0.74 0.64 0.52
Native Tree (> 1 m)	< 0.01	< 0.01	24.88 1, 372	41.86 7, 372	Non-burrow	All Herbaceous (≤ 0.3 m) Native Woody (> 1 m) All Woody (> 1 m) All Tree (> 1 m) Percent Closed Canopy Total Basal Area Pine Basal Area	-0.67 0.96 0.95 0.99 0.75 0.71 0.58
All Tree (> 1 m)	< 0.01	< 0.01	24.59 1, 372	41.86 7, 372	Non-burrow	All Herbaceous (≤ 0.3 m) Native Woody (> 1 m) All Woody (> 1 m) Native Tree (> 1 m) Percent Closed Canopy Total Basal Area Pine Basal Area	-0.67 0.96 0.95 0.99 0.75 0.71 0.59

[a]Sub-sample of total sample points at burrow and non-burrow locations

Table 3.4 Habitat parameters that were significantly different among eight habitat types in south Mississippi in summer 2010

Habitat Variable (Height)	P-value	Test Statistic (F)	Degrees of Freedom	Variables Highly Associated (Height)	Correlation Coefficient (r^2)
Debris (≤ 0.3 m)	0.01	2.55	7, 372	n/a	n/a
Leaflitter (≤ 0.3 m)	< 0.01	22.85	7, 372	All Grass (≤ 0.3 m) All Shrub (> 1 m) Native Grass (≤ 0.3 m) Native Herbaceous (≤ 0.3 m) Native Shrub (> 1 m)	-0.76 0.50 -0.70 -0.75 0.51
Log (≤ 0.3 m)	< 0.01	4.43	7, 372	n/a	n/a
Stump (≤ 0.3 m)	0.0026	3.20	7, 372	n/a	n/a
Native Herbaceous (≤ 0.3 m)	< 0.01	25.45	7, 372	Leaflitter (≤ 0.3 m) All Grass (≤ 0.3 m) All Shrub (> 1 m) Native Forb (≤ 0.3 m) Native Grass (≤ 0.3 m) Native Herbaceous (> 0.3 m - ≤ 1 m) Native Shrub (> 1 m)	-0.75 0.91 -0.55 0.53 0.94 0.50 -0.54
Non-native Herbaceous (≤ 0.3 m)	< 0.01	5.98	7, 372	Cogongrass (≤ 0.3 m) Non-native Grass (≤ 0.3 m)	0.53 0.98
Non-native Woody (≤ 0.3 m)	< 0.01	13.42	7, 372	Non-native Vine (> 1 m) Non-native Vine (≤ 0.3 m) Non-native Vine (> 0.3 m - ≤ 1 m) Non-native Woody (> 1 m) Non-native Woody (> 0.3 m - ≤ 1 m)	0.72 0.99 0.70 0.55 0.59
Native Grass (≤ 0.3 m)	< 0.01	23.33	7, 372	Leaflitter (≤ 0.3 m) Native Herbaceous (≤ 0.3 m) All Grass (≤ 0.3 m) All Shrub (> 1 m) Native Shrub (> 1 m)	-0.70 0.94 0.95 -0.52 -0.51
Non-native Grass (≤ 0.3 m)	< 0.01	6.17	7, 372	Non-native Herbaceous (≤ 0.3 m)	0.98
Cogongrass (≤ 0.3 m)	< 0.01	9.01	7, 372	Non-native Herbaceous (≤ 0.3 m)	0.53
All Grass (≤ 0.3 m)	< 0.01	31.00	7, 372	Leaflitter (≤ 0.3 m) All Shrub (> 1 m) Native Grass (≤ 0.3 m) Native Herbaceous (≤ 0.3 m) Native Shrub (> 1 m)	-0.76 -0.56 0.95 0.91 -0.55
Native Forb (≤ 0.3 m)	< 0.01	6.95	7, 372	Native Herbaceous (≤ 0.3 m) All Forb (≤ 0.3 m)	0.53 0.93
Unidentified Forb (≤ 0.3 m)	< 0.01	7.92	7, 372	n/a	n/a
All Forb (≤ 0.3 m)	< 0.01	6.32	7, 372	Native Forb (≤ 0.3 m)	0.93

Table 3.4 (Continued)

Non-native Vine (≤ 0.3 m)	< 0.01	11.39	7, 372	Non-native Woody (≤ 0.3 m) Non-native Vine (> 1 m) Non-native Vine (> 0.3 m - ≤ 1 m) Non-native Woody (> 0.3 m - ≤ 1 m)	0.99 0.74 0.71 0.57
Unidentified Vine (≤ 0.3 m)	0.02	2.44	7, 372	n/a	n/a
Native Shrub (≤ 0.3 m)	< 0.01	4.93	7, 372	All Shrub (≤ 0.3 m)	0.99
Non-native Shrub (≤ 0.3 m)	< 0.01	11.91	7, 372	Non-native Shrub (> 1 m) Non-native Woody (> 1 m)	0.58 0.56
All Shrub (≤ 0.3 m)	< 0.01	4.52	7, 372	Native Shrub (≤ 0.3 m)	0.99
Native Tree (≤ 0.3 m)	< 0.01	8.78	7, 372	All Tree (≤ 0.3 m)	0.99
Unidentified Tree (≤ 0.3 m)	0.01	2.54	7, 372	n/a	n/a
All Tree (≤ 0.3 m)	< 0.01	8.65	7, 372	Native Tree (≤ 0.3 m)	0.99
Native Herbaceous (> 0.3 m - ≤ 1 m)	< 0.01	18.70	7, 372	Native Herbaceous (≤ 0.3 m) All Forb (> 0.3 m - ≤ 1 m) All Herbaceous (> 0.3 m - ≤ 1 m) Native Forb (> 0.3 m - ≤ 1 m) Native Legume (> 0.3 m - ≤ 1 m)	0.50 0.94 0.97 0.95 0.61
All Herbaceous (> 0.3 m - ≤ 1 m)	< 0.01	17.28	7, 372	Native Herbaceous (> 0.3 m - ≤ 1 m) All Forb (> 0.3 m - ≤ 1 m) Native Forb (> 0.3 m - ≤ 1 m) Native Legume (> 0.3 m - ≤ 1 m)	0.97 0.94 0.92 0.60
Non-native Woody (> 0.3 m - ≤ 1 m)	< 0.01	10.96	7, 372	Non-native Woody (≤ 0.3 m) Non-native Vine (≤ 0.3 m) Non-native Shrub (> 1 m) Non-native Shrub (> 0.3 m - ≤ 1 m) Non-native Vine (> 1 m) Non-native Vine (> 0.3 m - ≤ 1 m) Non-native Woody (> 1 m)	0.59 0.57 0.55 0.75 0.64 0.80 0.65
Native Grass (> 0.3 m - ≤ 1 m)	0.02	2.36	7, 372	n/a	n/a
Native Forb (> 0.3 m - ≤ 1 m)	< 0.01	22.53	7, 372	Native Herbaceous (> 0.3 m - ≤ 1 m) All Herbaceous (> 0.3 m - ≤ 1 m) All Forb (> 0.3 m - ≤ 1 m)	0.95 0.92 0.98
Non-native Forb (> 0.3 m - ≤ 1 m)	0.01	4.36	7, 372	n/a	n/a
Unidentified Forb (> 0.3 m - ≤ 1 m)	0.0017	3.36	7, 372	All Forb (> 0.3 m - ≤ 1 m)	0.50
All Forb (> 0.3 m - ≤ 1 m)	< 0.01	21.90	7, 372	All Herbaceous (> 0.3 m - ≤ 1 m) Native Forb (> 0.3 m - ≤ 1 m) Native Herbaceous (> 0.3 m - ≤ 1 m) Unidentified Forb (> 0.3m - ≤ 1 m)	0.94 0.98 0.94 0.50

Table 3.4 (Continued)

Native Legume (> 0.3 m - ≤ 1 m)	0.0009	3.60	7, 372	Native Herbaceous (> 0.3 m - ≤ 1 m) All Herbaceous (> 0.3 m - ≤ 1 m)	0.61 0.60
Native Vine (> 0.3 m - ≤ 1 m)	< 0.01	12.77	7, 372	All Vine (> 0.3 m - ≤ 1 m)	0.99
Non-native Vine (> 0.3 m - ≤ 1 m)	< 0.01	9.13	7, 372	Non-native Woody (≤ 0.3 m) Non-native Vine (≤ 0.3 m) Non-native Woody (> 0.3 m - ≤ 1 m) Non-native Woody (> 1 m) Non-native Vine (> 1 m)	0.70 0.71 0.80 0.55 0.75
All Vine (> 0.3 m - ≤ 1 m)	< 0.01	13.45	7, 372	Native Vine (> 0.3 m - ≤ 1 m)	0.99
Non-native Shrub (> 0.3 m - ≤ 1 m)	< 0.01	6.96	7, 372	Non-native Woody (> 0.3 m - ≤ 1 m) Non-native Shrub (> 1 m) Non-native Woody (> 1 m)	0.75 0.53 0.53
Native Tree (> 0.3 m - ≤ 1 m)	< 0.01	5.82	7, 372	All Tree (> 0.3m - ≤ 1 m)	0.99
All Tree (> 0.3 m - ≤ 1 m)	< 0.01	5.48	7, 372	Native Tree (> 0.3 m - ≤ 1 m)	0.99
Native Herbaceous (> 1 m)	0.0006	3.75	7, 372	All Forb (> 1 m) All Herbaceous (> 1 m)	0.93 0.93
All Herbaceous (> 1 m)	0.0010	3.56	7, 372	All Forb (> 1 m) Native Herbaceous (> 1 m) Native Forb (> 1 m)	0.99 0.93 0.93
Non-native Woody (> 1 m)	< 0.01	19.11	7, 372	Non-native Woody (≤ 0.3 m) Non-native Shrub (≤ 0.3 m) Non-native Woody (> 0.3 m - ≤ 1 m) Non-native Vine (> 0.3 m - ≤ 1 m) Non-native Shrub (> 0.3 m - ≤ 1 m) Non-native Shrub (> 1 m) Non-native Vine (> 1 m)	0.55 0.56 0.65 0.55 0.53 0.94 0.55
Unidentified Woody (> 1 m)	0.05	2.04	7, 372	n/a	n/a
Native Forb (> 1 m)	0.0006	3.75	7, 372	All Forb (> 1 m) All Herbaceous (> 1 m)	0.93 0.93
All Forb (> 1 m)	0.0008	3.63	7, 372	All Herbaceous (> 1 m) Native Forb (> 1 m) Native Herbaceous (> 1 m)	0.99 0.93 0.93
Native Vine (> 1 m)	< 0.01	7.51	7, 372	All Shrub (> 1 m) Native Shrub (> 1 m)	0.54 0.52

Table 3.4 (Continued)

Non-native Vine (> 1 m)	< 0.01	4.93	7, 372	Non-native Woody (≤ 0.3 m) Non-native Vine (≤ 0.3 m) Non-native Woody (> 0.3 m - ≤ 1 m) Non-native Vine (> 0.3 m - ≤ 1 m) Non-native Woody (> 1 m)	0.72 0.74 0.64 0.75 0.55
All Vine (> 1 m)	< 0.01	8.93	7, 372	All Shrub (> 1 m) Native Shrub (> 1 m)	0.56 0.53
Native Shrub (> 1 m)	< 0.01	18.29	7, 372	Leaflitter (≤ 0.3 m) Native Herbaceous (≤ 0.3 m) Native Grass (≤ 0.3 m) All Grass (≤ 0.3 m) Native Vine (> 1 m) All Vine (> 1 m) All Shrub (> 1 m)	0.51 -0.54 -0.51 -0.55 0.52 0.53 0.97
Non-native Shrub (> 1 m)	< 0.01	19.13	7, 372	Non-native Shrub (≤ 0.3 m) Non-native Woody (> 0.3 m - ≤ 1 m) Non-native Shrub (> 0.3 m - ≤ 1 m) Non-native Woody (> 1 m)	0.58 0.55 0.53 0.94
All Shrub (> 1 m)	< 0.01	18.97	7, 372	Leaflitter (≤ 0.3 m) Native Herbaceous (≤ 0.3 m) Native Grass (≤ 0.3 m) All Grass (≤ 0.3 m) Native Vine (> 1 m) All Vine (> 1 m) Native Shrub (> 1 m)	0.50 -0.55 -0.52 -0.56 0.54 0.56 0.97
Non-native Tree (> 1 m)	0.0005	3.80	7, 372	n/a	n/a

Table 3.5 Mean estimates of overstory canopy coverage and basal area (m^2/ha) along line transects originating at active burrows of gopher tortoise (*Gopherus polyphemus*) and sample points unoccupied by gopher tortoise in habitat types of south Mississippi in summer 2010

Habitat Parameter	**Regeneration Area (< 5 yrs)**	**Early Successional Habitat**	**Densely Planted Pine (> 15 yrs)**	**Mixed Pine Hardwood Forest (> 15 yrs)**	**Unmanaged Mixed Forest in Sandhills (> 15 yrs)**	**Planted Longleaf (> 5 – ≤ 15 yrs)**	**Planted Longleaf (> 15 yrs)**	**Natural Longleaf (> 15 yrs)**
	Less[a], Moderately[b], Highly[c] Suitable Soils	**Less[a], Moderately[b] Suitable Soils**	**Less[a], Moderately[b] Suitable Soils**	**Moderately[b] Suitable Soils**	**Moderately[b], Highly[c] Suitable Soils**	**Less[a], Moderately[b] Suitable Soils**	**Moderately[b] Suitable Soils**	**Less[a], Moderately[b], Highly[c] Suitable Soils**
Active Burrow Locations								
	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)
Total Basal Area	0.00 (0.00)	0.95 (0.59)	No Sample Points	11.48 (1.33)	2.30 (2.30)	1.84 (0.86)	9.95 (2.76)	5.02(0.45)
Pine Basal Area	0.00 (0.00)	0.68 (0.38)	No Sample Points	9.95 (2.76)	2.30 (2.30)	0.92 (0.56)	9.95 (2.76)	4.33 (0.45)
Hardwood Basal Area	0.00 (0.00)	0.27 (0.27)	No Sample Points	1.53 (1.53)	0.00 (0.00)	0.92 (0.56)	0.00 (0.00)	0.72 (0.17)
Overstory Canopy Coverage	0.00% (0.00)	22.22% (7.26)	No Sample Points	83.33% (16.67)	33.33% (16.67)	50.00% (22.36)	58.33% (8.33)	33.17% (3.25)
Non-burrow Locations								
Total Basal Area	0.00 (0.00)	No Sample Points	21.09 (1.36)	11.59 (1.51)	9.18 (1.56)	4.13 (0.46)	12.93 (0.85)	11.82 (0.76)
Pine Basal Area	0.00 (0.00)	No Sample Points	20.95 (1.37)	6.77 (1.22)	7.75 (1.73)	3.67 (0.56)	12.93 (0.85)	9.93 (0.69)
Hardwood Basal Area	0.00 (0.00)	No Sample Points	0.14 (0.14)	4.82 (1.16)	1.43 (0.74)	0.46 (0.46)	0.00 (0.00)	1.88 (0.48)
Overstory Canopy Coverage	2.22% (1.55)	No Sample Points	98.00% (2.00)	87.9% (4.74)	80.00% (6.55)	20.00% (11.06)	63.64% (7.49)	57.95% (4.56)

[a]Less Suitable may include these soils or soil associations: Cahaba, Lucedale, Ruston, Smithdale-Lucy, Smithdale
[b]Moderately Suitable may include these soils or soil associations: Benndale, Benndale-Smithdale, Heidel, Jena-Bigbee, McLaurin-Benndale, McLaurin-Lucy, McLaurin
[c]Highly Suitable may include these soils or soil associations: Alaga, Bassfield, Lakeland, Latonia, Latonia-Trebloc, Wadley, Boykin, Wadley

Table 3.6 Mean percent coverage of ground cover features along line transects originating at active burrows of gopher tortoise (*Gopherus polyphemus*) and sample points unoccupied by gopher tortoise in habitat types of south Mississippi during summer 2010.

Habitat Features	Mean Percent Coverage of Ground Cover Features (< 0.3m) at Active Burrow and Non-burrow Locations							
	Regeneration Area (< 5 yrs)	**Early Successional Habitat**	**Densely Planted Pine (> 15 yrs)**	**Mixed Pine Hardwood Forest (> 15 yrs)**	**Unmanaged Mixed Forest in Sandhills (> 15 yrs)**	**Planted Longleaf (> 5 – ≤ 15 yrs)**	**Planted Longleaf (> 15 yrs)**	**Natural Longleaf (> 15 yrs)**
	Less[a], Moderately[b], Highly[c] Suitable Soils	**Less[a], Moderately[b] Suitable Soils**	**Less[a], Moderately[b] Suitable Soils**	**Moderately[b] Suitable Soils**	**Moderately[b], Highly[c] Suitable Soils**	**Less[a], Moderately[b] Suitable Soils**	**Moderately[b] Suitable Soils**	**Less[a], Moderately[b], Highly[c] Suitable Soils**
	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)
Active Burrow Locations								
Bare Ground	4.41 (3.80)	9.13 (2.33)	No Sample Points	----	2.77 (1.07)	1.82 (1.28)	----	4.43 (0.92)
Debris	1.24 (0.92)	----	No Sample Points	----	----	----	----	1.88 (0.41)
Leaflitter	1.53 (5.28)	1.09 (0.60)	No Sample Points	21.43 (12.66)	23.23 (13.78)	9.70 (4.49)	14.38 (3.15)	20.70 (2.39)
Logs	0.89 (0.48)	0.09 (0.06)	No Sample Points	8.10 (7.70)	----	----	3.28 (1.31)	1.15 (0.18)
Moss	----	----	No Sample Points	----	----	----	----	2.69 (0.93)
Stumps	0.56 (0.29)	----	No Sample Points	----	----	----	0.13 (0.13)	0.22 (0.11)
Non-burrow Locations								
Bare Ground	3.30 (1.02)	No Sample Points	----	----	0.41 (0.41)	----	----	0.71 (0.36)
Debris	0.56 (0.25)	No Sample Points	0.15 (0.15)	1.41 (0.81)	0.66 (0.31)	0.23 (0.23)	0.04 (0.04)	0.74 (0.22)
Leaflitter	3.61 (1.30)	No Sample Points	57.19 (6.25)	49.09 (5.35)	61.11 (6.96)	4.25 (2.59)	16.85 (3.80)	25.99 (3.06)
Logs	2.87 (0.64)	No Sample Points	0.82 (0.33)	1.65 (0.40)	0.15 (0.11)	0.30 (0.30)	2.51 (0.79)	1.71 (0.30)
Moss	----	No Sample Points	----	----	0.56 (0.32)	----	----	1.03 (0.93)
Stumps	0.25 (0.12)	No Sample Points	----	----	----	----	0.21 (0.20)	0.09 (0.04)

[a]Less Suitable may include these soils or soil associations: Cahaba, Lucedale, Ruston, Smithdale-Lucy, Smithdale [b]Moderately Suitable may include these soils or soil associations: Benndale, Benndale-Smithdale, Heidel, Jena-Bigbee, McLaurin-Benndale, McLaurin-Lucy, McLaurin

[c]Highly Suitable may include these soils or soil associations: Alaga, Bassfield, Lakeland, Latonia, Latonia-Trebloc, Wadley-Boykin, Wadley

Table 3.7 Mean percent coverage of herbaceous and woody vegetation in 3 height categories along line transects originating at active burrows of gopher tortoise (*Gopherus polyphemus*) in habitat types of south Mississippi in summer 2010.

Habitat Variable	Regeneration Area (< 5 yrs)	Early Successional Habitat	Mixed Pine Hardwood Forest (> 15 yrs)	Unmanaged Mixed Forest in Sandhills (> 15 yrs)	Planted Longleaf (> 5 - ≤ 15 yrs)	Planted Longleaf (> 15 yrs)	Natural Longleaf (> 15 yrs)
	Less[a], Moderately[b], Highly[c] Suitable Soils	Less[a], Moderately[b] Suitable Soils	Moderately[b] Suitable Soils	Moderately[b], Highly[c] Suitable Soils	Less[a], Moderately[b] Suitable Soils	Moderately[b] Suitable Soils	Less[a], Moderately[b], Highly[c] Suitable Soils
	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)
Herbaceous Plants (≤ 0.3 m)							
Native Herbaceous	82.91 (11.21)	96.46 (7.80)	68.97 (34.50)	70.47 (23.58)	96.96 (21.42)	99.12 (7.80)	76.40 (4.60)
Non-native Herbaceous	2.35 (2.35)	20.03 (8.22)	----	----	17.42 (17.42)	----	5.93 (1.88)
Unidentified Herbaceous	8.67 (3.04)	2.60 (1.09)	0.27 (0.27)	0.27 (0.27)	11.22 (6.01)	3.90 (1.29)	6.20 (1.28)
Total Herbaceous	**93.94 (10.59)**	**119.11 (5.55)**	**69.20 (34.45)**	**70.70 (23.35)**	**125.62 (9.37)**	**103.05 (8.27)**	**88.23 (5.13)**
Woody Plants (≤ 0.3 m)							
Native Woody	22.66 (8.78)	17.98 (5.16)	55.07 (21.08)	14.43 (8.33)	17.44 (3.91)	8.33 (1.84)	21.79 (2.53)
Non-native Woody	----	----	----	----	0.16 (0.16)	----	0.10 (0.10)
Unidentified Woody	----	0.59 (0.44)	0.27 (0.27)	----	----	----	1.55 (0.51)
Total Woody	**22.66 (8.78)**	**18.57 (5.35)**	**55.33 (21.30)**	**14.43 (8.33)**	**17.60 (3.84)**	**8.33 (1.84)**	**23.44 (2.71)**
Herbaceous Plants (> 0.3 m – ≤ 1 m)							
Native Herbaceous	31.00 (9.90)	26.39 (9.19)	2.80 (1.32)	2.03 (0.91)	4.70 (2.04)	24.37 (4.01)	12.10 (2.19)
Non-native Herbaceous	0.07 (0.07)	0.38 (0.38)	----	----	----	----	1.14 (0.53)
Unidentified Herbaceous	1.17 (0.61)	2.45 (1.33)	----	----	----	5.05 (3.62)	1.94 (0.46)
Total Herbaceous	**32.24 (10.11)**	**29.21 (9.94)**	**2.80 (1.32)**	**2.03 (0.91)**	**4.70 (2.04)**	**29.42 (6.35)**	**15.18 (2.39)**
Woody Plants (> 0.3 m – ≥ 1 m)							
Native Woody	40.90 (7.60)	21.05 (5.33)	80.57 (48.38)	17.70 (7.35)	16.22 (8.45)	27.78 (2.29)	26.97 (2.43)
Non-native Woody	1.24 (1.24)	0.76 (0.55)	0.50 (0.50)	----	----	1.02 (1.02)	0.19 (0.10)
Unidentified Woody	0.96 (0.96)	----	----	2.27 (2.27)	----	----	0.47 (0.19)
Total Woody	**43.10 (8.08)**	**21.81 (5.56)**	**81.07 (48.88)**	**19.97 (9.18)**	**16.22 (8.45)**	**28.78 (2.33)**	**27.63 (2.47)**
Herbaceous Plants (> 1 m)							
Native Herbaceous	0.14 (0.14)	0.08 (0.08)	----	----	----	----	0.02 (0.01)
Non-native Herbaceous	----	----	----	----	----	----	----
Unidentified Herbaceous	----	----	----	----	----	----	0.02 (0.02)
Total Herbaceous	**0.14 (0.14)**	**0.08 (0.08)**	----	----	----	----	**0.04 (0.03)**
Woody Plants (> 1 m)							
Native Woody	14.33 (5.80)	25.29 (7.23)	89.90 (11.52)	53.03 (22.42)	29.10 (8.95)	63.77 (8.83)	52.02 (4.59)
Non-native Woody	----	0.38 (0.38)	----	----	0.90 (0.90)	1.27 (1.27)	0.06 (0.06)
Unidentified Woody	----	----	----	----	----	----	0.38 (0.25)
Total Woody	**14.33 (5.80)**	**25.67 (7.34)**	**89.90 (11.52)**	**53.03 (22.42)**	**30.00 (9.52)**	**65.03 (8.94)**	**52.45 (4.64)**

[a]Less Suitable may include these soils or soil associations: Cahaba, Lucedale, Ruston, Smithdale-Lucy, Smithdale [b]Moderately Suitable may include these soils or soil associations: Benndale, Benndale-Smithdale, Heidel, Jena-Bigbee, McLaurin-Benndale, McLaurin-Lucy, McLaurin

[c]Highly Suitable may include these soils or soil associations: Alaga, Bassfield, Heidel, Lakeland, Latonia, Wadley-Boykin, Wadley

Table 3.8 Mean percent coverage of herbaceous and woody vegetation in 3 height categories along line transects originating at sample points unoccupied by gopher tortoise (*Gopherus polyphemus*) in habitat types of south Mississippi in summer 2010.

Habitat Variable	Regeneration Area (< 5 yrs)	Densely Planted Pine (> 15 yrs)	Mixed Pine Hardwood Forest (> 15 yrs)	Unmanaged Mixed Forest in Sandhills (> 15 yrs)	Planted Longleaf (> 5 - ≤ 15 yrs)	Planted Longleaf (> 15 yrs)	Natural Longleaf (> 15 yrs)
	Less[a], Moderately[b], Highly[c] Suitable Soils	**Less[a], Moderately[b] Suitable Soils**	**Moderately[b] Suitable Soils**	**Moderately[b], Highly[c] Suitable Soils**	**Less[a], Moderately[b] Suitable Soils**	**Moderately[b] Suitable Soils**	**Less[a], Moderately[b], Highly[c] Suitable Soils**
	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)
Herbaceous Plants (≤ 0.3 m)							
Native Herbaceous	104.38 (5.41)	4.24 (1.00)	18.42 (4.05)	29.50 (9.40)	100.83 (17.96)	95.28 (9.11)	78.63 (7.06)
Non-native Herbaceous	2.22 (0.90)	----	0.86 (0.57)	0.05 (0.05)	26.43 (13.24)	0.48 (0.48)	1.09 (0.52)
Unidentified Herbaceous	7.98 (2.02)	9.64 (3.15)	1.23 (0.41)	0.61 (0.30)	1.07 (0.66)	7.23 (2.05)	1.72 (0.51)
Total Herbaceous	**114.70 (5.36)**	**13.88 (3.10)**	**20.50 (4.28)**	**30.16 (9.55)**	**128.34 (7.25)**	**103.03 (8.74)**	**81.28 (7.16)**
Woody Plants (≤ 0.3 m)							
Native Woody	27.49 (4.59)	42.34 (10.48)	45.03 (6.55)	13.97 (3.24)	13.71 (4.46)	9.13 (2.44)	32.85 (3.73)
Non-native Woody	0.07 (0.04)	6.91 (3.71)	4.70 (3.26)	----	----	----	0.01 (0.01)
Unidentified Woody	0.15 (0.11)	----	0.26 (0.10)	0.71 (0.51)	0.08 (0.08)	0.04 (0.04)	0.37 (0.14)
Total Woody	**27.71 (4.59)**	**49.25 (11.98)**	**50.00 (7.23)**	**14.69 (3.12)**	**13.79 (4.45)**	**9.17 (2.46)**	**33.46 (3.81)**
Herbaceous Plants (> 0.3 m – ≥ 1 m)							
Native Herbaceous	33.47 (4.46)	4.12 (1.29)	0.60 (0.33)	2.63 (1.17)	25.07 (5.52)	19.94 (3.72)	11.12 (1.67)
Non-native Herbaceous	0.59 (0.33)	----	----	----	0.30 (0.30)	----	----
Unidentified Herbaceous	2.21 (0.63)	2.48 (1.35)	0.05 (0.05)	0.05 (0.05)	2.49 (0.83)	0.97 (0.25)	0.36 (0.11)
Total Herbaceous	**36.26 (4.74)**	**7.68 (1.76)**	**0.68 (0.33)**	**2.69 (1.19)**	**27.87 (6.12)**	**20.90 (3.70)**	**11.48 (1.69)**
Woody Plants (> 0.3 m – ≥ 1 m)							
Native Woody	34.51 (3.56)	36.15 (9.58)	49.65 (6.87)	59.44 (17.94)	30.99 (8.08)	55.68 (7.45)	41.52 (3.75)
Non-native Woody	0.03 (0.03)	4.42 (1.78)	1.43 (1.21)	----	----	0.04 (0.04)	0.02 (0.01)
Unidentified Woody	0.03 (0.03)	0.21 (0.16)	0.22 (0.14)	----	0.23 (0.23)	0.04 (0.04)	0.30 (0.14)
Total Woody	**34.58 (3.55)**	**40.68 (10.06)**	**51.24 (7.29)**	**59.44 (17.94)**	**31.21 (8.17)**	**55.75 (7.47)**	**41.85 (3.74)**
Herbaceous Plants (> 1 m)							
Native Herbaceous	2.22 (1.85)	2.03 (1.14)	----	----	----	----	----
Non-native Herbaceous	2.17 (1.65)	----	----	----	----	----	----
Unidentified Herbaceous	0.02 (0.02)	0.12 (0.12)	----	----	----	----	----
Total Herbaceous	**4.41 (3.47)**	**2.03 (1.14)**	**----**	**----**	**----**	**----**	**----**
Woody Plants (> 1 m)							
Native Woody	16.37 (4.30)	127.57 (9.14)	193.42 (13.79)	147.23 (22.74)	31.66 (7.05)	68.63 (6.49)	83.31 (6.75)
Non-native Woody	0.47 (0.38)	17.61 (6.34)	2.43 (1.49)	----	----	----	----
Unidentified Woody	----	----	1.15 (0.71)	----	----	----	----
Total Woody	**16.84 (4.28)**	**145.18 (12.11)**	**197.06 (13.57)**	**147.23 (22.74)**	**31.66 (7.05)**	**68.63 (6.49)**	**83.31 (6.75)**

[a]Less Suitable may include these soils or soil associations: Cahaba, Lucedale, Ruston, Smithdale-Lucy, Smithdale [b]Moderately Suitable may include these soils or soil associations: Benndale, Benndale-Smithdale, Heidel, Jena-Bigbee, McLaurin-Benndale, McLaurin-Lucy, McLaurin
[c]Highly Suitable may include these soils or soil associations: Alaga, Bassfield, Latonia, Latonia-Trebloc, Wadley-Boykin, Wadley

Table 3.9 Mean percent coverage of legumes, forbs, grasses, and grass-likes in 2 height categories along line transects originating at active burrows of gopher tortoise (*Gopherus polyphemus*) in habitat types of south Mississippi in summer 2010.

Habitat Variable	Regeneration Area (< 5 yrs)	Early Successional Habitat	Mixed Pine Hardwood Forest (> 15 yrs)	Unmanaged Mixed Forest in Sandhills (> 15 yrs)	Planted Longleaf (> 5 – ≤ 15 yrs)	Planted Longleaf (> 15 yrs)	Natural Longleaf (> 15 yrs)
	Less[a], Moderately[b], Highly[c] Suitable Soils	**Less[a], Moderately[b] Suitable Soils**	**Moderately[b] Suitable Soils**	**Moderately[b], Highly[c] Suitable Soils**	**Less[a], Moderately[b] Suitable Soils**	**Moderately[b] Suitable Soils**	**Less[a], Moderately[b], Highly[c] Suitable Soils**
	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)
Legumes (≤ 0.3 m)							
Native Legumes	0.21 (0.15)	4.04 (2.00)	8.33 (3.28)	0.5 (0.5)	3.04 (1.20)	3.53 (1.89)	3.55 (0.67)
Non-native Legumes	----	----	----	----	----	----	0.46 (0.35)
Unidentified Legumes	----	0.09 (0.6)	----	----	----	1.27 (0.74)	0.41 (0.12)
Total Legumes	**0.21 (0.15)**	**4.13 (2.00)**	**8.33 (3.28)**	**0.5 (0.5)**	**3.04 (1.20)**	**4.80 (2.36)**	**4.45 (0.76)**
Forbs (≤ 0.3 m)							
Native Forbs	4.68 (1.70)	17.97 (4.38)	11.13 (5.17)	3.53 (0.27)	25.44 (9.45)	6.70 (3.38)	9.19 (1.37)
Non-native Forbs	----	1.18 (1.18)	----	----	----	----	0.02 (0.01)
Unidentified Forbs	1.51 (0.76)	0.30 (0.15)	----	----	6.68 (4.54)	0.38 (0.38)	1.89 (0.45)
Total Forbs	**6.20 (2.05)**	**19.46 (4.56)**	**11.13 (5.17)**	**3.53 (0.27)**	**32.10 (10.32)**	**7.08 (3.76)**	**11.10 (1.50)**
Grasses (≤ 0.3 m)							
Native Grasses	75.20 (10.61)	73.92 (7.88)	49.50 (27.62)	66.17 (23.27)	68.48 (18.69)	88.38 (8.37)	59.69 (4.14)
Non-native Grasses	2.35 (2.35)	15.78 (6.47)	----	----	17.42 (17.42)	----	5.42 (1.76)
Unidentified Grasses	5.30 (2.65)	1.47 (0.66)	0.27 (0.27)	0.27 (0.27)	4.54 (3.66)	2.27 (0.96)	3.37 (1.02)
Total Grasses	**82.85 (11.22)**	**94.23 (4.59)**	**49.73 (27.54)**	**66.43 (23.01)**	**90.48 (6.87)**	**90.65 (8.86)**	**68.48 (4.60)**
Grass-likes (≤ 0.3 m)							
Native Grass-likes	2.82 (0.99)	0.55 (0.42)	----	0.27 (0.27)	----	0.52 (0.25)	1.26 (0.30)
Non-native Grass-likes	----	----	----	----	----	----	----
Unidentified Grass-likes	1.86 (1.86)	0.76 (0.76)	----	----	----	----	0.15 (0.05)
Total Grass-likes	**4.68 (1.84)**	**1.30 (0.83)**	**----**	**0.27 (0.27)**	**----**	**0.52 (0.25)**	**1.41 (0.30)**
Legumes (> 0.3 m – ≤ 1 m)							
Native Legumes	1.32 (0.56)	13.39 (5.32)	0.27 (0.27)	0.27 (0.27)	0.16 (0.16)	3.28 (1.42)	3.55 (1.17)
Non-native Legumes	----	----	----	----	----	----	1.05 (0.49)
Unidentified Legumes	0.69 (0.62)	1.05 (1.05)	----	----	----	2.78 (2.12)	0.11 (0.05)
Total Legumes	**2.00 (1.10)**	**14.44 (5.88)**	**0.27 (0.27)**	**0.27 (0.27)**	**0.16 (0.16)**	**6.05 (3.39)**	**4.71 (1.28)**
Forbs (> 0.3 m – ≤ 1 m)							
Native Forbs	29.69 (9.64)	12.88 (4.48)	2.53 (1.53)	1.77 (1.11)	4.56 (1.96)	21.08 (4.23)	8.12 (1.50)
Non-native Forbs	0.07 (0.07)	0.38 (0.38)	----	----	----	----	0.02 (0.01)
Unidentified Forbs	0.49 (0.24)	1.14 (0.44)	----	----	----	2.27 (1.53)	1.43 (0.31)
Total Forbs	**30.24 (9.58)**	**14.41 (4.84)**	**2.53 (1.53)**	**1.77 (1.11)**	**4.56 (1.96)**	**23.37 (4.56)**	**9.56 (1.63)**
Grasses (> 0.3 m – ≤ 1 m)							
Native Grasses	----	0.13 (0.13)	----	----	----	----	0.43 (0.23)
Non-native Grasses	----	----	----	----	----	----	0.08 (0.07)
Unidentified Grasses	----	----	----	----	----	----	0.40 (0.33)
Total Grasses	**----**	**0.13 (0.13)**	**----**	**----**	**----**	**----**	**0.90 (0.45)**
Grass-likes (> 0.3m – ≤ 1 m)							
Native Grass-likes	1.30 (0.79)	----	9.10 (8.36)	----	0.46 (0.30)	----	1.28 (0.42)
Non-native Grass-likes	----	----	----	----	----	----	----
Unidentified Grass-likes	----	----	----	----	----	----	----
Total Grass-likes	**1.30 (0.79)**	**----**	**9.10 (8.36)**	**----**	**0.46 (0.30)**	**----**	**1.28 (0.42)**

Table 3.10 Mean percent coverage of legumes, forbs, grasses, and grass-likes in 2 height categories along line transects originating at sample points unoccupied by gopher tortoise (*Gopherus polyphemus*) in habitat types of south Mississippi in summer 2010.

Habitat Variable	Regeneration Area (< 5 yrs)	Densely Planted Pines (> 15 yrs)	Mixed Pine Hardwood Forest (> 15 yrs)	Unmanaged Mixed Forest in Sandhills (> 15 yrs)	Planted Longleaf (> 5 – ≤ 15 yrs)	Planted Longleaf (> 15 yrs)	Natural Longleaf (> 15 yrs)
	Less[a], Moderately[b], Highly[c] Suitable Soils	Less[a], Moderately[b] Suitable Soils	Moderately[b] Suitable Soils	Moderately[b], Highly[c] Suitable Soils	Less[a], Moderately[b] Suitable Soils	Moderately[b] Suitable Soils	Less[a], Moderately[b], Highly[c] Suitable Soils
	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)
Legumes (≤ 0.3 m)							
Native Legumes	0.88 (0.34)	0.03 (0.03)	1.18 (0.37)	0.21 (0.12)	0.85 (0.40)	1.04 (0.55)	1.87 (0.32)
Non-native Legumes	----	----	----	----	----	----	----
Unidentified Legumes	0.14 (0.14)	----	0.16 (0.13)	----	----	0.28 (0.13)	0.10 (0.03)
Total Legumes	**1.02 (0.36)**	**0.03 (0.03)**	**1.33 (0.45)**	**0.21 (0.12)**	**0.85 (0.40)**	**1.32 (0.54)**	**1.97 (0.33)**
Forbs (≤ 0.3 m)							
Native Forbs	29.09 (6.23)	3.13 (0.94)	1.80 (0.57)	2.54 (1.20)	7.34 (2.62)	2.46 (0.36)	8.83 (1.18)
Non-native Forbs	0.07 (0.07)	----	----	----	----	----	0.03 (0.02)
Unidentified Forbs	1.53 (0.64)	9.61 (3.15)	0.35 (0.14)	0.25 (0.14)	0.92 (0.66)	0.35 (0.25)	1.01 (0.43)
Total Forbs	**30.49 (6.31)**	**12.74 (3.01)**	**2.14 (0.56)**	**2.79 (1.31)**	**8.24 (2.58)**	**2.80 (0.45)**	**9.86 (1.36)**
Grasses (≤ 0.3 m)							
Native Grasses	74.15 (5.84)	0.55 (0.33)	14.45 (3.63)	23.93 (7.76)	91.51 (16.56)	91.32 (9.23)	65.25 (6.23)
Non-native Grasses	2.16 (0.90)	----	0.86 (0.57)	0.05 (0.05)	26.43 (13.24)	----	0.90 (0.49)
Unidentified Grasses	6.32 (1.97)	----	0.84 (0.38)	0.25 (0.18)	0.15 (0.15)	6.60 (1.92)	0.60 (0.28)
Total Grasses	**82.62 (5.73)**	**0.55 (0.33)**	**16.15 (3.79)**	**24.24 (7.79)**	**118.10 (5.81)**	**98.42 (8.95)**	**66.91 (6.25)**
Grass-likes (≤ 0.3 m)							
Native Grass-likes	0.37 (0.23)	0.54 (0.31)	0.84 (0.63)	2.37 (1.43)	1.14 (0.63)	0.52 (0.21)	1.50 (0.82)
Non-native Grass-likes	----	----	----	----	----	----	----
Unidentified Grass-likes	----	0.03 (0.03)	----	----	----	----	0.02 (0.02)
Total Grass-likes	**0.37 (0.23)**	**0.58 (0.31)**	**0.84 (0.63)**	**2.37 (1.43)**	**1.14 (0.63)**	**0.52 (0.21)**	**1.52 (0.82)**
Legumes (> 0.3 m – ≤ 1 m)							
Native Legumes	1.35 (0.39)	----	0.29 (0.26)	0.05 (0.05)	0.16 (0.11)	1.31 (0.49)	1.90 (0.45)
Non-native Legumes	----	----	----	----	----	----	----
Unidentified Legumes	0.24 (0.13)	----	----	----	----	0.14 (0.08)	0.01 (0.01)
Total Legumes	**1.58 (0.51)**	**----**	**0.29 (0.26)**	**0.05 (0.05)**	**0.16 (0.11)**	**1.45 (0.53)**	**1.91 (0.45)**
Forbs (> 0.3 m – ≤ 1 m)							
Native Forbs	29.53 (4.24)	4.12 (1.29)	0.31 (0.20)	2.43 (1.16)	24.92 (5.54)	18.54 (3.74)	8.78 (1.54)
Non-native Forbs	0.59 (0.33)	----	----	----	----	----	----
Unidentified Forbs	1.98 (0.62)	2.48 (1.35)	0.05 (0.05)	0.05 (0.05)	2.49 (0.83)	0.84 (0.24)	0.39 (0.12)
Total Forbs	**32.09 (4.46)**	**6.60 (1.78)**	**0.37 (0.20)**	**2.48 (1.18)**	**27.43 (6.03)**	**19.36 (3.70)**	**9.18 (1.55)**
Grasses (> 0.3 m – ≤ 1 m)							
Native Grasses	2.59 (1.30)	----	----	0.10 (0.10)	----	----	0.43 (0.19)
Non-native Grasses	----	----	----	----	0.30 (0.30)	----	----
Unidentified Grasses	----	----	----	----	----	----	----

Table 3.10 (Continued)

Total Grasses	**2.59 (1.30)**	**----**	**----**	**0.10 (0.10)**	**0.30 (0.30)**	**----**	**0.43 (0.19)**
Grass-likes (> 0.3 m – ≤ 1 m)							
Native Grass-likes	----	----	----	0.05 (0.05)	----	----	0.01 (0.01)
Non-native Grass-likes	----	----	----	----	----	----	----
Unidentified Grass-likes	----	----	----	----	----	----	----
Total Grass-likes	**----**	**----**	**----**	**0.05 (0.05)**	**----**	**----**	**0.01 (0.01)**

[a]Less Suitable may include these soils or soil associations: Cahaba, Lucedale, Ruston, Smithdale-Lucy, Smithdale
[b]Moderately Suitable may include these soils or soil associations: Benndale, Benndale-Smithdale, Heidel, Jena-Bigbee, McLaurin-Benndale, McLaurin-Lucy, McLaurin
[c]Highly Suitable may include these soils or soil associations: Alaga, Bassfield, Latonia, Latonia-Trebloc, Wadley-Boykin, Wadley

Table 3.11 Mean percent coverage of non-native herbaceous plants in 2 height categories along line transects originating at active burrows of gopher tortoise (*Gopherus polyphemus*) and sample points unoccupied by gopher tortoise in habitat types of south Mississippi during summer 2010.

Non-native Plants Within Height Categories	Percent Coverage of Non-native Plants at Active Burrow and Non-burrow Locations							
	Regeneration Area (< 5 yrs)	Early Successional Habitat	Densely Planted Pine (> 15 yrs)	Mixed Pine Hardwood Forest (> 15 yrs)	Unmanaged Mixed Forest in Sandhills (> 15 yrs)	Planted Longleaf (> 5 – ≤ 15 yrs)	Planted Longleaf (> 15 yrs)	Natural Longleaf (> 15 yrs)
	Less[a], Moderately[b], Highly[c] Suitable Soils	Less[a], Moderately[b] Suitable Soils	Less[a], Moderately[b] Suitable Soils	Moderately[b] Suitable Soils	Moderately[b], Highly[c] Suitable Soils	Less[a], Moderately[b] Suitable Soils	Moderately[b] Suitable Soils	Less[a], Moderately[b], Highly[c] Suitable Soils
	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)
Active Burrow Locations								
(≤ 0.3 m)								
Cogongrass	----	3.07 (3.07)	No Sample Points	----	----	----	----	0.37 (0.24)
Other Grasses[a]	2.35 (2.35)	15.78 (6.47)	No Sample Points	----	----	17.42 (17.42)	----	5.42 (1.76)
Forbs, Legumes[b]	----	1.18 (1.18)	No Sample Points	----	----	----	----	0.24 (0.17)
(> 0.3 m – ≤ 1 m)								
Cogongrass	----	----	No Sample Points	----	----	----	----	----
Other Grasses[a]	----	----	No Sample Points	----	----	----	----	0.08 (0.07)
Forbs, Legumes[b]	0.07 (0.07)	0.38 (0.38)	No Sample Points	----	----	----	----	0.53 (0.25)
Non-burrow Locations								
(≤ 0.3 m)								
Cogongrass	----	No Sample Points	----	0.86 (0.57)	0.05 (0.05)	25.52 (13.08)	0.48 (0.48)	0.59 (0.46)
Other Grasses[a]	2.16 (0.90)	No Sample Points	----	0.86 (0.57)	0.05 (0.05)	26.43 (13.24)	0.48 (0.48)	0.90 (0.50)
Forbs, Legumes[b]	0.07 (0.07)	No Sample Points	----	----	----	----	----	0.03 (0.02)
(> 0.3 m – ≤ 1 m)								
Cogongrass	----	No Sample Points	----	----	----	----	----	----
Other Grasses[a]	----	No Sample Points	----	----	----	0.30 (0.30)	----	----
Forbs, Legumes[b]	0.60 (0.33)	No Sample Points	----	----	----	----	----	----

[a]Less Suitable may include these soils or soil associations: Cahaba, Lucedale, Ruston, Smithdale-Lucy, Smithdale
[b]Moderately Suitable may include these soils or soil associations: Benndale, Benndale-Smithdale, Heidel, Jena-Bigbee, McLaurin-Benndale, McLaurin-Lucy, McLaurin
[c]Highly Suitable may include these soils or soil associations: Alaga, Bassfield, Lakeland, Latonia, Latonia-Trebloc, Wadley-Boykin, Wadley

Table 3.12 Mean percent coverage of shrubs, vines, and trees in 3 height categories along line transects originating at active burrows of gopher tortoise (*Gopherus polyphemus*) in habitat types of south Mississippi in summer 2010.

Habitat Variable	**Regeneration Area (< 5 yrs)**	**Early Successional Habitat**	**Mixed Pine Hardwood Forest (> 15 yrs)**	**Unmanaged Mixed Forest in Sandhills (> 15 yrs)**	**Planted Longleaf (> 5 – ≤ 15 yrs)**	**Planted Longleaf (> 15 yrs)**	**Natural Longleaf (> 15 yrs)**
	Less[a], Moderately[b], Highly[c] Suitable Soils	**Less[a], Moderately[b] Suitable Soils**	**Moderately[b] Suitable Soils**	**Moderately[b], Highly[c] Suitable Soils**	**Less[a], Moderately[b] Suitable Soils**	**Moderately[b] Suitable Soils**	**Less[a], Moderately[b], Highly[c] Suitable Soils**
	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)
Shrubs (≤ 0.3 m)							
Native Shrubs	8.13 (4.76)	3.66 (1.55)	5.57 (0.53)	2.80 (1.66)	6.98 (3.73)	1.78 (0.94)	9.65 (1.58)
Non-native Shrubs	----	----	----	----	----	----	----
Unidentified Shrubs	----	----	----	----	----	----	1.22 (0.49)
Total Shrubs	**8.13 (4.76)**	**3.66 (1.55)**	**5.57 (0.53)**	**2.80 (1.66)**	**6.98 (3.73)**	**1.78 (0.94)**	**10.87 (1.75)**
Vines (≤ 0.3 m)							
Native Vines	12.87 (3.90)	13.14 (4.69)	44.43 (19.69)	11.60 (9.44)	9.54 (0.98)	2.53 (1.15)	8.81 (1.29)
Non-native Vines	----	----	----	----	0.16 (0.16)	----	0.10 (0.10)
Unidentified Vines	----	----	0.27 (0.27)	----	----	----	0.17 (0.09)
Total Vines	**12.87 (3.90)**	**13.14 (4.69)**	**44.67 (19.89)**	**11.60 (9.44)**	**9.68 (0.98)**	**2.53 (1.15)**	**9.08 (1.32)**
Trees (≤ 0.3 m)							
Native Trees	1.66 (0.87)	1.18 (0.47)	5.07 (2.68)	----	0.92 (0.55)	4.03 (1.44)	3.34 (0.52)
Non-native Trees	----	----	----	----	----	----	----
Unidentified Trees	----	0.17 (0.17)	----	----	----	----	----
Total Trees	**1.66 (0.87)**	**1.34 (0.51)**	**5.07 (2.68)**	**----**	**0.92 (0.55)**	**4.03 (1.44)**	**3.34 (0.52)**
Shrubs (> 0.3 m – ≤ 1 m)							
Native Shrubs	10.82 (2.94)	8.50 (2.95)	32.33 (17.46)	14.13 (5.59)	8.18 (5.17)	14.52 (3.05)	15.43 (1.64)
Non-native Shrubs	----	0.76 (0.55)	----	----	----	1.02 (1.02)	0.11 (0.06)
Unidentified Shrubs	0.96 (0.96)	----	----	2.27 (2.27)	----	----	0..07 (0.05)
Total Shrubs	**11.78 (2.82)**	**9.26 (3.15)**	**32.33 (17.46)**	**16.43 (6.89)**	**8.18 (5.17)**	**15.52 (2.63)**	**15.60 (1.63)**
Vines (> 0.3 m – ≤ 1 m)							
Native Vines	22.58 (5.14)	8.46 (2.96)	29.80 (21.88)	----	2.56 (1.84)	3.30 (1.28)	2.67 (0.51)
Non-native Vines	----	----	----	----	----	----	0.08 (0.08)
Unidentified Vines	1.24 (1.24)	----	----	----	----	----	0.01 (0.01)
Total Vines	**23.83 (5.38)**	**8.46 (2.96)**	**29.80 (21.88)**	**----**	**2.56 (1.84)**	**3.30 (1.28)**	**2.76 (0.55)**
Trees (> 0.3 m – ≤ 1 m)							
Native Trees	6.83 (3.00)	4.09 (1.04)	18.43 (10.71)	3.53 (3.14)	5.46 (2.28)	9.98 (3.02)	9.14 (1.23)
Non-native Trees	0.68 (0.47)	----	0.50 (0.50)	----	----	----	----
Unidentified Trees	----	----	----	----	----	----	0.14 (0.10)
Total Trees	**7.51 (2.87)**	**4.09 (1.04)**	**18.93 (11.15)**	**3.53 (3.14)**	**5.46 (2.28)**	**9.98 (3.02)**	**9.28 (1.24)**
Shrubs (> 1 m)							
Native Shrubs	3.57 (1.57)	1.34 (0.78)	19.70 (11.37)	8.60 (7.48)	7.12 (2.27)	----	7.26 (1.93)
Non-native Shrubs	----	0.38 (0.38)	----	----	----	1.27 (1.27)	0.06 (0.06)
Unidentified Shrubs	----	----	----	----	----	----	0.21 (0.16)
Total Shrubs	**3.57 (1.57)**	**1.72 (0.83)**	**19.70 (11.37)**	**8.60 (7.48)**	**7.12 (2.27)**	**1.27 (1.27)**	**7.53 (2.01)**
Vines (> 1 m)							
Native Vines	1.30 (0.79)	----	9.10 (8.36)	----	0.46 (0.30)	----	1.28 (0.42)
Non-native Vines	----	----	----	----	----	----	----
Unidentified Vines	----	----	----	----	----	----	----
Total Vines	**1.30 (0.79)**	**----**	**9.10 (8.36)**	**----**	**0.46 (0.30)**	**----**	**1.28 (0.42)**
Trees (> 1 m)							
Native Trees	9.44 (4.42)	23.96 (6.71)	61.10 (8.66)	44.43 (14.94)	21.54 (7.33)	63.77 (8.83)	43.48 (3.43)

Table 3.12 (Continued)

Non-native Trees	----	----	----	----	0.90 (0.90)	----	----
Unidentified Trees	----	----	----	----	----	----	0.09 (0.09)
Total Trees	**9.44 (4.42)**	**23.96 (6.71)**	**61.10 (8.66)**	**44.43 (14.94)**	**22.44 (7.87)**	**63.77 (8.83)**	**43.57 (3.42)**

[a]Less Suitable may include these soils or soil associations: Cahaba, Lucedale, Ruston, Smithdale-Lucy, Smithdale
[b]Moderately Suitable may include these soils or soil associations: Benndale, Benndale-Smithdale, Heidel, Jena-Bigbee, McLaurin-Benndale, McLaurin-Lucy, McLaurin
[c]Highly Suitable may include these soils or soil associations: Alaga, Bassfield, Heidel, Lakeland, Latonia, Wadley-Boykin, Wadley

Table 3.13 Mean percent coverage of shrubs, vines, and trees in 3 height categories along line transects originating at sample points unoccupied by gopher tortoise (*Gopherus polyphemus*) in habitat types of south Mississippi in summer 2010.

Habitat Variable	Regeneration Area (< 5 yrs)	Densely Planted Pine (> 15 yrs)	Mixed Pine Hardwood Forest (> 15 yrs)	Unmanaged Mixed Forest in Sandhills (> 15 yrs)	Planted Longleaf (> 5 – ≤ 15 yrs)	Planted Longleaf (> 15 yrs)	Natural Longleaf (> 15 yrs)
	Less[a], Moderately[b], Highly[c] Suitable Soils	**Less[a], Moderately[b] Suitable Soils**	**Moderately[b] Suitable Soils**	**Moderately[b], Highly[c] Suitable Soils**	**Less[a], Moderately[b] Suitable Soils**	**Moderately[b] Suitable Soils**	**Less[a], Moderately[b], Highly[c] Suitable Soils**
	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)
Shrubs (≤ 0.3 m)							
Native Shrubs	12.94 (3.45)	1.09 (0.36)	12.61 (2.64)	5.80 (1.66)	2.29 (0.93)	1.48 (0.56)	11.94 (1.88)
Non-native Shrubs	----	0.61 (0.31)	0.16 (0.16)	----	----	----	----
Unidentified Shrubs	----	----	----	----	----	----	0.34 (0.13)
Total Shrubs	**12.94 (3.45)**	**1.70 (0.48)**	**12.77 (2.63)**	**5.80 (1.66)**	**2.29 (0.93)**	**1.48 (0.56)**	**12.28 (1.91)**
Vines (≤ 0.3 m)							
Native Vines	11.70 (2.18)	40.70 (10.26)	26.41 (6.95)	7.34 (1.87)	11.43 (4.12)	6.31 (2.25)	18.66 (2.67)
Non-native Vines	0.07 (0.04)	6.30 (3.65)	4.55 (3.26)	----	----	----	0.01 (0.01)
Unidentified Vines	0.12 (0.10)	----	0.03 (0.03)	0.71 (0.51)	0.08 (0.08)	----	0.01 (0.01)
Total Vines	**11.88 (2.18)**	**47.0 (11.70)**	**30.98 (7.90)**	**8.04 (1.82)**	**11.51 (4.12)**	**6.31 (2.25)**	**17.77 (2.58)**
Trees (≤ 0.3 m)							
Native Trees	2.87 (1.11)	0.44 (0.27)	6.01 (0.94)	0.87 (0.55)	----	1.35 (0.39)	3.39 (0.70)
Non-native Trees	----	----	----	----	----	----	----
Unidentified Trees	----	----	----	----	----	0.04 (0.04)	----
Total Trees	**2.87 (1.11)**	**0.44 (0.27)**	**6.01 (0.94)**	**0.87 (0.55)**	**----**	**1.39 (0.39)**	**3.39 (0.70)**
Shrubs (> 0.3 m – ≤ 1 m)							
Native Shrubs	18.97 (3.11)	6.37 (1.86)	27.79 (4.21)	44.81 (9.87)	18.70 (6.97)	38.36 (6.60)	30.37 (2.89)
Non-native Shrubs	0.03 (0.03)	1.67 (0.87)	0.23 (0.23)	----	----	0.04 (0.04)	0.01 (0.01)
Unidentified Shrubs	0.03 (0.03)	0.15 (0.15)	----	----	0.15 (0.15)	----	0.19 (0.13)
Total Shrubs	**19.03 (3.10)**	**8.18 (2.13)**	**28.02 (4.22)**	**44.81 (9.87)**	**18.85 (6.93)**	**38.40 (6.62)**	**30.56 (2.89)**
Vines (> 0.3 m – ≤ 1 m)							
Native Vines	10.31 (2.38)	28.81 (8.70)	7.68 (2.14)	1.31 (0.65)	10.23 (5.53)	11.88 (2.61)	2.27 (0.47)
Non-native Vines	----	2.64 (1.09)	1.20 (1.20)	----	----	----	0.01 (0.01)
Unidentified Vines	----	----	----	----	0.08 (0.08)	----	----
Total Vines	**10.31 (2.38)**	**31.46 (9.00)**	**8.88 (2.63)**	**1.31 (0.65)**	**10.31 (5.60)**	**11.88 (2.61)**	**2.28 (0.48)**
Trees (> 0.3 m – ≤ 1 m)							
Native Trees	5.24 (0.90)	0.97 (0.73)	16.89 (3.88)	13.34 (10.54)	2.04 (0.65)	5.47 (1.91)	8.99 (1.50)
Non-native Trees	----	0.12 (0.12)	----	----	----	----	----
Unidentified Trees	----	0.06 (0.06)	----	----	----	----	----
Total Trees	**5.24 (0.90)**	**1.15 (0.73)**	**16.92 (3.89)**	**13.34 (10.54)**	**2.04 (0.65)**	**5.47 (1.91)**	**8.99 (1.50)**
Shrubs (> 1 m)							
Native Shrubs	4.85 (1.74)	22.33 (5.98)	42.97 (6.99)	35.20 (8.31)	6.29 (4.26)	----	7.50 (1.87)
Non-native Shrubs	0.47 (0.38)	16.18 (5.88)	1.33 (1.18)	----	----	----	----
Unidentified Shrubs	----	----	----	----	----	----	----
Total Shrubs	**5.32 (1.76)**	**38.51 (9.66)**	**17.03 (5.09)**	**35.20 (8.31)**	**6.29 (4.26)**	**----**	**7.50 (1.87)**
Vines (> 1 m)							
Native Vines	1.60 (0.84)	11.86 (3.20)	4.70 (1.64)	1.27 (0.78)	2.20 (1.70)	1.48 (0.95)	1.99 (1.08)
Non-native Vines	----	1.43 (0.94)	1.10 (0.94)	----	----	----	----
Unidentified Vines	----	----	----	----	----	----	----
Total Vines	**1.60 (0.84)**	**13.28 (3.28)**	**5.80 (1.90)**	**1.27 (0.78)**	**2.20 (1.70)**	**1.48 (0.95)**	**1.99 (1.08)**
Trees (> 1 m)							
Native Trees	9.92 (2.22)	93.39 (2.85)	145.79 (11.78)	110.75 (15.80)	23.18 (4.50)	67.15 (5.99)	73.87 (5.42)

Table 3.13 (Continued)

Non-native Trees	----	----	----	----	----	----	----
Unidentified Trees	----	----	----	----	----	----	----
Total Trees	**9.92 (2.22)**	**93.39 (2.85)**	**145.79 (11.78)**	**110.75 (15.80)**	**23.18 (4.50)**	**67.15 (5.99)**	**73.87 (5.42)**

[a]Less Suitable may include these soils or soil associations: Cahaba, Lucedale, Ruston, Smithdale-Lucy, Smithdale
[b]Moderately Suitable may include these soils or soil associations: Benndale, Benndale-Smithdale, Heidel, Jena-Bigbee, McLaurin-Benndale, McLaurin-Lucy, McLaurin
[c]Highly Suitable may include these soils or soil associations: Alaga, Bassfield, Latonia, Latonia-Trebloc, Wadley-Boykin, Wadley

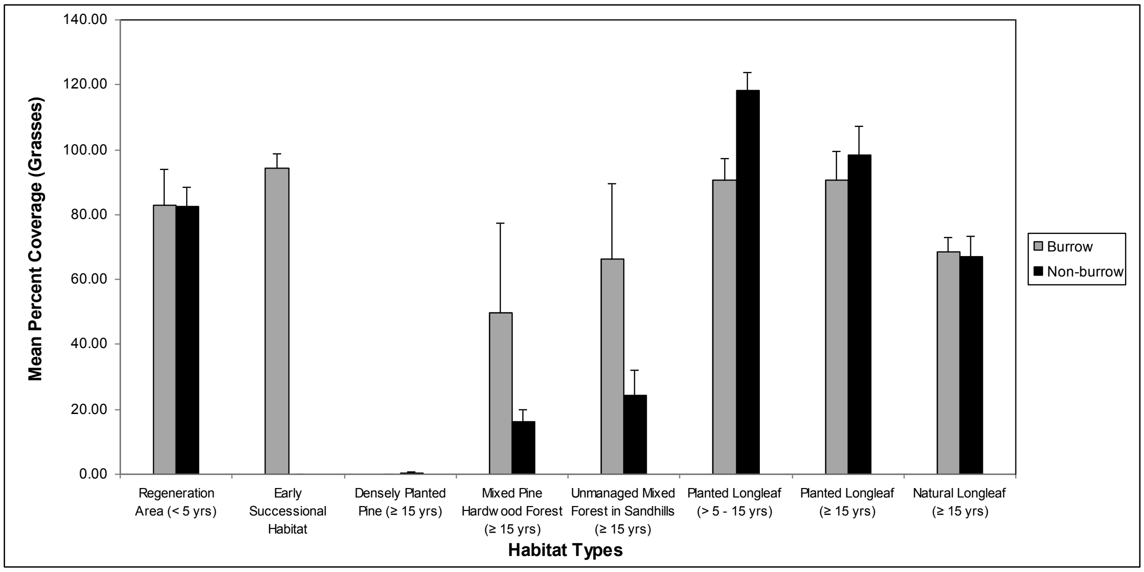

Figure 3.1 Mean percent coverage of all grasses in the ≤ 0.3 m height category along line transects originating at active gopher tortoise (*Gopherus polyphemus*) burrows and sample points unoccupied by gopher tortoise on public and private lands in habitat types of south Mississippi during summer 2010.

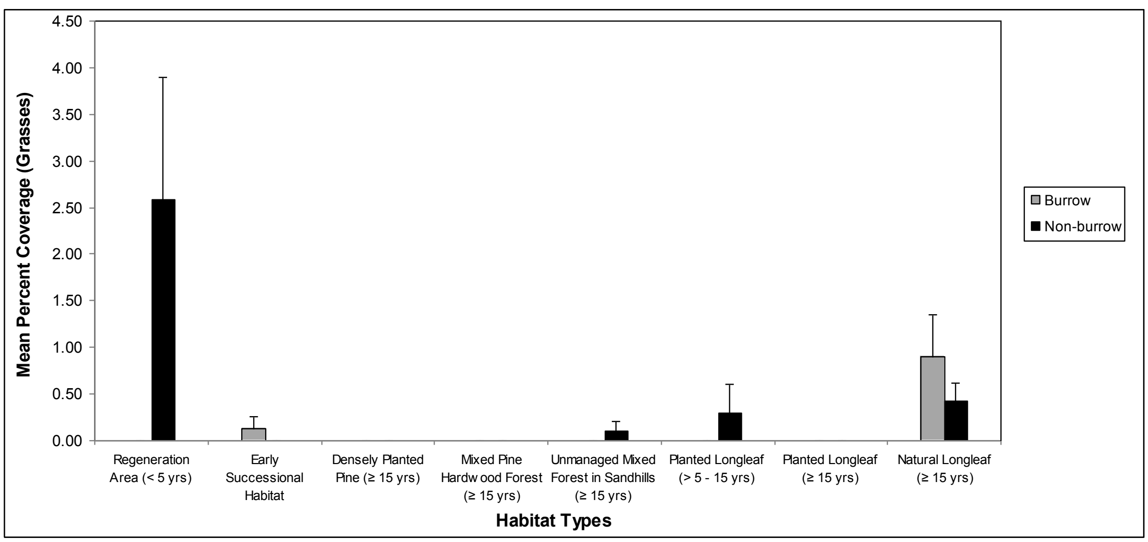

Figure 3.2 Mean percent coverage of all grasses in the > 0.3 m – ≤ 1 m height category along line transects originating at active gopher tortoise (*Gopherus polyphemus*) burrows and sample points unoccupied by gopher tortoise on public and private lands in habitat types of south Mississippi during summer 2010.

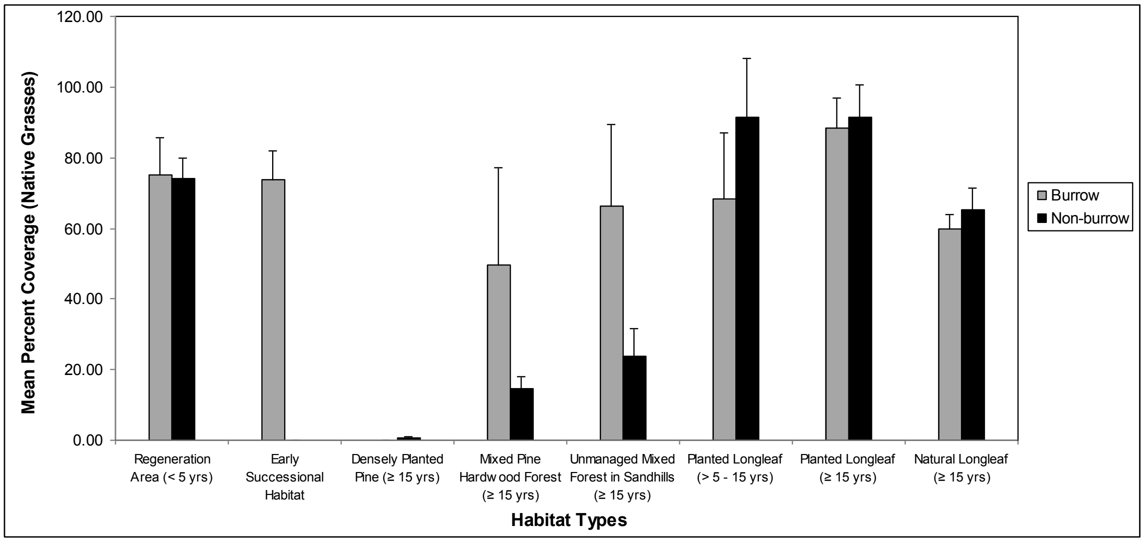

Figure 3.3 Mean percent coverage of native grasses in the ≤ 0.3 m height category along line transects originating at active gopher tortoise (*Gopherus polyphemus*) burrows and sample points unoccupied by gopher tortoise on public and private lands in habitat types of south Mississippi during summer 2010.

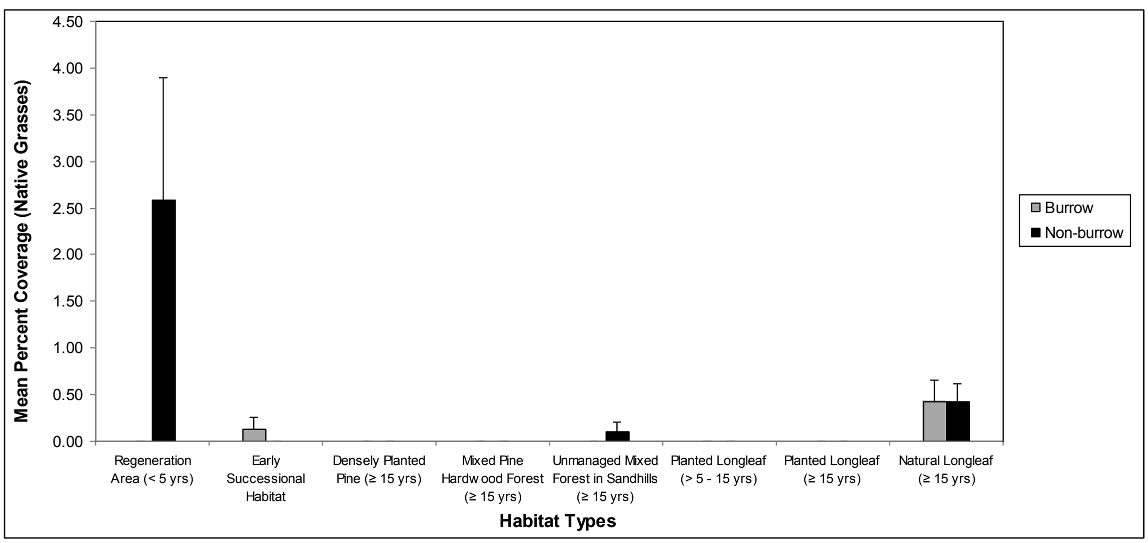

Figure 3.4 Mean percent coverage of native grasses in the > 0.3 m – ≤ 1 m height category along line transects originating at active gopher tortoise (*Gopherus polyphemus*) burrows and sample points unoccupied by gopher tortoise on public and private lands in habitat types of south Mississippi during summer 2010.

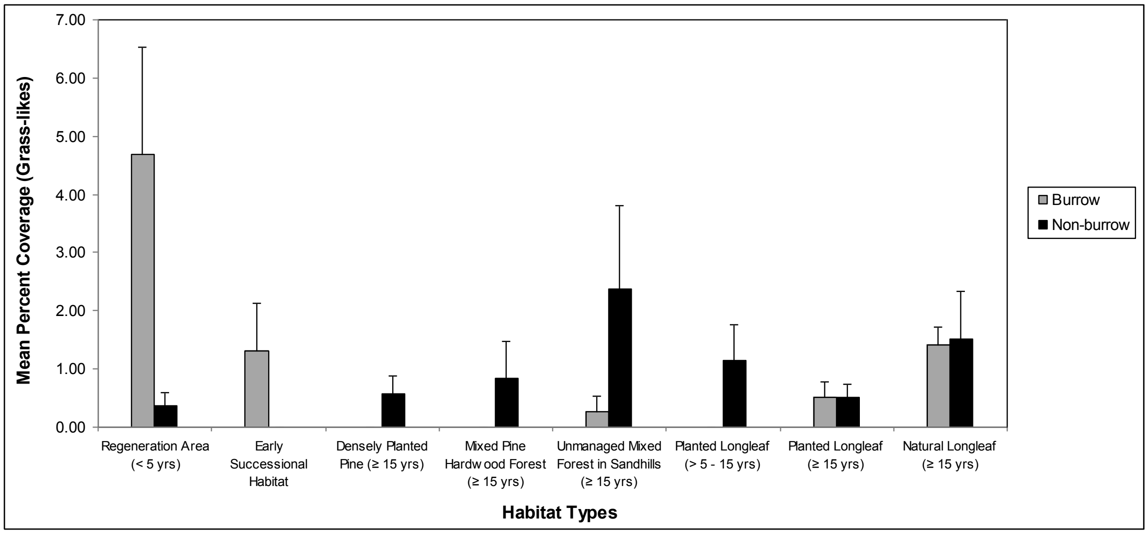

Figure 3.5 Mean percent coverage of all grass-likes in the ≤ 0.3 m height category along line transects originating at active gopher tortoise (*Gopherus polyphemus*) burrows and sample points unoccupied by gopher tortoise on public and private lands in habitat types of south Mississippi during summer 2010.

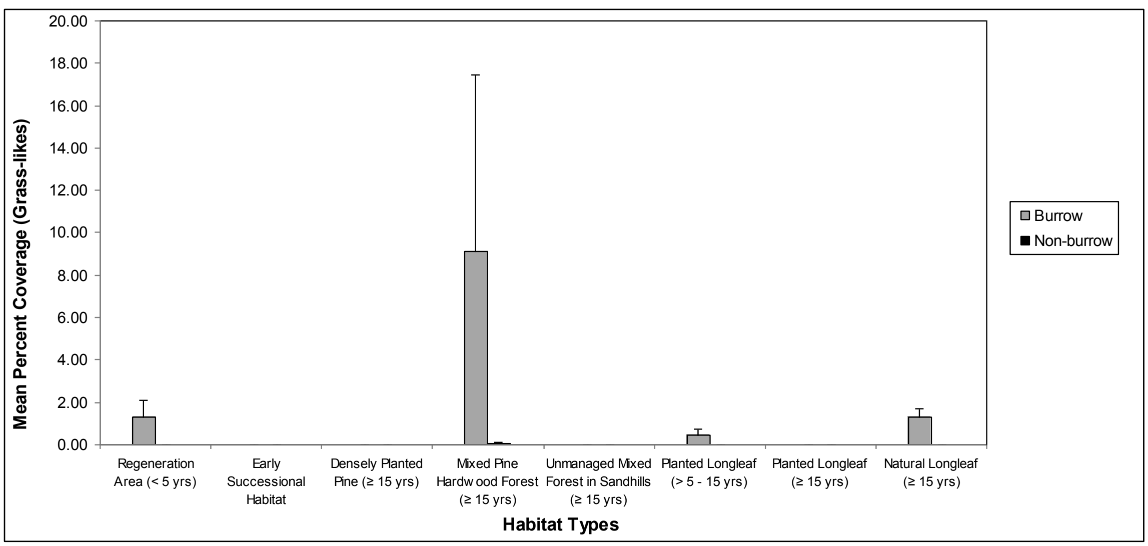

Figure 3.6 Mean percent coverage of all grass-likes in the > 0.3 m – ≤ 1 m height category along line transects originating at active gopher tortoise (*Gopherus polyphemus*) burrows and sample points unoccupied by gopher tortoise on public and private lands in habitat types of south Mississippi during summer 2010.

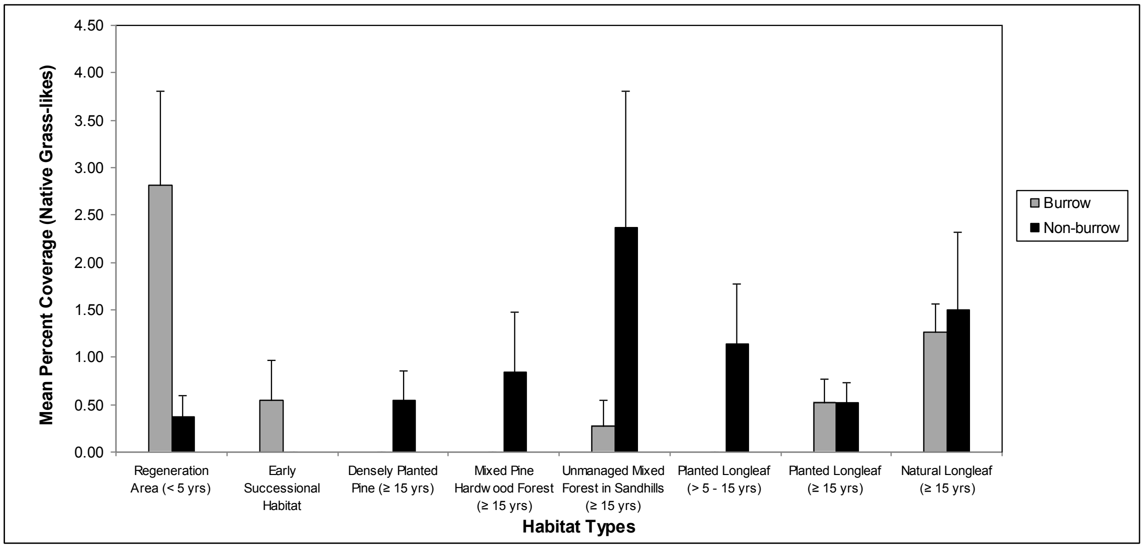

Figure 3.7 Mean percent coverage of native grass-likes in the ≤ 0.3 m height category along line transects originating at active gopher tortoise (*Gopherus polyphemus*) burrows and sample points unoccupied by gopher tortoise on public and private lands in habitat types of south Mississippi during summer 2010.

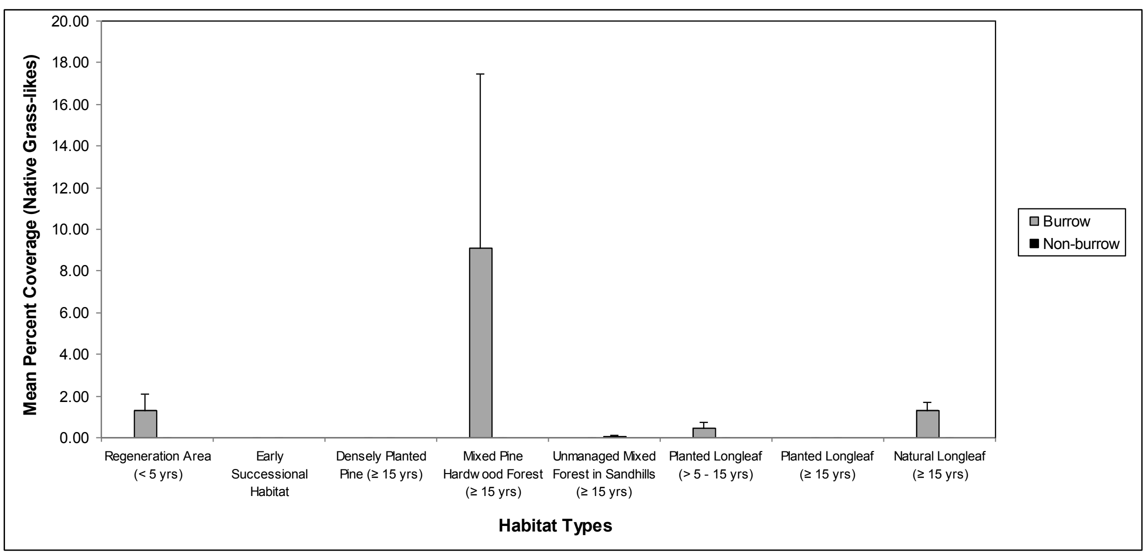

Figure 3.8 Mean percent coverage of native grass-likes in the > 0.3 m – ≤ 1 m height category along line transects originating at active gopher tortoise (*Gopherus polyphemus*) burrows and sample points unoccupied by gopher tortoise on public and private lands in habitat types of south Mississippi during summer 2010.

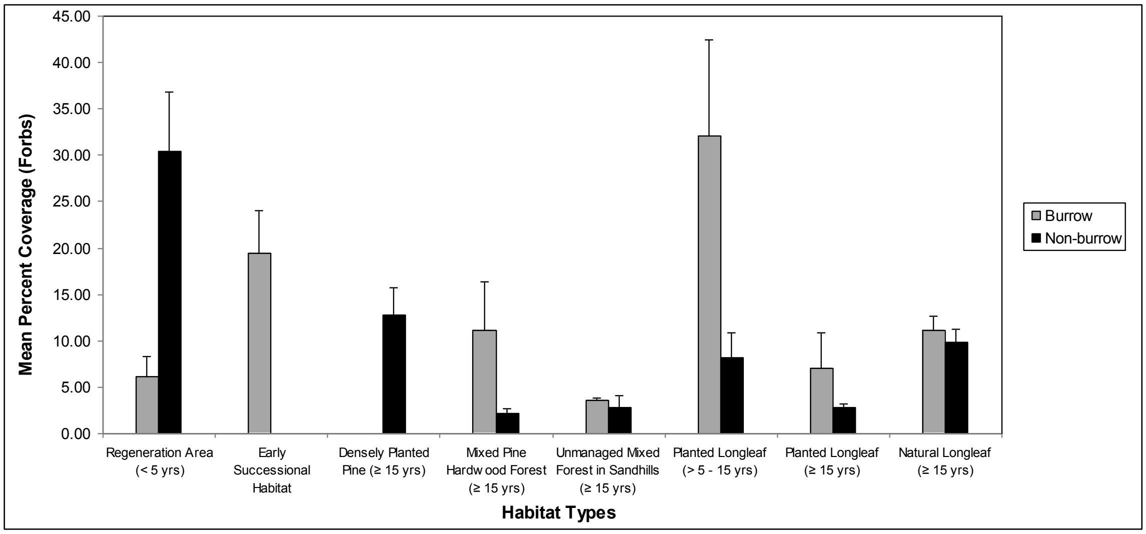

Figure 3.9 Mean percent coverage of all forbs in the ≤ 0.3 m height category along line transects originating at active gopher tortoise (*Gopherus polyphemus*) burrows and sample points unoccupied by gopher tortoise on public and private lands in habitat types of south Mississippi during summer 2010.

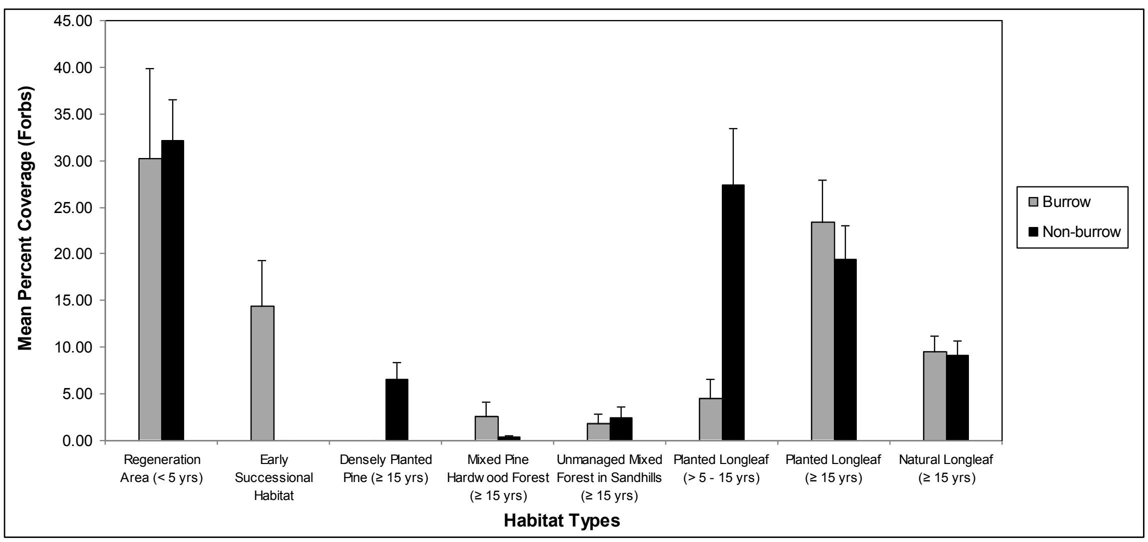

Figure 3.10 Mean percent coverage of all forbs in the > 0.3 m – ≤ 1 m height category along line transects originating at active gopher tortoise (*Gopherus polyphemus*) burrows and sample points unoccupied by gopher tortoise on public and private lands in habitat types of south Mississippi during summer 2010.

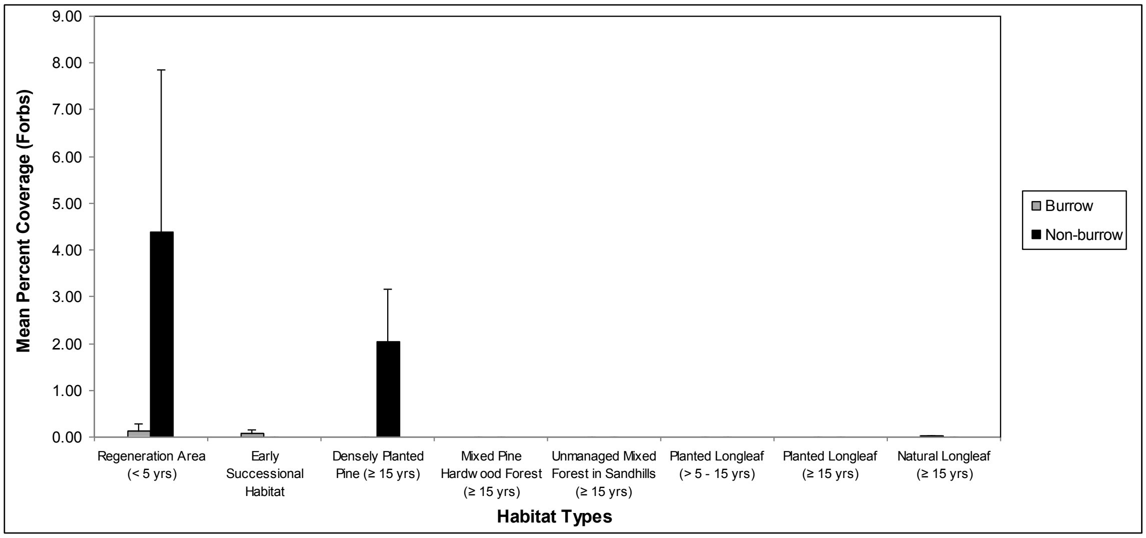

Figure 3.11 Mean percent coverage of all forbs in the > 1 m height category along line transects originating at active gopher tortoise (*Gopherus polyphemus*) burrows and sample points unoccupied by gopher tortoise on public and private lands in habitat types of south Mississippi during summer 2010.

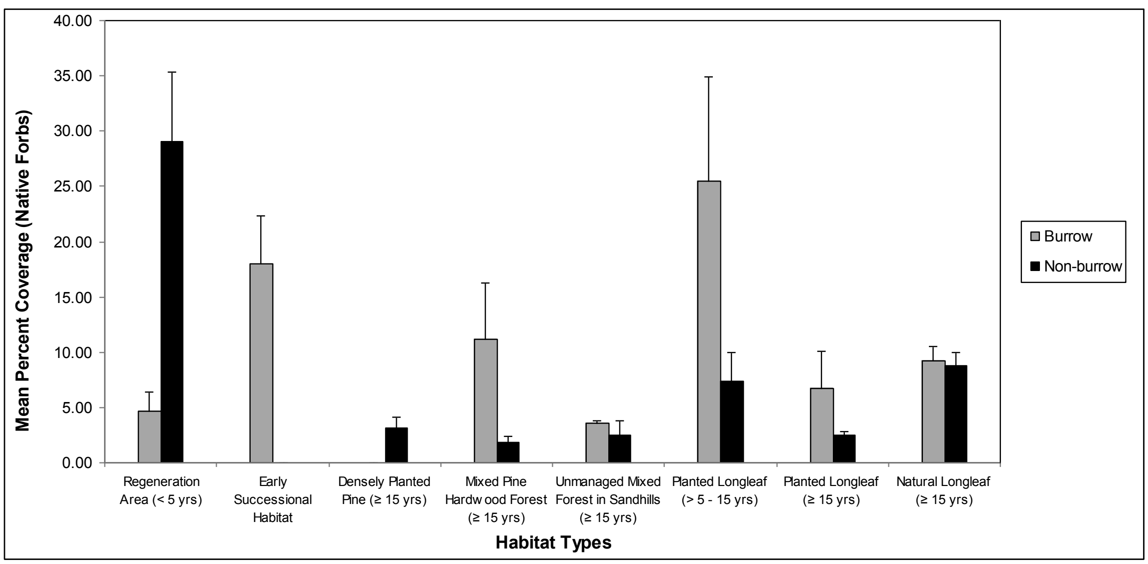

Figure 3.12 Mean percent coverage of native forbs in the ≤ 0.3 m height category along line transects originating at active gopher tortoise (*Gopherus polyphemus*) burrows and sample points unoccupied by gopher tortoise on public and private lands in habitat types of south Mississippi during summer 2010.

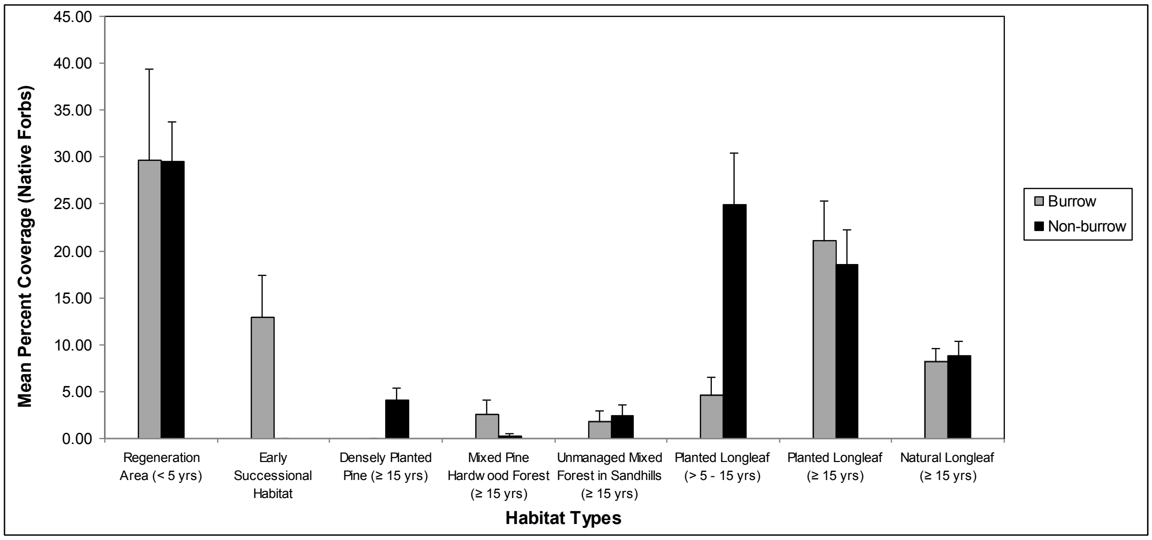

Figure 3.13 Mean percent coverage of native forbs in the > 0.3 m – ≤ 1 m height category along line transects originating at active gopher tortoise (*Gopherus polyphemus*) burrows and sample points unoccupied by gopher tortoise on public and private lands in habitat types of south Mississippi during summer 2010.

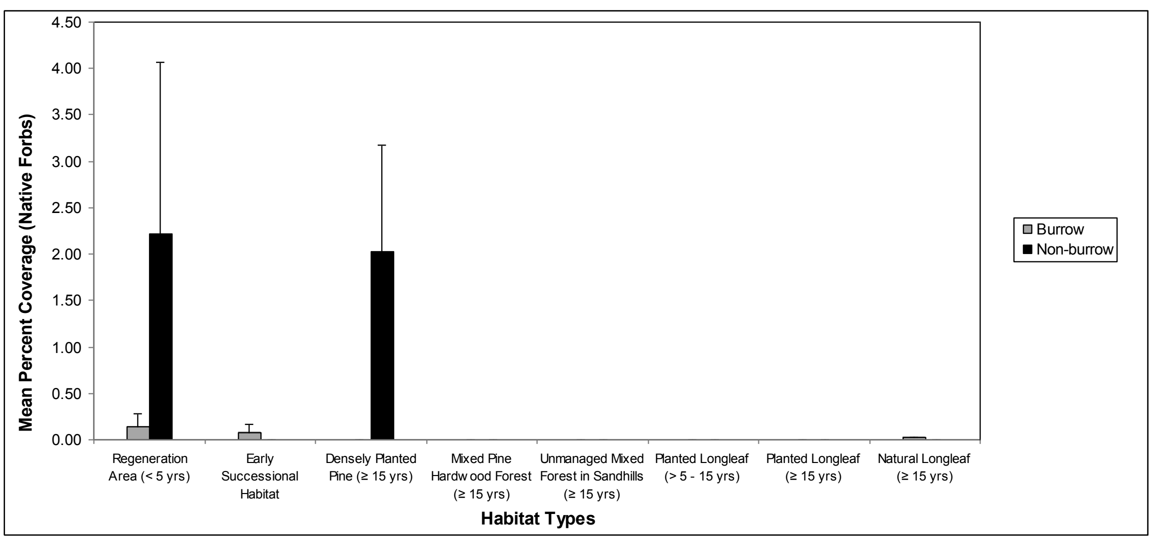

Figure 3.14 Mean percent coverage of native forbs in the > 1 m height category along line transects originating at active gopher tortoise (*Gopherus polyphemus*) burrows and sample points unoccupied by gopher tortoise on public and private lands in habitat types of south Mississippi during summer 2010.

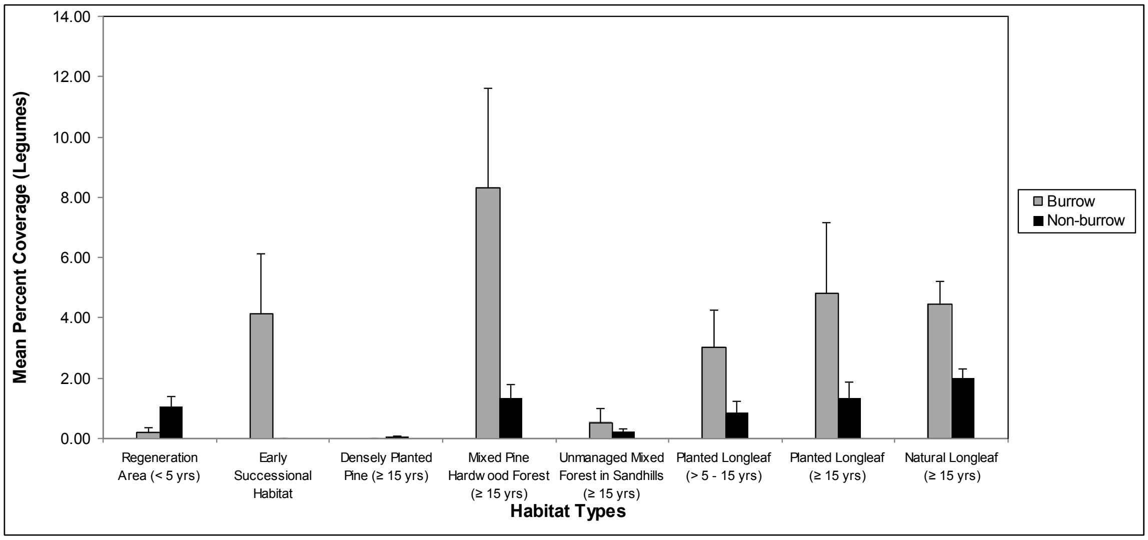

Figure 3.15 Mean percent coverage of all legumes in the ≤ 0.3 m height category along line transects originating at active gopher tortoise (*Gopherus polyphemus*) burrows and sample points unoccupied by gopher tortoise on public and private lands in habitat types of south Mississippi during summer 2010.

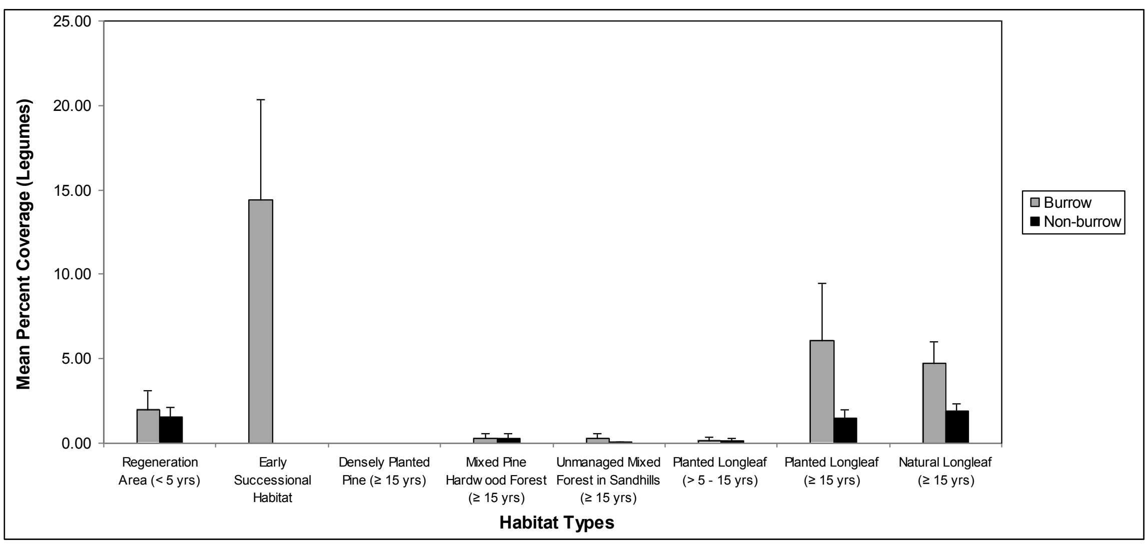

Figure 3.16 Mean percent coverage of all legumes in the > 0.3 m – ≤ 1 m height category along line transects originating at active gopher tortoise (*Gopherus polyphemus*) burrows and sample points unoccupied by gopher tortoise on public and private lands in habitat types of south Mississippi during summer 2010.

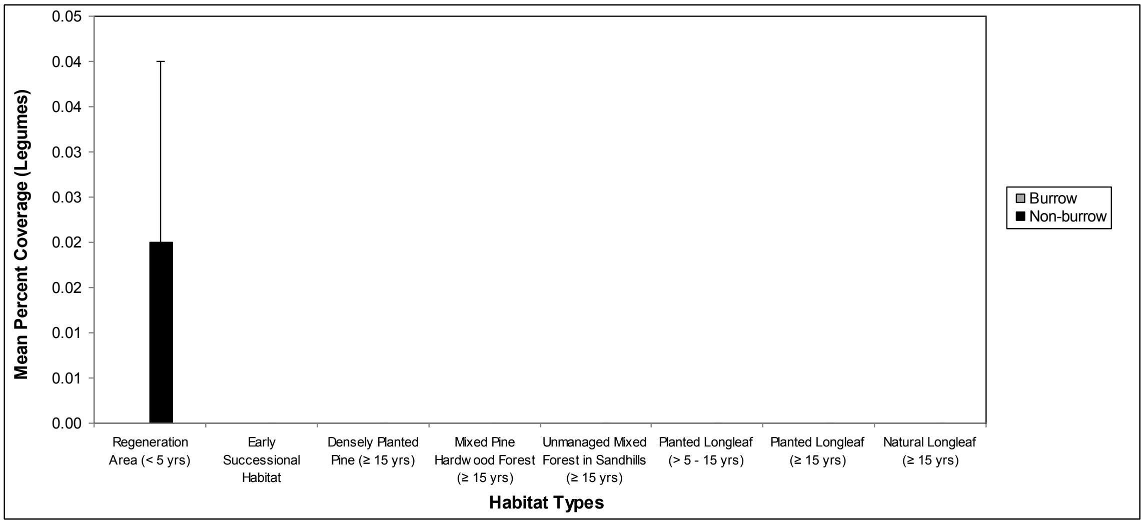

Figure 3.17 Mean percent coverage of all legumes in the > 1 m height category along line transects originating at active gopher tortoise (*Gopherus polyphemus*) burrows and sample points unoccupied by gopher tortoise on public and private lands in habitat types of south Mississippi during summer 2010.

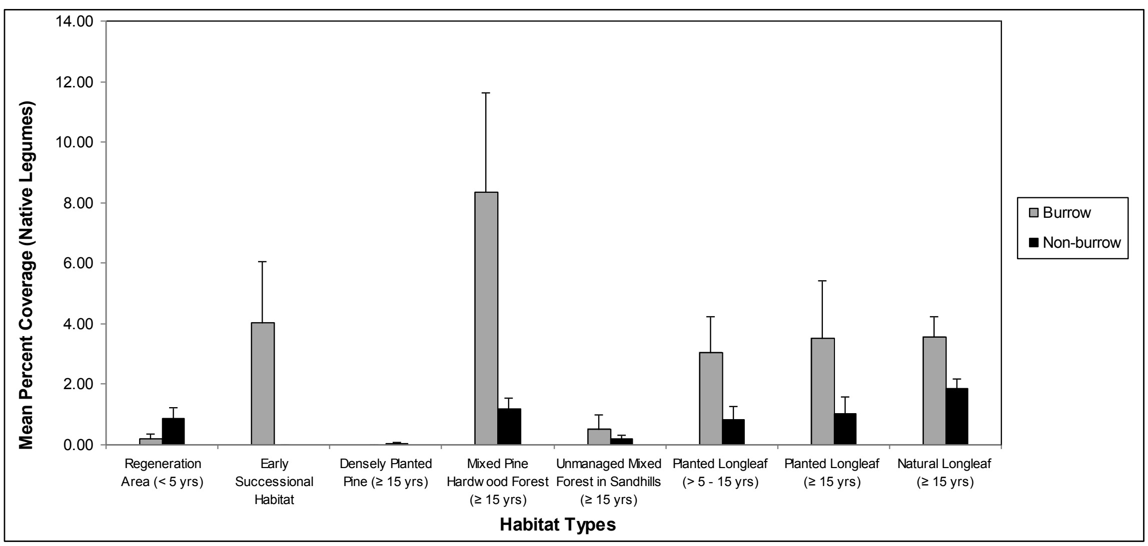

Figure 3.18 Mean percent coverage of native legumes in the ≤ 0.3 m height category along line transects originating at active gopher tortoise (*Gopherus polyphemus*) burrows and sample points unoccupied by gopher tortoise onpublic and private lands in habitat types of south Mississippi during summer 2010.

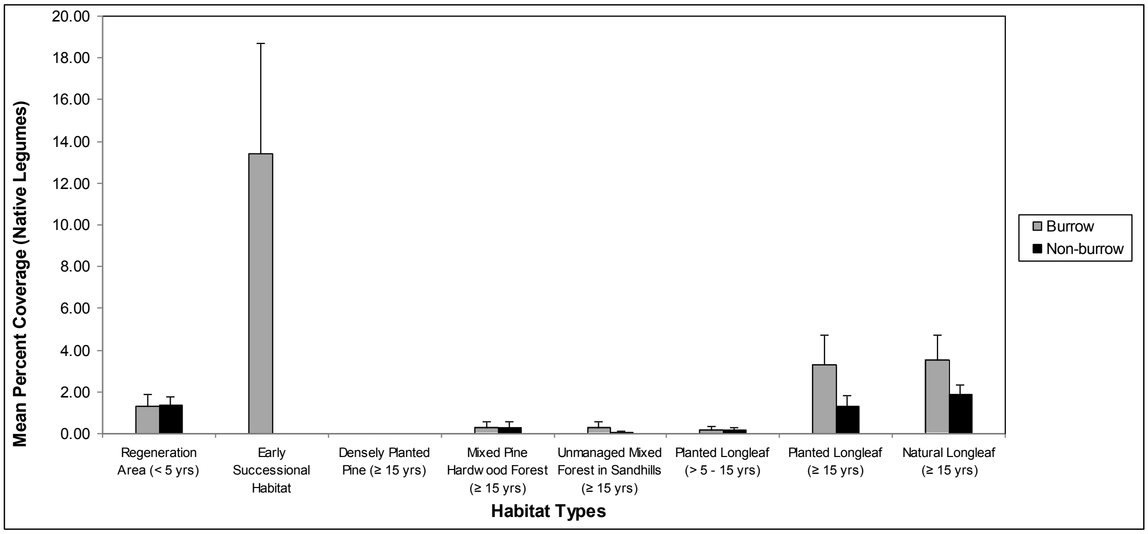

Figure 3.19 Mean percent coverage of native legumes in the > 0.3 m – ≤ 1 m height category along line transects originating at active gopher tortoise (*Gopherus polyphemus*) burrows and sample points unoccupied by gopher tortoise on public and private lands in habitat types of south Mississippi during summer 2010.

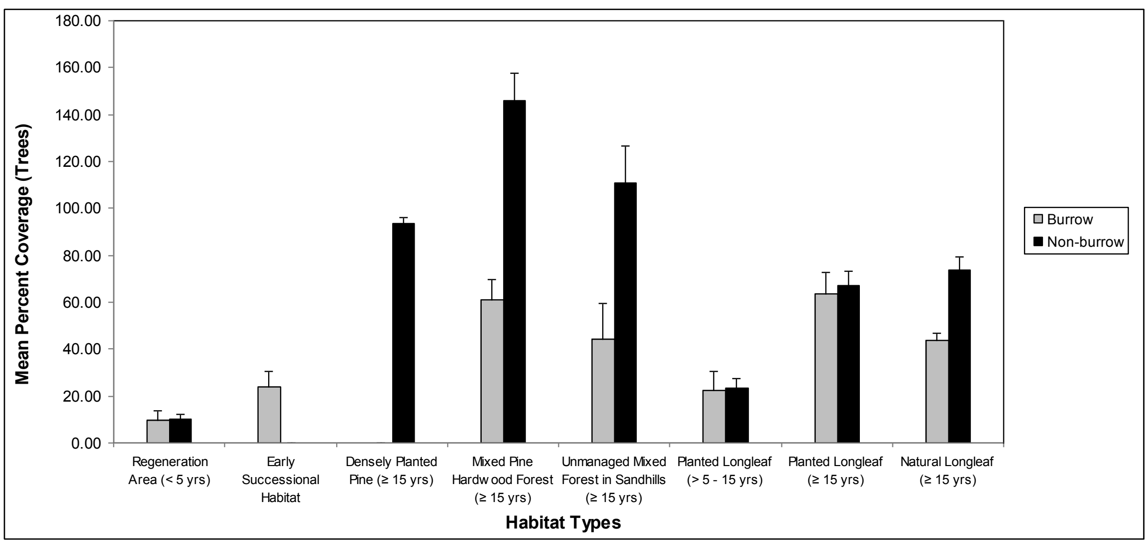

Figure 3.20 Mean percent coverage of all trees in the > 1 m height category along line transects originating at active gopher tortoise (*Gopherus polyphemus*) burrows and sample points unoccupied by gopher tortoise on public and private lands in habitat types of south Mississippi during summer 2010.

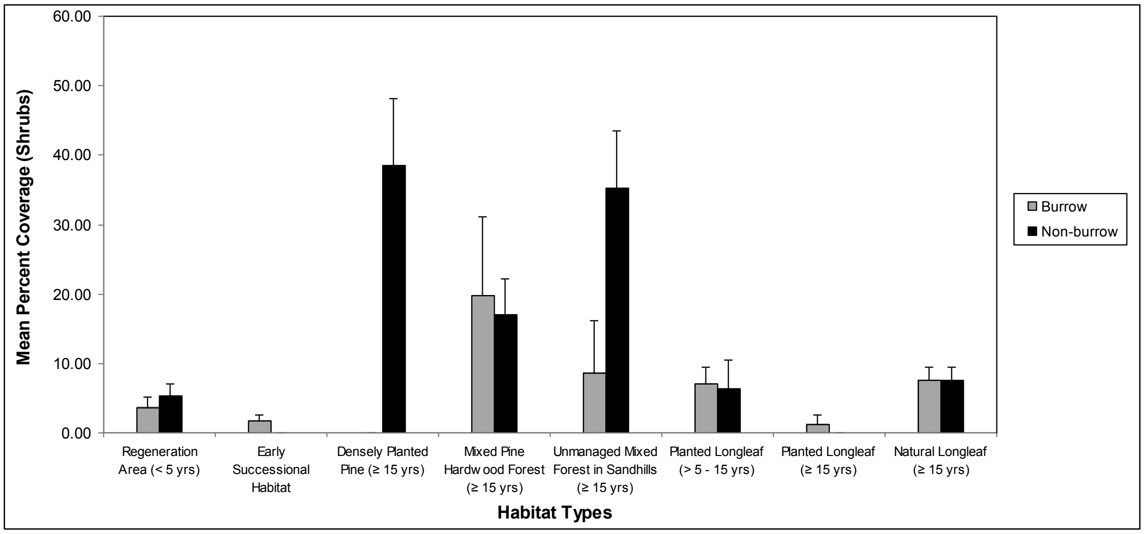

Figure 3.21 Mean percent coverage of all shrubs in the > 1 m height category along line transects originating at active gopher tortoise (*Gopherus polyphemus*) burrows and sample points unoccupied by gopher tortoise on public and private lands in habitat types of south Mississippi during summer 2010.

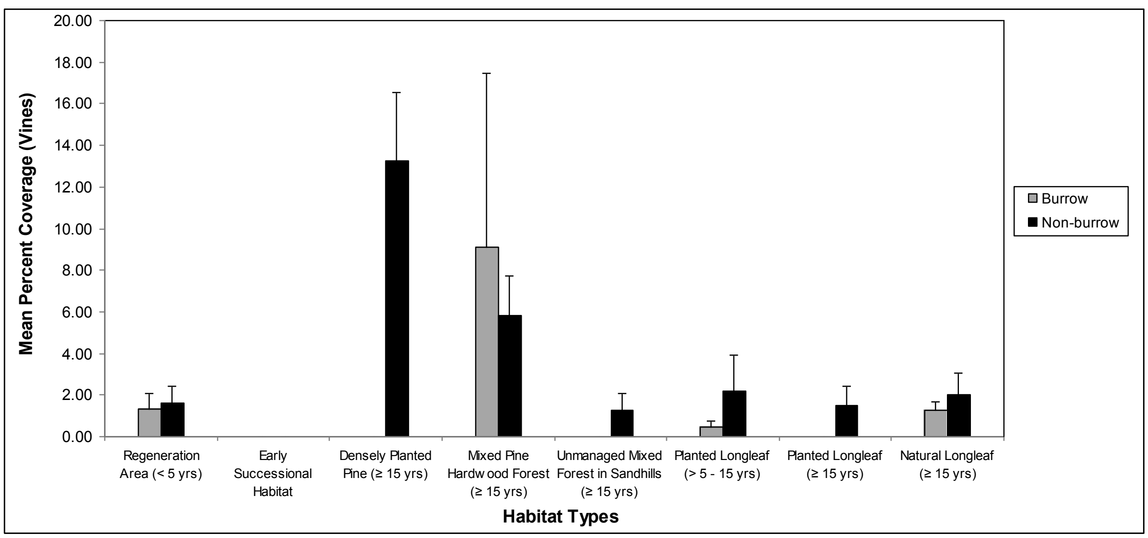

Figure 3.22 Mean percent coverage of all vines in the > 1 m height category along line transects originating at active gopher tortoise (*Gopherus polyphemus*) burrows and sample points unoccupied by gopher tortoise on public and private lands in habitat types of south Mississippi during summer 2010.

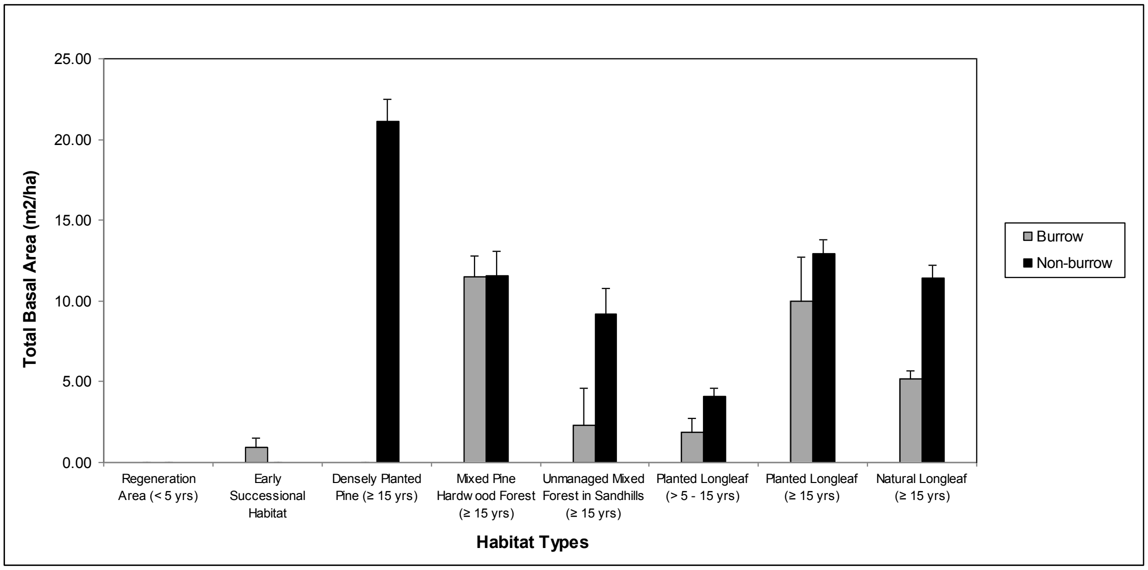

Figure 3.23 Mean total basal area (m^2/ha) at active gopher tortoise (*Gopherus polyphemus*) burrows and sample points unoccupied by gopher tortoise on public and private lands in habitat types of south Mississippi during summer 2010.

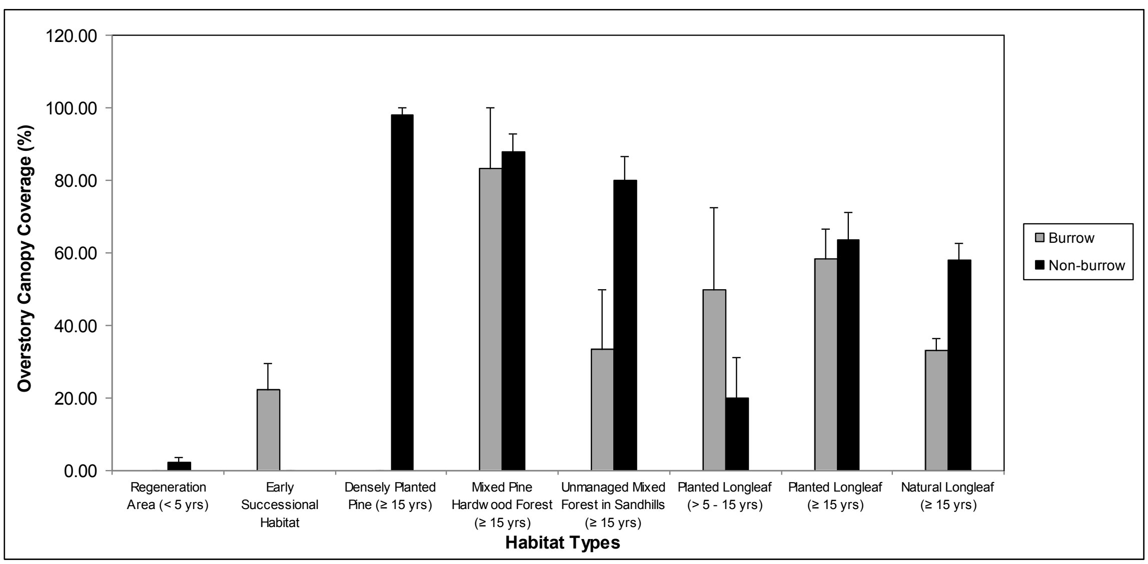

Figure 3.24 Mean overstory canopy coverage (%) at active gopher tortoise (*Gopherus polyphemus*) burrows and sample points unoccupied by gopher tortoise on public and private lands in habitat types of south Mississippi during summer 2010.

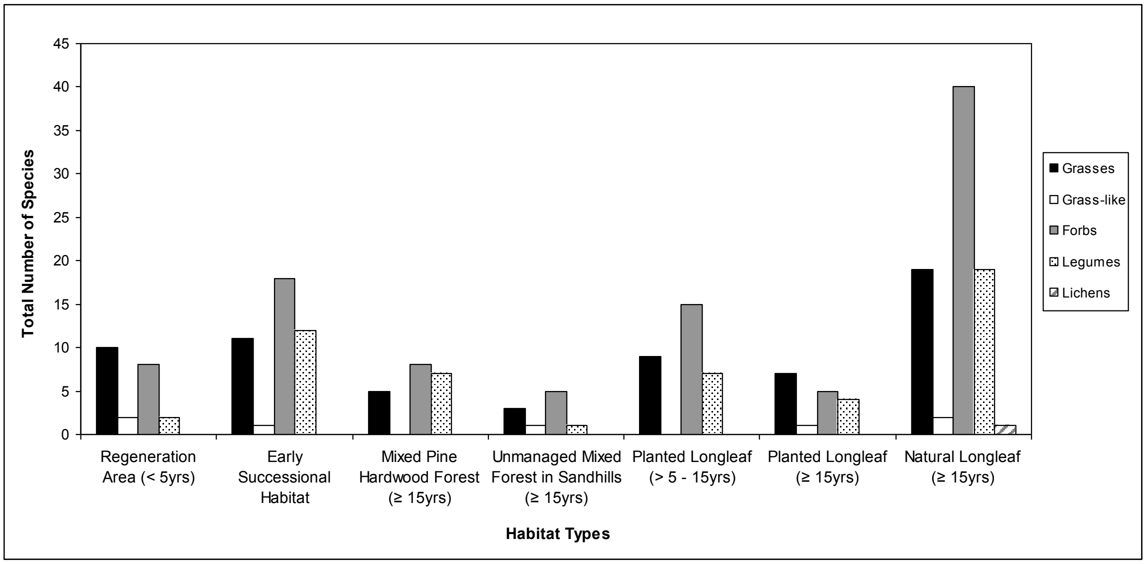

Figure 3.25 Species richness of herbaceous vegetation of ≤ 0.3 m in height at active gopher tortoise (*Gopherus polyphemus*) burrows on public and private lands in habitat types of south Mississippi during summer 2010.

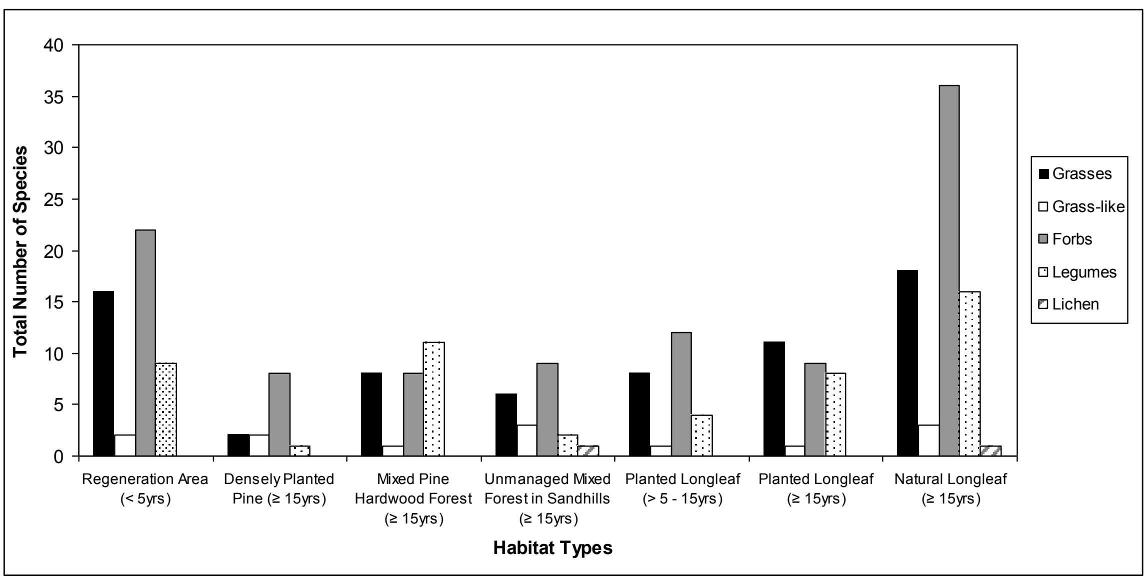

Figure 3.26 Species richness of herbaceous vegetation of ≤ 0.3 m in height at non-burrow locations on public and private lands in habitat types of south Mississippi during summer 2010.

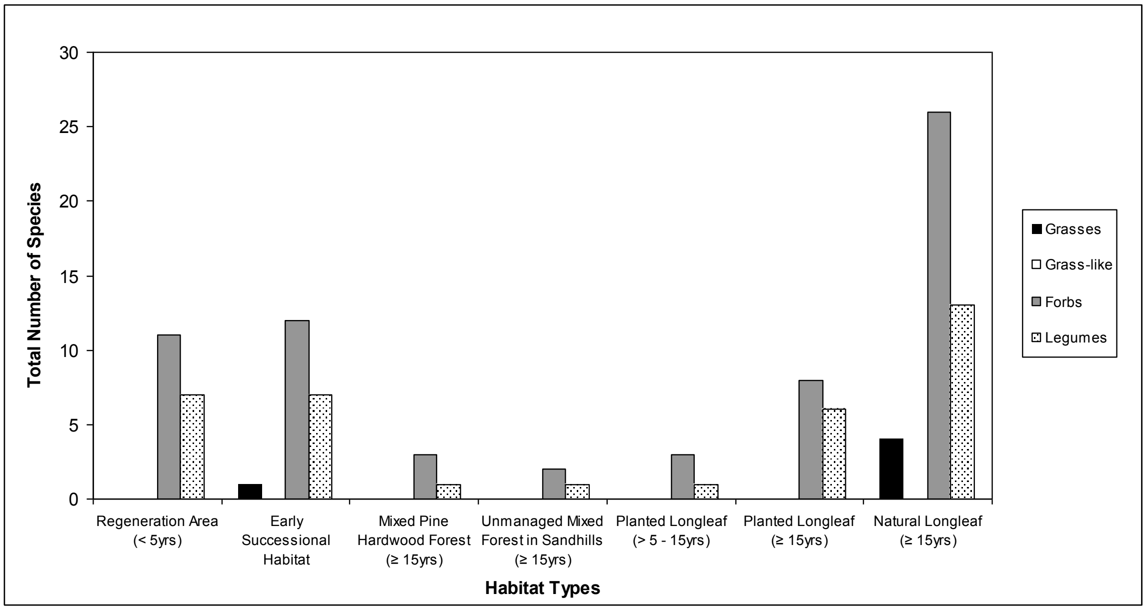

Figure 3.27 Species richness of herbaceous vegetation of > 0.3 m – ≤ 1 m in height at active gopher tortoise (*Gopherus polyphemus*) burrows on public and private lands in habitat types of south Mississippi during summer 2010.

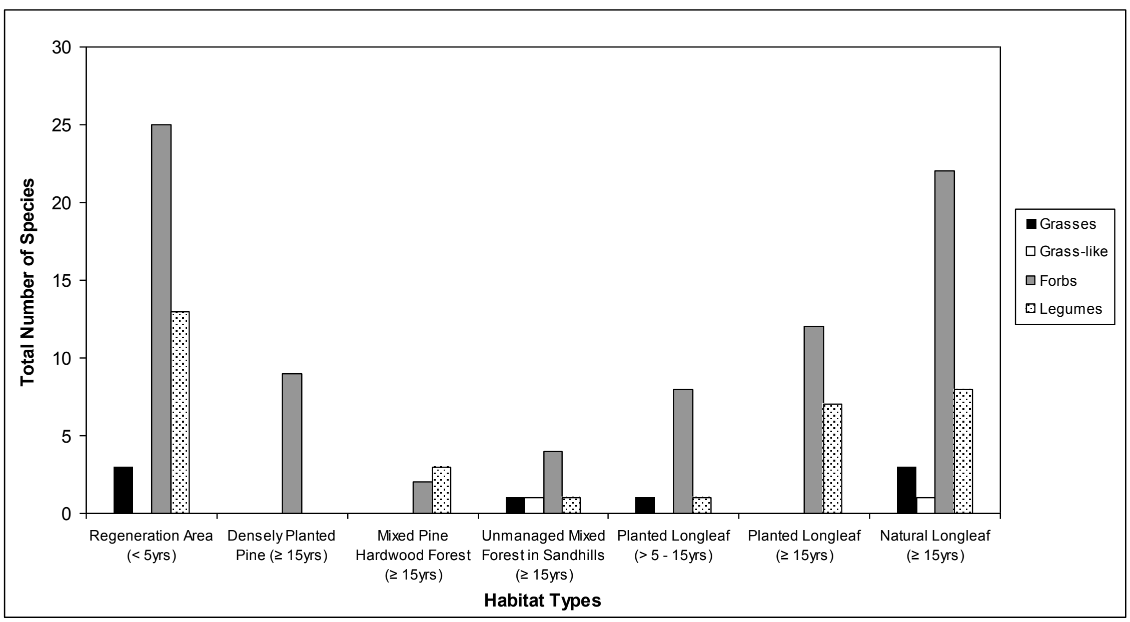

Figure 3.28 Species richness of herbaceous vegetation of > 0.3 m – ≤ 1 m in height at non-burrow locations on public and private locations in habitat types of south Mississippi during summer 2010.

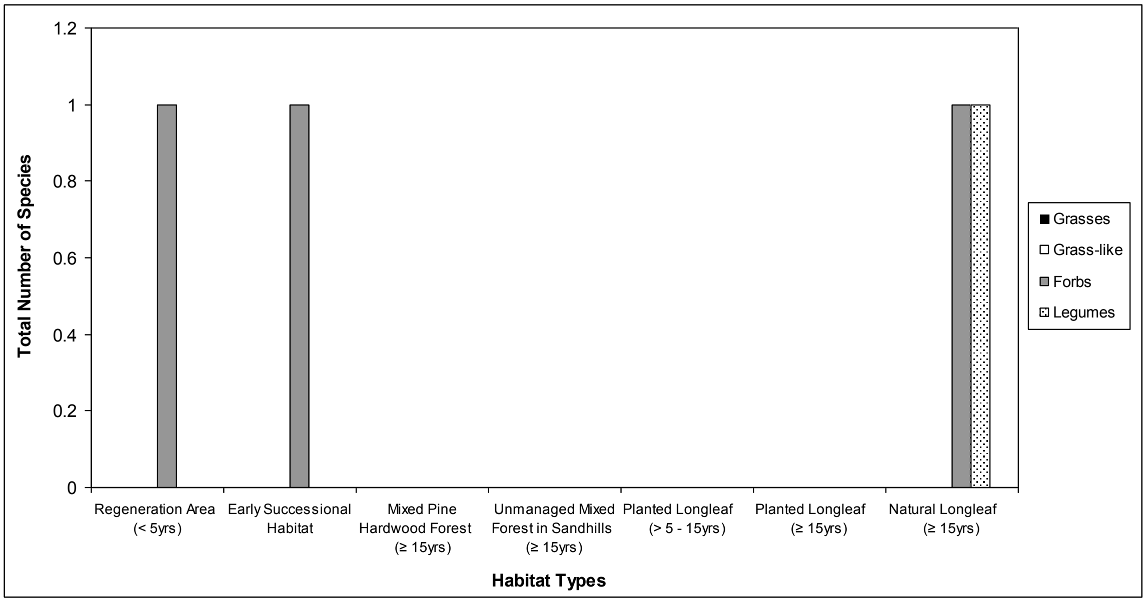

Figure 3.29 Species richness of herbaceous vegetation of > 1 m in height at active gopher tortoise (*Gopherus polyphemus*) burrows on public and private lands in habitat types of south Mississippi during summer 2010.

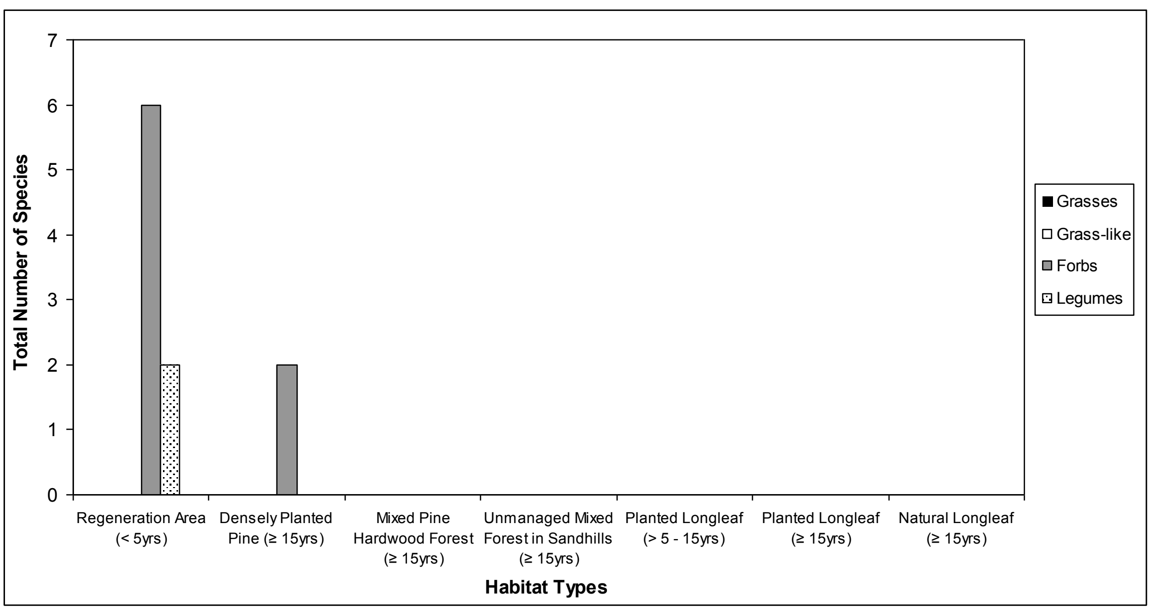

Figure 3.30 Species richness of herbaceous vegetation of > 1 m in height at non-burrow locations on public and private lands in habitat types of south Mississippi during summer 2010.

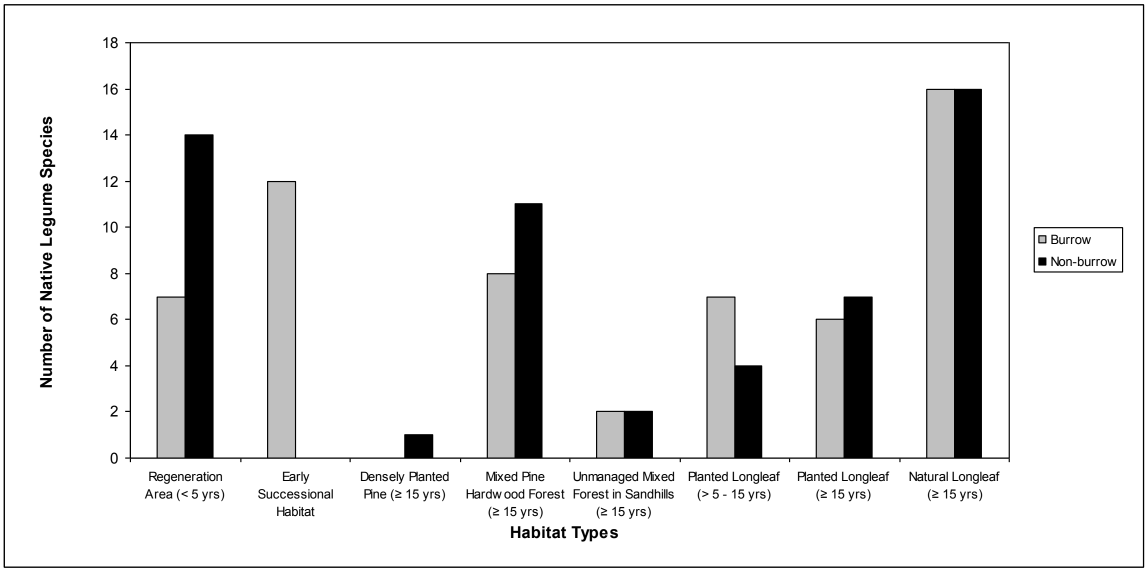

Figure 3.31 Species richness of native legumes at active gopher tortoise (*Gopherus polyphemus*) burrows and nonburrow locations on public and private lands in habitat types of south Mississippi during summer 2010.

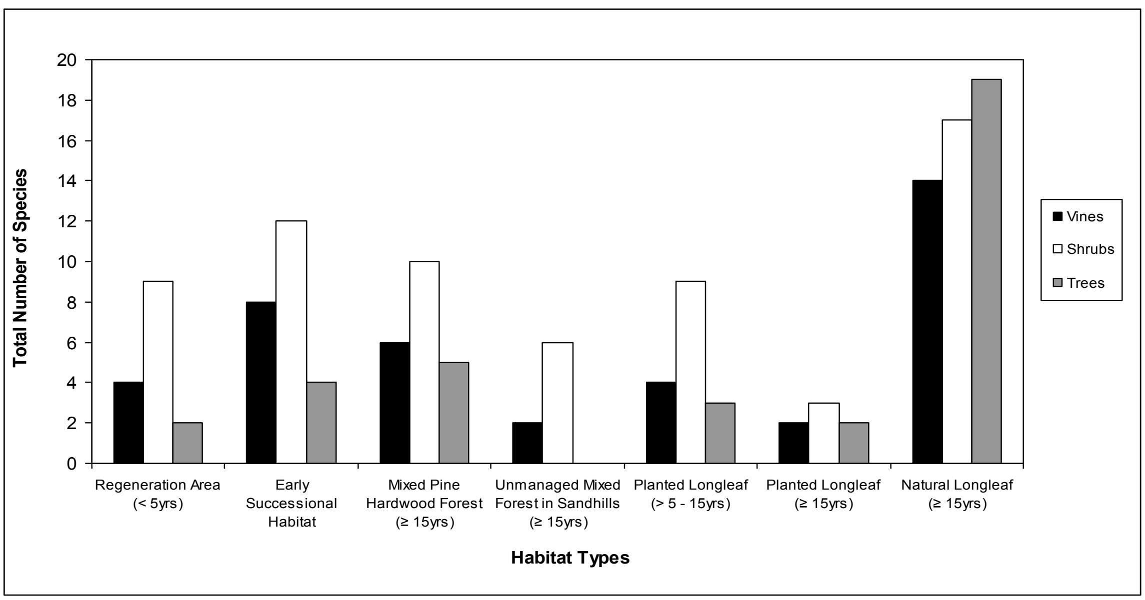

Figure 3.32 Species richness of woody vegetation of ≤ 0.3 m in height at active gopher tortoise (*Gopherus polyphemus*) burrows on public and private lands in habitat types of south Mississippi during summer 2010.

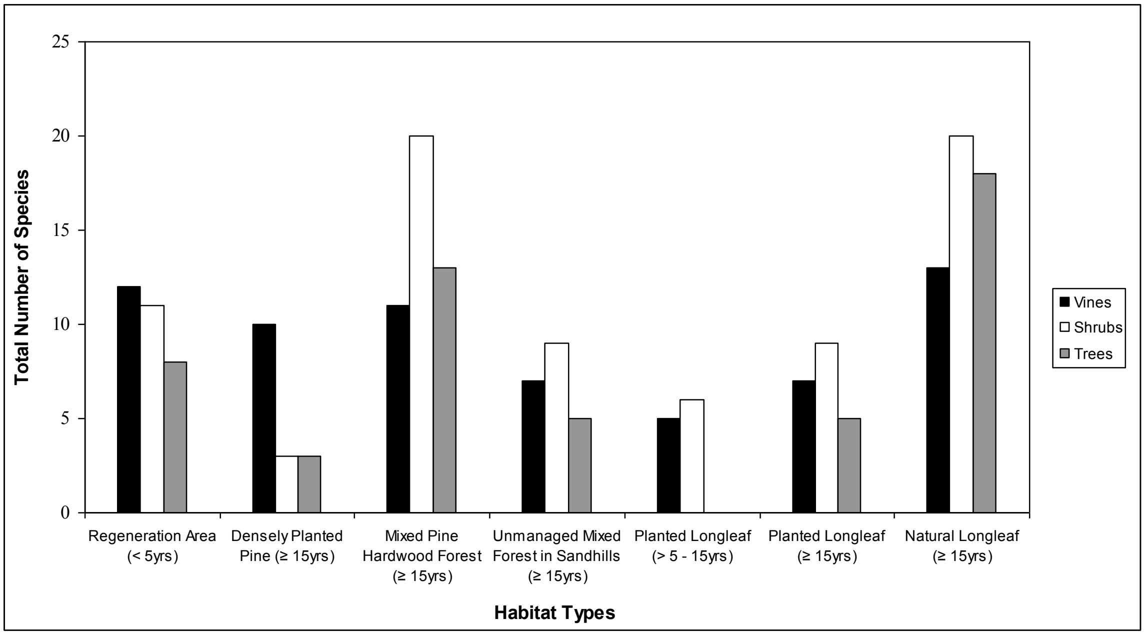

Figure 3.33 Species richness of woody vegetation of ≤ 0.3 m in height at non-burrow locations on public and private lands in habitat types of south Mississippi during summer 2010.

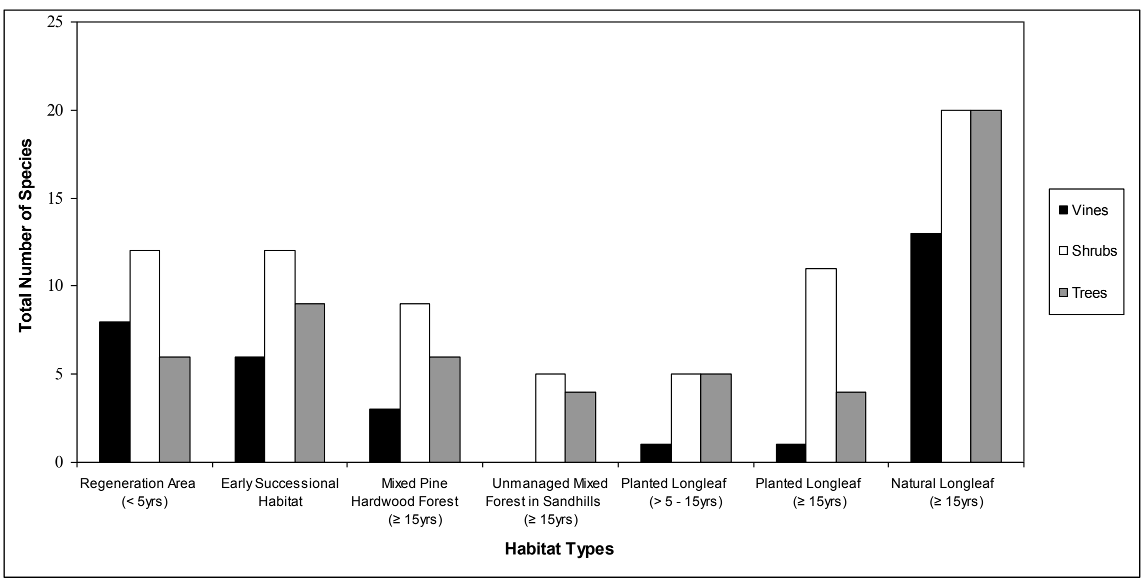

Figure 3.34 Species richness of woody vegetation of > 0.3 m – ≤ 1 m in height at active gopher tortoise (*Gopherus polyphemus*) burrows on public and private lands in habitat types of south Mississippi during summer 2010.

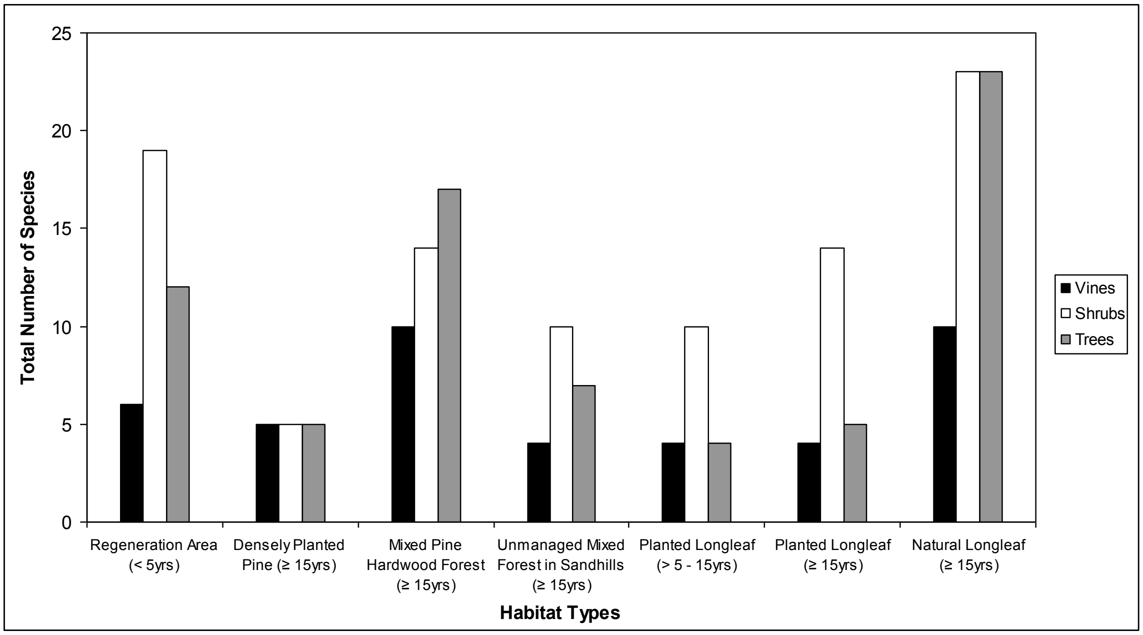

Figure 3.35 Species richness of woody vegetation of > 0.3 m – ≤ 1 m in height at non-burrow locations on public and private lands in habitat types of south Mississippi during summer 2010.

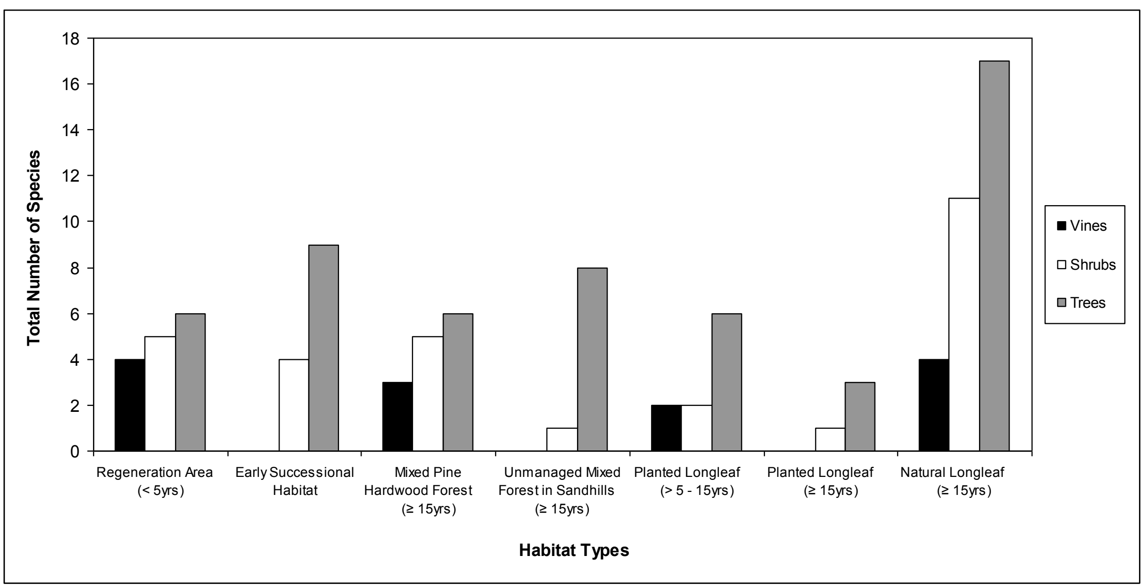

Figure 3.36 Species richness of woody vegetation of > 1 m in height at active gopher tortoise (*Gopherus polyphemus*) burrows on public and private lands in habitat types of south Mississippi during summer 2010.

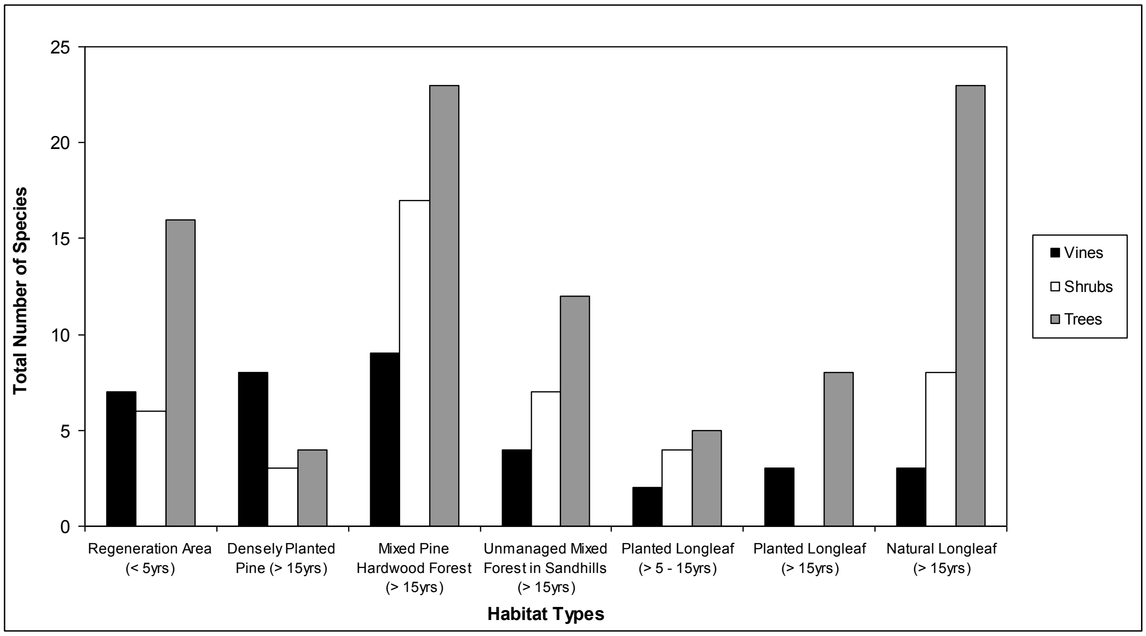

Figure 3.37 Species richness of woody vegetation of > 1 m in height at non-burrow locations on public and private lands in habitat types of south Mississippi during summer 2010.

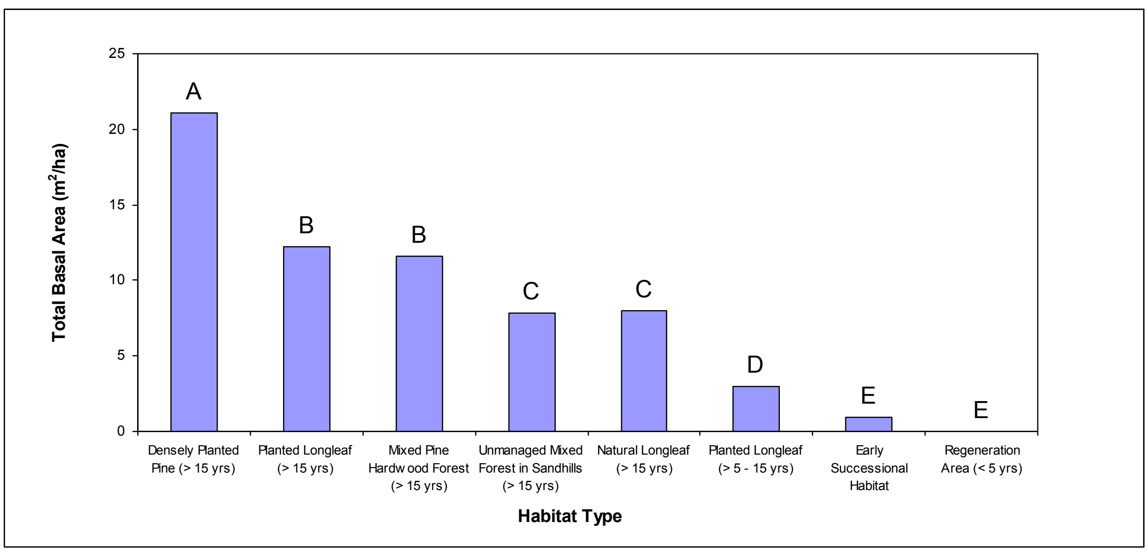

Figure 3.38 Fisher's least significant difference test for total basal area (m^2/ha) at active gopher tortoise (*Gopherus polyphemus*) burrows and non-burrow in habitat types on public and private lands of south Mississippi during summer 2010. Letters denote differences at $p < 0.05$ alpha level.

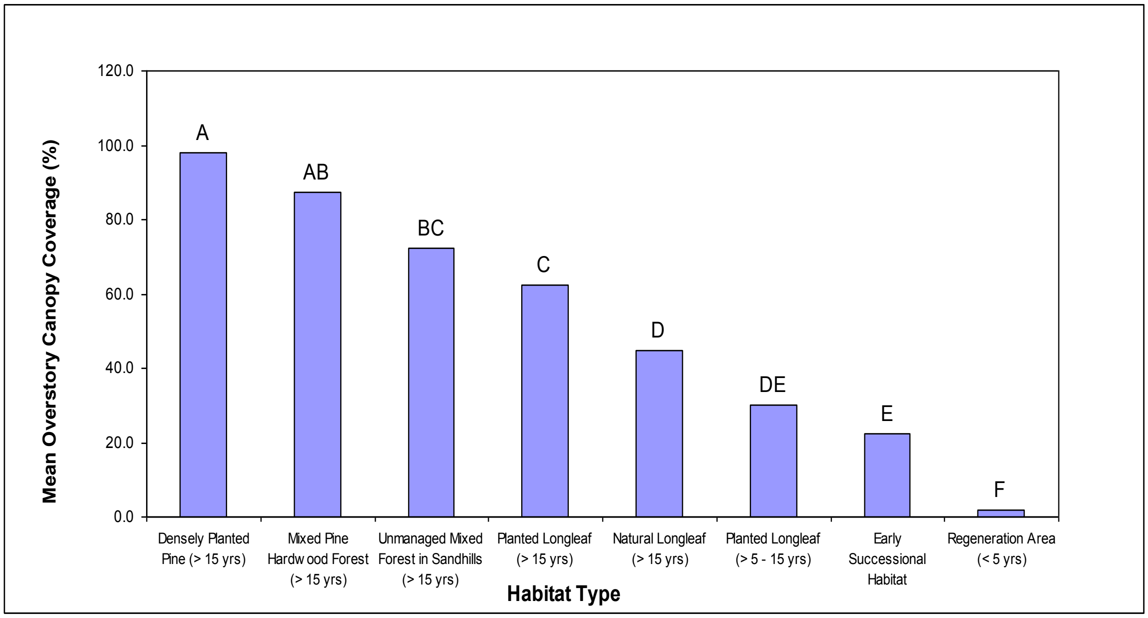

Figure 3.39 Fisher's least significant difference test for overstory canopy coverage at active gopher tortoise (*Gopherus polyphemus*) burrows and non-burrow in habitat types on public and private lands of south Mississippi during summer 2010. Letters denote differences at $p < 0.05$ alpha level.

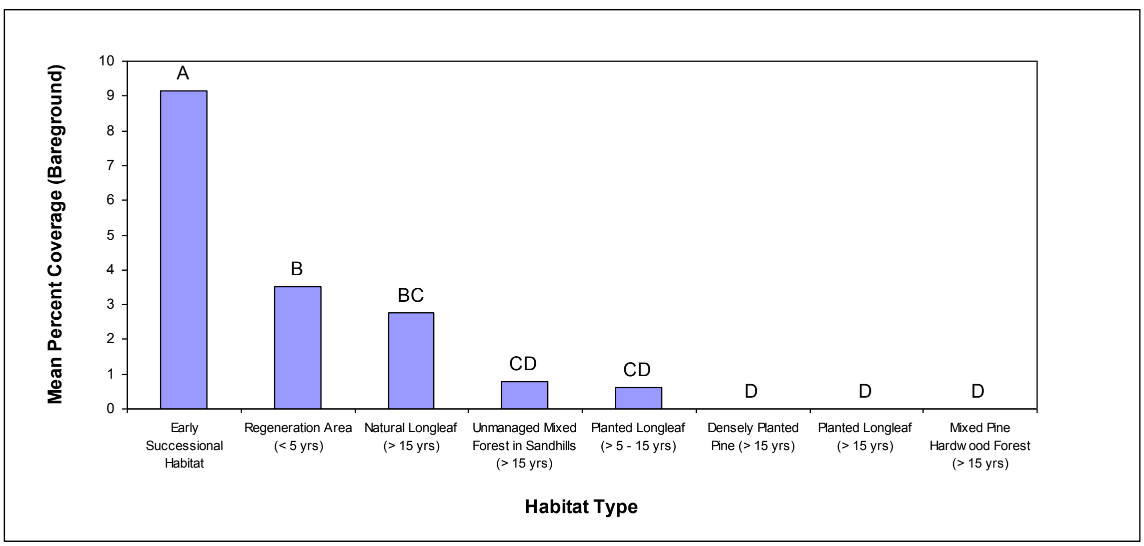

Figure 3.40 Fisher's least significant difference test for percent coverage of bareground at active gopher tortoise (*Gopherus polyphemus*) burrows and non-burrow in habitat types on public and private lands of south Mississippi during summer 2010. Letters denote differences at $p < 0.05$ alpha level.

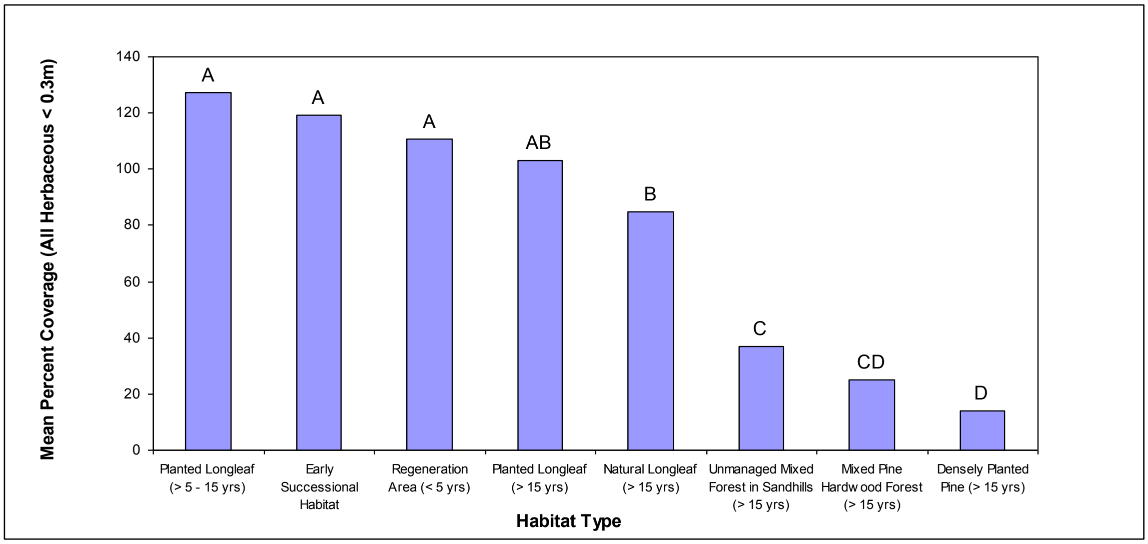

Figure 3.41 Fisher's least significant difference test for percent coverage of all herbaceous vegetation $\leq$ 0.3 m at active gopher tortoise (*Gopherus polyphemus*) burrows and non-burrow in habitat types on public and private lands of south Mississippi during summer 2010. Letters denote differences at $p < 0.05$ alpha level.

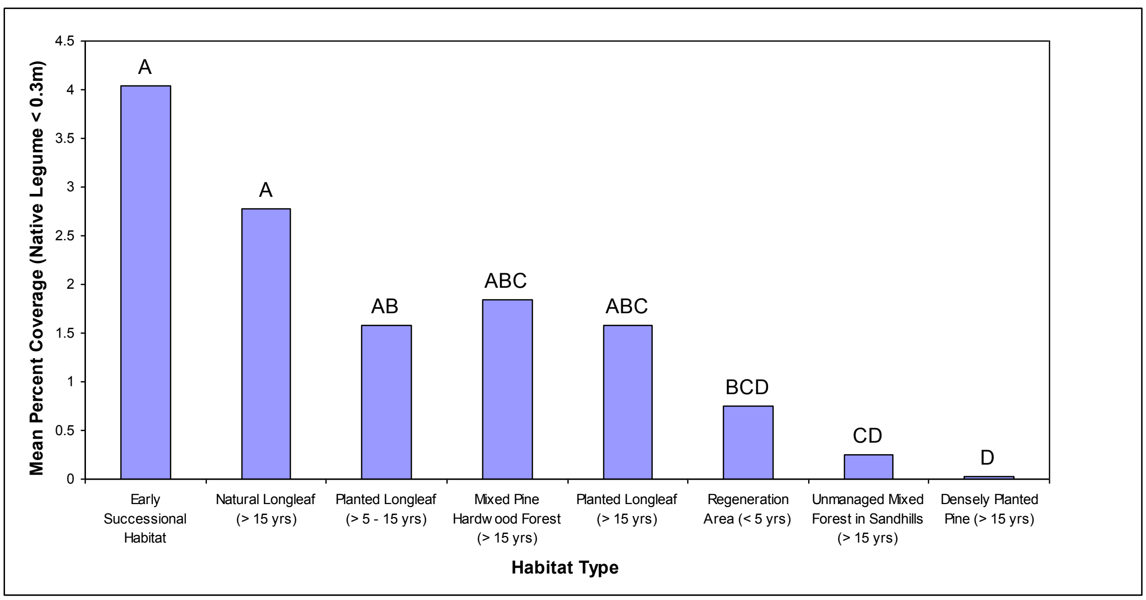

Figure 3.42 Fisher's least significant difference test for percent coverage of native legumes $\leq$ 0.3 m at active gopher tortoise (*Gopherus polyphemus*) burrows and non-burrow in habitat types on public and private lands of south Mississippi during summer 2010. Letters denote differences at $p < 0.05$ alpha level.

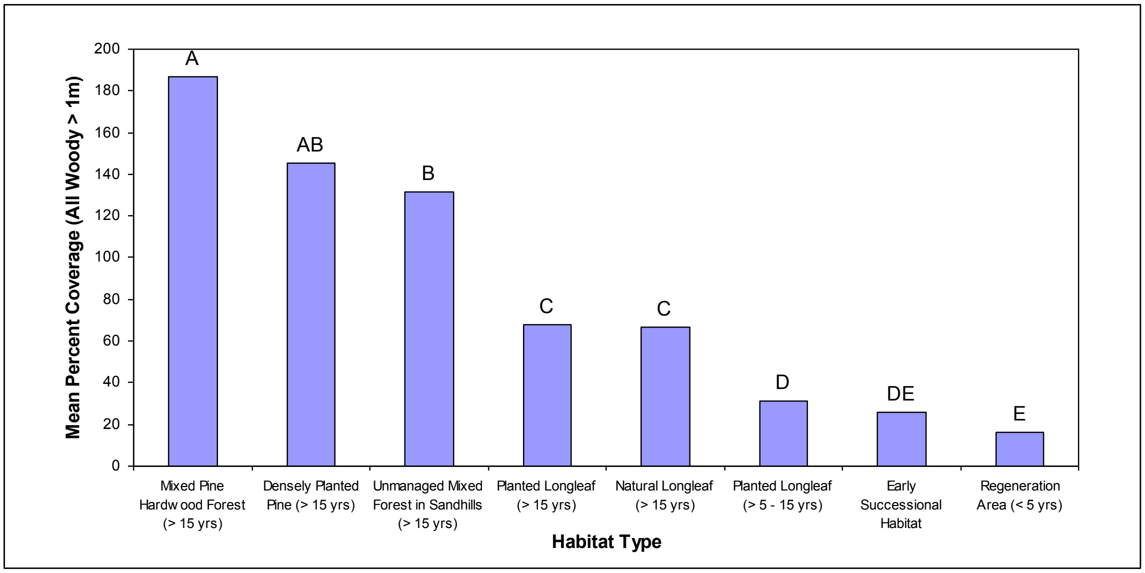

Figure 3.43 Fisher's least significant difference test for percent coverage of all woody vegetation > 1 m at active gopher tortoise (*Gopherus polyphemus*) burrows and non-burrow in habitat types on public and private lands of south Mississippi during summer 2010. Letters denote differences at $p < 0.05$ alpha level.

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CHAPTER IV

HABITAT CONDITIONS AND RED IMPORTED FIRE ANT INFESTATIONS ON PUBLIC AND PRIVATE LANDS IN SOUTH MISSISSIPPI

Introduction

Imported red fire ants (*Solenopsis invicta*) were inadvertently introduced from South America in the mid to late 1930's through the port of Mobile, Alabama (Pereira 2003). The warm, wet climate of the southeastern United States provided ideal conditions for fire ants to quickly colonize and flourish along roadsides, in parks, lawns, prime grazing and crop land, and other deforested areas throughout the region (Lofgren et al. 1975). Since their arrival, fire ants have infested over 134 million ha throughout the southeastern United States, Arizona, California, New Mexico, Oklahoma, and Texas (Wojcik et al. 2001, Lard et al. 2006, APHIS 2009). Their range continues to expand to the west and east by as much as 198 km per year and is predicted to eventually cover 25% of the United States (Vinson and Sorenson 1986, Vinson 1997, Kemp et al. 2000). Studies have indicated a more westerly expansion is likely because prolonged winter conditions to the north may negatively affect the fire ant's ability to reproduce and spread; however, extremely dry conditions could also hinder the degree of infestations in the western United States (Tschinkel 1993, Calcott and Collins 1996, Vinson 1997, Korzukhin et al. 2001, LeBrun et al 2012).

The fire ant is one of the most successful and reviled invasive species in the southeastern United States (Cumberland and Kirkman 2012). Complicating matters even more is the fact that in the infested range there are two social forms of the fire ant which are differentiated by the number of egg-laying queens in the colony and mound density characteristics (Lofgren et al. 1975). The monogyne form consists of a single egg-laying queen per mound; whereas, the polygyne form supports multiple egg-laying queens (Macom and Porter 1996, Tsutsui and Suarez 2003). Monogyne colonies typically have mound densities of 30 to 100 per ha with up to 200,000 workers; whereas, polygyne colonies can occur in densities of > 500 mounds per ha and have as many as 500,000 workers in a single mound (Porter and Savignano 1990, Trager 1991, Vinson 1997, Kemp et al. 2000, Sullivan 2003). Several studies have indicated the negative impacts associated with fire ant infestation are likely more pronounced with the polygyne form given its increased territoriality and the fact that mound densities are often 3 to 10 times that of monogyne colonies (Lofgren and Williams 1984, Porter and Savignano 1990, Tschinkel 1993, Vinson 1997).

Fire ants are noted for their negative effects on human health and well being and the significant economical and ecological damages they cause throughout their introduced range (Adams et al. 1983, Adams 1986, Vinson et al. 1993, Kemp et al. 2000, Jetter et al. 2002, Gutrich et al. 2007). These highly aggressive ants quickly swarm an unsuspecting intruder that disrupts their nest and sting them causing an initial burning sensation followed by swelling and irritation that can last several days (Jetter et al. 2002). Approximately 30% of humans in the infested range are bitten each year; however, <1%

are reported to suffer any serious allergic reaction or death related to complications from the fire ant bite (Vinson 1997).

The economic impacts related to fire ant infestations are widespread and may include damage to agriculture, livestock, electrical and farm equipment, infrastructure, costs of control or eradication, and revenue losses from reduced tourism and recreational activities (Lofgren et al. 1975, Vinson 1997, Lard et al. 2006, DeBerry et al 2008). Although economic impacts can be difficult to evaluate, one study reported damage estimates exceeding $5.6 billion annually for the entire infestated range (Lard et al. 2006). However, fire ants may also provide beneficial services to agricultural systems by reducing the prevalence of pest insects and their associated damages (Lofgren et al. 1975, Vinson 1997, Wojcik et al. 2001).

Quantifying the ecological and environmental costs associated with fire ant infestations can be even more challenging than those related to economics. In general, they may include extinction of indigenous biota, disruption of community structure, and changes in ecological processes (Allen et al. 2004). Their presence has serious implications for native wildlife in the southeastern United States. Fire ants can impact wildlife directly through predation of altricial young, pipping young, and occasionally adults (Allen et al. 1998, Wojcik et al. 2001). For these reasons, fire ants are particularly devastating for reptiles and birds but other ground-nesting wildlife and invertebrates may also experience deleterious effects associated with fire ant infestations (Porter and Savignano 1990, Allen et al. 1994, Pederson et al. 1996, Gotelli and Arnett 2000, Epperson and Heise 2003, Todd et al. 2008).

Often less understood but still potentially devastating are the indirect impacts on wildlife in the infested range of the imported red fire ant. These impacts may include reduced survival and weight gain resulting from envenomization, behavioral changes related to foraging patterns, habitat use, or physical response to fire ants, and reduced food availability for the impacted species (Holtcamp et al. 1997, Allen 1998, Mueller et al. 2001, Allen et al. 2004). Although adult individuals are likely susceptible to fire ant envenomization, the negative impacts associated with fire ant stings tend to be more prevalent in the newborn or recently hatched offspring (Drees 1994, Allen et al. 2004). One study reported significantly less weight gain in neonatal American alligators (*Alligator mississippiensis*) exposed to fire ants at the time of hatching (Allen et al. 1997). Approximately 50% of the survivors exhibited signs of non-lethal injuries including swelling of the extremities and pustules on the digits and around the eyes (Allen et al. 1997).

Two separate studies involving northern bobwhite (*Colinus virginianus*) reported greater abundance and increased chick survival in study areas treated for fire ants as compared to untreated areas (Allen et al. 1995, Mueller et al. 1999). Another study documented reduced survival in chicks exposed to 50 fire ants for 60 seconds and 200 ants for 15 seconds (Guiliano et al. 1996). Body mass was also lower for bobwhite chicks exposed to excessive numbers of fire ants (200 fire ants for 60 seconds; Guiliano et al. 1996). A similar study investigating white-tailed deer (*Odocoileus virginianus*) fawn recruitment reported higher recruitment in areas under fire ant suppression (Allen et al. 1997).

The presence of fire ants can alter the way an animal utilizes available habitat or influence changes in animal behavior that might not occur in the absence of fire ants (Holtcamp et al. 1997, Allen 1998, Langkilde 2000, Mueller et al. 2001, Wojcik et al. 2001, Pederson et al. 2003, Allen et al. 2004, Todd et al. 2008, Ligon et al. 2011). These changes in behavior likely occur as a result of the irritation associated with fire ant stings (Wojcik et al. 2001). Newborn or recently hatched offspring that depend on limited movement as a means of predator avoidance or adult individuals that might otherwise escape danger but are limited due to their small size or physical inability to escape may be particularly vulnerable to fire ant infestations (Allen et al. 1997, Mueller et al. 2001, Allen et al. 2004). Two studies investigating white-tailed deer fawn recruitment suggested debilitating injuries (blindness, etc.) related to fire ant stings and higher occurrences of predation resulting from increased fawn movement were sufficient to cause significantly lower recruitment numbers (Allen et al. 1997, Mueller et al. 2001). A similar study in southeast Texas reported northern bobwhite chicks devoted more time to walking and responding to fire ants rather than actively foraging and resting behaviors that are particularly important to the survival of precocial young that must acquire their own food while also maintaining a vigilant eye on predators (Pedersen 1996).

Other studies have reported behavioral tradeoffs made by wildlife when foraging in the presence of fire ants (Holtcamp et al. 1997, Orrock and Danielson 2004). When fire ants were present, deer mice (*Peromyscus* spp.) foraged for longer periods of time, made more frequent visits, and harvested more seeds in rich patches than poor, whereas in the absence of fire ants, there was no difference regardless of patch type (Holtcamp et al. 1997). Holtcamp et al. (2010) reported competitive displacement in habitat selection among cotton rats (*Sigmodon hispidus*), Northern pygmy mice (*Baiomys taylori*), and white-footed mice (*P. leucopus*) when fire ants were present in large numbers. Another study reported temporal variation in habitat use by cotton rats when fire ants were present, but no difference in Northern pygmy mice (Pedersen et al. 2003).

As a voracious predator, fire ants can disrupt invertebrate species richness and community diversity which may impact other wildlife species by reducing the amount of available food (Porter and Savignano 1990, Morris and Steigman 1993, Vinson 1997, Wojcik et al. 2001, Epperson and Allen 2010). This presents a unique set of challenges for birds and other insectivorous vertebrates, especially those that are already of conservation concern due to decreasing populations or habitat degradation throughout their native range (Allen et al. 2001, Ligon et al. 2012). One study reported an increase in loggerhead shrike (*Lanius ludovicianus*) occurrence and greater invertebrate species richness, diversity, and volume in areas undergoing fire ant treatment (Allen et al. 2001). Another study documented eastern bluebirds (*Sialia sialis*) nesting in treatment sites foraged closer to the nest, provisioned their offspring more frequently, and had nestlings that were in overall better physical condition than those in control areas (Ligon et al. 2012).

The imported red fire ant has the potential to impact a wide variety of vertebrate and invertebrate species, particularly those that are ecologically dependent on more open or semi-open habitats (Allen et al. 1994, Epperson and Heise 2003). These early successional habitats are often associated with disturbance, which depending on the frequency and intensity may be sufficient to maintain these conditions over time. Fire ants flourish in those habitats that have undergone disturbance by man or natural processes including flooding, landslides, fire, or disastrous storms (Tschinkel 1993). They have even been referred to as a "weedy" species because of their rapid growth, early and continuous reproduction, as well as their ability to quickly exploit ecologically disturbed habitats (Patterson 1993, Tschinkel 1993, King and Tschinkel 2006). In its native South America, the fire ant thrives in the Pantanal region within the floodplain of the Paraguay River of southern Brazil (Kemp et al. 2000). Even in this heavily disturbed and low diversity habitat, where conditions are often ideal for fire ants to maximize their ecological competiveness, they still exist at much lower densities than populations found on similarly disturbed habitats in the invaded regions of North America (Porter et al. 1992, Porter et al. 1997, Sullivan 2003). Several studies have attributed this disparity in fire ant abundance to competitive pressure from other ant species sharing the native range and available resources and more importantly the presence of biological control agents including pathogens, parasites, and natural predators (Porter et al. 1992, Porter et al. 1997, Briano et al. 2012).

While fire ant populations in South America are somewhat restricted by a host of biological controls, the southeastern United States presents an entirely different set of circumstances (Porter et al. 1992, Porter et al. 1997). The favorable climate along with the fire ant's biology, ecology, and lack of natural predators allowed them to spread virtually unfettered throughout the region (Patterson 1993). Since their arrival in the 1930's, fire ants have exploited a variety of habitat conditions and habitat types throughout the southeastern United States. Much of their success can be attributed to anthropogenic disturbance associated with a vast shift in land use patterns where forested lands were converted to homestead sites, pastures, roadways, and agricultural systems (Patterson 1993, Tschinkel 1993, Lebrun et. al 2012).

Throughout the infested range, fire ants thrive in frequently disturbed, open habitats characterized by plentiful sunlight and an herbaceous understory (Stiles and Jones 1998, Lubertazzi and Tschinkel 2003, Menzel and Nebeker 2008, Krushelnycky et al. 2009). Studies have indicated that disturbance is an important component for fire ant infestation because it allows sunlight to penetrate the canopy and herbaceous understory which is necessary for brood thermoregulation and it may also reduce competition from other ant species that are less resistant to disturbance (Porter and Tschinkel 1993, Williamson et al. 2002, Sternberg et al. 2006, Plowes et al. 2007). In Florida highland pines, a xeric habitat, fire ants were restricted to the heavily disturbed, mowed margins of paved roads and pond edges yet a few meters within the adjacent forest were replaced by its congener *S. geminata*, or tropical fire ant (Tschinkel 1988). However, as important as disturbance is in the biology of fire ants, it may not necessarily be a prerequisite for fire ant infestation (Krushelnycky et al 2009, Lebrun et al. 2012). In a Texas study, fire ants successfully invaded a grassland habitat that had not experienced any type of disturbance for at least 15 years prior to the fire ants arrival in that region (Helms and Vinson 2001). Another study from Florida, found fire ants were already the prevailing ant species in a pine flatwoods habitat characterized by low relief and a shallow water table and their ability to dominant the habitat was exacerbated by even minimal disturbance (Tschinkel 1988, Stuble et al. 2009).

Fire ants are well established throughout their invaded range in the southeastern United States and will likely continue to spread throughout the United States (Todd et al.

2008). The fire ants propensity to dominate native habitats places them in direct conflict with conservation efforts focused on threatened and endangered species, such as the gopher tortoise, which are biologically dependent on early successional habitats throughout the longleaf pine ecosystem of the southeastern United States (Lubertazzi and Tschinkel 2003).

Although studies have investigated the impacts and colonization trends of fire ants, few investigations have been reported in published literature that estimate mound densities occurring in the longleaf pine belt on private and public lands. Furthermore, limited information exists on fire ant mound densities associated with active tortoise and unoccupied sites across public and private lands in the Lower Coastal Plain. This study investigated relationships between mound densities of imported red fire ants and parameters, such as forest stand characteristics, ground cover conditions, active burrow presence, and land use and management histories. This information can offer insight into the habitat conditions that may contribute to greater fire ant densities on public and private lands. This understanding is especially important due to the ecological and economic impacts of imported fire ants and the potential for increased infestation under various restoration practices.

Study Objectives

My objective for this portion of my study included the following:

1. Investigate relationships between fire ant mound densities and habitat conditions at burrow and non-burrow locations within different forest restoration regimes.

Study Area

I conducted field experiments on 16 study sites on public and private lands in the Lower Gulf Coastal Plain of Mississippi. Habitat types delineated for investigation included longleaf pine forests (> 15 years of age) under fire management that supported gopher tortoises on highly suitable, moderately, and less suitable soils, longleaf pine forests (> 5 - ≤ 15 years of age), planted pine regeneration sites (≤ 5 years of age), and mixed pine-hardwood, mixed pine, or planted pine forests (> 15 years of age) with limited or no fire management. At least two of my private land study sites were enrolled in cost-share or other conservation programs. Public lands used for assessing habitat conditions at burrow and non-burrow sample points were located in Forrest, Greene, Marion, Perry, and Wayne counties in south Mississippi (Figure 2.1, Table 2.2). Private lands were located in Greene, Hancock, Lamar, Marion, and Perry counties in south Mississippi (Figure 2.1, Table 2.1).

Methods

Field Methods

Field data were collected from May to September 2010. Several study methods were used to investigate faunal and vegetation communities. Habitat evaluation included measurement of overstory, midstory, and understory vegetative conditions, basal area of trees, and percent canopy coverage using methods described by Hayes et al. (1981). One-hundred forty-eight transects (39%) originated from active gopher tortoise burrows whereas the remaining 234 transects (61%) occurred at non-burrow sample points. Red imported fire ant mound surveys were conducted simultaneously with habitat and vegetation structure surveys at each burrow and non-burrow sample point from April 2010 to September 2010 (Tables 2.5 and 2.6). I used 40-m circular plots to estimate the number of mounds at active burrow points and random non-burrow sample points within each forest type (Hayes et al. 1981). Fire ant mounds were identified based on mound characteristics, appearance, and behavior of ants within the mound (DeBerry et al. 2008). Specific details of field survey methods are provided in Chapter II.

Statistical analysis

The following hypotheses were investigated at the 5% level of significance:

1. H_0: Fire ant mound density is not related to vegetation characteristics in different habitat types.

   H_1: Fire ant mound density is related to vegetation characteristics in different habitat types.

My hypotheses were tested using several approaches as follows:

Normality Testing

Prior to analysis, all variables were examined for normality using the Shapiro-Wilk test (PROC UNIVARIATE, SAS 9.2). All tests for normality were considered significant at $p \leq 0.05$. If significant results were found, data was transformed using square-root transformations for count data and arcsine square-root transformations for percentage data (McDonald 2009).

Correlation Analysis

All habitat variables were examined for collinearity using Pearson correlation coefficients (PROC CORR, SAS 9.2). Pearson correlation coefficients evaluate relationships among explanatory variables (Myers 1990). If two explanatory variables had a coefficient > 0.65, they were evaluated as candidates for exclusion from the data set used in regression modeling. Based upon current knowledge and literature, the variable with the greatest biological significance for gopher tortoises, or other targeted species, was retained for inclusion in regression analysis.

2-way Analysis of Variance (ANOVA)

I used two-way ANOVA (PROC GLM, SAS 9.2) to test for significant differences in habitat characteristics between burrow and non-burrow sample points and among habitat types (Zar 1999). Explanatory variables that were significantly different between burrow and non-burrow sample points were considered for inclusion in stepwise multilinear regression analysis (Myers 1990, McDonald 2009).

Fire ant mound Densities

I estimated fire ant mound densities at active tortoise burrows and non-burrow locations in eight habitat types. I utilized comparisons of fire ant mound densities among different forest stand types at active burrow and non-burrow locations as reported by Smith (2011), who conducted a simultaneous field study in conjunction with my study.

Multiple Linear Regression

I used multiple linear regression to investigate potential relationships between the density of fire ant mounds at burrow and non-burrow sample points and vegetation conditions in selected habitat types. For linear regression modeling analyses, I used forest stand as the experimental unit. My faunal response variable was the density of fire ant mounds (mounds/ha) at burrow and non-burrow sample points. Determination of potential relationships between habitat conditions and the number of mounds was a multistep process. Data was examined for normality using the Shapiro-Wilk Test (PROC UNIVARIATE, SAS 9.2) and transformed when necessary using square-root transformations for count data and arcsine square-root transformations for percentage data (McDonald 2009). Variables were examined for collinearity using Pearson correlation coefficients which evaluated relationships among explanatory variables (Myers 1990). I used data reduction techniques to eliminate environmental variables exhibiting little variance among forest stand types and variables that were correlated (Johnson 1998). Additionally, the total number of explanatory variables was reduced further by examining collinearity using Pearson correlation coefficients (PROC CORR, SAS 9.2, Myers 1990). I investigated two stepwise multiple linear regression models in my study. The first model included all sample points at burrow locations and non-burrow sample points. The second model utilized a reduced sample to alleviate concerns related to known sampling and observer error during basal area sampling.

Results

Fire Ant Mound Surveys

I surveyed 382 40-m circular plots for fire ant mound densities on 16 gopher tortoise study sites on public and private lands in south Mississippi from July to September 2010 (Tables 4.1 and 4.2). Of the total circular plots 141 (53 burrow, 88 non-burrow) occurred on private lands, whereas 241 (95 burrow, 146 non-burrow) were located on public lands. The greatest number of circular plots at active tortoise burrows (n=101; 22 private land, 79 public land) were sampled in forest stands categorized as natural longleaf pine > 15 years; whereas, three circular plots occurred in one stand each of mixed pine-hardwood > 15 years and unmanaged mixed pine-hardwood > 15 years in the sand hills on public lands (Tables 4.1 and 4.2). Fewer burrow points were sampled for fire ant mounds due to a lack of active tortoise burrows on at least 8 forest stands. Tortoise burrows were not detected in stands of pine regeneration ≤ 5 years and planted longleaf pine > 15 years or one stand each of mixed pine-hardwood > 15 years and natural longleaf pine > 15 years on public land (Table 4.2). Similarly, burrows were not detected in one stand of pine regeneration ≤ 5 years and both stands of densely planted loblolly pine > 15 years on private land (Table 4.1).

Fire ant mound densities

The number of fire ant mounds detected at active tortoise burrows was generally greater than those at non-burrow locations (Smith 2011). Fire ant mound densities at active tortoise burrows ranged from 42.4 mounds/ha in mixed pine hardwood forests >15 years of age to 138.9 mounds/ha on pine regeneration areas ≤ 5 years of age (Table 4.3) Fire ant mound densities at non-burrow locations ranged from 12.9 mounds/ha in mixed pine hardwood forests > 15 years of age to 75.6 mounds/ha in planted longleaf pine > 15 years of age (Table 4.3).

Stepwise multiple linear regression modeling

I used two stepwise multiple linear regression models to evaluate potential relationships among forest stand characteristics and number of fire ant mounds. My complete stepwise multiple linear regression for model 1 had the following form: Mounds/ha = $B_0 \pm B_1$ (Percent Coverage of Overstory) $\pm B_2$ (Percent Coverage of Bare Ground) $\pm B_3$ (Percent Coverage of Herbaceous Plants $\leq$ 0.3 m) $\pm B_4$ (Percent Coverage of Woody Plants $\leq$ 0.3 m) $\pm B_5$ (Percent Coverage of Native Legumes $\leq$ 0.3 m) $\pm B_6$ (Percent Coverage of Non-native Legumes $\leq$ 0.3 m) $\pm B_7$ (Percent Coverage of Grass-like Plants $\leq$ 0.3 m) $\pm B_8$ (Percent Coverage of Woody Plants > 0.3m - $\leq$ 1 m) $\pm B_9$ (Percent Coverage of Leguminous Plants > 0.3 m - $\leq$ 1 m). Where: Mounds/ha = number of fire ant mounds per unit area, B_0 = intercept, and B_i = parameter estimate. Stepwise multiple linear regression analysis revealed 4 explanatory variables that were related to the number of fire ant mounds and habitat conditions. The number of fire ant mounds were associated positively with greater percent coverage of bare ground ($F = 34.32$, df = 4,376, $P < 0.01$) and percent coverage of grass-like vegetation $\leq$ 0.3 m in height ($F = 17.84$, df = 4,376, $P < 0.01$). Numbers of fire ant mounds were associated negatively with an increase in percent coverage of overstory canopy ($F = 4.39$, df = 4,376, $P = 0.04$) and percent coverage of woody plants $\leq$ 0.3 m in height ($F= 24.03$, df = 4,376, $P < 0.01$). The reduced linear regression model was as follows: Fire Ant Mound Density = 7.54 – 0.71 [Percent Coverage of Overstory] + 64.98 [Percent Coverage of Bare Ground] – 31.08 [Percent Coverage of Woody Plants $\leq$ 0.3 m] + 85.52 [Percent Coverage of Grass-like Plants $\leq$ 0.3 m]. The linear model $R^2 = 0.19$.

My complete stepwise multiple linear regression for model 2 had the following form: Mounds/ha = $B_0 \pm B_1$ (Percent Coverage of Overstory) $\pm B_2$ (Total Basal Area) $\pm B_3$ (Percent Coverage of Bare Ground) $\pm B_4$ (Percent Coverage of Herbaceous Plants $\leq$ 0.3 m) $\pm B_5$ (Percent Coverage of Woody Plants $\leq$ 0.3 m) + B_6 (Percent Coverage of

Native Legumes $\leq$ 0.3 m) + B_7 (Percent Coverage of Non-native Legumes $\leq$ 0.3 m) + B_8 (Percent Coverage of Grass-like Plants $\leq$ 0.3 m) + B_9 (Percent Coverage of Woody Plants > 0.3 m - $\leq$ 1 m) + B_{10} (Percent Coverage of Leguminous Plants > 0.3 m - $\leq$ 1 m). Where: Mounds/ha = number of fire ant mounds per unit area, B_0 = intercept, and B_i = parameter estimate. Stepwise multiple linear regression analysis revealed 3 explanatory variables that were related to the number of fire ant mounds and habitat conditions. Numbers of fire ant mounds were positively associated with an increase in percent coverage of bare ground ($F = 25.99$, df = 4,288, $P < 0.01$) and percent coverage of grass-like plants $\leq$ 0.3 m in height ($F = 10.90$, df = 4,288, $P = 0.001$). Numbers of ant mounds were negatively associated with an increase in percent coverage of woody plants $\leq$ 0.3 m in height ($F = 13.94$, df = 4,288, $P = 0.0002$). The reduced linear regression model was as follows: Fire Ant Mound Density = 7.04 + 71.73 [Percent Coverage of Bare Ground] – 30.58 [Percent Coverage of Woody Plants $\leq$ 0.3 m] + 82.82 [Percent Coverage of Grass-like Plants $\leq$ 0.3 m]. The linear model $R^2 = 0.16$.

Discussion

My study reported fire ant mound densities and associated habitat conditions across multiple forest-stand types in south Mississippi. Fire ant mound densities were generally greater in forest stands associated with open overstory canopy and mid-story conditions and the presence of active gopher tortoise burrows (Smith 2011). Forest management techniques, including reforestation and prescribed burning, were prevalent on both public and private lands in my study and have previously been reported as actions that can create conditions that may favor fire ant colonization and dispersal

(Williamson et al. 2002, Zettler et al. 2004, Smith 2011). Habitat disturbance related to military activities on at least one of my public land sites (Camp Shelby Joint Forces Training Site-T44) may also have played a part in creating favorable conditions for fire ant infestations (Yager et al. 2007, Edwards et al. 2016)

Numerous studies have documented the relationship between greater fire ant mound densities and the habitat conditions associated with frequent disturbance (Stiles and Jones 1998, Lubertazzi and Tschinkel 2003, Tschinkel 2006). Anthropogenic disturbance, in particular, is often cited as the primary means by which fire ants have successfully spread throughout their infested range (Tschinkel 1993, King and Tschinkel 2008). Fire ant mound densities are often greater in habitats exposed to disturbance related to clear cutting and intense site preparation, mowing, discing, and plowing (Tschinkel 1988, Vinson 1997, Williamson et al. 2002, King and Tschinkel 2006). In their Texas study, Allen et al. (1995) noted soil and vegetation disturbance related to land management as important contributors to increased fire ant colonization. Habitat disturbance related to forestry management may facilitate greater fire ant mound densities by creating more open conditions that allow sunlight to penetrate to the forest floor and provide better conditions for brood rearing and thermoregulation in fire ant colonies (Porter 1988, Porter and Tschinkel 1993, Stiles and Jones 1998, Tschinkel 2006).

I found similar trends in fire ant mound densities related to habitat characteristics at burrow and non-burrow locations as reported by Smith (2011), who conducted a simultaneous field study in conjunction with my study. Comparisons of mound densities among forest stand types as reported by Smith (2011) indicated mound densities were greater at active tortoise burrows in habitats categorized as pine regeneration $\leq$ 5 years of age, longleaf pine > 5 - ≤ 15 years of age, and longleaf pine > 15 years of age. Habitat conditions at burrow locations supporting greater fire ant mound densities generally exhibited more open conditions per findings of Smith (2011) and my regression models reflected this trend.

According to my models, habitat conditions that favored greater numbers of mounds included open overstory canopies and understory conditions including greater coverage of bare ground, grass-like vegetation ≤ 0.3 m in height and minimal coverage of woody plants ≤ 0.3 m in height. Forest stands characterized by conditions more favorable for fire ants also exhibited a preponderance of longleaf pine and some history of habitat disturbance, particularly prescribed fire or reforestation efforts (Smith 2011)**.** Although I detected a greater number of fire ant mounds at burrow locations in pine regeneration areas, density estimates were generally greater in all forest stands associated with active tortoise burrows (Smith 2011). My findings suggest that forest stand conditions that are more likely to support greater numbers of tortoises may also provide more favorable conditions for fire ant colonization.

Soil and vegetation disturbances are often unavoidable consequences associated with site preparation related to pine reforestation or other habitat management. In forested habitats, frequent disturbances of this nature may lead to greater coverage of bare mineral soil depending on the post-disturbance response of the vegetation community. My findings indicated fire ant mound densities were generally greater in habitats with increased exposure of bare ground, including regeneration areas, early successional habitats, and natural longleaf pine > 15 years of age (Smith 2011). These same habitat types were also more likely to support active tortoise burrows due in part to the open canopy and understory conditions. Adequate coverage of bare ground is an important component of suitable tortoise habitat because these areas are often utilized as burrowing and nesting sites (Auffenberg and Franz 1982, Diemer 1986, Mushinsky et al. 2006). The degree to which additional soil disturbance associated with burrow excavation can have a positive effect on fire ant colonization was not the focus of my study. However, recent studies investigating fire ant presence at tortoise burrows reported greater numbers of fire ants in the burrow apron and disturbed areas adjacent to the burrow than in random non-burrow locations (Wetterer and Moore 2005, Dziadzio et al. 2016). These findings are of special concern for habitat areas that support only isolated populations of tortoises as well as those that are currently enrolled or are candidates for inclusion in gopher tortoise conservation initiatives.

An abundant herbaceous understory comprised mostly of grass species was prevalent throughout many of the regeneration areas and longleaf pine dominated forest stands in my study. Herbaceous plants, especially grasses and legumes, are known to respond favorably to soil disturbance, which may explain the dominant coverage of grass species on many habitat areas associated with greater mound densities (Jones et al. 2007, Browning et al. 2004, Miller and Miller 2005, Smith 2011). However, my regression analysis indicated herbaceous vegetation ≤ 0.3 m in height was not associated with greater numbers of fire ant mounds. My findings indicated that greater numbers of mounds were associated with an increase in percent coverage of grass-like plants ≤ 0.3 m in height across all forest stand sites in my study. Grass-like species, particularly sedges (*Carex* spp. and *Cyperus* spp.) were the most frequently detected genera on my study sites. Species of sedges are common in open forest conditions associated with heightened levels of disturbances and seeds can remain viable in the seed bank for decades until disturbance is sufficient to provide proper scarification and germination conditions (Miller and Miller 2005). For regeneration areas in my study, a plausible explanation for the occurrence of greater fire ant mound densities in association with greater coverage of grass-like plants $\leq$ 0.3 m in height could be the recent soil disturbance associated with site preparation procedures in the last five years. In longleaf pine dominated habitats, including natural and planted longleaf > 15 years of age and planted longleaf > 5 - $\leq$ 15 years of age, disturbance associated with prescribed burning on a 3 to 5 year rotation may have been sufficient to promote increased fire ant colonization and greater coverage of understory herbaceous vegetation, particularly grass-like plants $\leq$ 0.3 m in height (Williamson et al. 2002).

Habitat management that contributed to greater coverage of bare ground and grass-like plants $\leq$ 0.3 m in height may have also contributed to the lower percent coverage of woody plants $\leq$ 0.3 m in height associated with greater numbers of fire ant mounds. Depending on the season and intensity of fire, prescribed burning can be an effective means of controlling the growth of woody plants, particularly in forest stands being managed for the conservation of imperiled or endangered species (DeBerry et al. 2008). Longleaf pine dominated habitats in my study, including longleaf > 15 years of age (natural and planted), and planted longleaf > 5 - $\leq$ 15 years of age, were under prescribed fire management on a 3 to 5 year rotation. For these habitat types, the frequency and intensity of burning may have been sufficient to maintain the lower percent coverage of woody plants $\leq$ 0.3 m in height associated with greater numbers of fire ant mounds (Smith 2011). For regeneration areas, prescribed fire was used less frequently due to the potential damage to the younger age class of trees associated with these forest stands (Browning et al. 2004, Deberry et al. 2008). However, soil and vegetation disturbances occurring during site preparation procedures and the increased exposure of sunlight on the forest floor may explain the association between greater numbers of ant mounds and lower percent coverage of woody plants ≤ 0.3 m in height.

Open canopy conditions are an important habitat requirement for fire ant colonization. These conditions are necessary for fire ants because it provides adequate sunlight at the forest floor and allows them to meet their thermoregulatory requirements for survival and reproduction (Tschinkel 2006). Greater numbers of fire ant mounds were associated with habitats characterized by open canopy conditions (Smith 2011). In my study, habitats generally associated with more open canopy conditions included regeneration areas ≤ 5 years of age, early successional habitats, and longleaf pine dominated habitats (planted/natural > 15 years of age, planted > 5 - ≤ 15 years of age). These same habitats were also more likely to support active tortoise burrows due to the open conditions associated with habitats under prescribed fire management. Forest stands classified as densely planted pine > 15 years of age and mixed pine hardwoods typically supported very few active tortoise burrows and fire was not a disturbance factor associated with these forest stands. This may explain the significantly lower mound densities in these habitat types when compared to other habitats in my study (Smith 2011). The presence of greater fire ant mound numbers associated with habitats exhibiting more open canopy conditions, sunlight exposure, and fire disturbance compared to other habitats lacking these attributes may indicate a linkage between the aforementioned characteristics and fire ant infestation (Williams et al. 2002, Smith 2011).

Although my findings suggest that fire or other habitat disturbance may improve conditions that allow for greater fire ant infestations, other studies have indicated that habitat disturbance may not be a necessary requirement for advanced fire ant colonization (Tschinkel 1988, Helms and Vinson 2001, Stuble et al. 2009).

In my study, greater numbers of mounds were associated with forest stands characterized by open canopies and understory conditions and some recent history of disturbance. My findings were similar to other studies reporting habitat conditions associated with fire ant colonization; however, my regression analysis presented models that were weak predictors of habitat conditions associated with fire ant infestations across habitat types in my study. One plausible explanation for weak predictive models could be related to the fire ants ability to tolerate a wide range of environmental and habitat conditions (Taber 2000, Tschinkel 2006). Fire ants thrive in habitats where frequent disturbance has led to conditions that are more suitable for colonization (Stiles and Jones 1998, Lubertazzi and Tschinkel 2003, Tschinkel 2006). In their native South America, fire ants flourish in the seasonally flooded pantanal region of Brazil, whereas, in North America, disturbance associated with land clearing for agriculture and development has created conditions supporting increased fire ant colonization (Tschinkel 1993). Fire ants exhibit a wide range of tolerance and have successfully colonized a variety of habitats along highly variable temperature, soil moisture, and disturbance gradients (Tschinkel 2006). Although habitats characterized by more sunlight and frequent disturbance appear to favor fire ant colonization, the lack or reduced incidence of these factors is not necessarily an impediment to increased colonization (Tschinkel 1988, Helms and Vinson 2001, Stuble et al. 2009). This phenomenon, and the potential negative effects of fire ants on wildlife, further complicates efforts to predict habitat conditions associated with increased fire ant colonization, particularly as it relates to the conservation and management of threatened and endangered species.

Conclusions

According to my models, habitat conditions that favored greater numbers of fire ant mounds included open canopies and understory conditions including less coverage of woody plants ≤ 0.3 m in height and greater coverage of bare ground and herbaceous vegetation, especially grass-like species ≤ 0.3 m in height. These conditions were more often associated with habitats categorized as regeneration areas ≤ 5 years of age, early successional habitat, longleaf pine > 15 years of age (planted and natural), and longleaf pine > 5 - ≤ 15 years of age. Furthermore, habitats favoring greater numbers of fire ant mounds were generally managed with prescribed fire and were more likely to support active tortoise burrows (Smith 2011).

Numerous studies have reported the deleterious effects of fire ants on gopher tortoise nests and hatchlings as well as other imperiled species associates endemic to the longleaf pine ecosystem (Landers et al. 1980, Giuliano et al. 1996, Epperson and Heise 2003, Todd et al. 2008). Consequently, habitat management practices often associated with longleaf pine restoration or conservation of imperiled species may have the unintended consequence of promoting increased colonization of fire ants (Williamson et al. 2002). Understanding the habitat conditions that may promote fire ant colonization rates is essential for conservation programs where the primary focus is habitat management for species dependent on periodic disturbance to maintain conditions promoting long term survival, growth, and reproduction (Diemer 1986, Allen et al. 1995, Epperson and Heise 2003, DeBerry et al. 2008).

Silvicultural management that promotes the restoration of longleaf pine on public and privately owned lands in the southeastern United States is compatible with efforts to improve habitat conditions for gopher tortoises and species associates. Because these same practices may also promote greater colonization of fire ants, careful monitoring and control of known fire ant colonies is essential on habitats slated for longleaf pine restoration or properties that are currently enrolled or are under consideration for inclusion in imperiled species conservation programs (DeBerry et al. 2008). Large-scale control of fire ant infestations is generally limited, however methods currently available for controlling individual colonies range from hot water boilers to broadcast applications of pesticides (Sullivan 2003, King and Tschinkel 2006, DeBerry et al. 2008). Another control method being considered involves the introduction of non-native organisms into the United States as biological control agents, however there is some concern regarding the effectiveness of potentially replacing one invasive species with another (Williams et al. 2003). While many of the available methods provide only temporary control, an even greater concern, specifically with pesticides, is the potential harm to non-target species such as gopher tortoises, in habitat areas being treated for fire ant infestations (Williams et al. 2003).

Table 4.1 .Sampling intensity for red imported fire ants (Solenopsis invicta) at gopher tortoise (Gopherus polyphemus) burrow and non-burrow sample points in habitat types on private lands in south Mississippi during summer 2010

Study Site, County Forest Stand Type (Age)	Tortoises Present?	Total No. Active Tortoise Burrows	Sample Points for Fire Ant Mound Counts		Dominant Soil Category for Gopher Tortoises[b]
			Active Burrow Number of Points	Non-burrow Number of Points	
Box Property, Greene	Yes	6			Moderately/Highly Suitable
Planted Longleaf Pine (≤ 5 years)			5	0	
Brooke Property, Hancock	Yes	19			Less/Moderately Suitable
Mixed Loblolly, Longleaf Pine (≤ 5 years)			3	10	
Natural Longleaf Pine (> 15 years, Uneven ages)			4	10	
Planted Longleaf Pine (> 5 - ≤ 15 years)			5	10	
Early Successional Habitat: Road Right-of-way and food plot			2	0	
Mixed Pine/Hardwood			1	0	
Browning Property, Lamar	Yes	17			Moderately/Highly Suitable
Natural Longleaf Pine (> 15 years, Uneven ages)			12	0	
Hensarling Property, Perry	No	0			Less/Moderately Suitable
Loblolly Pine Regeneration (≤ 5 years)				15	
Wright Property, Lamar	Yes	29			Moderately Suitable
Longleaf Pine Regeneration (≤ 5 years)			3	15	
Planted Loblolly Pine (> 15 years)			0	10	
Planted Longleaf Pine (> 15 years)			6	13	
Natural Longleaf Pine (> 15 years) hardwood understory			6	0	
Early Successional Habitat: Field or Pipeline Right-of-Way			6	0	
Yager Property, Marion	No	0			Less/Moderately Suitable
Planted Loblolly Pine (> 15 years)			0	15	
Totals Sample Points Across All Sites		**71**	**53**	**88**	

[a] Each sample point included a center point with a 40 m diameter – all fire ant mounds were counted in this circular plot. Transects – 20 m in length.
[b] Soil categories delineated by US Fish and Wildlife Service (1990) and (2012) related to burrowing and nesting conditions for gopher tortoises

Table 4.2 Sampling intensity for red imported fire ants (Solenopsis invicta) at gopher tortoise (Gopherus polyphemus) burrow and non-burrow sample points in habitat types on public lands in south Mississippi during summer 2010.

Study Site, County Forest Stand Type (Age)	Tortoises Present	Total No.Active Tortoise Burrows	Sample Points for Fire Ant Mound Counts		Dominant Soil Category[b]
			Active Burrow Number of Points	Non-burrow Number of Points	
Camp Tiak Boy Scout Camp, Forrest	Yes	12			Moderately Suitable
Natural Longleaf Pine (> 15 years)			0	6	
Planted Longleaf Pine (> 15 years)			0	6	
Mixed Loblolly, Longleaf Pine (> 15 years)			0	3	
Early Successional Habitats: Fields, Rights-of-Way			8	0	
Chickasawhay Tortoise Area, Wayne	Yes	33			Less/Moderately/ Highly Suitable
Mixed Longleaf Pine-Scrub Oak – Sandhill Communities (> 15 years)			15	11	
Dead Dog Bog State Area, Greene	Yes	37			Moderately/Highly Suitable
Mixed Pine-Hardwood, Scrub Oak (> 15 years)			3	15	
Natural Longleaf Pine (> 15 years)			12	0	
Marion County Wildlife Management Area, Marion	Yes	40			Less/Moderately Suitable
Natural Longleaf Pine (> 15 years)			15	15	
ACUB Gunthrie-Phillips, Forrest	No	0			Moderately Suitable
Planted Loblolly Pine//Hardwoods (> 15 years)			0	15	
Camp Shelby Joint Forces Training Site - Mars Hill, Perry	Yes	12			Less/Moderately Suitable
Natural Longleaf Pine (>15 years, Uneven ages)			12	15	
Camp Shelby Joint Forces Training Site - Site 7, Perry	Yes	16			Moderately Suitable
Natural Longleaf Pine (> 15 years, Uneven ages)			10	15	
Camp Shelby Joint Forces Training Site – T-44, Perry	Yes	15			Moderately Suitable
Natural Longleaf Pine (> 15 years, Uneven ages)			15	16	
Camp Shelby Joint Forces Training Site, Forrest	Yes	2			Moderately Suitable
Regeneration Loblolly Pine (≤ 5 years)			0	5	
Natural Longleaf Pine (> 5 – 8 years)			0	10	
Early Successional Habitats: Fields, Rights-of-Way			2	0	
DeSoto National Forest, Forrest and Perry	Yes	3			Moderately Suitable
Mixed Pine-Hardwood (> 15 years)			3	14	
Totals Across All Sites		**170**	**95**	**146**	

[a] Each sample point included a center point with a 40 m diameter – all fire ant mounds were counted in this circular plot. Transects – 20 m in length.
[b] Soil categories delineated by US Fish and Wildlife Service (1990) and (2012) related to burrowing and nesting conditions for gopher tortoises.

Table 4.3 Average number of mounds of red imported fire ants (Solenopsis invicta) detected in 40 m diameter circular plots and number of mounds/hectare at active tortoise burrows and non-burrow locations on private and public lands in south Mississippi during 2010.

Forest Stand or Habitat Type Age Class (Age Class) Soil categories for Gopher Tortoises	Active Tortoise Burrow Locations		Non-burrow Locations	
	Mound Density/40 m circular Plot Mean (± standard error)	**Mound Density/ Hectare**	**Mound Density/40 m circular Plot Mean (± standard error)**	**Mound Density/ Hectare**
Regeneration Areas: Longleaf, Loblolly Mixed Pine (< 5 years) Less, Moderately, and Highly Suitable	14.84 (± 3.57)	138.9	4.60 (± 1.09)	36.6
Dense Planted Loblolly Pine (> 15 years) Less and Moderately Suitable	No active burrows detected in this habitat type		1.95 (± 0.77)	13.7
Mixed Pine, Hardwood Forest (> 15 years) Moderately Suitable	5.33 (± 1.45)	42.4	1.65 (± 0.78)	12.9
Early Successional Habitats: Fields, Pipelines, Food Plots Less and Moderately Suitable	9.64 (± 2.99)	76.9	No sample points established in this habitat type	
Unmanaged Mixed Forest in Sandhills (> 15 years) Moderately and Highly Suitable	12.33 (± 6.96)	98.2	2.40 (± 0.79)	19.1
Planted Longleaf Pine (> 5 – < 15 years) Less and Moderately Suitable	16.40 (± 4.18)	130.5	9.20 (± 1.88)	73.2
Planted Longleaf Pine (> 15 years) Moderately Suitable	6.67 (± 0.88)	53.1	11.62 (± 1.37)	75.6
Natural Longleaf Pine (> 15 years) Less, Moderately, and Highly Suitable	12.39 (± 2.43)	105.0	5.34 (± 1.55)	45.9

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CHAPTER V

BIRD COMMUNITIES OF PUBLIC AND PRIVATE FORESTLANDS IN SOUTH MISSISSIPPI

Introduction

The longleaf pine (*Pinus palustris*) is synonomous with the southern forest and the associated fire-dependent ecosystem once dominated approximately 40 million hectares from southeastern Virginia to central Florida and west to eastern Texas (Frost 1993, Landers et al. 1995, Outcalt 2000). The historical longleaf pine ecosystem was characterized by open, park-like “pine barrens” of even and un-even aged mosaics of forests, woodlands, and savannas, interconnected by an abundant and diverse groundcover of bunchgrasses and other herbaceous plants, and minimal understory hardwoods and shrubs (Landers et al. 1995, Moser and Wade 2005). Frequent, low-intensity fire played an important role in both shaping and maintaining the open conditions and habitat diversity associated with the longleaf pine ecosystem (Outcalt 2000, Van Lear and Harlow 2002). Today, this once prevalent ecosystem has been reduced by as much as 98% and exists in scattered fragments across the southeastern United States (Frost 2006). Several factors have contributed to this loss including unsustainable harvest, exclusion of natural fire, and conversion of land to other uses such as agriculture or intensive silviculture (Frost 1993, America’s Longleaf Initiative 2009).

Many species of wildlife have adapted to the pyric conditions associated with the longleaf pine ecosystem (DeBerry et al. 2008). However, interruptions in natural fire regimes have contributed to the decline and loss of many wildlife species that would otherwise thrive in the open park-like conditions of longleaf pine forests (Brennan et al. 1998). Restoration and management of longleaf pine forests by prescribed fire and control of invasive species can benefit species of conservation concern, including gopher tortoises (*Gopherus polyphemus*), and "grassland birds" (Bailey et al. 2006, DeBerry 2008).

The suite of birds commonly referred to as "grassland birds" includes avian species that are dependent on some form of grassland habitat for part or all of their life cycle (Vickery et al. 1999). In the southeastern United States these birds frequently occur in the pine-grassland habitats associated within the natural range of the longleaf pine. Grassland birds benefit greatly from the plant diversity and structure of longleaf pines forests managed with prescribed fire. Included in this group are game and non-game birds, such as northern bobwhite (*Colinus virginianus*) and Bachman's sparrow (*Peucaea aestivalis*). Many other species benefit from the habitat diversity associated with changes in topography, hyrdrology, and mosaics of recently burned and unburned patches. Non-game birds including indigo bunting (*Passerina cyanea*), blue grosbeak (*Guiraca caerula*), brown-headed nuthatch (*Sita pusilla*), yellow-breasted chat (*Icteria virens*), and at least six species of woodpeckers thrive in longleaf pine forests with an abundant herbaceous ground cover, standing snags, and interspersion of thicket cover in drainages (Yarrow and Yarrow 1999, Sibley 2001).

The region-wide decline in longleaf pine forests and associated habitats has contributed to population declines among many species of grassland birds. In particular, the loss of early successional habitat throughout the natural range of the longleaf pine has been particularly devastating for species that depend on this important nesting and brood-rearing habitat (Brennan and Kuvlesky 2005). Habitat loss and degradation are often attributed to suppression of human-induced or natural disturbances. For this reason, many species of grassland birds that were once prevalent throughout longleaf pine forests are now listed as threatened or endangered and occur in isolated population across a highly fragmented landscape (Brennan et al. 1998, Askins 2000, Carroll and Cooper 2005). The restoration and management of longleaf pine forests and sandhill habitats could potentially increase the availability of suitable habitat for grassland birds in the southeastern United States (DeBerry et al. 2008). Both the northern bobwhite and Bachman's sparrow are species of high conservation concern and closely associated with longleaf pine grassland habitats across the southeastern United States (Brennan and Kuvlesky 2005).

The northern bobwhite is an important species in longleaf pine forest and sandhill habitats due to its status as an upland gamebird and its conservation concern status (Burger 2001). Habitat loss and degradation are considered the primary reasons for northern bobwhite population declines but other factors including increased depredation, population isolation, and conversion of native plants to non-native invasive grasses have also contributed to range-wide population declines (Dickson 2001, Washburn et al. 2002, Browning et al. 2004, Hamrick et al. 2007). In forested landscapes, northern bobwhite depend on fire-maintained ecosystems, such as longleaf pine forests, with an abundance of food including hard mast, seeds, and invertebrates and ground cover plants for nesting and brood rearing (Burger 2001, Frost 2006).

The Bachman's sparrow is a non-game grassland bird that frequents both forested and open grasslands and is one of the most characteristic birds of habitats within the longleaf pine ecosystem. High quality habitat for Bachman's sparrow include open pine forests with an abundant herbaceous understory that provides ideal nesting, brooding, and foraging conditions (Dunning and Watts 1990, Dunning and Watts 1991, Haggerty 1998, Askins 2000, DeBerry et al. 2008). Much like the northern bobwhite, Bachman's sparrow has also experienced population declines as a result of the loss and degradation of open and forested habitats (Sauer et al. 2011). For these reasons, Bachman's sparrow is considered a high priority species and a candidate for conservation initiatives, as well as programs focusing specifically on restoration and management of critical habitats, particularly longleaf pine forests.

Gopher tortoises and grassland birds inhabit very similar habitat conditions throughout longleaf pine forests of the southeastern United States. Generally speaking, gopher tortoises and grassland birds thrive in open, upland habitats characterized by a sparse canopy and midstory, and an understory supporting a wide variety of herbaceous vegetation (Browning et al. 2004, Mushinsky et al. 2006, DeBerry et al. 2008). Natural or prescribed fire and other actions that mimic natural process and disturbances are essential in maintaining the habitat conditions necessary for sustainable populations of gopher tortoises and grassland birds in longleaf pine forests (Brennan et al. 1998). In the absence of human-induced or natural disturbance, habitat conditions quickly degrade rendering them useless to gopher tortoises, grassland birds and other species associates endemic to longleaf pine forests (Guyer and Hermann 1997, Aresco and Guyer 1999, Jones and Dorr 2004, Yager et al. 2007). Management practices that restore and enhance gopher tortoise habitat can also benefit associated species, including grassland birds.

Many studies have investigated separately the habitat requirements of gopher tortoises and grassland birds in upland forests of the southeastern United States (Engstrom et al. 1984, Diemer 1986, Jones and Dorr 2004, Mushinsky et al. 2006, Askins 2000, Masters et al. 2002). However, very few studies have reported bird community characteristics as they relate to habitat occupied by gopher tortoises on public and private land bases under various forest management regimes. This study investigated key bird community characteristics including species richness, abundance of all species, and abundance of targeted grassland birds (northern bobwhite, Bachman's sparrow) in habitats occupied by gopher tortoises on public and private forestlands of south Mississippi. Information gleaned from this portion of my study could benefit targeted wildlife species as well as private landowners by assisting wildlife professionals in the identification of areas for enrollment in programs that restore and manage longleaf pine and sandhill communities of the Gulf Coastal Plain.

Study Objective

My objective for this portion of my study included the following:

1. Record and report bird species richness, abundance, and abundance of grassland birds, including northern bobwhite (*Colinus virginianus*) and Bachman's sparrow (*Peucaea aestivalis*) within gopher tortoise study sites.

Study Areas

I conducted field experiments on 16 study sites on public and private lands in the Lower Gulf Coastal Plain of Mississippi. Habitat types delineated for investigation included longleaf pine forests (> 15 years of age) under fire management that supported gopher tortoises on highly suitable, moderately, and less suitable soils, longleaf pine forests (> 5 - ≤ 15 years of age), planted pine regeneration sites (≤ 5 years of age), and mixed pine-hardwood, mixed pine, or planted pine forests (> 15 years of age) with limited or no fire management. At least two of my private land study sites were enrolled in cost-share or other conservation programs. Public lands used for assessing habitat conditions at burrow and non-burrow sample points were located in Forrest, Greene, Marion, Perry, and Wayne counties in south Mississippi (Table 5.2). Private lands were located in Greene, Hancock, Lamar, Marion, and Perry counties in south Mississippi (Table 5.1).

Methods

Field Methods

I monitored 10 study sites (6 public, 4 private) using the point count method to assess avian community characteristics from May 2010 to July of 2010 (Ralph et al. 1995, Rosenstock et al. 2002, Braun 2005). Study sites were located in Forrest, Greene, Hancock, Lamar, Marion, and Perry counties in south Mississippi (Tables 5.1 - 5.2). I omitted selected stands on study sites from inclusion in my study due to close proximity of study sites to one another (< 200 m) and stand sizes of < 4 ha as per recommendations advanced by Hanowski and Niemi (1995). Bird surveys were designed to assess bird species richness and abundance in conjunction with habitats occupied by gopher tortoises. Point count stations were established at random locations within specified habitat types at each study site (Tables 5.1 - 5.2). The same 2 observers, me and a field technician, conducted all breeding bird surveys throughout the 2010 survey period to reduce biases associated with observer experience and variation. The point count methodology adhered to bird sampling approaches as recommended by the U.S. Fish and Wildlife Service land bird monitoring protocol (Knutson et al. 2008). Specific details of field survey methods are provided in Chapter II.

Results

A total of 86 species of birds were detected across all study sites at point count stations and as incidental sightings of birds flying over or through study sites at the time of surveys (Tables 5.3 - 5.5). A total of 60 species of birds were detected within 250 meter bands of point count stations on all study sites. Total species richness of birds for each study site and mean abundance of selected species varied depending on habitat type (Tables 5.3 - 5.4, 5.6). The greatest number of species (51) was detected in habitats categorized as planted and natural longleaf pine > 15 years of age, whereas only 27 species were detected in unmanaged mixed forests in the sand hills (Table 5.3). Greater mean species richness was associated with habitats categorized as longleaf pine forests > 15 years of age, whereas the lowest mean species richness was detected in stands categorized as densely planted loblolly pine > 15 years of age (Table 5.3). Mean abundance of birds/point count station across all habitat types ranged from 12.5 to 18.6 birds per station (Table 5.4). The highest mean abundance was detected in pine regeneration areas ≤ 5 years of age, whereas the lowest mean abundance was recorded at point count stations in densely stocked, closed canopy loblolly pine stands > 15 years of age (Tables 5.4 and 5.6).

Mean abundances of northern bobwhite and Bachman's sparrow were generally higher in habitats that also supported active gopher tortoise burrows. Regeneration areas ≤ 5 years of age supported the highest mean abundance of northern bobwhite, whereas the lowest mean abundance was associated with habitats categorized as mixed pine hardwoods > 15 years of age (Tables 5.4 and 5.6). The only habitat type in my study in which Bachman's sparrow were reported were stands categorized as planted and natural longleaf pine >15 years of a age (Tables 5.4 and 5.6).

Discussion

I reported bird species richness and abundance at point count stations across five forested habitats in south Mississippi. Species richness and abundance varied depending on the habitat type with habitats categorized as planted and natural longleaf pine > 15 years of age exhibiting the greatest species richness of all habitat types in my study. Longleaf pine forests in my study had a history of prescribed burning related to longleaf pine restoration and gopher tortoise management; therefore, these habitats were characterized by open canopy forests, sparse midstories, and abundant ground coverage of native grasses, forbs, and legumes (Bailey et al. 2006, DeBerry et al. 2008). My findings suggest that the habitat conditions associated with forest lands under management as longleaf pine restoration sites and gopher tortoise conservation areas provided more suitable habitat for northern bobwhite and Bachman's sparrow.

In my study, longleaf pine forests were typically managed with prescribed fire on a 3 to 5-year fire return interval. For this reason, habitat conditions associated with these stands included a reduced coverage of ground-level and mid-story vegetation, interspersion of natural openings, and greater coverage of understory herbaceous vegetation including grasses, forbs, and legumes, which are characteristics commonly associated with frequently burned pinewood habitats (Engstrom et al. 1984, Browning et al. 2004, Cox and Widener 2008). Furthermore, the diversity and structure of ground cover vegetation in frequently burned longleaf pine forests provided important nesting and foraging habitat for many grassland birds, which was exhibited on at least two of my fire-maintained longleaf pine sites by personal observations of foraging behavior by a northern bobwhite hen and clutch (White et al. 2005, Cox and Widener 2008). Bachman's sparrow is also dependent on the open conditions associated with frequently burned pine habitats and utilize the herbaceous understory as a source of nesting and foraging habitat (Dunning and Watts 1990, Dunning and Watts 1991, Haggerty 1998, Askins 2000, DeBerry et al. 2008). Bachman's sparrow in my study was limited to frequently burned longleaf pine habitats, however, it has been reported that pine forest habitats can provide similar conditions granted the frequency and intensity of fire is sufficient to maintain suitable habitat conditions (Hunter et al. 2001).

In addition to greater numbers of northern bobwhite and Bachman's sparrow in longleaf pine forests, other species of birds also appeared to benefit from the interspersion of habitat types associated with variations in topography, hydrology, and mosaic arrangements of recently burned and unburned patches (Yarrow and Yarrow 1999). In two regeneration sites, the presence of advanced thicket and shrub cover provided suitable habitat for eastern towhee (*Pipilo erythrophthalmus*) and orchard oriole (*Icterus spurius*) (DeBerry 2005, Allen et al. 2006). In another regeneration site, the detection of Kentucky warbler (*Oporornis formosus*) was likely related to the interspersion of hardwoods along a forested drainage adjacent to the stand (Sibley 2001).

Cavity-nesting bird species including Carolina chickadee (*Poecile carolinensis*), tufted titmouse (*Baeolophus bicolor*), brown-headed nuthatch, eastern bluebird (*Sialia sialis*), great-crested flycatcher (*Myiarchus crinitus*), and four species of woodpeckers were detected across multiple habitat types in my study. Carolina chickadee and tufted titmouse were among the most abundant cavity nesters in most habitat types. However, other species such as the great-crested flycatcher, eastern bluebird and brown-headed nuthatch were detected in greater abundance in association with the early successional vegetation communities that were prevalent in fire maintained longleaf pine forests in my study. Previous studies have reported the importance of standing snags as a source of nesting and foraging habitat for brown-headed nuthatch and other cavity nesting species in pine forests of the southeastern United States (Stribling et al. 1990, Wilson and Watts 1999, Lohr et al. 2002). Because of its close association with the mature pines, the brown-headed nuthatch is often considered an indicator of the health of southeastern pine forests (Deberry et al. 2008).

Whereas longleaf pine forests supported greater numbers of bird species that thrive in more open conditions, forested habitats exhibiting closed canopies, abundant midstories, and increase shade and ground leaf litter and supported a greater abundance of thicket-nesting and forest interior birds. In my study, these habitats were categorized as densely planted loblolly pine > 15 years of age, mixed pine hardwood > 15 years of age, and unmanaged mixed forest in sandhills. The habitat conditions associated with these forest stands were likely the result of dense stocking at stand establishment and lack of prescribed fire or other silviculture management (Engstrom et al. 1984, Aresco and Guyer 1999). Bird species associated with these conditions included wood thrush (*Hylocichla mustelina*), yellow-billed cuckoo (*Coccyzus americanus*), red-eyed vireo (*Vireo olivaceus*), white-eyed vireo (*Vireo griseus*), and yellow-throated vireo (*Vireo flavifrons*; Sibley 2001). Although these habitat types were sampled as separate units in my study, the maintenance of mixed and hardwood forests along drainages and riparian habitats may increase habitat quality and quantity for these species within sites managed for longleaf regeneration (Yarrow and Yarrow 1999). This is particularly important because several of the species that I detected in my study are listed as species of high conservation concern (Sauer et al. 2011). Furthermore, mixed-pine hardwood forests can be retained on soils that are of poor site index for longleaf pine and considered of marginal value to gopher tortoises as indicated by soil categories for gopher tortoises (USFWS 1990, 2012).

My findings support other studies that have investigated bird communities associated with pine forests of the southeastern United States (Engstrom et al. 1984, Burger 2001, Carroll and Cooper 2005, Cox and Jones 2007). Although I only reported species richness and abundance in habitats being managed for gopher tortoises, other studies are needed to further investigate species assemblages associated with these habitats. Future studies should consider estimating densities of selected species, including northern bobwhite and Bachman's sparrow, and selected species guilds (cavity-nesters, shrub-thicket nesters, etc.) associated with longleaf pine forests and other habitats being managed as gopher tortoise habitat. Investigating relationships between habitat conditions in areas managed for tortoises and the bird species assemblages associated with these conditions could provide valuable information for lands that are currently enrolled or are being considered as candidates for inclusion in longleaf restoration or gopher tortoise conservation programs.

Conclusions

My findings indicate that restoration and management for longleaf pine forests is compatible with efforts to restore habitat quality and quantity for gopher tortoises and grassland birds (Deberry et al. 2008). In my study, active gopher tortoise burrows were detected more frequently in longleaf pine forests > 15 years of age that had been managed with prescribed fire on a 3 to 5 year fire return interval. Habitat conditions associated with longleaf pine forests included open canopies, sparse midstories, adequate coverage of bare ground, and an abundant herbaceous understory dominated by grasses, legumes, and other forbs. These conditions provided excellent burrowing, foraging, and nesting habitat for gopher tortoises (Auffenberg and Franz 1982).

Similarly, habitat conditions in longleaf pine forests that supported greater numbers of tortoises also provided excellent conditions for a number of pine grassland birds, including northern bobwhite and Bachman's sparrow. In recent years, both species have experienced range-wide population declines due to the loss and degradation of habitat. Although, both species can thrive in a number of pine dominated habitats, longleaf pine represents the best option for both species because longleaf pine can be burned early and often over the stand rotation (Hunter et al. 2001, DeBerry et al. 2008). Longleaf pine forests that are managed with frequent prescribed fire maintain the early successional conditions that are associated with high quality foraging and nesting habitat for northern bobwhite, Bachman's sparrow, and many other pine grassland birds. In circumstances were longleaf pine restoration is not an option, other pine forests including mature loblolly or shortleaf pine, can also provide the necessary habitat conditions that support similar bird species assemblages. However, the success or failure of these scenarios is often dictated by the density of pines and the hardwood and grass component, which may be controlled by the season and frequency of burning (Hunter et al. 2001).

Table 5.1 Sampling intensity for breeding bird surveys in habitat types on private lands in south Mississippi during summer 2010.

Study Site, County Forest Stand Type (Age)	Tortoises Present?	Total No. Active Tortoise Burrows	Number of Breeding Bird Survey Point Count Stations	Dominant Soil Category for Gopher Tortoises[b]
Brooke Property, Hancock	Yes	19	**7**	Less/Moderately Suitable
Mixed Loblolly, Longleaf Pine (≤ 5 years)			0	
Natural Longleaf Pine (> 15 years, Uneven ages)			4	
Planted Longleaf Pine (> 5 - ≤ 15 years)			3	
Early Successional Habitat: Road Right-of-way and food plot			0	
Mixed Pine/Hardwood			0	
Hensarling Property, Perry	No	0	**2**	Less/Moderately Suitable
Loblolly Pine Regeneration (≤ 5 years)			2	
Wright Property, Lamar	Yes	29	**9**	Moderately Suitable
Longleaf Pine Regeneration (≤ 5 years)			1	
Planted Loblolly Pine (> 15 years)			3	
Planted Longleaf Pine (> 15 years)			4	
Natural Longleaf Pine (> 15 years) hardwood understory			1	
Early Successional Habitat: Field or Pipeline Right-of-Way			0	
Yager Property, Marion	No	0	**2**	Less/Moderately Suitable
Planted Loblolly Pine (> 15 years)			2	
Totals Sample Points Across All Sites		**48**	**20**	

Table 5.2 Sampling intensity for breeding bird surveys in habitat types on public lands in south Mississippi during summer 2010.

Study Site, County Forest Stand Type (Age)	Tortoises Present	Total No. Active Tortoise Burrows	Number of Breeding Bird Survey Point Count Stations	Dominant Soil Category[b]
Camp Tiak Boy Scout Camp, Forrest	Yes	12	**4**	Moderately Suitable
Natural Longleaf Pine (> 15 years)			2	
Planted Longleaf Pine (> 15 years)			2	
Mixed Loblolly, Longleaf Pine (> 15 years)			0	
Early Successional Habitats: Fields, Rights-of-Way			0	
Dead Dog Bog State Area, Greene	Yes	37	**4**	Moderately/Highly Suitable
Mixed Pine-Hardwood, Scrub Oak (> 15 years)			2	
Natural Longleaf Pine (> 15 years)			2	
Marion County Wildlife Management Area, Marion	Yes	40	**5**	Less/Moderately Suitable
Natural Longleaf Pine (> 15 years)			5	
ACUB Gunthrie-Phillips, Forrest	No	0	**4**	Moderately Suitable
Planted Loblolly Pine//Hardwoods (> 15 years)			4	
Camp Shelby Joint Forces Training Site – T-44, Perry	Yes	15	**5**	Moderately Suitable
Natural Longleaf Pine (> 15 years, Uneven ages)			5	
Camp Shelby Joint Forces Training Site, Forrest	Yes	2	**3**	Moderately Suitable
Regeneration Loblolly Pine (≤ 5 years)			2	
Natural Longleaf Pine (> 5 – 8 years)			1	
Early Successional Habitats: Fields, Rights-of-Way			0	
DeSoto National Forest, Forrest and Perry	Yes	3	**4**	Moderately Suitable
Mixed Pine-Hardwood (> 15 years)			4	
Totals Across All Sites		**109**	**29**	

Table 5.3 Total species abundance, mean species richness, and relative abundance of bird species in different habitat types of south Mississippi in May to July 1, 2010.

Habitat or Forest Types and Dominant Soil Categories for Gopher Tortoises	**No. of Sites (No. of Stations)**	**Total Species Richness/Site**	**Mean Species Richness/Site**	**Mean Abundance/Site**
No or Limited Prescribed Fire				
Regeneration Areas (≤ 5 years of age) Less, Moderately Suitable Soils *Wright & VH Properties, Camp Shelby*	3 (6)	45	27.8	20.4
Dense Planted Loblolly Pine Forests (> 15 years of age) Less, Moderately Suitable Soils *Yager & Wright Properties*	2 (5)	36	26.5	14.3
Mixed Pine Hardwood Forest with Midstory (> 15 years of age) Moderately, Suitable Soils *Desoto NF, ACUB*	2 (8)	38	32.0	15.2
Unmanaged Mixed Forests in Sandhills (> 15 years of age) Moderately, Highly Suitable Soils *Dead Dog Bog Area*	1 (2)	27	27.0	16.7
Managed with Prescribed Fire (3 – 5 year intervals)				
Planted Longleaf Pine (> 5 - ≤ 15 years of age) Less, Moderately Suitable Soils *Brooke Property*	1 (3)	34	34.0	20.4
Planted and Natural Longleaf Pine (> 15 years of age) Less, Moderately Suitable Soils *Brooke & Wright Properties, Camp Shelby-T44, Camp Tiak, Marion County WMA*	5 (23)	51	35.4	19.96
Natural Longleaf Pine (> 15 years of age) Moderately, Highly Suitable Soils *Dead Dog Bog Area*	1 (2)	28	28.0	16.8

Table 5.4 Mean abundance and range of abundance estimates/point count station of all bird species detected on five different habitat types in south Mississippi during breeding bird surveys in May to July 1, 2010.

Bird Species	**Longleaf Pine (> 15 yrs)** 6 Study Sites/ 25 Stations		**Longleaf Pine (> 5- ≤ 15 yrs)** 1 Study Site/3 Stations		**Pine Regeneration (≤ 5 yrs)** 3 Study Sites/6 Stations		**Loblolly Pine (> 15 yrs)** 2 Study Sites/ 5 Stations		**Pine – Hardwoods (> 15 yrs)** 3 Study Sites/ 10 Stations	
Common Name ***Scientific Name***	Mean Abundance	Range/Site	Mean Abundance	Range/Site	Mean Abundance	Range/ Site	Mean Abundance	Range/ Site	Mean Abundance	Range/ Site
Famiy Accipitridae										
Red-shouldered Hawk *Buteo lineatus*	0.011	0.00-0.067	0.00	------------	0.083	0.00-0.33	0.00	------------	0.028	0.00-0.083
Famiy Anatidae										
Wood Duck *Aix sponsa*	0.00	------------	0.00	------------	0.00	------------	0.056	0.00-0.111	0.00	0.00
Family Bombycillidae										
Cedar Waxwing *Bombycilla cedrorum*	0.022	0.00-0.133	0.00	------------	0.00	-----------	0.00	------------	0.00	------------
Family Caprimulgidae										
Common Nighthawk *Chordeiles minor*	0.014	0.00-0.083	0.00	------------	0.00	---------	0.00	------------	0.00	----------
Family Cardinalidae										
Northern Cardinal *Cardinalis cardinalis*	1.192	0.733-2.167	1.00	------------	1.125	0.33-1.67	1.639	0.778-2.50	2.195	1.917-2.50
Blue Grosbeak *Passerina caerulea*	0.119	0.00-0.333	0.333	------------	0.417	0.00-1.00	0.00	------------	0.00	------------
Indigo Bunting *Passerina cyanea*	1.147	0.50-1.467	1.778	------------	2.042	1.50-2.67	0.750	0.00-1.50	0.111	0.00-0.167
Family Charadriidae										
Killdeer *Charadrius vociferous*	0.00	------------	0.00	------------	0.042	0.00-0.17	0.167	0.00-0.333	0.00	------------
Family Columbidae										

Table 5.4 (Continued)

Eurasian Collared-Dove *Streptopelia decaocto*	0.014	0.00-0.083	0.00	------------	0.00	----------	0.056	0.00-0.111	0.00	----------
Mourning Dove *Zenaida macroura*	0.25	0.067-0.583	0.222	------------	0.25	0.00-0.50	0.139	0.111-0.167	0.194	0.083-0.333
Family Corvidae										
American Crow Corvus brachyrhynchos	0.014	0.00-0.083	0.00	------------	0.083	0.00-0.33	0.00	------------	0.00	------------
Fish Crow *Corvus ossifragus*	0.00	------------	0.00	------------	0.083	0.00-0.33	0.00	------------	0.00	------------
Blue Jay *Cyanocitta cristata*	0.864	0.333-1.50	1.667	------------	0.583	0.00-1.17	0.333	------------	0.50	0.333-0.833
Family Cuculidae										
Yellow-billed Cuckoo *Coccyzus americanus*	0.175	0.00-0.667	0.00	------------	0.083	0.00-0.33	0.056	0.00-0.111	0.50	0.167-1.00
Family Emberizidae										
Bachman's Sparrow *Peucaea aestivalis*	0.820	0.00-2.267	0.00	------------	0.00	------------	0.00	------------	0.00	------------
Eastern Towhee *Pipilo erythrophthalmus*	1.514	1.067-2.167	1.556	------------	1.583	1.33-2.33	0.778	0.556-1.00	1.194	0.833-1.50
Chipping Sparrow *Spizella passerine*	0.036	0.00-0.133	0.00	------------	0.00	-----------	0.00	------------	0.028	0.00-0.083
Field Sparrow *Spizella pusilla*	0.00	------------	0.00	------------	0.083	0.00-0.33	0.00	------------	0.00	------------
Family Hirundinidae										
Purple Martin *Progne subis*	0.014	0.00-0.083	0.00	------------	0.00	------------	0.00	------------	0.00	------------
Family Icteridae										
Red-winged Blackbird *Agelaius phoeniceus*	0.00	------------	0.111	------------	0.00	-----------	0.111	0.00-0.222	0.00	------------

Table 5.4 (Continued)

Orchard Oriole *Icterus spurious*	0.033	0.00-0.133	0.00	------------	0.500	0.00-1.50	0.00	------------	0.00	------------
Brown-headed Cowbird *Molothrus ater*	0.15	0.00-0.50	0.444	------------	0.417	0.17-0.67	0.084	0.00-0.167	0.00	------------
Eastern Meadowlark *Sturnella magna*	0.00	------------	0.222	------------	0.00	-----------	0.00	------------	0.00	------------
Common Grackle *Quiscalus quiscula*	0.019	0.00-0.111	0000	------------	0.00	-----------	0.00	------------	0.00	------------
Family Mimidae										
Gray Catbird *Dumetella carolinensis*	0.078	0.00-0.333	0.667	------------	0.042	0.00-0.17	0.00	------------	0.028	0.00-0.083
Northern Mockingbird *Mimus polyglottos*	0.367	0.00-1.083	1.556	------------	1.208	0.67-1.83	0.00	------------	0.222	0.00-0.50
Brown Thrasher *Toxostoma rufum*	0.131	0.067-0.333	0.00	------------	0.208	0.00-0.33	0.084	0.00-0.167	0.111	0.00-0.25
Family Odontophoridae										
Northern Bobwhite *Colinus virginianus*	0.489	0.00-1.083	0.778	------------	0.792	0.00-1.33	0.056	0.00-0.111	0.028	0.00-0.083
Family Paridae										
Tufted Titmouse *Baeolophus bicolor*	0.292	0.083-0.60	0.111	------------	0.417	0.00-1.00	0.056	0.00-1.00	0.639	0.50-0.833
Carolina Chickadee *Poecile carolinensis*	0.445	0.067-0.75	0.00	------------	0.333	0.00-0.67	1.028	0.833-1.222	0.555	0.00-0.833
Family Parulidae										
Prairie Warbler *Dendroica discolor*	0.358	0.00-0.933	0.111	------------	0.458	0.00-1.00	0.00	------------	0.028	0.00-0.083
Pine Warbler *Dendroica pinus*	1.061	0.333-1.533	0.333	------------	0.250	0.00-0.50	1.917	1.667-2.167	0.861	0.50-1.083

Table 5.4 (Continued)

Common Yellowthroat *Geothlypis trichas*	0.958	0.333-1.667	1.778	------------	1.125	0.33-1.67	0.084	0.00-0.167	0.167	0.083-0.25
Yellow-breasted Chat *Icteria virens*	1.183	0.667-1.80	1.778	------------	1.334	0.67-2.50	0.334	0.00-0.667	0.305	0.250-0.333
Kentucky Warbler *Oporornis formosus*	0.00	------------	0.00	------------	0.250	0.00-1.00	0.00	------------	0.00	------------
Hooded Warbler *Wilsonia citrina*	0.367	0.00-1.167	0.111	------------	0.125	0.00-0.50	0.917	0.00-1.833	1.306	1.00-1.667
Family Phasianidae										
Eastern Wild Turkey *Meleagris gallopavo*	0.00	------------	0.00	------------	0.00	----------	0.055	0.00-0.11	0.00	----------
Family Picidae										
Pileated Woodpecker *Dryocopus pileatus*	0.20	0.00-0.50	0.556	------------	0.167	0.00-0.33	0.00	------------	0.278	0.167-0.417
Northern Flicker *Colaptes auratus*	0.089	0.00-0.25	0.333	------------	0.125	0.00-0.33	0.00	------------	0.083	0.00-0.167
Red-bellied Woodpecker *Melanerpes carolinus*	0.722	0.333-0.933	0.778	------------	1.084	0.67-1.67	0.528	0.222-0.833	0.694	0.333-1.083
Red-headed Woodpecker *Melanerpes erythrocephalus*	0.311	0.00-0.933	0.111	------------	0.167	0.00-0.67	0.00	------------	0.028	0.00-0.083
Downy Woodpecker *Picoides pubescens*	0.117	0.00-0.25	0.333	------------	0.417	0.00-1.00	0.00	------------	0.195	0.167-0.25
Family Polioptilidae										
Blue-gray Gnatcatcher *Polioptila caerulea*	0.303	0.00-0.75	0.00	------------	0.208	0.00-0.33	0.084	0.00-0.167	0.50	0.417-0.583
Family Sittidae										

Table 5.4 (Continued)

Brown-headed Nuthatch *Sitta pusilla*	0.37	0.00-0.667	0.556	------------	0.208	0.00-0.33	0.139	0.111-0.167	0.195	0.00-0.417
Family Strigidae										
Great Horned Owl *Bubo virginianius*	0.022	0.00-0.133	0.00	------------	0.00	------------	0.00	------------	0.00	------------
Barred Owl *Strix varia*	0.00	------------	0.00	------------	0.00	------------	0.00	------------	0.028	0.00-0.083
Family Thraupidae										
Summer Tanager *Piranga rubra*	0.325	0.00-0.533	0.00	------------	0.167	0.00-0.33	0.139	0.111-0.167	0.139	0.00-0.333
Family Trochilidae										
Ruby-throated Hummingbird *Archilochus colubris*	0.00	------------	0.00	------------	0.00	------------	0.00	------------	0.083	0.00-0.083
Family Troglodytidae										
Carolina Wren *Thryothorus ludovicianus*	1.003	0.417-1.50	0.111	------------	0.708	0.33-1.00	1.945	1.556-2.333	1.417	0.500-1.917
Family Turdidae										
Veery *Catharus fuscescens*	0.00	------------	0.00	------------	0.00	-----------	0.00	------------	0.028	0.00-0.083
Wood Thrush *Hylocichla mustelina*	0.078	0.00-0.333	0.00	------------	0.042	0.00-0.17	0.084	0.00-0.167	0.389	0.00-0.833
Eastern Bluebird *Sialia sialis*	0.261	0.00-0.60	0.222	------------	0.083	0.00-0.33	0.056	0.00-0.111	0.00	------------
Family Tyrannidae										
Eastern Wood-peewee *Contopus virens*	0.397	0.00-1.00	0.00	------------	0.083	0.00-0.33	0.00	------------	0.028	0.00-0.083
Great-crested Flycatcher *Myiarchus crinitus*	0.583	0.267-0.833	0.111	------------	0.375	0.33-0.50	0.472	0.444-0.50	0.278	0.167-0.50

Table 5.4 (Continued)

Eastern Phoebe *Sayornis phoebe*	0.014	0.00-0.083	0.00	------------	0.00	------------	0.00	------------	0.00	------------
Eastern Kingbird *Tyrannus tyrannus*	0.186	0.00-0.667	0.444	------------	0.375	0.00-0.83	0.00	------------	0.00	------------
Family Vireonidae										
Yellow-throated Vireo *Vireo flavifrons*	0.206	0.083-0.267	0.111	------------	0.042	0.00-0.17	0.167	0.00-0.333	0.222	0.00-0.417
White-eyed Vireo *Vireo griseus*	0.250	0.00-0.833	0.333	------------	0.333	0.00-0.50	0.084	0.00-0.167	0.50	0.333-0.667
Red-eyed Vireo *Vireo olivaceus*	0.286	0.083-0.667	0.00	------------	0.125	0.00-0.50	0.139	0.111-0.167	0.778	0.50-0.917
Mean Abundance of All Bird Species/ Point Count Stations/Site	17.86		18.56		18.63		12.54		14.86	

Table 5.5 Bird species and associated number of observations of birds that flew over or through habitats with point count stations and birds that were heard calling at greater than 250 m from point count stations in south Mississippi during May to July1, 2010.

Bird Species **Common Name** ***Scientific Name***	**Longleaf Pine (> 15 yrs)** **6 Study Sites/25 Stations** **Number Observed**	**Longleaf Pine (> 5 - ≤ 15 yrs)** **1 Study Site/3 Stations** **Number Observed**	**Pine Regeneration (≤ 5 years)** **3 Study Sites/6 Stations** **Number Observed**	**Loblolly Pine (> 15 yrs)** **2 Study Sites/5 Stations** **Number Observed**	**Pine – Hardwoods (> 15 yrs)** **3 Study Sites/10 Stations** **Number Observed**
Bird that Flew Over or Through Study Sites					
American Crow *Corvus brachyrhynchos*	19	1	1	6	4
Barn Swallow *Hirundo rustica*	1	0	1	0	0
Black Vulture *Coragyps atratus*	0	0	0	1	0
Blue Jay *Cyanocitta cristata*	6	0	2	2	3
Canada Goose *Branta Canadensis*	1	0	0	0	0
Chimney Swift *Chaetura pelagic*	20	0	5	2	4
Common Grackle *Quiscalus quiscula*	0	3	0	2	0
Common Nighthawk *Chordeiles minor*	3	3	0	0	0
Eastern Bluebird *Sialia sialis*	0	0	1	0	0
Eastern Kingbird *Tyrannus tyrannus*	1	0	0	0	1
Fish Crow *Corvus ossifragus*	6	0	1	0	0
Great Blue Heron *Ardea Herodias*	0	0	1	0	0
Great Egret *Ardea alba*	0	1	0	0	0

Table 5.5 (Continued)

Indigo Bunting *Passerina cyanea*	1	0	1	0	0
Killdeer *Charadrius vociferous*	1	0	1	0	0
Mississippi Kite *Ictinia mississippiensis*	8	0	0	1	0
Purple Martin *Progne subis*	10	4	2	11	5
Red-bellied Woodpecker *Melanerpes carolinus*	0	0	1	0	0
Red-shouldered Hawk *Buteo lineatus*	1	0	0	0	0
Red-winged Blackbird *Agelaius phoeniceus*	3	0	0	0	0
Ruby-throated Hummingbird *Archilochus colubris*	6	0	0	1	0
Tree Swallow *Tachycineta bicolor*	0	0	2	0	0
Turkey Vulture *Cathartes aura*	0	1	0	0	0
Birds Detected at > 250m Distances					
Belted Kingfisher *Ceryle alcyon*	0	0	1	0	0
Chuck-will's-widow *Caprimulgus carolinensis*	1	0	0	0	0
Red-tailed Hawk *Buteo jamaicensis*	0	0	2	0	0

Table 5.6 Range in mean abundance of four species of pine-grassland birds detected in five habitat types in south Mississippi during point count surveys for breeding birds during May to July 2010.

Habitat or Forest Types, Dominant Soil Category	Total Species Detected[a]	Range in Mean Abundance of Selected Species of Birds per Study Site[b]			
		Northern Bobwhite Quail	**Bachman's Sparrow**	**Indigo Bunting**	**Brown-headed Nuthatch**
Pine Regeneration Areas ($\leq$ 5 years) Less, Moderately Suitable Soil	38	0.00-1.33	0	1.50-2.67	0.00-0.33
Mixed Pine Hardwood Forest with Midstory (> 15 years of age) *Desoto NF, ACUB* Moderately Suitable Soil	39	0.00-0.83	0	0.00-0.17	0.17-0.42
Planted and Natural Longleaf Pine (> 15 years of age) Less, Moderately Suitable Soils	48	0.25-1.08	0.00-2.27	1.00-1.47	0.00-0.67
Longleaf Pine (> 15 years) Moderately, Highly Suitable Soil	24	0	0	0.50	0
Planted Longleaf Pine (> 5 - $\leq$ 15 years of age) Less, Moderately Suitable Soils	34	0.78[c]	0	1.78[c]	0.56[c]

[a] Total species detected represent the total number of bird species identified within point count stations in each habitat type.
[b] Mean abundance of each bird species indicated represents the mean number of individuals detected at point count stations within each habitat type averaged over three survey periods.
[c] One study site was available in the > 5 – $\leq$ 15 year age class of longleaf pine; therefore, the average number of birds for this study site are indicated as opposed to a range of averages for multiple study sites

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CHAPTER VI

SUMMARY AND CONCLUSIONS

The restoration and management of longleaf pine forests and sandhill communities on public and private lands are important for the conservation of gopher tortoises and species associates indigenous to pine-grassland ecosystems (Bailey et al. 2006). Although conservation efforts have made great strides on lands in the public domain there has been minimal focus on the potential for conservation on privately owned lands (Knight 1999). Furthermore, 66% of the United States is in private ownership, and by contributing 80% of the available wildlife habitat, these lands are important to animal production, recreational use, and society (Benson 2001, Alavalapati et al. 2002, DeBerry and Moore 2006). While habitat management on private lands is critical to the sustainability of all wildlife species, it is especially important for those that are threatened or endangered (Moorman et al. 2002). Nearly half of all endangered species occur on private land and nearly all threatened species have a portion of their distribution on private land (Knight 1999, Parkhurst and Shogren 2003, Wilcove and Lee 2004). The long-term survival of most endangered species depends not only on our ability to prevent further losses but also our ability to increase their populations by restoring degraded habitats, often on private lands (Wilcove and Lee 2004). However, efforts to conserve wildlife habitat on private lands are particularly challenging, because often the costs are a burden to the landowner while the benefits are shared by the general public (Noonan and Zagata 1982, Matta et al. 2009). Private landowners are more inclined to be better stewards of wildlife habitat when economic incentives and technical assistance are available to offset the costs associated with habitat management (Noonan and Zagata 1982, Williams and Lathbury 1996, Benson 2001, Parkhurst and Shogren 2003). Privately owned lands enrolled in cost share programs funded by federal and state agencies and organizations could contribute to habitat quantity and quality for rare reptiles and grassland birds, such as northern bobwhites and Bachman's sparrows (Jones and Dorr 2004, Sladek et al. 2006, Baxley 2007). For example, habitat restoration and management activities funded by Farm Bill Programs on non-industrial lands have produced positive benefits in recreation and wildlife habitat quality (Burger 2000, Burger 2006, Riffell et al. 2007).

The Farm Bill Program provides numerous opportunities for private landowners to receive cost share and/or technical assistance for wildlife habitat management on their land. One in particular, the Conservation Reserve Program, was established in 1985 through the Food Security Act and is administered by the Natural Resources Conservation Service (Dunn et al. 1993). This program makes rent payments and cost sharing available to agricultural landowners who agree to retire less productive farmland for a fixed period of time (Hadlock and Beckwith 2002). While its original focus was erosion control today this program provides many other benefits including: improved connectivity among landscape elements, enhanced dispersal of plant species among woodlots, development of wildlife habitat, restoration of regional diversity, improvements in carbon flux, and enhanced aesthetics (Dunn et al. 1993). Success stories involving the Conservation Reserve Program as a mechanism for improving wildlife habitat are typically associated with avian habitat management (Johnson and Schwartz 1993, Herkert 2007). However, in 2006 the Farm Bill established a new initiative called the Longleaf Pine Initiative CP 36 which focused on the restoration of longleaf pine-grassland habitats on private lands. This initiative could benefit a diversity of wildlife species, including rare reptiles and upland game species. The Longleaf Pine Initiative was designed to reforest approximately 100,000 hectares of longleaf pine in nine southern states (USFWS 2006). As a voluntary cost share program it provides annual rental payments and cost-share assistance to landowners to restore longleaf pine on eligible private lands (USFWS 2006).

Other federal programs that provide assistance and cost share opportunities to private landowners include Partners for Fish and Wildlife, Environmental Quality Incentives Program (EQIP), and Wildlife Habitat Incentives Program (WHIP). The EQIP and WHIP, both administered by the Natural Resources Conservation Service, are especially important for private landowners given their emphasis on wildlife habitat. For example, EQIP focuses on manure management systems, erosion control, and invasive species/pest management but recent funding has addressed habitat management for threatened and endangered species (Browning et al. 2004, Berkland and Rewa 2005). However, WHIP is different from other programs because its focus is entirely on habitat management including habitats of national and state significance and specifically related to threatened or endangered species (Browning et al. 2004, Gray et al. 2005).

Another option for habitat conservation in the private sector is through the establishment of conservation or mitigation banks. A conservation bank is a parcel of habitat that is managed for the protection of sensitive species and used to offset impacts to these species occurring on nonbank lands (Lane et al. 2003). They have the potential to resolve many endangered species conflicts on private lands and give landowners greater flexibility in meeting the requirements of the Endangered Species Act while also advancing recovery of endangered species (Bonnie 1999). Mitigation of endangered species allows landowners or developers to purchase credits from other private landowners who will in turn stand to profit from their efforts to conserve or restore critical habitat on their property (Bonnie 1999, Hadlock and Beckwith 2002). However, establishment costs can be high, and the large areas required may be disadvantageous to smaller landowners unless they can establish a cooperative banking project that offers enough habitat at a competitive price (Casey et al. 2006). The U.S. Fish and Wildlife Service established specific guidelines for establishing conservation banks specifically for the gopher tortoise in the western portion of its range (Mississippi, Alabama, Louisiana; USFWS 2009). In 2001, the first federal conservation bank was established in Mobile, Alabama as a public/private partnership between the U.S. Fish and Wildlife Service, Environmental Defense, and the Mobile Area Water and Sewage System (Hudson 2007). Likewise, the U.S. Fish and Wildlife Service assisted Westervelt Ecological Services in establishing the first entrepreneurial conservation bank for gopher tortoises. The 486-hectare Chickasawhay Conservation Bank in Greene County, Mississippi will generate revenue from timber sales and hunting leases, but the focus will be maximizing habitat for gopher tortoises (McGuire 2010).

Private landowners value the management and use of natural resources in different ways. Some individuals place a high aesthetic value on ownership and the opportunity to manage habitat for wildlife. Others enjoy nature for these same reasons while also appreciating the potential economic incentives from managing for timber and wildlife habitat on their land. Many of the forest management practices that improve timber quality are also beneficial to wildlife (Yarrow and Yarrow 1999). Furthermore, the costs of improving wildlife habitat can be reduced if done in conjunction with other land management and even offset the costs if the landowner is able to generate additional revenue (Yarrow and Yarrow 1999). Some of these could include fee hunting and fishing, agro-forestry, pine straw, or other outdoor related activities (Measells et al. 2005, Mozumber et al. 2007). The demand for fee-hunting opportunities is currently on the rise (Pike 2007). Private landowners can meet this demand by maintaining suitable wildlife habitat conditions on their property while also improving the overall wildlife recreational value of the property.

Fee hunting can take the form of hunting plantations or preserves where guests pay for the opportunity to hunt and other accommodations (i.e. lodging, gun rental, meals, etc.). An online search of upland bird hunting plantations found daily base prices ranging from \$245 to \$990 depending on the size of the establishment and other amenities available to guests (PKS Quail and Pheasant Hunts 2012, Riverview Plantation 2012). However, one plantation in northeast Mississippi provides guests the option of an "all inclusive" two day hunt for \$2350 (Prairie Wildlife 2012). Private landowners also have the option of leasing access to their property to individuals interested in wildlife recreational activities. Yarrow and Yarrow (1999) reported lease values in the southeast at \$2 to \$7 per acre, with some near \$20, but nevertheless well above the cost of integrating turkey and deer management. A more recent study in Mississippi reported lease prices ranging from \$5 to \$150/acre/year (Jones unpublished data). In this study, 111 tracts sold for recreational use in 2005-2008 were leased for hunting at the time of sale at an average of $24.77 per acre. Furthermore, Jones et al. (2006) found that recreational opportunities accounted for a 36% increase in price per hectare received for private properties sold in Mississippi.

Land owners interested in increasing their land value might consider conserving native forest types and implementing habitat management practices to increase wildlife populations, thereby enhancing outdoor recreational opportunities on their land (Jones et al. 2006). The restoration and management of longleaf pine on private lands through federal cost share programs would not only offset associated costs and promote conservation of an imperiled ecosystem but also provide the potential for a long term economic return on investment from the forest related resources and wildlife related recreation.

Managing imperiled ecosystems on private lands is beneficial both to the owner and the general public. While the economic incentives for the landowner may be intuitively obvious the local environmental impact may not be realized until it is viewed at the landscape scale. Because the longleaf pine ecosystem exists in fragmented patches across its former range, restoration on private land adds to the overall acreage and creates connectivity of forest patches through habitat corridors. These corridors provide several benefits including enhanced biotic movement, extra foraging areas, refuge during disturbances, and enhancement of the aesthetic appeal of the landscape (Saunders et al. 1991). Bennett (1990) suggested that another benefit of corridors was the increased gene flow between populations that are otherwise isolated within disjunct patches. Haddad and Tewksbury (2005) described the most effective corridor as one that serves as both a conduit and as a habitat as these would be suitable for the widest array of plants and animals that are in need of conservation in fragmented landscapes. There are some concerns about the negative impacts of corridors on wildlife populations including spread of disease, increased predation, and the spread of invasive exotics that might otherwise not invade an isolated patch (Simberloff and Cox 1987, Hess 1994, Weldon 2006). Habitat corridors are considered a practical conservation measure and are now regularly incorporated into many land-use plans and conservation strategies (Bennett 1990). Wide-ranging species are frequently the focus of connectivity and corridor research because these species require large areas to support a viable population (Hoctor et al. 2008). In the southeastern United States there are numerous ongoing corridor initiatives being considered through the efforts of federal and state agencies and non-government conservation organizations. An example is the Pinhook Swamp Corridor in Florida that connects the Okefenokee National Forest of south Georgia and north Florida to the Osceola National Forest both of which historically functioned as an integrated swamp system and now are a part of the largest corridor east of the Mississippi River (Hoctor et al. 2008). The Florida Department of Environmental Protection, The Nature Conservancy, the Department of Defense, and others partnered to acquire the more than 3,200 hectares as a continuous habitat for a host of threatened and endangered species including the Florida panther (*Felis concolor coryi*), black bear (*Ursus americana*), and red-cockaded woodpecker (*Picoides borealis*) (Bennett 2003). The U.S. Fish and Wildlife Service and the Natural Resources Conservation Service hope to apply these same principles in their efforts to preserve habitat for threatened and endangered species like the gopher tortoise in upland habitats of the southeastern United States.

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APPENDIX A

SUMMARY TABLE OF PLANT SPECIES DETECTED IN THREE HEIGHT CATEGORIES ALONG LINE TRANSECTS ORIGINATING AT ACTIVE GOPHER TORTOISE (GOPHERUS POLYPHEMUS) BURROWS

Table A.1 Mean percent coverage of plant species (grasses, grass-likes, forbs, legumes, vines, shrubs, trees) detected along line transects originating at active gopher tortoise (*Gopherus polyphemus*) burrows in habitat types of south Mississippi during summer 2010.

Plant Genera		**Forest Stand Type (Age Class)**						
		Regeneration Areas (≤ 5 yrs)	**Early Successional Habitat**	**Mixed Pine Hardwood Forest (> 15 yrs)**	**Unmanaged Mixed Forest in Sandhills (> 15 yrs)**	**Planted Longleaf Pine (> 5 – ≤ 15 yrs)**	**Planted Longleaf Pine (> 15 yrs)**	**Natural Longleaf Pine (> 15 yrs)**
		Burrow (n = 3)	**Burrow (n = 4)**	**Burrow (n = 1)**	**Burrow (n = 1)**	**Burrow (n = 1)**	**Burrow (n = 1)**	**Burrow (n = 9)**
		Percent Coverage	Percent Coverage	Percent Coverage	Percent Coverage	Percent Coverage	Percent Coverage	Percent Coverage
		Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)
Scientific Name	**Origin**	Range	Range	Range	Range	Range	Range	Range
Understory (≤ 0.3 m in height)								
Forbs								
Ambrosia artemisiifolia	N	----	----	----	----	0.30 (0.30)	----	0.01 (0.01)
		----	----	----	----	0.0 – 1.52	----	0.0 – 0.76
Ambrosia sp.	N	----	0.09 (0.08)	----	----	----	----	----
		----	0.0 – 1.52	----	----	----	----	----
Total: *Ambrosia* sp.	**N**	**----**	**0.09 (0.08)**	**----**	**----**	**0.30 (0.30)**	**----**	**0.01 (0.01)**
		----	**0.0 – 1.52**	**----**	**----**	**0.0 – 1.52**	**----**	**0.0 – 0.76**
Aster adnatus	N	----	----	1.52 (1.16)	----	----	----	0.15 (0.05)
		----	----	0.0 – 3.79	----	----	----	0.0 – 2.27
Aster agundis	N	----	----	----	----	0.46 (0.19)	----	0.04 (0.04)
		----	----	----	----	0.0 – 0.76	----	0.0 – 3.79
Aster dumosus	N	----	----	----	----	----	----	0.26 (0.09)
		----	----	----	----	----	----	0.0 – 6.82
Aster linariifolius	N	----	----	----	----	----	----	0.04 (0.03)
		----	----	----	----	----	----	0.0 – 2.27
Aster patens	N	----	----	0.76 (0.44)	----	----	----	0.08 (0.04)
		----	----	0.0 – 1.52	----	----	----	0.0 – 2.27
Aster sp.	N	0.28 (0.19)	1.04 (0.42)	1.01 (0.67)	----	0.46 (0.19)	----	0.34 (0.11)
		0.0 – 1.52	0.0 – 6.82	0.0 – 2.27	----	0.0 – 0.76	----	0.0 – 6.06
Total: *Aster* sp.	**N**	**0.28 (0.19)**	**1.04 (0.42)**	**3.28 (1.97)**	**----**	**0.91 (0.56)**	**----**	**0.89 (0.17)**
		0.0 – 1.52	**0.0 – 6.82**	**0.0 – 6.82**	**----**	**0.0 – 3.03**	**----**	**0.0 – 7.58**
Blephilia ciliate	N	----	----	----	----	----	----	0.01 (0.01)

Table A.1 (Continued)

		----	----	----	----	----	----	0.0 – 0.76
Total: *Blephilia* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.01 (0.01)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 – 0.76**
Chrysopsis mariana	πN	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 – 0.76
Total: *Chrysopsis* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.01 (0.01)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 – 0.76**
Cnidoscolus stimulosus	N	0.34 (0.34)	0.19 (0.13)	----	----	0.15 (0.15)	----	0.04 (0.03)
		0.0 – 3.79	0.0 – 2.27	----	----	0.0 – 0.76	----	0.0 – 2.27
Total: *Cnidoscolus* sp.	**N**	**0.34 (0.34)**	**0.19 (0.13)**	**----**	**----**	**0.15 (0.15)**	**----**	**0.04 (0.03)**
		0.0 – 3.79	**0.0 – 2.27**	**----**	**----**	**0.0 – 0.76**	**----**	**0.0 – 2.27**
Coreopsis major	N	----	----	2.02 (2.02)	----	----	----	0.24 (0.15)
		----	----	0.0 – 6.06	----	----	----	0.0 – 14.39
Coreopsis sp.	N	----	----	----	----	----	----	0.09 (0.06)
		----	----	----	----	----	----	0.0 – 6.06
Coreopsis tripteris	N	----	----	----	----	----	----	0.04 (0.02)
		----	----	----	----	----	----	0.0 – 1.52
Total: *Coreopsis* sp.	**N**	**----**	**----**	**2.02 (2.02)**	**----**	**----**	**----**	**0.38 (0.17)**
		----	**----**	**0.0 – 6.06**	**----**	**----**	**----**	**0.0 – 15.15**
Croton capitatus	N	----	0.24 (0.21)	----	----	----	----	----
		----	0.0 – 3.79	----	----	----	----	----
Croton sp.	N	----	0.09 (0.06)	----	----	----	----	----
		----	0.0 – 0.76	----	----	----	----	----
Total: *Croton* sp.	**N**	**----**	**0.33 (0.25)**	**----**	**----**	**----**	**----**	**----**
		----	**0.0 – 4.55**	**----**	**----**	**----**	**----**	**----**
Diodia sp.	N	1.38 (0.95)	5.35 (2.28)	----	0.25 (0.25)	1.06 (0.66)	----	0.03 (0.03)
		0.0 – 9.09	0.0 – 32.58	----	0.0 – 0.76	0.0 – 3.03	----	0.0 – 3.03
Diodia teres	N	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 – 0.76
Diodia virginiana	N	----	----	----	----	----	----	0.19 (0.15)
		----	----	----	----	----	----	0.0 – 15.15
Total: *Diodia* sp.	**N**	**1.38 (0.95)**	**5.35 (2.28)**	**----**	**0.25 (0.25)**	**1.06 (0.66)**	**----**	**0.23 (0.16)**
		0.0 – 9.09	**0.0 – 32.58**	**----**	**0.0 – 0.76**	**0.0 – 3.03**	**----**	**0.0 – 15.15**
Elephantopus sp.	N	----	0.05 (0.04)	----	----	----	----	----
		----	0.0 – 0.76	----	----	----	----	----
Elephantopus tomentosus	N	----	0.33 (0.25)	0.76 (0.76)	----	0.15 (0.15)	0.51 (0.25)	0.35 (0.11)
		----	0.0 – 4.55	0.0 – 2.27	----	0.0 – 0.76	0.0 – 1.52	0.0 – 6.82
Total: *Elephantopus* sp.	**N**	**----**	**0.38 (0.25)**	**0.76 (0.76)**	**----**	**0.15 (0.15)**	**0.51 (0.25)**	**0.35 (0.11)**
		----	**0.0 – 4.55**	**0.0 – 2.27**	**----**	**0.0 – 0.76**	**0.0 – 1.52**	**0.0 – 6.82**

Table A.1 (Continued)

Erigeron sp.	N	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 – 0.76
Total: *Erigeron* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.01 (0.01)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 – 0.76**
Eryngium aquaticum	N	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 – 0.76
Eryngium yuccifolium	N	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 – 0.76
Total: *Eryngium* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.02 (0.01)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 – 0.76**
Eupatorium capillifolium	N	----	0.33 (0.29)	----	----	0.15 (0.15)	----	0.06 (0.04)
		----	0.0 – 5.30	----	----	0.0 – 0.76	----	0.0 – 3.79
Eupatorium hyssopifolium	N	----	----	----	----	----	----	0.03 (0.03)
		----	----	----	----	----	----	0.0 – 3.03
Eupatorium rotundifolia	N	----	0.09 (0.08)	----	----	0.76 (0.59)	----	0.04 (0.02)
		----	0.0 – 1.52	----	----	0.0 – 3.03	----	0.0 – 1.52
Eupatorium sp.	N	0.89 (0.62)	0.05 (0.04)	----	----	0.46 (0.30)	----	0.53 (0.27)
		0.0 – 6.82	0.0 – 0.76	----	----	0.0 – 1.52	----	0.0 – 25.00
Total: *Eupatorium* sp.	**N**	**0.89 (0.62)**	**0.47 (0.31)**	**----**	**----**	**1.36 (0.50)**	**----**	**0.66 (0.27)**
		0.0 – 6.82	**0.0 – 5.30**	**----**	**----**	**0.0 – 3.03**	**----**	**0.0 – 25.00**
Euphorbia pubentissima	N	----	----	----	----	----	----	0.05 (0.03)
		----	----	----	----	----	----	0.0 – 2.27
Euphorbia sp.	N	0.14 (0.14)	0.09 (0.06)	1.26 (0.67)	----	1.06 (0.46)	----	0.05 (0.02)
		0.0 – 1.52	0.0 – 0.76	0.0 – 2.27	----	0.0 – 2.27	----	0.0 – 1.52
Total: *Euphorbia* sp.	**N**	**0.14 (0.14)**	**0.09 (0.06)**	**1.26 (0.67)**	**----**	**1.06 (0.46)**	**----**	**0.09 (0.03)**
		0.0 – 1.52	**0.0 – 0.76**	**0.0 – 2.27**	**----**	**0.0 – 2.27**	**----**	**0.0 – 2.27**
Euthamia tenuifolia	N	----	0.57 (0.34)	----	----	1.36 (1.36)	----	----
		----	0.0 – 6.06	----	----	0.0 – 6.82	----	----
Total: *Euthamia* sp.	**N**	**----**	**0.57 (0.34)**	**----**	**----**	**1.36 (1.36)**	**----**	**----**
		----	**0.0 – 6.06**	**----**	**----**	**0.0 – 6.82**	**----**	**----**
Galium pilosum	N	----	----	----	----	----	----	0.02 (0.02)
		----	----	----	----	----	----	0.0 – 2.27
Galium sp.	N	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 – 0.76
Total: *Galium* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.03 (0.02)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 – 2.27**
Helenium amarum	N	----	----	----	----	----	----	0.59 (0.59)
		----	----	----	----	----	----	0.0 – 59.09
Total: *Helenium* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.59 (0.59)**

Table A.1 (Continued)

		----	**----**	**----**	**----**	**----**	**----**	**0.0 – 59.09**
Hypericum gentianoides	N	----	----	----	----	----	----	0.02 (0.02
		----	----	----	----	----	----	0.0 – 1.52
Total: *Hypericum* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.02 (0.02**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 – 1.52**
Ipomoea sp.	N	----	0.09 (0.08)	----	----	----	----	----
		----	0.0 – 1.52	----	----	----	----	----
Total: *Ipomoea* sp.	**N**	**----**	**0.09 (0.08)**	**----**	**----**	**----**	**----**	**----**
		----	**0.0 – 1.52**	**----**	**----**	**----**	**----**	**----**
Liatris sp.	N	----	----	----	----	----	----	0.02 (0.01)
		----	----	----	----	----	----	0.0 – 0.76
Total: *Liatris* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.02 (0.01)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 – 0.76**
Linum medium	N	----	----	----	----	----	----	0.02 (0.02)
		----	----	----	----	----	----	0.0 – 1.52
Linum sp.	N	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 – 0.76
Total: *Linum* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.02 (0.02)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 – 1.52**
Oxalis sp.	N	----	0.14 (0.13)	----	----	----	----	0.02 (0.02)
		----	0.0 – 2.27	----	----	----	----	0.0 – 1.52
Oxalis stricta	N	----	----	----	----	----	----	0.05 (0.02)
		----	----	----	----	----	----	0.0 – 1.52
Total: *Oxalis* sp.	**N**	**----**	**0.14 (0.13)**	**----**	**----**	**----**	**----**	**0.06 (0.03)**
		----	**0.0 – 2.27**	**----**	**----**	**----**	**----**	**0.0 – 1.52**
Pityopsis graminifolia	N	----	8.81 (3.77)	0.76 (0.44)	0.25 (0.25)	0.46 (0.19)	4.92 (3.59)	3.50 (0.92)
		----	0.0 – 60.61	0.0 – 1.52	0.0 – 0.76	0.0 – 0.76	0.0 – 22.73	0.0 – 1.52
Total: *Pityopsis* sp.	**N**	**----**	**8.81 (3.77)**	**0.76 (0.44)**	**0.25 (0.25)**	**0.46 (0.19)**	**4.92 (3.59)**	**3.50 (0.92)**
		----	**0.0 – 60.61**	**0.0 – 1.52**	**0.0 – 0.76**	**0.0 – 0.76**	**0.0 – 22.73**	**0.0 – 1.52**
Polygala nana	N	----	0.05 (0.04)	----	----	0.30 (0.30)	----	----
		----	0.0 – 0.76	----	----	0.0 – 1.52	----	----
Polygala sp.	N	0.14 (0.14)	----	----	----	----	0.13 (0.13)	----
		0.0 – 1.52	----	----	----	----	0.0 – 0.76	----
Total: *Polygala* sp.	**N**	**0.14 (0.14)**	**0.05 (0.04)**	**----**	**----**	**0.30 (0.30)**	**0.13 (0.13)**	**----**
		0.0 – 1.52	**0.0 – 0.76**	**----**	**----**	**0.0 – 1.52**	**0.0 – 0.76**	**----**
Polypremum procumbens	N	1.31 (0.88)	1.47 (0.52)	----	0.25 (0.25)	14.55 (9.47)	----	0.29 (0.14)
		0.0 – 7.58	0.0 – 7.58	----	0.0 – 0.76	0.0 – 51.52	----	0.0 – 9.09
Total: *Polyprenum* sp.	**N**	**1.31 (0.88)**	**1.47 (0.52)**	**----**	**0.25 (0.25)**	**14.55 (9.47)**	**----**	**0.29 (0.14)**
		0.0 – 7.58	**0.0 – 7.58**	**----**	**0.0 – 0.76**	**0.0 – 51.52**	**----**	**0.0 – 9.09**
Pteridium aquilinum	N	----	----	----	----	----	----	0.05 (0.05)

Table A.1 (Continued)

		----	----	----	----	----	----	0.0 – 4.55
Total: *Pteridium* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.05 (0.05)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 – 4.55**
Rhexia sp.	N	----	0.05 (0.04)	----	----	----	----	----
		----	0.0 – 0.76	----	----	----	----	----
Total: *Rhexia* sp.	**N**	**----**	**0.05 (0.04)**	**----**	**----**	**----**	**----**	**----**
		----	**0.0 – 0.76**	**----**	**----**	**----**	**----**	**----**
Rudbeckia sp.	N	----	----	----	----	----	----	0.02 (0.02)
		----	----	----	----	----	----	0.0 – 2.27
Total: *Rudbeckia* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.02 (0.02)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 – 2.27**
Solanum carolinense	N	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 – 0.76
Total: *Solanum* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.01 (0.01)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 – 0.76**
Solidago odora	N	----	0.28 (0.12)	2.02 (0.67)	1.26 (0.25)	0.61 (0.44)	----	0.29 (0.10)
		----	0.0 – 1.52	0.76 – 3.03	0.76 – 1.52	0.0 – 2.27	----	0.0 – 7.58
Total: *Solidago* sp.	**N**	**----**	**0.28 (0.12)**	**2.02 (0.67)**	**1.26 (0.25)**	**0.61 (0.44)**	**----**	**0.29 (0.10)**
		----	**0.0 – 1.52**	**0.76 – 3.03**	**0.76 – 1.52**	**0.0 – 2.27**	**----**	**0.0 – 7.58**
Stylisma humistrata	N	----	----	----	----	----	----	0.71 (0.47)
		----	----	----	----	----	----	0.0 – 37.12
Stylisma patens	N	----	----	----	----	----	----	0.05 (0.03)
		----	----	----	----	----	----	0.0 - 3.03
Total: *Stylisma* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.77 (0.47)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 – 37.12**
Tragia sp.	N	0.34 (0.24)	0.76 (0.29)	1.01 (0.67)	----	1.36 (0.37)	1.26 (0.38)	0.41 (0.09)
		0.0 – 2.27	0.0 – 4.55	0.0 – 2.27	----	0.0 – 2.27	0.0 – 2.27	0.0 – 5.30
Total: *Tragia* sp.	**N**	**0.34 (0.24)**	**0.76 (0.29)**	**1.01 (0.67)**	**----**	**1.36 (0.37)**	**1.26 (0.38)**	**0.41 (0.09)**
		0.0 – 2.27	**0.0 – 4.55**	**0.0 – 2.27**	**----**	**0.0 – 2.27**	**0.0 – 2.27**	**0.0 – 5.30**
Vernonia sp.	N	----	----	----	0.51 (0.51)	----	----	0.02 (0.01)
		----	----	----	0.0 – 1.52	----	----	0.0 – 0.76
Total: *Vernonia* sp.	**N**	**----**	**----**	**----**	**0.51 (0.51)**	**----**	**----**	**0.02 (0.01)**
		----	**----**	**----**	**0.0 – 1.52**	**----**	**----**	**0.0 – 0.76**
Viola sp.	N	----	----	----	----	----	0.13 (0.13)	0.01 (0.01)
		----	----	----	----	----	0.0 – 0.76	0.0 – 0.76

Table A.1 (Continued)

Total: *Viola* sp.	**N**	----	----	----	----	----	**0.13 (0.13)**	**0.01 (0.01)**
		----	----	----	----	----	**0.0 – 0.76**	**0.0 – 0.76**
Yucca filamentosa	N	----	----	----	----	----	----	0.11 (0.11)
		----	----	----	----	----	----	0.0 – 10.61
Total: *Yucca* sp.	**N**	----	----	----	----	----	----	**0.11 (0.11)**
		----	----	----	----	----	----	**0.0 – 10.61**
Phyllanthus sp.	Nn	----	0.28 (0.25)	----	----	----	----	----
		----	0.0 – 4.55	----	----	----	----	----
Total: *Phyllanthus* sp.	**Nn**	----	**0.28 (0.25)**	----	----	----	----	----
		----	**0.0 – 4.55**	----	----	----	----	----
Solanum capsicoides	Nn	----	----	----	----	----	----	0.02 (0.02)
		----	----	----	----	----	----	0.0 – 1.52
Total: *Solanum* sp.	**Nn**	----	----	----	----	----	----	**0.02 (0.02)**
		----	----	----	----	----	----	**0.0 – 1.52**
Solanum sp.	Unk	----	----	----	----	0.91 (0.91)	----	----
		----	----	----	----	0.0 – 4.55	----	----
Total: *Solanum* sp.	**Unk**	----	----	----	----	**0.91 (0.91)**	----	----
		----	----	----	----	**0.0 – 4.55**	----	----
Grasses								
Andropogon gerardii	N	----	----	----	----	----	----	0.06 (0.06)
		----	----	----	----	----	----	0.0 – 6.06
Andropogon sp.	N	33.06 (7.58)	27.42 (5.84)	31.82 (18.94)	47.73 (15.53)	3.03 (2.67)	43.43 (8.76)	20.68 (2.56)
		1.52 – 79.55	0.0 – 79.55	12.88 – 69.69	16.67 – 63.64	0.0 – 13.64	11.36 – 69.69	0.0 – 100.00
Total: *Andropogon* sp.	**N**	**33.06 (7.58)**	**27.42 (5.84)**	**31.82 (18.94)**	**47.73 (15.53)**	**3.03 (2.67)**	**43.43 (8.76)**	**20.74 (2.56)**
		1.52 – 79.55	**0.0 – 79.55**	**12.88 – 69.69**	**16.67 – 63.64**	**0.0 – 13.64**	**11.36 – 69.69**	**0.0 – 100.00**
Aristida beyrichiana	N	----	0.85 (0.76)	----	----	----	----	0.04 (0.03)
		----	0.0 – 13.64	----	----	----	----	0.0 – 3.03
Aristida sp.	N	----	2.56 (2.27)	----	----	----	----	2.82 (0.96)
		----	0.0 – 40.91	----	----	----	----	0.0 – 77.27
Aristida stricta	N	1.58 (1.58)	4.64 (2.25)	8.84 (8.84)	----	17.23 (8.03)	8.71 (3.25)	8.00 (2.06)
		0.0 – 17.42	0.0 – 39.39	0.0 – 26.52	----	0.0 – 40.91	0.0 – 21.21	0.0 – 96.97
Total: *Aristida* sp.	**N**	**1.58 (1.58)**	**8.05 (3.02)**	**8.84 (8.84)**	----	**17.23 (8.03)**	**8.71 (3.25)**	**10.86 (2.17)**
		0.0 – 17.42	**0.0 – 40.91**	**0.0 – 26.52**	----	**0.0 – 40.91**	**0.0 – 21.21**	**0.0 – 96.97**
Brachiaria playtphylla	N	1.31 (1.31)	----	----	----	----	----	----
		0.0 – 14.39	----	----	----	----	----	----
Total: *Brachiaria* sp.	**N**	**1.31 (1.31)**	----	----	----	----	----	----
		0.0 – 14.39	----	----	----	----	----	----
Chasmanthium sessiliflorum	N	----	----	0.25 (0.25)	----	----	----	0.19 (0.13)
		----	----	0.0 – 0.76	----	----	----	0.0 – 11.36

Table A.1 (Continued)

Chasmanthium sp.	N	0.89 (0.89)	1.66 (0.82)	1.77 (1.77)	----	1.21 (0.51)	----	0.01 (0.01)
		0.0 – 9.85	0.0 – 11.36	0.0 – 5.30	----	0.0 – 2.27	----	0.0 – 0.76
Total: *Chasmanthium* sp.	**N**	**0.89 (0.89)**	**1.66 (0.82)**	**2.02 (1.66)**	**----**	**1.21 (0.51)**	**----**	**0.20 (0.13)**
		0.0 – 9.85	**0.0 – 11.36**	**0.0 – 5.30**	**----**	**0.0 – 2.27**	**----**	**0.0 – 11.36**
Ctenium aromaticum	N	----	----	----	----	0.15 (0.15)	----	----
		----	----	----	----	0.0 – 0.76	----	----
Total: *Ctenium* sp.	**N**	**----**	**----**	**----**	**----**	**0.15 (0.15)**	**----**	**----**
		----	**----**	**----**	**----**	**0.0 – 0.76**	**----**	**----**
Danthonia sericea	N	----	----	----	----	----	----	0.53 (0.35)
		----	----	----	----	----	----	0.0 – 31.82
Total: *Danthonia* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.53 (0.35)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 – 31.82**
Dichanthelium aciculare	N	----	----	----	0.76 (0.76)	----	----	0.68 (0.45)
		----	----	----	0.0 – 2.27	----	----	0.0 – 34.85
Dichanthelium sp.	N	33.26 (5.77)	10.32 (1.49)	6.57 (5.47)	17.68 (7.38)	14.55 (4.95)	29.04 (5.26)	7.76 (1.11)
		2.27 – 61.36	0.0 – 21.97	0.0 – 17.42	3.03 – 26.52	0.76 – 25.76	14.39 – 52.27	0.0 – 60.61
Total: *Dichanthelium* sp.	**N**	**33.26 (5.77)**	**10.32 (1.49)**	**6.57 (5.47)**	**18.43 (7.85)**	**14.55 (4.95)**	**29.04 (5.26)**	**8.43 (1.23)**
		2.27 – 61.36	**0.0 – 21.97**	**0.0 – 17.42**	**3.03 – 26.52**	**0.76 – 25.76**	**14.39 – 52.27**	**0.0 – 60.61**
Eragrostis sp.	N	----	----	----	----	1.06 (0.66)	----	----
		----	----	----	----	0.0 – 3.03	----	----
Total: *Eragrostis* sp.	**N**	**----**	**----**	**----**	**----**	**1.06 (0.66)**	**----**	**----**
		----	**----**	**----**	**----**	**0.0 – 3.03**	**----**	**----**
Paspalum floridanum	N	----	16.00 (7.11)	----	----	----	2.15 (1.58)	0.04 (0.03)
		----	0.0 – 97.73	----	----	----	0.0 – 9.85	0.0 – 2.27
Total: *Paspalum* sp.	**N**	**----**	**16.00 (7.11)**	**----**	**----**	**----**	**2.15 (1.58)**	**0.04 (0.03)**
		----	**0.0 – 97.73**	**----**	**----**	**----**	**0.0 – 9.85**	**0.0 – 2.27**
Saccharum alopecuroides	N	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 – 0.76
Saccharum giganteum	N	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 - 0.76
Total: *Saccharum* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.02 (0.01)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 - 0.76**
Schizachyrium scoparium	N	4.34 (3.41)	19.69 (4.67)	----	----	30.76 (8.24)	4.79 (1.98)	10.29 (1.77)
		0.0 – 37.88	0.0 – 56.82	----	----	0.0 – 46.21	0.0 – 11.36	0.0 – 87.12
Total: *Schizachyrium* sp.	**N**	**4.34 (3.41)**	**19.69 (4.67)**	**----**	**----**	**30.76 (8.24)**	**4.79 (1.98)**	**10.29 (1.77)**
		0.0 – 37.88	**0.0 – 56.82**	**----**	**----**	**0.0 – 46.21**	**0.0 – 11.36**	**0.0 – 87.12**
Sorghastrum secundum	N	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 – 0.76
Sorghastrum sp.	N	----	----	----	----	----	0.25 (0.25)	0.08 (0.07)

Table A.1 (Continued)

		----	----	----	----	----	0.0 – 1.52	0.0 – 6.82
Total: *Sorghastrum* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**0.25 (0.25)**	**0.09 (0.07)**
		----	**----**	**----**	**----**	**----**	**0.0 – 1.52**	**0.0 – 6.82**
Tridens sp.	N	----	----	----	----	----	----	0.86 (0.43)
		----	----	----	----	----	----	0.0 – 34.09
Total: *Tridens* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.86 (0.43)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 – 34.09**
Cynodon dactylon	Nn	1.79 (1.79)	----	----	----	----	----	0.32 (0.32)
		0.0 – 19.69	----	----	----	----	----	0.0 – 31.82
Total: *Cynodon* sp.	**Nn**	**1.79 (1.79)**	**----**	**----**	**----**	**----**	**----**	**0.32 (0.32)**
		0.0 – 19.69	**----**	**----**	**----**	**----**	**----**	**0.0 – 31.82**
Digitaria ciliaris	Nn	----	3.41 (3.03)	----	----	----	----	----
		----	0.0 – 54.55	----	----	----	----	----
Digitaria sanguinalis	Nn	----	2.37 (2.10)	----	----	----	----	----
		----	0.0 – 37.88	----	----	----	----	----
Digitaria sp.	Nn	0.55 (0.55)	2.69 (1.56)	----	----	15.30 (15.30)	----	0.21 (0.14)
		0.0 – 6.06	0.0 – 25.00	----	----	0.0 – 76.52	----	0.0 – 12.88
Total: *Digitaria* sp.	**Nn**	**0.55 (0.55)**	**8.48 (5.23)**	**----**	**----**	**15.30 (15.30)**	**----**	**0.21 (0.14)**
		0.0 – 6.06	**0.0 – 92.42**	**----**	**----**	**0.0 – 76.52**	**----**	**0.0 – 12.88**
Imperata cylindrica	Nn	----	3.46 (3.16)	----	----	----	----	0.37 (0.24)
		----	0.0 – 55.30	----	----	----	----	0.0 – 18.94
Total: *Imperata* sp.	**Nn**	**----**	**3.46 (3.16)**	**----**	**----**	**----**	**----**	**0.37 (0.24)**
		----	**0.0 – 55.30**	**----**	**----**	**----**	**----**	**0.0 – 18.94**
Microstegium sp.	Nn	----	----	0.25 (0.25)	----	----	----	----
		----	----	0.0 – 0.76	----	----	----	----
Total: *Microstegium* sp.	**Nn**	**----**	**----**	**0.25 (0.25)**	**----**	**----**	**----**	**----**
		----	**----**	**0.0 – 0.76**	**----**	**----**	**----**	**----**
Paspalum notatum	Nn	----	9.28 (4.24)	----	----	2.12 (2.12)	----	4.43 (1.73)
		----	0.0 – 70.46	----	----	0.0 – 10.61	----	0.0 – 95.46
Paspalum urvillei	Nn	----	----	----	----	----	----	0.09 (0.09)
		----	----	----	----	----	----	0.0 – 9.09
Total: *Paspalum* sp.	**Nn**	**----**	**9.28 (4.24)**	**----**	**----**	**2.12 (2.12)**	**----**	**4.52 (1.73)**
		----	**0.0 – 70.46**	**----**	**----**	**0.0 – 10.61**	**----**	**0.0 – 95.46**
Sorghum halepense	Nn	----	----	----	----	----	----	0.02 (0.02)
		----	----	----	----	----	----	0.0 – 1.52
Total: *Sorghum* sp.	**Nn**	**----**	**----**	**----**	**----**	**----**	**----**	**0.02 (0.02)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 – 1.52**
Panicum sp.	Unk	0.55 (0.31)	----	----	0.25 (0.25)	----	0.76 (0.76)	0.50 (0.19)
		0.0 – 3.03	----	----	0.0 – 0.76	----	0.0 – 4.55	0.0 – 14.39

Table A.1 (Continued)

Total: *Panicum* sp.	**Unk**	**0.55 (0.31)**	**----**	**----**	**0.25 (0.25)**	**----**	**0.76 (0.76)**	**0.50 (0.19)**
		0.0 – 3.03	**----**	**----**	**0.0 – 0.76**	**----**	**0.0 – 4.55**	**0.0 – 14.39**
Paspalum sp.	Unk	0.07 (0.07)	1.18 (0.56)	----	----	2.73 (1.93)	0.63 (0.41)	0.30 (0.09)
		0.0 – 0.76	0.0 – 7.58	----	----	0.0 – 9.85	0.0 – 2.27	0.0 – 6.82
Total: *Paspalum* sp.	**Unk**	**0.07 (0.07)**	**1.18 (0.56)**	**----**	**----**	**2.73 (1.93)**	**0.63 (0.41)**	**0.30 (0.09)**
		0.0 – 0.76	**0.0 – 7.58**	**----**	**----**	**0.0 – 9.85**	**0.0 – 2.27**	**0.0 – 6.82**
Grass-likes								
Carex sp.	N	2.55 (0.93)	----	----	0.25 (0.25)	----	0.51 (0.25)	1.20 (0.29)
		0.0 – 9.09	----	----	0.0 – 0.76	----	0.0 – 1.52	0.0 – 17.42
Total: *Carex* sp.	**N**	**2.55 (0.93)**	**----**	**----**	**0.25 (0.25)**	**----**	**0.51 (0.25)**	**1.20 (0.29)**
		0.0 – 9.09	**----**	**----**	**0.0 – 0.76**	**----**	**0.0 – 1.52**	**0.0 – 17.42**
Cyperus echinatus	N	----	0.14 (0.09)	----	----	----	----	----
		----	0.0 – 1.52	----	----	----	----	----
Cyperus sp.	N	0.28 (0.21)	1.33 (0.85)	----	----	----	----	0.06 (0.04)
		0.0 – 2.27	0.0 – 13.64	----	----	----	----	0.0 – 3.79
Total: *Cyperus* sp.	**N**	**0.28 (0.21)**	**1.47 (0.84)**	**----**	**----**	**----**	**----**	**0.06 (0.04)**
		0.0 – 2.27	**0.0 – 13.64**	**----**	**----**	**----**	**----**	**0.0 – 3.79**
Legumes								
Centrosema sp.	N	----	0.05 (0.04)	----	----	----	----	0.04 (0.04)
		----	0.0 – 0.76	----	----	----	----	0.0 – 3.79
Centrosema virginianum	N	----	----	----	----	----	----	0.15 (0.11)
		----	----	----	----	----	----	0.0 – 9.85
Total: *Centrosema* sp.	**N**	**----**	**0.05 (0.04)**	**----**	**----**	**----**	**----**	**0.19 (0.11)**
		----	**0.0 – 0.76**	**----**	**----**	**----**	**----**	**0.0 – 9.85**
Chamaecrista fasciculata	N	----	0.14 (0.09)	0.51 (0.51)	----	0.46 (0.30)	----	0.48 (0.23)
		----	0.0 – 1.52	0.0 – 1.52	----	0.0 – 1.52	----	0.0 – 21.21
Total: *Chamaecrista* sp.	**N**	**----**	**0.14 (0.09)**	**0.51 (0.51)**	**----**	**0.46 (0.30)**	**----**	**0.48 (0.23)**
		----	**0.0 – 1.52**	**0.0 – 1.52**	**----**	**0.0 – 1.52**	**----**	**0.0 – 21.21**
Clitoria mariana	N	----	0.38 (0.34)	0.25 (0.25)	----	----	----	----
		----	0.0 – 6.06	0.0 – 0.76	----	----	----	----
Total: *Clitoria* sp.	**N**	**----**	**0.38 (0.34)**	**0.25 (0.25)**	**----**	**----**	**----**	**----**
		----	**0.0 – 6.06**	**0.0 – 0.76**	**----**	**----**	**----**	**----**
Crotalaria purshii	N	----	----	0.25 (0.25)	----	----	----	----
		----	----	0.0 – 0.76	----	----	----	----
Total: *Crotalaria* sp.	**N**	**----**	**----**	**0.25 (0.25)**	**----**	**----**	**----**	**----**
		----	**----**	**0.0 – 0.76**	**----**	**----**	**----**	**----**
Desmodium ciliare	N	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 – 0.76

Table A.1 (Continued)

Desmodium laevigatum	N	----	0.19 (0.12)	----	----	----	----	----
		----	0.0 – 1.52	----	----	----	----	----
Desmodium lineatum	N	----	0.28 (0.25)	----	----	----	1.64 (1.64)	----
		----	0.0 – 4.55	----	----	----	0.0 – 9.85	----
Desmodium obtusum	N	----	----	----	----	----	----	0.02 (0.02)
		----	----	----	----	----	----	0.0 – 1.52
Desmodium rotundifolium	N	----	0.19 (0.17)	----	----	----	----	0.02 (0.02)
		----	0.0 – 3.03	----	----	----	----	0.0 – 1.52
Desmodium sp.	N	0.07 (0.07)	0.05 (0.04)	----	----	----	0.38 (0.38)	0.41 (0.12)
		0.0 – 0.76	0.0 – 0.76	----	----	----	0.0 – 2.27	0.0 – 6.82
Total: *Desmodium* sp.	**N**	**0.07 (0.07)**	**0.71 (0.30)**	**----**	**----**	**----**	**2.02 (1.61)**	**0.43 (0.12)**
		0.0 – 0.76	**0.0 – 4.55**	**----**	**----**	**----**	**0.0 – 9.85**	**0.0 – 6.82**
Galactia regularis	N	----	0.57 (0.51)	----	----	----	----	----
		----	0.0 – 9.09	----	----	----	----	----
Galactia sp.	N	----	----	----	----	0.46 (0.30)	----	0.26 (0.17)
		----	----	----	----	0.0 – 1.52	----	0.0 – 16.67
Total: *Galactia* sp.	**N**	**----**	**0.57 (0.51)**	**----**	**----**	**0.46 (0.30)**	**----**	**0.26 (0.17)**
		----	**0.0 – 9.09**	**----**	**----**	**0.0 – 1.52**	**----**	**0.0 – 16.67**
Lespedeza hirta	N	----	----	0.51 (0.51)	----	----	----	----
		----	----	0.0 – 0.76	----	----	----	----
Lespedeza procumbens	N	----	0.33 (0.29)	1.26 (0.51)	----	0.15 (0.15)	----	0.31 (0.15)
		----	0.0 – 5.30	0.76 – 2.27	----	0.0 – 0.76	----	0.0 – 13.64
Lespedeza repens	N	----	----	----	----	0.15 (0.15)	----	0.05 (0.04)
		----	----	----	----	0.0 – 0.76	----	0.0 – 3.79
Lespedeza virginica	N	----	0.09 (0.06)	----	----	----	----	0.02 (0.01)
		----	0.0 – 0.76	----	----	----	----	0.0 – 0.76
Total: *Lespedeza* sp.	**N**	**----**	**0.43 (0.29)**	**1.77 (1.01)**	**----**	**0.30 (0.19)**	**----**	**0.37 (0.16)**
		----	**0.0 – 5.30**	**0.0 – 3.79**	**----**	**0.0 - 0.76**	**----**	**0.0 – 13.64**
Mimosa microphylla	N	----	----	----	----	----	----	0.08 (0.04)
		----	----	----	----	----	----	0.0 – 3.03
Total: *Mimosa* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.08 (0.04)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 – 3.03**
Rhynchosia reniformis	N	----	----	----	----	----	----	0.30 (0.17)
		----	----	----	----	----	----	0.0 – 15.91
Rhynchosia sp.	N	----	----	----	----	0.15 (0.15)	----	0.08 (0.03)
		----	----	----	----	0.0 – 0.76	----	0.0 – 2.27
Total: *Rhynchosia* sp.	**N**	**----**	**----**	**----**	**----**	**0.15 (0.15)**	**----**	**0.38 (0.17)**
		----	**----**	**----**	**----**	**0.0 – 0.76**	**----**	**0.0 – 15.91**
Stylosanthes biflora	N	----	1.33 (0.59)	5.05 (2.24)	----	1.06 (0.57)	0.88 (0.49)	0.39 (0.13)

Table A.1 (Continued)

		----	0.0 – 9.85	0.76 – 8.33	----	0.0 – 3.03	0.0 – 3.03	0.0 – 9.09
Total: *Stylosanthes* sp.	**N**	**----**	**1.33 (0.59)**	**5.05 (2.24)**	**----**	**1.06 (0.57)**	**0.88 (0.49)**	**0.39 (0.13)**
		----	**0.0 – 9.85**	**0.76 – 8.33**	**----**	**0.0 – 3.03**	**0.0 – 3.03**	**0.0 – 9.09**
Tephrosia florida	N	----	----	----	----	----	----	0.04 (0.04)
		----	----	----	----	----	----	0.0 – 3.79
Tephrosia sp.	N	----	----	----	----	----	----	0.37 (0.18)
		----	----	----	----	----	----	0.0 – 14.39
Tephrosia spicata	N	0.14 (0.14)	0.99 (0.49)	0.51 (0.51)	----	0.61 (0.28)	0.38 (0.38)	0.46 (0.16)
		0.0 – 1.52	0.0 – 8.33	0.0 – 1.52	----	0.0 – 1.52	0.0 – 2.27	0.0 – 12.12
Tephrosia virginiana	N	----	----	----	0.51 (0.51)	----	0.63 (0.63)	0.04 (0.02)
		----	----	----	0.0 – 1.52	----	0.0 – 3.79	0.0 – 1.52
Total: *Tephrosia* sp.	**N**	**0.14 (0.14)**	**0.99 (0.49)**	**0.51 (0.51)**	**0.51 (0.51)**	**0.61 (0.28)**	**1.01 (1.01)**	**0.90 (0.23)**
		0.0 – 1.52	**0.0 – 8.33**	**0.0 – 1.52**	**0.0 – 1.52**	**0.0 – 1.52**	**0.0 - 9.85**	**0.0 – 14.39**
Kummerowia striata	Nn	----	----	----	----	----	----	0.03 (0.03)
		----	----	----	----	----	----	0.0 – 3.03
Total: *Kummerowia* sp.	**Nn**	**----**	**----**	**----**	**----**	**----**	**----**	**0.03 (0.03)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 – 3.03**
Lespedeza cuneata	Nn	----	----	----	----	----	----	0.11 (0.07)
		----	----	----	----	----	----	0.0 – 4.55
Total: *Lespedeza* sp.	**Nn**	**----**	**----**	**----**	**----**	**----**	**----**	**0.11 (0.07)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 – 4.55**
Senna obtusifolia	Nn	----	1.04 (0.93)	----	----	----	----	----
		----	0.0 – 16.67	----	----	----	----	----
Total: *Senna* sp.	**Nn**	**----**	**1.04 (0.93)**	**----**	**----**	**----**	**----**	**----**
		----	**0.0 – 16.67**	**----**	**----**	**----**	**----**	**----**
Trifolium repens	Nn	----	----	----	----	----	----	0.35 (0.35)
		----	----	----	----	----	----	0.0 – 34.85
Total: *Trifolium* sp.	**Nn**	**----**	**----**	**----**	**----**	**----**	**----**	**0.35 (0.35)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 – 34.85**
Crotalaria sp.	Unk	----	----	----	----	----	----	0.08 (0.08)
		----	----	----	----	----	----	0.0 – 8.33
Total: *Crotalaria* sp.	**Unk**	**----**	**----**	**----**	**----**	**----**	**----**	**0.08 (0.08)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 – 8.33**
Lespedeza sp.	Unk	----	0.05 (0.04)	----	----	----	----	0.29 (0.08)
		----	0.0 – 0.76	----	----	----	----	0.0 – 4.55
Total: *Lespedeza* sp.	**Unk**	**----**	**0.05 (0.04)**	**----**	**----**	**----**	**----**	**0.29 (0.08)**
		----	**0.0 – 0.76**	**----**	**----**	**----**	**----**	**0.0 – 4.55**
Mosses								
Cladonia sp.	N	----	----	----	----	----	----	0.47 (0.32)

Table A.1 (Continued)

		----	----	----	----	----	----	0.0 – 31.06
Cladonia subtenuis	N	----	----	----	----	----	----	2.06 (0.85)
		----	----	----	----	----	----	0.0 – 68.18
Total: *Cladonia* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**2.54 (0.89)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 – 68.18**
Shrubs								
Callicarpa americana	N	----	----	0.25 (0.25)	----	----	----	0.04 (0.03)
		----	----	0.0 – 0.76	----	----	----	0.0 – 3.03
Total: *Callicarpa* sp.	**N**	**----**	**----**	**0.25 (0.25)**	**----**	**----**	**----**	**0.04 (0.03)**
		----	**----**	**0.0 – 0.76**	**----**	**----**	**----**	**0.0 – 3.03**
Ceanothus americanus	N	----	----	0.25 (0.25)	----	----	----	0.13 (0.10)
		----	----	0.0 – 0.76	----	----	----	0.0 – 9.85
Total: *Ceanothus* sp.	**N**	**----**	**----**	**0.25 (0.25)**	**----**	**----**	**----**	**0.13 (0.10)**
		----	**----**	**0.0 – 0.76**	**----**	**----**	**----**	**0.0 – 9.85**
Crataegus marshallii	N	----	0.09 (0.08)	----	----	----	----	----
		----	0.0 – 1.52	----	----	----	----	----
Total: *Crataegus* sp.	**N**	**----**	**0.09 (0.08)**	**----**	**----**	**----**	**----**	**----**
		----	**0.0 – 1.52**	**----**	**----**	**----**	**----**	**----**
Gaylussacia dumosa	N	----	0.62 (0.38)	----	----	1.36 (1.36)	0.38 (0.38)	0.83 (0.29)
		----	0.0 – 5.30	----	----	0.0 – 6.82	0.0 – 2.27	0.0 – 17.42
Gaylussacia sp.	N	----	----	----	1.01 (1.01)	0.30 (0.19)	----	0.29 (0.15)
		----	----	----	0.0 – 3.03	0.0 – 0.76	----	0.0 – 12.12
Total: *Gaylussacia* sp.	**N**	**----**	**0.62 (0.38)**	**----**	**1.01 (1.01)**	**1.67 (1.49)**	**0.38 (0.38)**	**1.13 (0.33))**
		----	**0.0 – 5.30**	**----**	**0.0 – 3.03**	**0.0 – 7.58**	**0.0 – 2.27**	**0.0 – 17.42**
Hypericum hypericoides	N	----	0.05 (0.04)	----	0.51 (0.51)	----	----	0.06 (0.03)
		----	0.0 – 0.76	----	0.0 – 1.52	----	----	0.0 – 1.52
Hypericum sp.	N	----	----	----	0.51 (0.51)	0.91 (0.61)	----	0.28 (0.17)
		----	----	----	0.0 – 1.52	0.0 – 3.03	----	0.0 – 16.67
Total: *Hypericum* sp.	**N**	**----**	**0.05 (0.04)**	**----**	**1.01(0.51)**	**0.91 (0.61)**	**----**	**0.34 (0.17)**
		----	**0.0 – 0.76**	**----**	**0.0 – 1.52**	**0.0 – 3.03**	**----**	**0.0 – 16.67**
Ilex coriacea	N	0.62 (0.62)	----	----	----	0.15 (0.15)	----	----
		0.0 – 6.82	----	----	----	0.0 – 0.76	----	----
Ilex glabra	N	1.03 (0.89)	0.28 (0.25)	0.25 (0.25)	----	0.15 (0.15)	----	0.71 (0.44)
		0.0 – 9.85	0.0 – 4.55	0.0 – 0.76	----	0.0 – 0.76	----	0.0 – 40.91
Ilex opaca	N	----	----	----	----	----	----	0.05 (0.03)
		----	----	----	----	----	----	0.0 – 3.03
Ilex vomitoria	N	2.55 (1.53)	1.18 (0.49)	----	----	0.46 (0.46)	----	0.50 (0.17)
		0.0 – 14.39	0.0 – 7.58	----	----	0.0 – 2.27	----	0.0 – 10.61
Total: *Ilex* sp.	**N**	**4.20 (2.41)**	**1.47 (0.52)**	**0.25 (0.25)**	**----**	**0.76 (0.59)**	**----**	**1.26 (0.48)**

Table A.1 (Continued)

		0.0 – 24.24	**0.0 – 7.58**	**0.0 – 0.76**	----	**0.0 – 3.03**	----	**0.0 – 40.91**
Licania michauxii	N	----	----	----	0.25 (0.25)	0.76 (0.48)	----	0.21 (0.10)
		----	----	----	0.0 – 0.76	0.0 – 2.27	----	0.0 – 8.33
Total: *Licania* sp.	**N**	----	----	----	**0.25 (0.25)**	**0.76 (0.48)**	----	**0.21 (0.10)**
		----	----	----	**0.0 – 0.76**	**0.0 – 2.27**	----	**0.0 – 8.33**
Myrica cerifera	N	0.14 (0.14)	0.14 (0.13)	0.51 (0.51)	----	----	----	0.57 (0.18)
		0.0 – 1.52	0.0 – 2.27	0.0 – 1.52	----	----	----	0.0 – 11.36
Total: *Myrica* sp.	**N**	**0.14 (0.14)**	**0.14 (0.13)**	**0.51 (0.51)**	----	----	----	**0.57 (0.18)**
		0.0 – 1.52	**0.0 – 2.27**	**0.0 – 1.52**	----	----	----	**0.0 – 11.36**
Quercus pumila	N	----	----	----	----	----	----	0.35 (0.24)
		----	----	----	----	----	----	0.0 – 18.18
Total: *Quercus* sp.	**N**	----	----	----	----	----	----	**0.35 (0.24)**
		----	----	----	----	----	----	**0.0 – 18.18**
Rhus copallinum	N	----	0.14 (0.07)	0.76 (0.44)	----	0.76 (0.48)	----	0.71 (0.15)
		----	0.0 – 0.76	0.0 – 1.52	----	0.0 – 2.27	----	0.0 – 6.82
Total: *Rhus* sp.	**N**	----	**0.14 (0.07)**	**0.76 (0.44)**	----	**0.76 (0.48)**	----	**0.71 (0.15)**
		----	**0.0 – 0.76**	**0.0 – 1.52**	----	**0.0 – 2.27**	----	**0.0 – 6.82**
Toxicodendron pubescens	N	0.62 (0.44)	----	0.25 (0.25)	----	----	----	1.98 (0.61)
		0.0 – 4.55	----	0.0 – 0.76	----	----	----	0.0 – 44.69
Total: *Toxicodendron* sp.	**N**	**0.62 (0.44)**	----	**0.25 (0.25)**	----	----	----	**1.98 (0.61)**
		0.0 – 4.55	----	**0.0 – 0.76**	----	----	----	**0.0 – 44.69**
Vaccinium arboretum	N	----	0.09 (0.08)	0.25 (0.25)	0.25 (0.25)	----	----	0.41 (0.14)
		----	0.0 – 1.52	0.0 – 0.76	0.0 – 0.76	----	----	0.0 – 11.36
Vaccinium elliottii	N	0.28 (0.21)	1.09 (0.54)	0.25 (0.25)	0.25 (0.25)	1.06 (0.51)	----	0.41 (0.12)
		0.0 – 2.27	0.0 – 8.33	0.0 – 0.76	0.0 – 0.76	0.0 – 2.27	----	0.0 – 8.33
Vaccinium myrsinites	N	1.17 (1.17)	0.38 (0.24)	1.01 (0.67)	1.01 (1.01)	1.36 (0.73)	0.88 (0.49)	1.37 (0.50)
		0.0 – 12.88	0.0 – 3.79	0.0 – 2.27	0.0 – 3.03	0.0 – 3.79	0.0 – 3.03	0.0 – 34.85
Vaccinium sp.	N	1.38 (0.74)	0.05 (0.04)	0.25 (0.25)	----	0.61 (0.28)	----	0.91 (0.37)
		0.0 – 6.82	0.0 – 0.76	0.0 – 0.76	----	0.0 – 1.52	----	0.0 – 28.03
Vaccinium stamineum	N	0.14 (0.14)	----	1.52 (1.52)	----	----	0.51 (0.51)	0.29 (0.16)
		0.0 – 1.52)	----	0.0 – 4.55	----	----	0.0 – 3.03	0.0 – 13.64
Total: *Vaccinium* sp.	**N**	**2.96 (1.98)**	**1.61 (0.63)**	**3.28 (1.54)**	**1.52 (0.76)**	**3.03 (1.31)**	**1.38 (0.97)**	**3.37 (0.71)**
		0.0 – 21.97	**0.0 – 8.33**	**0.76 – 6.06**	**0.76 - 3.03**	**0.0 – 6.82**	**0.0 - 6.06**	**0.0 – 36.36**
Rosa sp.	Unk	0.07 (0.07)	----	----	----	----	----	1.16 (0.49)
		0.0 – 0.76	----	----	----	----	----	0.0 – 33.33
Total: *Rosa* sp.	**Unk**	**0.07 (0.07)**	----	----	----	----	----	**1.16 (0.49)**
		0.0 – 0.76	----	----	----	----	----	**0.0 – 33.33**
Trees								
Acer rubrum	N	----	0.05 (0.04)	----	----	----	----	7.42 (2.16)

Table A.1 (Continued)

		----	0.0 – 0.76	----	----	----	----	0.0 – 100.00
Total: *Acer* sp.	**N**	**----**	**0.05 (0.04)**	**----**	**----**	**----**	**----**	**7.42 (2.16)**
		----	**0.0 – 0.76**	**----**	**----**	**----**	**----**	**0.0 – 100.00**
Carya tomentosa	N	----	----	0.25 (0.25)	----	----	----	0.05 (0.03)
		----	----	0.0 – 0.76	----	----	----	0.0 – 2.27
Total: *Carya* sp.	**N**	**----**	**----**	**0.25 (0.25)**	**----**	**----**	**----**	**0.05 (0.03)**
		----	**----**	**0.0 – 0.76**	**----**	**----**	**----**	**0.0 – 2.27**
Cornus florida	N	----	----	----	----	----	----	0.08 (0.05)
		----	----	----	----	----	----	0.0 – 3.79
Total: *Cornus* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.08 (0.05)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 – 3.79**
Diospyros virginiana	N	----	----	----	----	0.15 (0.15)	----	0.16 (0.08)
		----	----	----	----	0.0 – 0.76	----	0.0 – 6.06
Total: *Diospyros* sp.	**N**	**----**	**----**	**----**	**----**	**0.15 (0.15)**	**----**	**0.16 (0.08)**
		----	**----**	**----**	**----**	**0.0 – 0.76**	**----**	**0.0 – 6.06**
Liquidambar styraciflua	N	----	----	2.53 (2.53)	----	----	----	0.02 (0.02)
		----	----	0.0 – 7.58	----	----	----	0.0 – 1.52
Total: *Liquidambar* sp.	**N**	**----**	**----**	**2.53 (2.53)**	**----**	**----**	**----**	**0.02 (0.02)**
		----	**----**	**0.0 – 7.58**	**----**	**----**	**----**	**0.0 – 1.52**
Nyssa sylvatica	N	----	----	----	----	----	----	0.02 (0.02)
		----	----	----	----	----	----	0.0 – 2.27
Total: *Nyssa* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.02 (0.02)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 – 2.27**
Persea sp.	N	----	----	----	----	----	----	0.05 (0.05)
		----	----	----	----	----	----	0.0 – 4.55
Total: *Persea* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.05 (0.05)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 – 4.55**
Pinus palustris	N	1.52 (0.76)	0.76 (0.33)	1.01 (0.67)	----	0.61 (0.61)	3.28 (1.59)	1.40 (0.30)
		0.0 – 7.58	0.0 – 4.55	0.0 – 2.27	----	0.0 – 3.03	0.0 – 9.85	0.0 – 18.18
Pinus taeda	N	----	0.38 (0.17)	1.01 (0.67)	----	----	0.76 (0.62)	0.09 (0.05)
		----	0.0 – 2.27	0.0 – 2.27	----	----	0.0 – 3.79	0.0 – 3.79
Total: *Pinus* sp.	**N**	**1.52 (0.76)**	**1.14 (0.43)**	**2.02 (1.34)**	**----**	**0.61 (0.61)**	**4.05 (1.45)**	**1.50 (0.32)**
		0.0 – 7.58	**0.0 – 5.30**	**0.0 – 4.55**	**----**	**0.0 – 3.03**	**0.0 – 9.85**	**0.0 – 18.18**
Prunus serotina	N	0.14 (0.14)	----	----	----	----	----	0.02 (0.02)
		0.0 – 1.52	----	----	----	----	----	0.0 – 1.52
Total: *Prunus* sp.	**N**	**0.14 (0.14)**	**----**	**----**	**----**	**----**	**----**	**0.02 (0.02)**
		0.0 – 1.52	**----**	**----**	**----**	**----**	**----**	**0.0 – 1.52**
Quercus falcata	N	----	0.05 (0.04)	----	----	----	----	0.03 (0.03)
		----	0.0 – 0.76	----	----	----	----	0.0 – 3.03
Quercus incana	N	----	----	0.25 (0.25)	----	----	----	0.30 (0.12)

Table A.1 (Continued)

		----	----	0.0 – 0.76	----	----	----	0.0 – 8.33
Quercus laevis	N	----	----	----	----	----	----	0.20 (0.11)
		----	----	----	----	----	----	0.0 – 8.33
Quercus margaretta	N	----	----	----	----	----	----	0.18 (0.12)
		----	----	----	----	----	----	0.0 – 11.36
Quercus marilandica	N	----	----	----	----	----	----	0.17 (0.09)
		----	----	----	----	----	----	0.0 – 8.33
Quercus nigra	N	----	----	----	----	----	----	0.06 (0.05)
		----	----	----	----	----	----	0.0 – 4.55
Quercus pagoda	N	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 – 0.76
Quercus sp.	N	----	0.31 (0.27)	----	----	----	----	0.47 (0.14)
		----	0.0 – 4.94	----	----	----	----	0.0 – 9.09
Quercus stellate	N	----	----	----	----	----	----	0.02 (0.02)
		----	----	----	----	----	----	0.0 – 1.52
Total: *Quercus* sp.	**N**	**----**	**0.24 (0.21)**	**0.25 (0.25)**	**----**	**----**	**----**	**1.44 (0.28)**
		----	**0.0 – 3.79**	**0.0 – 0.76**	**----**	**----**	**----**	**0.0 – 13.64**
Sassafras albidum	N	----	----	----	----	0.15 (0.15)	----	0.02 (0.02)
		----	----	----	----	0.0 – 0.76	----	0.0 – 1.52
Total: *Sassafras* sp.	**N**	**----**	**----**	**----**	**----**	**0.15 (0.15)**	**----**	**0.02 (0.02)**
		----	**----**	**----**	**----**	**0.0 – 0.76**	**----**	**0.0 – 1.52**
Symplocos tinctoria	N	0.14 (0.14)	0.09 (0.08)	----	----	----	----	----
		0.0 – 1.52	0.0 – 1.52	----	----	----	----	----
Total: *Symplocos* sp.	**N**	**0.14 (0.14)**	**0.09 (0.08)**	**----**	**----**	**----**	**----**	**----**
		0.0 – 1.52	**0.0 – 1.52**	**----**	**----**	**----**	**----**	**----**
Vines								
Berchemia scandens	N	----	----	0.51 (0.25)	----	----	----	----
		----	----	0.0 – 0.76	----	----	----	----
Total: *Berchemia* sp.	**N**	**----**	**----**	**0.51 (0.25)**	**----**	**----**	**----**	**----**
		----	**----**	**0.0 – 0.76**	**----**	**----**	**----**	**----**
Bignonia capreolata	N	----	----	----	----	----	----	0.27 (0.21)
		----	----	----	----	----	----	0.0 – 19.69
Total: *Bignonia* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.27 (0.21)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 – 19.69**
Gelsemium sempervirens	N	1.24 (1.02)	1.04 (0.79)	0.25 (0.25)	1.52 (1.52)	----	----	1.15 (0.39)
		0.0 – 11.36	0.0 – 14.39	0.0 – 0.76	0.0 – 4.55	----	----	0.0 – 26.52
Total: *Gelsemium* sp.	**N**	**1.24 (1.02)**	**1.04 (0.79)**	**0.25 (0.25)**	**1.52 (1.52)**	**----**	**----**	**1.15 (0.39)**
		0.0 – 11.36	**0.0 – 14.39**	**0.0 – 0.76**	**0.0 – 4.55**	**----**	**----**	**0.0 – 26.52**
Mitchella repens	N	----	0.05 (0.04)	----	----	----	----	0.03 (0.03)

Table A.1 (Continued)

		----	0.0 – 0.76	----	----	----	----	0.0 – 3.03
Total: *Mitchella* sp.	**N**	**----**	**0.05 (0.04)**	**----**	**----**	**----**	**----**	**0.03 (0.03)**
		----	**0.0 – 0.76**	**----**	**----**	**----**	**----**	**0.0 – 3.03**
Parthenocissus quinquefolia	N	0.07 (0.07)	0.14 (0.13)	----	----	----	----	0.05 (0.04)
		0.0 – 0.76	0.0 – 2.27	----	----	----	----	0.0 – 3.79
Total: *Parthenocissus* sp.	**N**	**0.07 (0.07)**	**0.14 (0.13)**	**----**	**----**	**----**	**----**	**0.05 (0.04)**
		0.0 – 0.76	**0.0 – 2.27**	**----**	**----**	**----**	**----**	**0.0 – 3.79**
Rubus sp.	N	9.09 (3.03)	7.48 (2.40)	32.32 (16.71)	----	6.82 (1.33)	1.77 (0.77)	3.12 (0.89)
		0.0 – 26.52	0.0 – 42.42	5.30 – 62.88	----	1.52 – 8.33	0.0 – 5.30	0.0 – 43.94
Rubus trivialis	N	----	----	----	----	----	----	0.08 (0.06)
		----	----	----	----	----	----	0.0 – 5.30
Total: *Rubus* sp.	**N**	**9.09 (3.03)**	**7.48 (2.40)**	**32.32 (16.71)**	**----**	**6.82 (1.33)**	**1.77 (0.77)**	**3.19 (0.91)**
		0.0 – 26.52	**0.0 – 42.42**	**5.30 – 62.88**	**----**	**1.52 – 8.33**	**0.0 – 5.30**	**0.0 – 43.94**
Smilax bona-nox	N	----	----	----	----	----	----	0.02 (0.02)
		----	----	----	----	----	----	0.0 – 1.52
Smilax glabra	N	----	----	0.25 (0.25)	----	----	----	0.02 (0.02)
		----	----	0.0 – 0.76	----	----	----	0.0 – 1.52
Smilax glauca	N	----	0.14 (0.09)	----	----	1.97 (1.09)	----	0.11 (0.06)
		----	0.0 – 1.52	----	----	0.0 – 5.30	----	0.0 – 5.30
Smilax laurifolia	N	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 – 0.76
Smilax pumila	N	----	1.04 (0.73)	----	10.10 (10.10)	0.76 (0.76)	0.76 (0.76)	1.77 (0.41)
		----	0.0 – 12.88	----	0.0 – 30.30	0.0 – 3.79	0.0 – 4.55	0.0 – 20.46
Smilax rotundifolia	N	----	----	----	----	----	----	0.06 (0.05)
		----	----	----	----	----	----	0.0 – 5.30
Smilax sp.	N	2.48 (1.08)	0.47 (0.22)	----	----	----	----	0.29 (0.09)
		0.0 – 9.85	0.0 – 3.79	----	----	----	----	0.0 – 6.06
Total: *Smilax* sp.	**N**	**2.48 (1.08)**	**1.66 (0.73)**	**0.25 (0.25)**	**10.10 (10.10)**	**2.73 (1.01)**	**0.76 (0.76)**	**2.28 (0.41)**
		0.0 – 9.85	**0.0 – 12.88**	**0.0 – 0.76**	**0.0 – 30.30**	**0.0 - 5.30**	**0.0 – 4.55**	**0.0 – 20.46**
Toxicodendron radicans	N	----	2.04 (1.46)	3.79 (2.00)	----	----	----	0.02 (0.02)
		----	0.0 – 26.52	0.0 – 6.82	----	----	----	0.0 – 1.52
Total: *Toxicodendron* sp.	**N**	**----**	**2.04 (1.46)**	**3.79 (2.00)**	**----**	**----**	**----**	**0.02 (0.02)**
		----	**0.0 – 26.52**	**0.0 – 6.82**	**----**	**----**	**----**	**0.0 – 1.52**
Vitis rotundifolia	N	----	2.37 (1.98)	7.32 (1.54)	----	----	----	1.79 (0.61)
		----	0.0 – 35.61	4.55 – 9.85	----	----	----	0.0 – 34.85
Total: *Vitis* sp.	**N**	**----**	**2.37 (1.98)**	**7.32 (1.54)**	**----**	**----**	**----**	**1.79 (0.61)**
		----	**0.0 – 35.61**	**4.55 – 9.85**	**----**	**----**	**----**	**0.0 – 34.85**
Lonicera japonica	Nn	----	----	----	----	0.15 (0.15)	----	----
		----	----	----	----	0.0 – 0.76	----	----

Table A.1 (Continued)

Total: *Lonicera* sp.	**Nn**	----	----	----	----	**0.15 (0.15)**	----	----
		----	----	----	----	**0.0 – 0.76**	----	----
Lygodium japonicum	Nn	----	----	----	----	----	----	0.09 (0.09)
		----	----	----	----	----	----	0.0 – 9.85
Total: *Lygodium* sp.	**Nn**	----	----	----	----	----	----	**0.09 (0.09)**
		----	----	----	----	----	----	**0.0 – 9.85**
Midstory (> 0.3 m - ≤ 1m in height)								
Forbs								
Agalinis sp.	N	----	----	----	----	----	----	0.02 (0.02)
		----	----	----	----	----	----	0.0 – 1.52
Total: *Agalinis* sp.	**N**	----	----	----	----	----	----	**0.02 (0.02)**
		----	----	----	----	----	----	**0.0 – 1.52**
Ambrosia artemisiifolia	N	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 – 0.76
Ambrosia sp.	N	0.14 (0.09)	0.09 (0.06)	----	----	----	----	----
		0.0 – 0.76	0.0 – 0.76	----	----	----	----	----
Total: *Ambrosia* sp.	**N**	**0.14 (0.09)**	**0.09 (0.06)**	----	----	----	----	**0.01 (0.01)**
		0.0 – 0.76	**0.0 – 0.76**	----	----	----	----	**0.0 – 0.76**
Aster adnatus	N	----	----	----	----	----	----	0.02 (0.01)
		----	----	----	----	----	----	0.0 – 0.76
Aster agundis	N	----	----	----	----	----	----	0.03 (0.03)
		----	----	----	----	----	----	0.0 – 3.03
Aster dumosus	N	----	----	----	----	----	----	0.11 (0.05)
		----	----	----	----	----	----	0.0 – 3.79
Aster patens	N	----	----	----	----	----	----	0.12 (0.07)
		----	----	----	----	----	----	0.0 – 6.82
Aster sp.	N	3.09 (2.08)	2.18 (1.08)	----	----	0.15 (0.15)	4.04 (1.46)	1.07 (0.34)
		0.0 – 21.97	0.0 – 17.42	----	----	0.0 – 0.76	0.0 – 9.09	0.0 – 25.00
Total: *Aster* sp.	**N**	**3.09 (2.08)**	**2.18 (1.08)**	----	----	**0.15 (0.15)**	**4.04 (1.46)**	**1.36 (0.39)**
		0.0 – 21.97	**0.0 – 17.42**	----	----	**0.0 – 0.76**	**0.0 – 9.09**	**0.0 – 31.82**
Blephilia ciliate	N	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 – 0.76
Total: *Blephilia* sp.	**N**	----	----	----	----	----	----	**0.01 (0.01)**
		----	----	----	----	----	----	**0.0 – 0.76**
Coreopsis major	N	----	----	----	----	----	----	0.02 (0.01)
		----	----	----	----	----	----	0.0 – 0.76
Coreopsis sp.	N	----	0.14 (0.13)	----	----	----	0.63 (0.63)	0.05 (0.03)
		----	0.0 – 2.27	----	----	----	0.0 – 3.79	0.0 – 1.52

Table A.1 (Continued)

Total: *Coreopsis* sp.	**N**	**----**	**0.14 (0.13)**	**----**	**----**	**----**	**0.63 (0.63)**	**0.07 (0.03)**
		----	**0.0 – 2.27**	**----**	**----**	**----**	**0.0 – 3.79**	**0.0 – 1.52**
Croton sp.	N	----	0.43 (0.28)	----	----	----	----	----
		----	0.0 – 4.55	----	----	----	----	----
Total: *Croton* sp.	**N**	**----**	**0.43 (0.28)**	**----**	**----**	**----**	**----**	**----**
		----	**0.0 – 4.55**	**----**	**----**	**----**	**----**	**----**
Diodia sp.	N	11.16 (7.58)	7.62 (4.08)	----	----	----	----	0.65 (0.32)
		0.0 – 84.85	0.0 – 69.69	----	----	----	----	0.0 – 26.52
Total: *Diodia* sp.	**N**	**11.16 (7.58)**	**7.62 (4.08)**	**----**	**----**	**----**	**----**	**0.65 (0.32)**
		0.0 – 84.85	**0.0 – 69.69**	**----**	**----**	**----**	**----**	**0.0 – 26.52**
Eupatorium capillifolium	N	0.21 (0.21)	0.09 (0.06)	----	----	----	----	0.03 (0.02)
		0.0 – 2.27	0.0 – 0.76	----	----	----	----	0.0 – 2.27
Eupatorium hyssopifolium	N	----	----	----	----	----	----	0.02 (0.02)
		----	----	----	----	----	----	0.0 – 1.52
Eupatorium leucolepsis	N	----	----	----	0.25 (0.25)	----	----	----
		----	----	----	0.0 – 0.76	----	----	----
Eupatorium rotundifolia	N	0.34 (0.24)	----	----	----	0.76 (0.34)	0.63 (0.63)	0.04 (0.03)
		0.0 – 2.27	----	----	----	0.0 – 1.52	0.0 -3.79	0.0 – 2.27
Eupatorium sp.	N	0.83 (0.62)	----	----	----	0.15 (0.15)	0.25 (0.25)	0.38 (0.13)
		0.0 – 6.82	----	----	----	0.0 – 0.76	0.0 – 1.52	0.0 – 8.33
Total: *Eupatorium* sp.	**N**	**1.38 (0.61)**	**0.09 (0.06)**	**----**	**0.25 (0.25)**	**0.91 (0.44)**	**0.88 (0.63)**	**0.46 (0.13)**
		0.0 – 6.82	**0.0 – 0.76**	**----**	**0.0 – 0.76**	**0.0 – 2.27**	**0.0 – 3.79**	**0.0 – 8.33**
Euphorbia pubentissima	N	----	----	----	----	----	----	0.02 (0.02)
		----	----	----	----	----	----	0.0 – 1.52
Euphorbia sp.	N	0.34 (0.19)	----	0.25 (0.25)	----	----	1.14 (0.55)	0.12 (0.05)
		0.0 – 1.52	----	0.0 – 0.76	----	----	0.0 – 3.03	0.0 – 3.79
Total: *Euphorbia* sp.	**N**	**0.34 (0.19)**	**----**	**0.25 (0.25)**	**----**	**----**	**1.14 (0.55)**	**0.14 (0.05)**
		0.0 – 1.52	**----**	**0.0 – 0.76**	**----**	**----**	**0.0 – 3.03**	**0.0 – 3.79**
Euthamia tenuifolia	N	1.65(1.65)	0.81 (0.55)	----	----	----	----	----
		0.0 – 18.18	0.0 – 9.85	----	----	----	----	----
Total: *Euthamia* sp.	**N**	**1.65(1.65)**	**0.81 (0.55)**	**----**	**----**	**----**	**----**	**----**
		0.0 – 18.18	**0.0 – 9.85**	**----**	**----**	**----**	**----**	**----**
Helianthus sp.	N	4.61 (2.79)	0.28 (0.25)	----	----	----	3.79 (2.40)	0.13 (0.07)
		0.0 – 25.00	0.0 – 4.55	----	----	----	0.0 – 12.12	0.0 – 5.30
Total: *Helianthus* sp.	**N**	**4.61 (2.79)**	**0.28 (0.25)**	**----**	**----**	**----**	**3.79 (2.40)**	**0.13 (0.07)**
		0.0 – 25.00	**0.0 – 4.55**	**----**	**----**	**----**	**0.0 – 12.12**	**0.0 – 5.30**
Hibiscus sp.	N	----	----	----	----	----	0.76 (0.76)	0.12 (0.09)
		----	----	----	----	----	0.0 – 4.55	0.0 – 7.58
Total: *Hisbiscus* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**0.76 (0.76)**	**0.12 (0.09)**
		----	**----**	**----**	**----**	**----**	**0.0 – 4.55**	**0.0 – 7.58**

Table A.1 (Continued)

Liatris sp.	N	----	0.05 (0.04)	----	----	----	----	0.02 (0.01)
		----	0.0 – 0.76	----	----	----	----	0.0 – 0.76
Total: *Liatris* sp.	**N**	**----**	**0.05 (0.04)**	**----**	**----**	**----**	**----**	**0.02 (0.01)**
		----	**0.0 – 0.76**	**----**	**----**	**----**	**----**	**0.0 – 0.76**
Linum sp.	N	----	----	----	----	----	----	0.02 (0.02)
		----	----	----	----	----	----	0.0 – 1.52
Total: *Linum* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.02 (0.02)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 – 1.52**
Onoclea sensibilis	N	----	----	----	----	----	----	0.02 (0.02)
		----	----	----	----	----	----	0.0 – 2.27
Total: *Onoclea* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.02 (0.02)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 – 2.27**
Polypremum procumbens	N	0.62 (0.62)	----	----	----	----	----	0.09 (0.07)
		0.0 – 6.82	----	----	----	----	----	0.0 – 6.82
Total: Polypremum sp.	**N**	**0.62 (0.62)**	**----**	**----**	**----**	**----**	**----**	**0.09 (0.07)**
		0.0 – 6.82	**----**	**----**	**----**	**----**	**----**	**0.0 – 6.82**
Pteridium aquilinum	N	----	----	----	----	----	4.29 (4.29)	3.22 (1.19)
		----	----	----	----	----	0.0 – 25.76	0.0 – 78.03
Total: Pteridium sp.	**N**	**----**	**----**	**----**	**----**	**----**	**4.29 (4.29)**	**3.22 (1.19)**
		----	**----**	**----**	**----**	**----**	**0.0 – 25.76**	**0.0 – 78.03**
Pycnanthemum incanum	N	----	0.09 (0.08)	1.77 (1.77)	----	----	----	0.02 (0.02)
		----	0.0 – 1.52	0.0 – 5.30	----	----	----	0.0 – 1.52
Total: Pycnanthemum sp.	**N**	**----**	**0.09 (0.08)**	**1.77 (1.77)**	**----**	**----**	**----**	**0.02 (0.02)**
		----	**0.0 – 1.52**	**0.0 – 5.30**	**----**	**----**	**----**	**0.0 – 1.52**
Rudbeckia sp.	N	----	----	----	----	----	----	0.02 (0.02)
		----	----	----	----	----	----	0.0 – 1.52
Total: Rudbeckia sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.02 (0.02)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 – 1.52**
Solidago odora	N	4.68 (3.10)	2.60 (0.84)	0.51 (0.51)	1.52 (0.88)	3.49 (1.56)	4.67 (1.26)	1.33 (0.28)
		0.0 – 31.06	0.0 – 11.36	0.0 – 1.52	0.0 – 3.03	0.0 – 7.58	2.27 – 10.61	0.0 – 13.64
Solidago sp.	N	1.31 (0.88)	----	----	----	----	----	0.23 (0.21)
		0.0 – 7.58	----	----	----	----	----	0.0 – 21.21
Total: Solidago sp.	**N**	**5.99 (3.03)**	**2.60 (0.84)**	**0.51 (0.51)**	**1.52 (0.88)**	**3.49 (1.56)**	**4.67 (1.26)**	**1.56 (0.34)**
		0.0 – 31.06	**0.0 – 11.36**	**0.0 – 1.52**	**0.0 – 3.03**	**0.0 – 7.58**	**2.27 – 10.61**	**0.0 – 21.21**
Vernonia sp.	N	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 – 0.76
Total: Vernonia sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.01 (0.01)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 – 0.76**
Conyza canadensis	Nn	0.07 (0.07)	----	----	----	----	----	0.02 (0.02)
		0.0 – 0.76	----	----	----	----	----	0.0 – 1.52

Table A.1 (Continued)

Total: Conyza sp.	**Nn**	**0.07 (0.07)**	----	----	----	----	----	**0.02 (0.02)**
		0.0 – 0.76	----	----	----	----	----	**0.0 – 1.52**
Verbena brasiliensis	Nn	----	----	----	----	----	----	0.04 (0.03)
		----	----	----	----	----	----	0.0 – 2.27
Total: Verbena sp.	**Nn**	----	----	----	----	----	----	**0.04 (0.03)**
		----	----	----	----	----	----	**0.0 – 2.27**
Yucca sp.	Unk	----	0.28 (0.25)	----	----	----	----	----
		----	0.0 – 4.55	----	----	----	----	----
Total: *Yucca* sp.	**Unk**	----	**0.28 (0.25)**	----	----	----	----	----
		----	**0.0 – 4.55**	----	----	----	----	----
Grasses								
Andropogon sp.	N	----	----	----	----	----	----	0.37 (0.22)
		----	----	----	----	----	----	0.0 – 15.91
Total: *Andropogon* sp.	**N**	----	----	----	----	----	----	**0.37 (0.22)**
		----	----	----	----	----	----	**0.0 – 15.91**
Aristida stricta	N	----	0.14 (0.13)	----	----	----	----	----
		----	0.0 – 2.27	----	----	----	----	----
Total: *Aristida* sp.	**N**	----	**0.14 (0.13)**	----	----	----	----	----
		----	**0.0 – 2.27**	----	----	----	----	----
Saccharum giganteum	N	----	----	----	----	----	----	0.06 (0.06)
		----	----	----	----	----	----	0.0 – 6.06
Total: *Saccharum* sp.	**N**	----	----	----	----	----	----	**0.06 (0.06)**
		----	----	----	----	----	----	**0.0 – 6.06**
Paspalum notatum	Nn	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 – 0.76
Total: *Paspalum* sp.	**Nn**	----	----	----	----	----	----	**0.01 (0.01)**
		----	----	----	----	----	----	**0.0 – 0.76**
Sorghum halepense	Nn	----	----	----	----	----	----	0.07 (0.07)
		----	----	----	----	----	----	0.0 – 6.82
Total: *Sorghum* sp.	**Nn**	----	----	----	----	----	----	**0.07 (0.07)**
		----	----	----	----	----	----	**0.0 – 6.82**
Paspalum sp.	Unk	----	----	----	----	----	----	0.03 (0.03)
		----	----	----	----	----	----	0.0 – 3.03
Total: *Paspalum* sp.	**Unk**	----	----	----	----	----	----	**0.03 (0.03)**
		----	----	----	----	----	----	**0.0 – 3.03**
Legumes								
Centrosema sp.	N	----	----	----	----	----	----	0.02 (0.02)
		----	----	----	----	----	----	0.0 – 1.52

Table A.1 (Continued)

Centrosema virginiana	N	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 – 0.76
Total: *Centrosema* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.02 (0.02)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 – 1.52**
Chamaecrista fasciculata	N	0.41 (0.19)	8.19 (2.98)	----	----	----	1.01 (0.72)	1.95 (0.99)
		0.0 – 1.52	0.0 – 34.09	----	----	----	0.0 – 4.55	0.0 – 71.97
Total: *Chamaecrista* sp.	**N**	**0.41 (0.19)**	**8.19 (2.98)**	**----**	**----**	**----**	**1.01 (0.72)**	**1.95 (0.99)**
		0.0 – 1.52	**0.0 – 34.09**	**----**	**----**	**----**	**0.0 – 4.55**	**0.0 – 71.97**
Desmodium obtusum	N	----	----	0.25 (0.25)	----	----	----	0.01 (0.01)
		----	----	0.0 – 0.76	----	----	----	0.0 – 0.76
Desmodium sp.	N	----	----	----	0.25 (0.25)	----	----	0.36 (0.19)
		----	----	----	0.0 – 0.76)	----	----	0.0 – 15.91
Total: *Desmodium* sp.	**N**	**----**	**----**	**0.25 (0.25)**	**0.25 (0.25)**	**----**	**----**	**0.37 (0.19)**
		----	**----**	**0.0 – 0.76**	**0.0 – 0.76)**	**----**	**----**	**0.0 – 15.91**
Galactia sp.	N	0.07 (0.07)	----	----	----	0.15 (0.15)	----	----
		0.0 – 0.76	----	----	----	0.0 – 0.76	----	----
Total: *Galactia* sp.	**N**	**0.07 (0.07)**	**----**	**----**	**----**	**0.15 (0.15)**	**----**	**----**
		0.0 – 0.76	**----**	**----**	**----**	**0.0 – 0.76**	**----**	**----**
Lespedeza angustifolia	N	----	0.05 (0.04)	----	----	----	----	----
		----	0.0 – 0.76	----	----	----	----	----
Lespedeza repens	N	----	----	----	----	----	----	0.02 (0.02)
		----	----	----	----	----	----	0.0 – 1.52
Lespedeza virginica	N	----	6.39 (2.49)	----	----	----	----	0.04 (0.02)
		----	0.0 – 27.27	----	----	----	----	0.0 – 1.52
Total: *Lespedeza* sp.	**N**	**----**	**7.58 (3.12)**	**----**	**----**	**----**	**----**	**0.05 (0.03)**
		----	**0.0 - 45.46**	**----**	**----**	**----**	**----**	**0.0 – 3.03**
Mimosa microphylla	N	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 – 0.76
Total: *Mimosa* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.01 (0.01)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 – 0.76**
Rhynchosia sp.	N	0.14 (0.14)	0.28 (0.25)	----	----	----	0.13 (0.13)	0.02 (0.02)
		0.0 – 1.52	0.0 – 4.55	----	----	----	0.0 – 0.76	0.0 – 1.52
Rhynchosia tomentosa	N	----	----	----	----	----	0.51 (0.51)	----
		----	----	----	----	----	0.0 – 3.03	----
Total: *Rhynchosia* sp.	**N**	**0.14 (0.14)**	**0.28 (0.25)**	**----**	**----**	**----**	**0.63 (0.49)**	**0.02 (0.02)**
		0.0 – 1.52	**0.0 – 4.55**	**----**	**----**	**----**	**0.0 – 3.03**	**0.0 – 1.52**
Sesbania sp.	N	----	----	----	----	----	----	0.08 (0.08)
		----	----	----	----	----	----	0.0 – 8.33

Table A.1 (Continued)

Total: *Sesbania* sp.	**N**	----	----	----	----	----	----	**0.08 (0.08)**
		----	----	----	----	----	----	**0.0 – 8.33**
Stylosanthes biflora	N	0.28 (0.21)	0.14 (0.09)	----	----	----	0.63 (0.36)	0.13 (0.05)
		0.0 – 2.27	0.0 – 1.52	----	----	----	0.0 – 2.27	0.0 – 3.03
Total: *Stylosanthes* sp.	**N**	**0.28 (0.21)**	**0.14 (0.09)**	----	----	----	**0.63 (0.36)**	**0.13 (0.05)**
		0.0 – 2.27	**0.0 – 1.52**	----	----	----	**0.0 – 2.27**	**0.0 – 3.03**
Tephrosia sp.	N	----	----	----	----	----	----	0.24 (0.19)
		----	----	----	----	----	----	0.0 – 18.94
Tephrosia spicata	N	0.21 (0.11)	----	----	----	----	0.63 (0.41)	0.09 (0.04)
		0.0 – 0.76	----	----	----	----	0.0 – 2.27	0.0 – 2.27
Tephrosia virginiana	N	0.21 (0.21)	----	----	----	----	0.38 (0.38)	0.64 (0.18)
		0.0 – 2.27	----	----	----	----	0.0 – 2.27	0.0 – 8.33
Total: *Tephrosia* sp.	**N**	**0.41(0.21)**	----	----	----	----	**1.01 (0.47)**	**0.98 (0.26)**
		0.0 - 2.27	----	----	----	----	**0.0 - 2.27**	**0.0 – 18.94**
Lepedeza cuneata	Nn	----	----	----	----	----	----	0.82 (0.43)
		----	----	----	----	----	----	0.0 – 28.03
Total: *Lespedeza* sp.	**Nn**	----	----	----	----	----	----	**0.82 (0.43)**
		----	----	----	----	----	----	**0.0 – 28.03**
Senna obtusifolia	Nn	----	0.43 (0.38)	----	----	----	----	0.23 (0.23)
		----	0.0 – 6.82	----	----	----	----	0.0 – 23.49
Total: *Senna* sp.	**Nn**	----	**0.43 (0.38)**	----	----	----	----	**0.23 (0.23)**
		----	**0.0 – 6.82**	----	----	----	----	**0.0 – 23.49**
Lespedeza sp.	Unk	0.69 (0.62)	1.14 (1.01)	----	----	----	0.38 (0.38)	0.040.02)
		0.0 – 6.82	0.0 – 18.18	----	----	----	0.0 – 2.27	0.0 – 1.52
Total: *Lespedeza* sp.	**Unk**	**0.69 (0.62)**	**1.14 (1.01)**	----	----	----	**0.38 (0.38)**	**0.040.02)**
		0.0 – 6.82	**0.0 – 18.18**	----	----	----	**0.0 – 2.27**	**0.0 – 1.52**
Shrubs								
Aralia spinosa	N	----	----	----	----	----	----	0.08 (0.08)
		----	----	----	----	----	----	0.0 – 8.33
Total: *Aralia* sp.	**N**	----	----	----	----	----	----	**0.08 (0.08)**
		----	----	----	----	----	----	**0.0 – 8.33**
Callicarpa americana	N	1.38 (0.78)	0.09 (0.08)	2.53 (2.53)	----	0.91 (0.91)	----	0.50 (0.21)
		0.0 – 6.82	0.0 – 1.52	0.0 – 7.58	----	0.0 – 4.55	----	0.0 – 18.18
Total: *Callicarpa* sp.	**N**	**1.38 (0.78)**	**0.09 (0.08)**	**2.53 (2.53)**	----	**0.91 (0.91)**	----	**0.50 (0.21)**
		0.0 – 6.82	**0.0 – 1.52**	**0.0 – 7.58**	----	**0.0 – 4.55**	----	**0.0 – 18.18**
Ceanothus americanus	N	----	0.38 (0.29)	----	----	----	1.77 (1.49)	0.07 (0.04)
		----	0.0 -5.30	----	----	----	0.0 – 9.09	0.0 – 3.79

Table A.1 (Continued)

Total: *Ceanothus* sp.	**N**	----	**0.38 (0.29)**	----	----	----	**1.77 (1.49)**	**0.07 (0.04)**
		----	**0.0 -5.30**	----	----	----	**0.0 – 9.09**	**0.0 – 3.79**
Crataegus marshallii	N	----	----	----	----	----	----	0.02 (0.02)
		----	----	----	----	----	----	0.0 – 1.52
Crataegus sp.	N	----	----	----	----	----	----	0.08 (0.05)
		----	----	----	----	----	----	0.0 – 3.03
Total: *Crataegus* sp.	**N**	----	----	----	----	----	----	**0.09 (0.05)**
		----	----	----	----	----	----	**0.0 – 3.03**
Gaylussacia dumosa	N	----	----	----	----	----	0.25 (0.25)	0.16 (0.08)
		----	----	----	----	----	0.0 – 1.52	0.0 – 6.82
Gaylussacia sp.	N	----	----	----	----	----	----	0.02 (0.02)
		----	----	----	----	----	----	0.0 – 1.52
Total: *Gaylussacia* sp.	**N**	----	----	----	----	----	**0.25 (0.25)**	**0.17 (0.08)**
		----	----	----	----	----	**0.0 – 1.52**	**0.0 – 6.82**
Hypericum hypericoides	N	----	0.05 (0.04)	----	----	----	----	0.04 (0.03)
		----	0.0 – 0.76	----	----	----	----	0.0 – 2.27
Hypericum sp.	N	0.69 (0.41)	0.05 (0.04)	----	----	----	0.88 (0.49)	0.08 (0.04)
		0.0 – 3.79	0.0 – 0.76	----	----	----	0.0 – 3.03	0.0 – 3.03
Total: *Hypericum* sp.	**N**	**0.69 (0.41)**	**0.09 (0.06)**	----	----	----	**0.88 (0.49)**	**0.11 (0.05)**
		0.0 – 3.79	**0.0 – 0.76**	----	----	----	**0.0 – 3.03**	**0.0 – 3.03**
Ilex coriacea	N	0.48 (0.48)	----	----	----	1.06 (1.06)	----	----
		0.0 – 5.30	----	----	----	0.0 – 5.30	----	----
Ilex glabra	N	0.62 (0.44)	0.24 (0.21)	5.30 (5.30)	2.53 (2.53)	0.61 (0.61)	0.76 (0.52)	0.98 (0.33)
		0.0 – 4.55	0.0 – 3.79	0.0 – 15.91	0.0 – 7.58	0.0 – 3.03	0.0 – 3.03	0.0 – 21.97
Ilex opaca	N	----	----	1.01 (1.01)	----	----	----	0.02 (0.02)
		----	----	0.0 – 3.03	----	----	----	0.0 – 1.52
Ilex vomitoria	N	1.99 (1.13)	3.17 (1.67)	0.76 (0.76)	9.34 (3.64)	3.64 (3.64)	----	1.82 (0.40)
		0.0 – 12.12	0.0 – 28.79	0.0 – 2.27	2.27 – 14.39	0.0 – 18.18	----	0.0 – 28.03
Total: *Ilex* sp.	**N**	**3.09 (1.43)**	**3.41 (1.86)**	**7.07 (5.97)**	**11.87 (4.97)**	**5.30 (3.37)**	**0.76 (0.52)**	**2.82 (0.56)**
		0.0 – 14.39	**0.0 – 32.58**	**0.0 – 18.94**	**2.27 – 18.94**	**0.0 – 18.18**	**0.0 – 3.03**	**0.0 – 28.03**
Licania michauxii	N	0.07 (0.07)	----	----	----	----	----	0.32 (0.19)
		0.0 – 0.76	----	----	----	----	----	0.0 – 17.42
Total: *Licania* sp.	**N**	**0.07 (0.07)**	----	----	----	----	----	**0.32 (0.19)**
		0.0 – 0.76	----	----	----	----	----	**0.0 – 17.42**
Myrica cerifera	N	0.28 (0.28)	0.33 (0.29)	14.14 (11.94)	----	----	3.28 (1.52)	0.94 (0.24)
		0.0 – 3.03	0.0 – 5.30	0.0 – 37.88	----	----	0.0 – 9.85	0.0 – 11.36
Total: *Myrica* sp.	**N**	**0.28 (0.28)**	**0.33 (0.29)**	**14.14 (11.94)**	----	----	**3.28 (1.52)**	**0.94 (0.24)**
		0.0 – 3.03	**0.0 – 5.30**	**0.0 – 37.88**	----	----	**0.0 – 9.85**	**0.0 – 11.36**
Rhus copallinum	N	0.41 (0.24)	2.84 (1.39)	1.52 (1.52)	0.76 (0.76)	----	0.63 (0.63)	3.05 (0.88)
		0.0 – 2.27	0.0 – 22.73	0.0 – 4.55	0.0 – 2.27	----	0.0 – 3.79	0.0 – 67.42

Table A.1 (Continued)

Total: *Rhus* sp.	**N**	**0.41 (0.24)**	**2.84 (1.39)**	**1.52 (1.52)**	**0.76 (0.76)**	----	**0.63 (0.63)**	**3.05 (0.88)**
		0.0 – 2.27	**0.0 – 22.73**	**0.0 – 4.55**	**0.0 – 2.27**	----	**0.0 – 3.79**	**0.0 – 67.42**
Toxicodendron pubescens	N	0.07 (0.07)	----	----	----	----	1.89 (1.29)	0.26 (0.09)
		0.0 – 0.76	----	----	----	----	0.0 – 7.58	0.0 – 6.06
Total: *Toxicodendron* sp.	**N**	**0.07 (0.07)**	----	----	----	----	**1.89 (1.29)**	**0.26 (0.09)**
		0.0 – 0.76	----	----	----	----	**0.0 – 7.58**	**0.0 – 6.06**
Vaccinium arboretum	N	1.99 (1.22)	0.09 (0.08)	6.31 (3.97)	0.51 (0.25)	----	2.39 (1.67)	3.62 (0.81)
		0.0 – 12.88	0.0 – 1.52	0.0 – 13.64	0.0 – 0.76	----	0.0 – 9.85	0.0 – 54.55
Vaccinium elliottii	N	0.48 (0.33)	1.89 (1.04)	0.76 (0.76)	1.01 (0.51)	----	----	1.35 (0.38)
		0.0 – 3.03	0.0 – 14.39	0.0 – 2.27	0.0 – 1.52	----	----	0.0 – 26.52
Vaccinium myrsinites	N	----	----	----	----	----	2.15 (0.88)	0.05 (0.03)
		----	----	----	----	----	0.0 – 6.06	0.0 – 2.27
Vaccinium sp.	N	2.41 (2.26)	0.28 (0.17)	----	----	1.97 (1.21)	0.25 (0.25)	1.58 (0.41)
		0.0 – 25.00	0.0 – 2.27	----	----	0.0 – 5.30	0.0 – 1.52	0.0 – 21.21
Vaccinium stamineum	N	----	0.24 (0.21)	----	----	----	1.14 (0.55)	0.42 (0.15)
		----	0.0 – 3.79	----	----	----	0.0 – 3.03	0.0 – 9.85
Total: *Vaccinium* sp.	**N**	**4.89 (2.36)**	**2.51 (1.05)**	**7.07 (4.68)**	**1.52 (0.44)**	**1.97 (1.21)**	**5.93 (2.11)**	**7.01 (1.09)**
		0.0 – 25.00	**0.0 – 14.39**	**0.0 - 15.91**	**0.76 - 2.27**	**0.0 – 5.30**	**0.0 – 14.39**	**0.0 – 56.82**
Viburnum dentatum	N	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 – 0.76
Total: *Viburnum* sp.	**N**	----	----	----	----	----	----	**0.01 (0.01)**
		----	----	----	----	----	----	**0.0 – 0.76**
Lespedeza bicolor	Nn	----	0.85 (0.56)	----	----	----	1.01 (1.01)	0.11 (0.06)
		----	0.0 – 9.85	----	----	----	0.0 – 6.06	0.0 – 3.79
Total: *Lespedeza* sp.	**Nn**	----	**0.85 (0.56)**	----	----	----	**1.01 (1.01)**	**0.11 (0.06)**
		----	**0.0 – 9.85**	----	----	----	**0.0 – 6.06**	**0.0 – 3.79**
Rosa sp.	Unk	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 – 0.76
Total: *Rosa* sp.	**Unk**	----	----	----	----	----	----	**0.01 (0.01)**
		----	----	----	----	----	----	**0.0 – 0.76**
Trees								
Acer rubrum	N	----	0.09 (0.08)	----	----	----	----	0.01 (0.01)
		----	0.0 – 1.52	----	----	----	----	0.0 – 0.76
Total: *Acer* sp.	**N**	----	**0.09 (0.08)**	----	----	----	----	**0.01 (0.01)**
		----	**0.0 – 1.52**	----	----	----	----	**0.0 – 0.76**
Carya tomentosa	N	----	0.24 (0.15)	----	----	----	----	0.77 (0.25)
		----	0.0 – 2.27	----	----	----	----	0.0 – 15.91

Table A.1 (Continued)

Total: *Carya* sp.	**N**	----	**0.24 (0.15)**	----	----	----	----	**0.77 (0.25)**
		----	**0.0 – 2.27**	----	----	----	----	**0.0 – 15.91**
Castanea sp.	N	----	----	----	----	----	----	0.04 (0.04)
		----	----	----	----	----	----	0.0 – 3.79
Total: *Castanea* sp.	**N**	----	----	----	----	----	----	**0.04 (0.04)**
		----	----	----	----	----	----	**0.0 – 3.79**
Cornus florida	N	----	----	1.01 (1.01)	----	----	----	0.27 (0.18)
		----	----	0.0 – 3.03	----	----	----	0.0 – 16.67
Total: *Cornus* sp.	**N**	----	----	**1.01 (1.01)**	----	----	----	**0.27 (0.18)**
		----	----	**0.0 – 3.03**	----	----	----	**0.0 – 16.67**
Diospyros virginiana	N	1.03 (0.48)	0.47 (0.21)	----	0.76 (0.76)	0.61 (0.61)	1.64 (0.74)	1.09 (0.24)
		0.0 – 4.55	0.0 – 3.03	----	0.0 – 2.27	0.0 – 3.03	0.0 – 4.55	0.0 – 12.12
Total: *Diospyros* sp.	**N**	**1.03 (0.48)**	**0.47 (0.21)**	----	**0.76 (0.76)**	**0.61 (0.61)**	**1.64 (0.74)**	**1.09 (0.24)**
		0.0 – 4.55	**0.0 – 3.03**	----	**0.0 – 2.27**	**0.0 – 3.03**	**0.0 – 4.55**	**0.0 – 12.12**
Liquidambar styraciflua	N	----	----	8.59 (4.38)	----	----	----	0.19 (0.11)
		----	----	0.0 – 14.39	----	----	----	0.0 – 10.61
Total: *Liquidambar* sp.	**N**	----	----	**8.59 (4.38)**	----	----	----	**0.19 (0.11)**
		----	----	**0.0 – 14.39**	----	----	----	**0.0 – 10.61**
Persea sp.	N	----	----	----	----	----	----	0.04 (0.04)
		----	----	----	----	----	----	0.0 – 3.79
Total: *Persea* sp.	**N**	----	----	----	----	----	----	**0.04 (0.04)**
		----	----	----	----	----	----	**0.0 – 3.79**
Pinus echinata	N	----	----	----	----	----	----	0.02 (0.02)
		----	----	----	----	----	----	0.0 – 1.52
Pinus palustris	N	0.41 (0.29)	1.47 (1.10)	----	----	1.82 (0.78)	----	0.38 (0.18)
		0.0 – 3.03	0.0 – 19.69	----	----	0.0 – 3.79	----	0.0 – 15.15
Pinus sp.	N	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 – 0.76
Pinus taeda	N	0.28 (0.19)	0.28 (0.14)	----	----	----	----	----
		0.0 – 1.52	0.0 – 1.52	----	----	----	----	----
Total: *Pinus* sp.	**N**	**0.69 (0.38)**	**1.75 (1.09)**	----	----	**1.82 (0.78)**	----	**0.39 (0.18)**
		0.0 - 3.03	**0.0 - 19.69**	----	----	**0.0 – 3.79**	----	**0.0 – 15.15**
Prunus serotina	N	----	0.43 (0.38)	5.05 (3.64)	----	0.76 (0.76)	----	0.17 (0.08)
		----	0.0 – 6.82	0.0 – 12.12	----	0.0 – 3.79	----	0.0 – 6.06
Total: *Prunus* sp.	**N**	----	**0.43 (0.38)**	**5.05 (3.64)**	----	**0.76 (0.76)**	----	**0.17 (0.08)**
		----	**0.0 – 6.82**	**0.0 – 12.12**	----	**0.0 – 3.79**	----	**0.0 – 6.06**
Quercus alba	N	----	----	----	0.25 (0.25)	----	----	----
		----	----	----	0.0 – 0.76	----	----	----
Quercus falcate	N	0.48(0.33)	1.23 (0.66)	3.03 (3.03)	----	1.97 (1.21)	4.67 (2.27)	0.81 (0.33)
		0.0 – 3.03	0.0 – 11.36	0.0 – 9.09	----	0.0 – 5.30	0.0 – 12.88	0.0 – 22.73

Table A.1 (Continued)

Quercus incana	N	----	----	----	1.77 (1.77)	----	3.41 (1.78)	1.16 (0.31)
		----	----	----	0.0 – 5.30	----	0.0 – 11.36	0.0 – 18.94
Quercus laevis	N	----	----	----	----	----	----	0.85 (0.33)
		----	----	----	----	----	----	0.0 – 19.69
Quercus laurifolia	N	4.41 (2.69)	----	----	----	----	----	----
		0.0 – 28.79	----	----	----	----	----	----
Quercus margaretta	N	----	----	----	----	----	----	0.89 (0.41)
		----	----	----	----	----	----	0.0 – 25.76
Quercus marilandica	N	----	----	----	0.76 (0.76)	----	----	0.54 (0.26)
		----	----	----	0.0 – 2.27	----	----	0.0 – 16.67
Quercus nigra	N	0.48 (0.48)	0.76 (0.34)	0.51 (0.51)	----	----	----	0.49 (0.15)
		0.0 – 5.30	0.0 – 4.55	0.0 – 1.52	----	----	----	0.0 – 9.09
Quercus pagoda	N	----	----	----	----	----	----	0.06 (0.04)
		----	----	----	----	----	----	0.0 – 3.03
Quercus phellos	N	----	----	----	----	----	----	0.03 (0.03)
		----	----	----	----	----	----	0.0 – 3.03
Quercus sp.	N	0.41 (0.34)	----	----	----	----	----	0.97 (0.28)
		0.0 – 3.79	----	----	----	----	----	0.0 – 18.94
Quercus stellate	N	----	----	----	----	----	----	0.16 (0.08)
		----	----	----	----	----	----	0.0 – 6.06
Total: *Quercus* sp.	**N**	**5.79 (2.69)**	**1.99 (0.76)**	**3.54 (3.54)**	**2.78 (2.41)**	**1.97 (1.21)**	**8.08 (2.46)**	**5.96 (0.92)**
		0.0 – 28.79	**0.0 - 11.36**	**0.0 - 10.61**	**0.0 - 7.58**	**0.0 – 5.30**	**0.0 - 12.88**	**0.0 – 48.49**
Sassafras albidum	N	----	0.24 (0.17)	----	----	0.30 (0.30)	0.25 (0.25)	0.02 (0.01)
		----	0.0 – 3.03	----	----	0.0 – 1.52	0.0 – 1.52	0.0 – 0.76
Total: *Sassafras* sp.	**N**	**----**	**0.24 (0.17)**	**----**	**----**	**0.30 (0.30)**	**0.25 (0.25)**	**0.02 (0.01)**
		----	**0.0 – 3.03**	**----**	**----**	**0.0 – 1.52**	**0.0 – 1.52**	**0.0 – 0.76**
Symplocos tinctoria	N	0.62 (0.42)	0.62 (0.39)	0.25 (0.25)	----	----	----	0.24 (0.15)
		0.0 – 3.79	0.0 – 6.06	0.0 – 0.76	----	----	----	0.0 – 11.36
Total: *Symplocos* sp.	**N**	**0.62 (0.42)**	**0.62 (0.39)**	**0.25 (0.25)**	**----**	**----**	**----**	**0.24 (0.15)**
		0.0 – 3.79	**0.0 – 6.06**	**0.0 – 0.76**	**----**	**----**	**----**	**0.0 – 11.36**
Triadica sebifera	Nn	----	----	0.51 (0.51)	----	----	----	----
		----	----	0.0 – 1.52	----	----	----	----
Total: *Triadica* sp.	**Nn**	**----**	**----**	**0.51 (0.51)**	**----**	**----**	**----**	**----**
		----	**----**	**0.0 – 1.52**	**----**	**----**	**----**	**----**

Table A.1 (Continued)

Vines								
Berchemia scandens	N	----	----	5.05 (4.68)	----	----	----	----
		----	----	0.0 – 14.39	----	----	----	----
Total: *Berchemia* sp.	**N**	**----**	**----**	**5.05 (4.68)**	**----**	**----**	**----**	**----**
		----	**----**	**0.0 – 14.39**	**----**	**----**	**----**	**----**
Bignonia capreolata	N	0.07 (0.07)	----	----	----	----	----	0.06 (0.04)
		0.0 – 0.76	----	----	----	----	----	0.0 – 3.79
Total: *Bignonia* sp.	**N**	**0.07 (0.07)**	**----**	**----**	**----**	**----**	**----**	**0.06 (0.04)**
		0.0 – 0.76	**----**	**----**	**----**	**----**	**----**	**0.0 – 3.79**
Gelsemium sempervirens	N	4.41 (2.54)	0.05 (0.04)	----	----	----	----	0.28 (0.08)
		0.0 – 21.97	0.0 – 0.76	----	----	----	----	0.0 – 3.79
Total: *Gelsemium* sp.	**N**	**4.41 (2.54)**	**0.05 (0.04)**	**----**	**----**	**----**	**----**	**0.28 (0.08)**
		0.0 – 21.97	**0.0 – 0.76**	**----**	**----**	**----**	**----**	**0.0 – 3.79**
Jacquemontia tamnifolia	N	----	----	----	----	----	----	0.08 (0.08)
		----	----	----	----	----	----	0.0 – 7.58
Total: *Jacquemontia* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.08 (0.08)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 – 7.58**
Parthenocissus quinquefolia	N	----	----	----	----	----	----	0.02 (0.02)
		----	----	----	----	----	----	0.0 – 1.52
Total: *Parthenocissus* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.02 (0.02)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 – 1.52**
Passiflora incarnata	N	1.38 (1.30)	0.05 (0.04)	----	----	----	----	----
		0.0 – 14.39	0.0 – 0.76	----	----	----	----	----
Total: *Passiflora* sp.	**N**	**1.38 (1.30)**	**0.05 (0.04)**	**----**	**----**	**----**	**----**	**----**
		0.0 – 14.39	**0.0 – 0.76**	**----**	**----**	**----**	**----**	**----**
Rubus sp.	N	11.78 (3.21)	7.86 (2.69)	5.30 (4.57)	----	2.58 (1.85)	3.28 (1.28)	0.93 (0.27)
		0.0 – 30.30	0.0 – 34.85	0.0 – 14.39	----	0.0 – 9.85	0.0 – 7.58	0.0 – 15.15
Total: *Rubus* sp.	**N**	**11.78 (3.21)**	**7.86 (2.69)**	**5.30 (4.57)**	**----**	**2.58 (1.85)**	**3.28 (1.28)**	**0.93 (0.27)**
		0.0 – 30.30	**0.0 – 34.85**	**0.0 – 14.39**	**----**	**0.0 – 9.85**	**0.0 – 7.58**	**0.0 – 15.15**
Smilax bona-nox	N	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 – 0.76
Smilax glauca	N	----	0.05 (0.04)	----	----	----	----	----
		----	0.0 – 0.76	----	----	----	----	----
Smilax laurifolia	N	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 – 0.76
Smilax pumila	N	----	----	----	----	----	----	0.04 (0.03)
		----	----	----	----	----	----	0.0 – 2.27
Smilax rotundifolia	N	----	----	----	----	----	----	0.03 (0.03)
		----	----	----	----	----	----	0.0 – 3.03

Table A.1 (Continued)

Smilax sp.	N	4.27 (2.31)	0.57 (0.31)	----	----	----	----	0.33 (0.23)
		0.0 – 26.52	0.0 – 5.30	----	----	----	----	0.0 – 22.73
Total: *Smilax* sp.	**N**	**4.27 (2.31)**	**0.62 (0.31)**	**----**	**----**	**----**	**----**	**0.41 (0.23)**
		0.0 – 26.52	**0.0 – 5.30**	**----**	**----**	**----**	**----**	**0.0 – 22.73**
Toxicodendron radicans	N	0.07 (0.07)	----	----	----	----	----	0.01 (0.01)
		0.0 – 0.76	----	----	----	----	----	0.0 – 0.76
Total: *Toxicodendron* sp.	**N**	**0.07 (0.07)**	**----**	**----**	**----**	**----**	**----**	**0.01 (0.01)**
		0.0 – 0.76	**----**	**----**	**----**	**----**	**----**	**0.0 – 0.76**
Vitis aestivalis	N	----	0.28 (0.25)	----	----	----	----	0.01 (0.01)
		----	0.0 – 4.55	----	----	----	----	0.0 – 0.76
Vitis rotundifolia	N	0.62 (0.49)	0.66 (0.59)	19.44 (12.75)	----	----	----	0.88 (0.29)
		0.0 – 5.30	0.0 – 10.61	3.79 – 44.69	----	----	----	0.0 – 15.91
Total: *Vitis* sp.	**N**	**0.62 (0.49)**	**0.95 (0.63)**	**19.44 (12.75)**	**----**	**----**	**----**	**0.89 (0.29)**
		0.0 – 5.30	**0.0 – 10.61**	**3.79 – 44.69**	**----**	**----**	**----**	**0.0 – 15.91**
Lonicera japonica	Nn	1.24 (1.24)	----	----	----	----	----	----
		0.0 – 13.64	----	----	----	----	----	----
Total: *Lonicera* sp.	**Nn**	**1.24 (1.24)**	**----**	**----**	**----**	**----**	**----**	**----**
		0.0 – 13.64	**----**	**----**	**----**	**----**	**----**	**----**
Lygodium japonicum	Nn	----	----	----	----	----	----	0.08 (0.08)
		----	----	----	----	----	----	0.0 – 7.58
Total: *Lygodium* sp.	**Nn**	**----**	**----**	**----**	**----**	**----**	**----**	**0.08 (0.08)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 – 7.58**
Upper Story (> 1m in height)								
Forbs								
Aster sp.	N	----	----	----	----	----	----	0.02 (0.02)
		----	----	----	----	----	----	0.0 – 1.52
Total: *Aster* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.02 (0.02)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 – 1.52**
Eupatorium sp.	N	0.14 (0.14)	----	----	----	----	----	----
		0.0 – 1.52	----	----	----	----	----	----
Total: *Eupatorium* sp.	**N**	**0.14 (0.14)**	**----**	**----**	**----**	**----**	**----**	**----**
		0.0 – 1.52	**----**	**----**	**----**	**----**	**----**	**----**
Solidago odora	N	----	0.09 (0.08)	----	----	----	----	----
		----	0.0 – 1.52	----	----	----	----	----
Total: *Solidago* sp.	**N**	**----**	**0.09 (0.08)**	**----**	**----**	**----**	**----**	**----**
		----	**0.0 – 1.52**	**----**	**----**	**----**	**----**	**----**
Legumes								
Desmodium sp.	N	----	----	----	----	----	----	0.02 (0.02)
		----	----	----	----	----	----	0.0 – 2.27

Table A.1 (Continued)

Total: *Desmodium* sp.	**N**	----	----	----	----	----	----	**0.02 (0.02)**
		----	----	----	----	----	----	**0.0 – 2.27**
Shrubs								
Callicarpa americana	N	0.34 (0.34)	----	2.78 (2.79)	----	----	----	0.29 (0.17)
		0.0 – 3.79	----	0.0 – 8.33	----	----	----	0.0 – 14.39
Total: *Callicarpa* sp.	**N**	**0.34 (0.34)**	----	**2.78 (2.79)**	----	----	----	**0.29 (0.17)**
		0.0 – 3.79	----	**0.0 – 8.33**	----	----	----	**0.0 – 14.39**
Crataegus marshallii	N	----	----	----	----	----	----	0.02 (0.02)
		----	----	----	----	----	----	0.0 – 2.27
Crataegus sp.	N	----	----	----	----	----	----	0.14 (0.11)
		----	----	----	----	----	----	0.0 – 10.61
Total: *Crataegus* sp.	**N**	----	----	----	----	----	----	**0.17 (0.11)**
		----	----	----	----	----	----	**0.0 – 10.61**
Ilex glabra	N	----	----	3.54 (3.54)	----	----	----	0.08 (0.08)
		----	----	0.0 – 10.61	----	----	----	0.0 – 7.58
Ilex opaca	N	----	----	----	----	----	----	0.16 (0.16)
		----	----	----	----	----	----	0.0 – 15.91
Ilex vomitoria	N	0.83 (0.56)	0.81 (0.63)	----	8.59 (7.48)	5.00 (2.29)	----	2.69 (0.80)
		0.0 – 6.06	0.0 – 11.36	----	0.0 – 23.49	0.0 – 10.61	----	0.0 – 48.49
Total: *Ilex* sp.	**N**	**0.83 (0.56)**	**0.81 (0.63)**	**3.54 (3.54)**	**8.59 (7.48)**	**5.00 (2.29)**	----	**2.93 (0.83)**
		0.0 – 6.06	**0.0 – 11.36**	**0.0 – 10.61**	**0.0 – 23.49**	**0.0 – 10.61**	----	**0.0 – 48.49**
Myrica cerifera	N	0.28 (0.28)	----	1.77 (1.77)	----	----	----	0.15 (0.15)
		0.0 – 3.03	----	0.0 – 5.30	----	----	----	0.0 – 15.15
Total: *Myrica* sp.	**N**	**0.28 (0.28)**	----	**1.77 (1.77)**	----	----	----	**0.15 (0.15)**
		0.0 – 3.03	----	**0.0 – 5.30**	----	----	----	**0.0 – 15.15**
Rhus copallinum	N	1.58 (1.07)	0.52 (0.46)	11.11 (6.34)	----	----	----	0.17 (0.09)
		0.0 – 9.85	0.0 – 8.33	0.0 – 21.97	----	----	----	0.0 – 7.58
Total: *Rhus* sp.	**N**	**1.58 (1.07)**	**0.52 (0.46)**	**11.11 (6.34)**	----	----	----	**0.17 (0.09)**
		0.0 – 9.85	**0.0 – 8.33**	**0.0 – 21.97**	----	----	----	**0.0 – 7.58**
Vaccinium arboreum	N	0.41 (0.41)	----	0.51 (0.51)	----	----	----	2.29 (0.83)
		0.0 – 4.55	----	0.0 – 1.52	----	----	----	0.0 – 55.30
Vaccinium elliottii	N	----	0.19 (0.17)	----	----	----	----	0.65 (0.30)
		----	0.0 – 3.03	----	----	----	----	0.0 – 17.42
Vaccinium sp.	N	0.14 (0.14)	----	----	----	2.12 (1.49)	----	0.77 (0.58)
		0.0 – 1.52	----	----	----	0.0 – 7.58	----	0.0 – 57.58
Total: *Vaccinium* sp.	**N**	**0.55 (0.42)**	**0.19 (0.17)**	**0.51 (0.51)**	----	**2.12 (1.49)**	----	**3.71 (1.27)**
		0.0 – 4.55	**0.0 – 3.03**	**0.0 – 1.52**	----	**0.0 – 7.58**	----	**0.0 – 81.06**
Lespedeza bicolor	Nn	----	0.43 (0.38)	----	----	----	1.26 (1.26)	0.06 (0.06)
		----	0.0 – 6.82	----	----	----	0.0 – 7.58	0.0 – 6.06

Table A.1 (Continued)

Total: *Lespedeza* sp.	**Nn**	---- ----	**0.43 (0.38)** **0.0 – 6.82**	---- ----	---- ----	---- ----	**1.26 (1.26)** **0.0 – 7.58**	**0.06 (0.06)** **0.0 – 6.06**
Trees								
Carya tomentosa	N	---- ----	---- ----	---- ----	---- ----	---- ----	---- ----	0.41 (0.19) 0.0 – 13.64
Total: *Carya* sp.	**N**	---- ----	---- ----	---- ----	---- ----	---- ----	---- ----	**0.41 (0.19)** **0.0 – 13.64**
Cornus florida	N	---- ----	1.52 (0.97) 0.0 – 15.91	0.51 (0.51) 0.0 – 1.52	---- ----	---- ----	---- ----	1.52 (0.65) 0.0 – 40.15
Total: *Cornus* sp.	**N**	---- ----	**1.52 (0.97)** **0.0 – 15.91**	**0.51 (0.51)** **0.0 – 1.52**	---- ----	---- ----	---- ----	**1.52 (0.65)** **0.0 – 40.15**
Diospyros virginiana	N	0.69 (0.69) 0.0 – 7.58	0.85 (0.60) 0.0 – 10.61	---- ----	---- ----	---- ----	---- ----	0.26 (0.12) 0.0 – 7.58
Total: *Diospyros* sp.	**N**	**0.69 (0.69)** **0.0 – 7.58**	**0.85 (0.60)** **0.0 – 10.61**	---- ----	---- ----	---- ----	---- ----	**0.26 (0.12)** **0.0 – 7.58**
Liquidambar styraciflua	N	3.51 (2.45) 0.0 – 24.24	2.84 (1.39) 0.0 – 16.67	8.08 (4.06) 0.0 – 12.88	---- ----	---- ----	---- ----	---- ----
Total: *Liquidambar* sp.	**N**	**3.51 (2.45)** **0.0 – 24.24**	**2.84 (1.39)** **0.0 – 16.67**	**8.08 (4.06)** **0.0 – 12.88**	---- ----	---- ----	---- ----	---- ----
Nyssa sylvatica	N	---- ----	0.62 (0.41) 0.0 – 6.82	---- ----	---- ----	---- ----	---- ----	---- ----
Total: *Nyssa* sp.	**N**	---- ----	**0.62 (0.41)** **0.0 – 6.82**	---- ----	---- ----	---- ----	---- ----	---- ----
Persea borbonia	N	---- ----	---- ----	---- ----	---- ----	---- ----	---- ----	0.32 (0.29) 0.0 – 28.79
Persea sp.	N	---- ----	---- ----	---- ----	---- ----	---- ----	---- ----	0.03 (0.03) 0.0 – 3.03
Total: *Persea* sp.	**N**	---- ----	---- ----	---- ----	---- ----	---- ----	---- ----	**0.35 (0.29)** **0.0 – 28.79**
Pinus echinata	N	---- ----	---- ----	---- ----	---- ----	---- ----	---- ----	0.25 (0.16) 0.0 – 14.39
Pinus palustris	N	---- ----	9.04 (3.76) 0.0 – 43.94	39.89 (21.43) 3.03 – 77.27	3.79 (3.79) 0.0 – 11.36	4.24 (1.99) 0.0 – 10.61	60.23 (8.63) 30.30 – 95.46	21.07 (2.27) 0.0 – 95.46
Pinus taeda	N	---- ----	0.66 (0.41) 0.0 – 6.06	---- ----	---- ----	1.06 (1.06) 0.0 – 5.30	2.78 (2.78)	2.72 (0.99) 0.0 – 68.18
Total: *Pinus* sp.	**N**	---- ----	**9.71 (3.95)** **0.0 – 50.00**	**39.89 (21.43)** **3.03 – 77.27**	**3.79 (3.79)** **0.0 – 11.36**	**5.30 (1.69)** **0.0 – 10.61**	**63.01 (8.66)** **30.30 - 95.46**	**24.04 (2.40)** **0.0 – 95.46**
Prunus serotina	N	0.28 (0.28) 0.0 – 3.03	0.28 (0.25) 0.0 – 4.55	8.59 (5.83) 0.0 – 19.69	---- ----	---- ----	---- ----	0.25 (0.12) 0.0 – 10.61

Table A.1 (Continued)

Total: *Prunus* sp.	**N**	**0.28 (0.28)**	**0.28 (0.25)**	**8.59 (5.83)**	----	----	----	**0.25 (0.12)**
		0.0 – 3.03	**0.0 – 4.55**	**0.0 – 19.69**	----	----	----	**0.0 – 10.61**
Quercus alba	N	----	----	----	7.32 (7.32)	3.03 (3.03)	----	0.62 (0.62)
		----	----	----	0.0 – 21.97	0.0 – 15.15	----	0.0 – 62.88
Quercus falcata	N	0.55 (0.55)	4.74 (2.97)	2.78 (2.78)	9.59 (8.49)	10.91 (5.86)	0.76 (0.76)	1.99 (0.73)
		0.0 – 6.06	0.0 – 52.27	0.0 – 8.33	0.0 – 26.52	0.0 – 27.27	0.0 – 4.55	0.0 – 59.09
Quercus incana	N	1.86 (1.86)	----	----	1.77 (1.77)	2.27 (1.76)	----	1.64 (0.55)
		0.0 – 20.46	----	----	0.0 – 5.30	0.0 – 9.09	----	0.0 – 43.94
Quercus laevis	N	----	----	----	----	----	----	5.09 (1.34)
		----	----	----	----	----	----	0.0 – 72.73
Quercus laurifolia	N	2.55 (2.07)	----	----	----	----	----	----
		0.0 – 22.73	----	----	----	----	----	----
Quercus margaretta	N	----	----	----	----	----	----	1.77 (0.96)
		----	----	----	----	----	----	0.0 – 92.42
Quercus marilandica	N	----	----	----	4.55 (4.55)	----	----	1.73 (0.63)
		----	----	----	0.0 – 13.64	----	----	0.0 – 45.46
Quercus nigra	N	----	5.16 (2.19)	1.26 (1.26)	13.38 (13.38)	----	----	2.29 (0.87)
		----	0.0 – 27.27	0.0 – 3.79	0.0 – 40.15	----	----	0.0 – 62.12
Quercus phellos	N	----	----	----	0.51 (0.51)	----	----	----
		----	----	----	0.0 – 1.52	----	----	----
Quercus sp.	N	----	----	----	----	----	----	0.35 (0.25)
		----	----	----	----	----	----	0.0 – 19.69
Quercus stellata	N	----	----	----	3.54 (3.54)	----	----	0.71 (0.52)
		----	----	----	0.0 – 10.61	----	----	0.0 – 49.24
Total: *Quercus* sp.	**N**	**4.95 (2.69)**	**9.86 (3.46)**	**4.04 (4.04)**	**40.66 (17.41)**	**16.21 (6.41)**	**0.76 (0.76)**	**16.19 (2.33)**
		0.0 - 22.73	**0.0 - 52.27**	**0.0 - 12.12**	**15.91 - 74.24**	**0.0 - 31.82**	**0.0 – 4.55**	**0.0 - 112.12**
Sassafras albidum	N	----	----	----	----	----	----	0.02 (0.02)
		----	----	----	----	----	----	0.0 – 1.52
Total: *Sassafras* sp.	**N**	----	----	----	----	----	----	**0.02 (0.02)**
		----	----	----	----	----	----	**0.0 – 1.52**
Symplocos tinctoria	N	----	----	----	----	----	----	0.19 (0.15)
		----	----	----	----	----	----	0.0 – 13.64
Total: *Symplocos* sp.	**N**	----	----	----	----	----	----	**0.19 (0.15)**
		----	----	----	----	----	----	**0.0 – 13.64**
Triadica sebifera	Nn	----	----	----	----	0.91 (0.91)	----	----
		----	----	----	----	0.0 – 4.55	----	----
Total: *Triadica* sp.	**Nn**	----	----	----	----	**0.91 (0.91)**	----	----
		----	----	----	----	**0.0 – 4.55**	----	----

Table A.1 (Continued)

Vines								
Berchemia scandens	N	----	----	1.26 (1.26)	----	----	----	----
		----	----	0.0 – 3.79	----	----	----	----
Total: *Berchemia* sp.	**N**	**----**	**----**	**1.26 (1.26)**	**----**	**----**	**----**	**----**
		----	**----**	**0.0 – 3.79**	**----**	**----**	**----**	**----**
Bignonia capreolata	N	0.14 (0.14)	----	----	----	----	----	----
		0.0 – 1.52	----	----	----	----	----	----
Total: *Bignonia* sp.	**N**	**0.14 (0.14)**	**----**	**----**	**----**	**----**	**----**	**----**
		0.0 – 1.52	**----**	**----**	**----**	**----**	**----**	**----**
Gelsemium sempervirens	N	0.41 (0.28)	----	----	----	----	----	0.08 (0.05)
		0.0 – 2.27	----	----	----	----	----	0.0 – 4.55
Total: *Gelsemium* sp.	**N**	**0.41 (0.28)**	**----**	**----**	**----**	**----**	**----**	**0.08 (0.05)**
		0.0 – 2.27	**----**	**----**	**----**	**----**	**----**	**0.0 – 4.55**
Rubus sp.	N	0.28 (0.28)	----	1.52 (0.88)	----	0.30 (0.30)	----	----
		0.0 – 3.03	----	0.0 – 3.03	----	0.0 – 1.52	----	----
Total: *Rubus* sp.	**N**	**0.28 (0.28)**	**----**	**1.52 (0.88)**	**----**	**0.30 (0.30)**	**----**	**----**
		0.0 – 3.03	**----**	**0.0 – 3.03**	**----**	**0.0 – 1.52**	**----**	**----**
Smilax laurifolia	N	----	----	----	----	0.15 (0.15)	----	0.17 (0.17)
		----	----	----	----	0.0 – 0.76	----	0.0 – 16.67
Smilax rotundifolia	N	----	----	----	----	----	----	0.08 (0.08)
		----	----	----	----	----	----	0.0 – 7.58
Smilax sp.	N	0.48 (0.41)	----	----	----	----	----	0.02 (0.02)
		0.0 – 4.55	----	----	----	----	----	0.0 – 2.27
Total: *Smilax* sp.	**N**	**0.48 (0.41)**	**----**	**----**	**----**	**0.15 (0.15)**	**----**	**0.26 (0.18)**
		0.0 – 4.55	**----**	**----**	**----**	**0.0 – 0.76**	**----**	**0.0 – 16.67**
Vitis rotundifolia	N	----	----	6.31 (6.31)	----	----	----	0.93 (0.36)
		----	----	0.0 – 18.94	----	----	----	0.0 – 27.27
Total: *Vitis* sp.	**N**	**----**	**----**	**6.31 (6.31)**	**----**	**----**	**----**	**0.93 (0.36)**
		----	**----**	**0.0 – 18.94**	**----**	**----**	**----**	**0.0 – 27.27**

APPENDIX B

SUMMARY TABLE OF PLANT SPECIES DETECTED IN THREE HEIGHT CATEGORIES ALONG LINE TRANSECTS ORIGINATING AT SAMPLE POINTS UNOCCUPIED BY GOPHER TORTOISE (*GOPHERUS POLYPHEMUS*) BURROWS

Table B.1 Mean percent coverage of plant species (grasses, grass-likes, forbs, legumes, vines, shrubs, trees) detected along line transects originating at sample points unoccupied by gopher tortoise (*Gopherus polyphemus*) burrows in habitat types of south Mississippi during summer 2010.

Plant Genera		**Forest Stand Type (Age Class)**						
		Regeneration Areas (≤ 5 yrs)	**Dense Planted Pine (> 15 yrs)**	**Mixed Pine Hardwood Forest (> 15 yrs)**	**Unmanaged Mixed Forest in Sandhills (> 15 yrs)**	**Planted Longleaf Pine (> 5 – ≤ 15 yrs)**	**Planted Longleaf Pine (> 15 yrs)**	**Natural Longleaf Pine (>15 yrs)**
		Non-burrow (n = 3)	**Non-burrow (n = 2)**	**Non-burrow (n = 2)**	**Non-burrow (n = 1)**	**Non-burrow (n = 1)**	**Non-burrow (n = 2)**	**Non-burrow (n = 7)**
		Percent Coverage	Percent Coverage	Percent Coverage	Percent Coverage	Percent Coverage	Percent Coverage	Percent Coverage
		Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)
Scientific Name	**Origin**	Range	Range	Range	Range	Range	Range	Range
Understory (≤ 0.3 m in height)								
Forbs								
Aletris lutea	N	----	----	----	----	----	----	0.02 (0.01)
		----	----	----	----	----	----	0.0 - 0.76
Total: *Aletris* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.02 (0.01)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 - 0.76**
Ambrosia artemisiifolia	N	0.39 (0.26)	----	----	----	----	----	----
		0.0 – 10.61	----	----	----	----	----	----
Ambrosia sp.	N	----	----	----	----	----	0.03 (0.03)	----
		----	----	----	----	----	0.0 - 0.76	----
Total: *Ambrosia* sp.	**N**	**0.39 (0.26)**	**----**	**----**	**----**	**----**	**0.03 (0.03)**	**----**
		0.0 – 10.61	**----**	**----**	**----**	**----**	**0.0 - 0.76**	**----**
Asclepias sp.	N	----	----	----	0.05 (0.05)	----	----	----
		----	----	----	0.0 - 0.76	----	----	----
Total: *Asclepias* sp.	**N**	**----**	**----**	**----**	**0.05 (0.05)**	**----**	**----**	**----**
		----	**----**	**----**	**0.0 - 0.76**	**----**	**----**	**----**
Asplenium platyneuron	N	----	2.27 (0.98)	----	----	----	----	----
		----	0.0 – 18.94	----	----	----	----	----

Table B.1 (Continued)

Total: *Asplenium* sp.	**N**	----	**2.27 (0.98)**	----	----	----	----	----
		----	**0.0 – 18.94**	----	----	----	----	----
Aster adnatus	N	----	----	----	----	----	----	0.33 (0.13)
		----	----	----	----	----	----	0.0 - 9.85
Aster dumosus	N	----	----	----	----	----	----	0.17 (0.12)
		----	----	----	----	----	----	0.0 - 9.85
Aster linariifolius	N	----	----	----	----	----	----	0.28 (0.13)
		----	----	----	----	----	----	0.0 - 6.82
Aster patens	N	----	----	0.08 (0.06)	----	----	----	0.02 (0.01)
		----	----	0.0 - 1.52	----	----	----	0.0 - 0.76
Aster sp.	N	0.08 (0.06)	----	----	----	2.05 (1.25)	0.03 (0.03)	0.03 (0.02)
		0.0 – 2.27	----	----	----	0.0 - 12.88	0.0 - 076	0.0 - 0.76
Total: *Aster* sp.	**N**	**0.08 (0.06)**	----	**0.08 (0.06)**	----	**2.05 (1.25)**	**0.03 (0.03)**	**0.84 (0.24)**
		0.0 – 2.27	----	**0.0 - 1.52**	----	**0.0 - 12.88**	**0.0 - 076**	**0.0 - 15.15**
Chrysopsis mariana	N	----	----	----	----	----	----	0.30 (0.23)
		----	----	----	----	----	----	0.0 - 19.69
Total: *Chrysopsis* sp.	**N**	----	----	----	----	----	----	**0.30 (0.23)**
		----	----	----	----	----	----	**0.0 - 19.69**
Cnidoscolus stimulosus	N	----	----	----	----	----	0.03 (0.03)	0.07 (0.04)
		----	----	----	----	----	0.0 - 0.76	0.0 - 2.27
Total: *Cnidoscolus* sp.	**N**	----	----	----	----	----	**0.03 (0.03)**	**0.07 (0.04)**
		----	----	----	----	----	**0.0 - 0.76**	**0.0 - 2.27**
Coreopsis major	N	0.03 (0.02)	----	0.08 (0.08)	0.10 (0.07)	----	----	0.07 (0.03)
		0.0 – 0.76	----	0.0 - 2.27	0.0 - 0.76	----	----	0.0 - 2.27
Total: *Coreopsis* sp.	**N**	**0.03 (0.02)**	----	**0.08 (0.08)**	**0.10 (0.07)**	----	----	**0.07 (0.03)**
		0.0 – 0.76	----	**0.0 - 2.27**	**0.0 - 0.76**	----	----	**0.0 - 2.27**
Croton capitatus	N	1.94 (0.93)	----	----	----	----	----	----
		0.0 – 35.61	----	----	----	----	----	----
Croton sp.	N	0.19 (0.13)	----	----	----	----	----	----
		0.0 – 5.30	----	----	----	----	----	----
Total: *Croton* sp.	**N**	**2.12 (0.96)**	----	----	----	----	----	----
		0.0 – 35.61	----	----	----	----	----	----
Diodia sp.	N	0.46 (0.27)	----	----	0.61 (0.50)	0.08 (0.08)	----	0.32 (0.22)
		0.0 – 11.36	----	----	0.0 - 7.58	0.0 - 0.76	----	0.0 - 15.15
Diodia teres	N	17.10 (4.84)	----	----	----	----	----	0.08 (0.06)
		0.0 – 97.73	----	----	----	----	----	0.0 - 4.55
Total: *Diodia* sp.	**N**	**17.56 (4.81)**	----	----	**0.61 (0.50)**	**0.08 (0.08)**	----	**0.39 (0.23)**
		0.0 – 97.73	----	----	**0.0 - 7.58**	**0.0 - 0.76**	----	**0.0 - 15.15**
Elephantopus sp.	N	----	----	----	----	0.76 (0.76)	----	----
		----	----	----	----	0.0 - 7.58	----	----

Table B.1 (Continued)

Elephantopus tomentosus	N	0.10 (0.10)	----	0.31 (0.23)	----	----	0.24 (0.10)	0.81 (0.25)
		0.0 – 4.55	----	0.0 - 6.06	----	----	0.0 - 1.52	0.0 - 13.64
Total: *Elephantopus* sp.	**N**	**0.10 (0.10)**	**----**	**0.31 (0.23)**	**----**	**0.76 (0.76)**	**0.24 (0.10)**	**0.81 (0.25)**
		0.0 – 4.55	**----**	**0.0 - 6.06**	**----**	**0.0 - 7.58**	**0.0 - 1.52**	**0.0 - 13.64**
Erechtites hieracifolia	N	0.02 (0.02)	0.36 (0.19)	----	----	----	----	0.03 (0.03)
		0.0 – 0.76	0.0 – 3.79	----	----	----	----	0.0 - 3.03
Total: *Erechtites* sp.	**N**	**0.02 (0.02)**	**0.36 (0.19)**	**----**	**----**	**----**	**----**	**0.03 (0.03)**
		0.0 – 0.76	**0.0 – 3.79**	**----**	**----**	**----**	**----**	**0.0 - 3.03**
Eryngium aquaticum	N	----	----	----	----	----	----	0.02 (0.01)
		----	----	----	----	----	----	0.0 - 0.76
Total: *Eryngium* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.02 (0.01)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 - 0.76**
Eupatorium capillifolium	N	0.10 (0.10)	0.21 (0.11)	----	----	0.08 (0.08)	----	0.01 (0.01)
		0.0 – 4.55	0.0 – 2.27	----	----	0.0 - 0.76	----	0.0 - 0.76
Eupatorium hyssopifolium	N	0.14 (0.10)	----	----	----	----	----	0.03 (0.02)
		0.0 – 4.55	----	----	----	----	----	0.0 - 1.52
Eupatorium perfoliatum	N	0.02 (0.02)	----	----	----	----	----	----
		0.0 – 0.76	----	----	----	----	----	----
Eupatorium rotundifolia	N	0.32 (0.12)	----	0.08 (0.04)	0.15 (0.08)	0.46 (0.26)	0.10 (0.06)	0.18 (0.05)
		0.0 – 4.55	----	0.0 - 0.76	0.0 - 0.76	0.0 - 2.27	0.0 - 0.76	0.0 - 2.27
Eupatorium serotinum	N	0.05 (0.05)	----	----	----	----	----	----
		0.0 – 2.27	----	----	----	----	----	----
Eupatorium sp.	N	1.26 (0.92)	----	0.03 (0.03)	----	0.38 (0.20)	----	0.21 (0.09)
		0.0 – 40.91	----	0.0 - 0.76	----	0.0 - 1.52	----	0.0 - 6.06
Total: *Eupatorium* sp.	**N**	**1.89 (0.97)**	**0.21 (0.11)**	**0.10 (0.05)**	**0.15 (0.08)**	**0.91 (0.32)**	**0.10 (0.06)**	**0.42 (0.12)**
		0.0 – 41.67	**0.0 – 2.27**	**0.0 - 0.76**	**0.0 - 0.76**	**0.0 - 3.03**	**0.0 - 0.76**	**0.0 - 6.06**
Euphorbia pubentissima	N	----	----	0.31 (0.18)	----	----	----	0.11 (0.05)
		----	----	0.0 - 4.55	----	----	----	0.0 - 3.03
Euphorbia sp.	N	0.12 (0.07)	----	0.03 (0.03)	0.05 (0.05)	0.08 (0.08)	0.21 (0.09)	0.10 (0.04)
		0.0 – 2.27	----	0.0 - 0.76	0.0 - 0.76	0.0 - 0.76	0.0 - 1.52	0.0 - 1.52
Total: *Euphorbia* sp.	**N**	**0.12 (0.07)**	**----**	**0.34 (0.18)**	**0.05 (0.05)**	**0.08 (0.08)**	**0.21 (0.09)**	**0.22 (0.06)**
		0.0 – 2.27	**----**	**0.0 - 4.55**	**0.0 - 0.76**	**0.0 - 0.76**	**0.0 - 1.52**	**0.0 - 3.03**
Euthamia tenuifolia	N	0.10 (0.06)	0.03 (0.03)	----	----	0.38 (0.30)	----	0.06 (0.06)
		0.0 – 2.27	0.0 – 0.76	----	----	0.0 - 3.03	----	0.0 - 5.30
Total: *Euthamia* sp.	**N**	**0.10 (0.06)**	**0.03 (0.03)**	**----**	**----**	**0.38 (0.30)**	**----**	**0.06 (0.06)**
		0.0 – 2.27	**0.0 – 0.76**	**----**	**----**	**0.0 - 3.03**	**----**	**0.0 - 5.30**
Hisbiscus aculeatus	N	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 - 0.76
Hibiscus sp.	N	----	----	----	----	----	----	0.06 (0.05)
		----	----	----	----	----	----	0.0 - 4.55

Table B.1 (Continued)

Total: *Hisbiscus* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.07 (0.05)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 - 4.55**
Lactuca canadensis	N	----	----	----	----	----	----	0.02 (0.01)
		----	----	----	----	----	----	0.0 - 0.76
Total: *Lactuca* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.02 (0.01)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 - 0.76**
Onosmodium virginianum	N	----	----	----	----	----	----	0.03 (0.02)
		----	----	----	----	----	----	0.0 - 1.52
Total: *Onosmodium* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.03 (0.02)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 - 1.52**
Oxalis sp.	N	----	----	0.03 (0.03)	----	0.08 (0.08)	----	----
		----	----	0.0 - 0.76	----	0.0 - 0.76	----	----
Oxalis stricta	N	0.25 (0.20)	0.06 (0.04)	----	----	----	----	0.01 (0.01)
		0.0 – 9.09	0.0 – 0.76	----	----	----	----	0.0 - 0.76
Total: *Oxalis* sp.	**N**	**0.25 (0.20)**	**0.06 (0.04)**	**0.03 (0.03)**	**----**	**0.08 (0.08)**	**----**	**0.01 (0.01)**
		0.0 – 9.09	**0.0 – 0.76**	**0.0 - 0.76**	**----**	**0.0 - 0.76**	**----**	**0.0 - 0.76**
Phytolacca americana	N	----	0.03 (0.03)	----	----	0.30 (0.30)	----	----
		----	0.0 – 0.76	----	----	0.0 - 3.03	----	----
Total: *Phytolacca* sp.	**N**	**----**	**0.03 (0.03)**	**----**	**----**	**0.30 (0.30)**	**----**	**----**
		----	**0.0 – 0.76**	**----**	**----**	**0.0 - 3.03**	**----**	**----**
Pityopsis graminifolia	N	0.05 (0.04)	----	----	----	0.68 (0.60)	1.14 (0.39)	3.11 (0.71)
		0.0 – 1.52	----	----	----	0.0 - 6.06	0.0 - 6.06	0.0 - 37.88
Total: *Pityopsis* sp.	**N**	**0.05 (0.04)**	**----**	**----**	**----**	**0.68 (0.60)**	**1.14 (0.39)**	**3.11 (0.71)**
		0.0 – 1.52	**----**	**----**	**----**	**0.0 - 6.06**	**0.0 - 6.06**	**0.0 - 37.88**
Plantago sp.	N	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 - 0.76
Total: *Plantago* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.01 (0.01)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 - 0.76**
Polygala nana	N	0.10 (0.05)	----	----	----	----	----	----
		0.0 – 1.52	----	----	----	----	----	----
Polygala sp.	N	----	----	----	----	----	0.07 (0.07)	0.03 (0.03)
		----	----	----	----	----	0.0 - 1.52	0.0 - 2.27
Total: *Polygala* sp.	**N**	**0.10 (0.05)**	**----**	**----**	**----**	**----**	**0.07 (0.07)**	**0.03 (0.03)**
		0.0 – 1.52	**----**	**----**	**----**	**----**	**0.0 - 1.52**	**0.0 - 2.27**
Polygonum sp.	N	----	4.55 (2.59)	----	----	----	----	----
		----	0.0 – 52.27	----	----	----	----	----
Total: *Polygonum* sp.	**N**	**----**	**4.55 (2.59)**	**----**	**----**	**----**	**----**	**----**
		----	**0.0 – 52.27**	**----**	**----**	**----**	**----**	**----**
Polypremum procumbens	N	3.69 (2.11)	----	----	0.76 (0.58)	----	----	0.01 (0.01)
		0.0 – 93.18	----	----	0.0 - 8.33	----	----	0.0 - 0.76

Table B.1 (Continued)

Total: *Polypremum* sp.	**N**	**3.69 (2.11)**	----	----	**0.76 (0.58)**	----	----	**0.01 (0.01)**
		0.0 – 93.18	----	----	**0.0 - 8.33**	----	----	**0.0 - 0.76**
Pteridium aquilinum	N	1.85 (0.89)	----	----	0.05 (0.05)	----	----	0.25 (0.16)
		0.0 – 34.85	----	----	0.0 - 0.76	----	----	0.0 - 12.88
Total: *Pteridium* sp.	**N**	**1.85 (0.89)**	----	----	**0.05 (0.05)**	----	----	**0.25 (0.16)**
		0.0 – 34.85	----	----	**0.0 - 0.76**	----	----	**0.0 - 12.88**
Rhexia alifanus	N	----	----	----	----	----	----	0.03 (0.02)
		----	----	----	----	----	----	0.0 - 1.52
Rhexia mariana	N	----	----	----	----	----	----	0.24 (0.24)
		----	----	----	----	----	----	0.0 - 21.21
Rhexia sp.	N	----	----	----	----	----	----	0.03 (0.02)
		----	----	----	----	----	----	0.0 - 1.52
Total: *Rhexia* sp.	**N**	----	----	----	----	----	----	**0.30 (0.25)**
		----	----	----	----	----	----	**0.0 - 21.97**
Solidago odora	N	0.15 (0.06)	----	0.13 (0.09)	0.25 (0.14)	0.61 (0.39)	----	0.24 (0.08)
		0.0 – 1.52	----	0.0 - 2.27	0.0 - 1.52	0.0 - 3.79	----	0.0 - 5.30
Solidago rugosa	N	----	----	----	----	----	----	0.03 (0.03)
		----	----	----	----	----	----	0.0 - 2.27
Solidago sp.	N	----	----	----	0.40 (0.22)	0.15 (0.15)	----	0.03 (0.02)
		----	----	----	0.0 - 3.03	0.0 - 1.52	----	0.0 - 1.52
Total: *Solidago* sp.	**N**	**0.15 (0.06)**	----	**0.13 (0.09)**	**0.66 (0.33)**	**0.76 (0.45)**	----	**0.30 (0.08)**
		0.0 - 1.52	----	**0.0 - 2.27**	**0.0 - 4.55**	**0.0 - 3.79**	----	**0.0 - 5.30**
Stylisma humistrata	N	----	----	----	----	----	----	0.19 (0.15)
		----	----	----	----	----	----	0.0 - 12.88
Stylisma sp.	N	----	----	----	----	----	----	0.02 (0.02)
		----	----	----	----	----	----	0.0 - 1.52
Total: *Stylisma* sp.	**N**	----	----	----	----	----	----	**0.21 (0.15)**
		----	----	----	----	----	----	**0.0 - 12.88**
Tragia sp.	N	0.22 (0.08)	0.15 (0.11)	0.60 (0.22)	----	1.29 (0.62)	0.65 (0.26)	0.86 (0.20)
		0.0 – 2.27	0.0 – 2.27	0.0 - 4.55	----	0.0 - 6.06	0.0 - 3.79	0.0 - 11.36
Total: *Tragia* sp.	**N**	**0.22 (0.08)**	**0.15 (0.11)**	**0.60 (0.22)**	----	**1.29 (0.62)**	**0.65 (0.26)**	**0.86 (0.20)**
		0.0 – 2.27	**0.0 – 2.27**	**0.0 - 4.55**	----	**0.0 - 6.06**	**0.0 - 3.79**	**0.0 - 11.36**
Trilisa odoratissima	N	----	----	----	0.05 (0.05)	----	----	0.11 (0.07)
		----	----	----	0.0 - 0.76	----	----	0.0 - 5.30
Total: *Trilisa* sp.	**N**	----	----	----	**0.05 (0.05)**	----	----	**0.11 (0.07)**
		----	----	----	**0.0 - 0.76**	----	----	**0.0 - 5.30**
Vernonia sp.	N	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 - 0.76

Table B.1 (Continued)

Total: *Vernonia* sp.	**N**	----	----	----	----	----	----	**0.01 (0.01)**
		----	----	----	----	----	----	**0.0 - 0.76**
Commelina communis	Nn	----	----	----	----	----	----	0.03 (0.02)
		----	----	----	----	----	----	0.0 - 1.52
Total: *Commelina* sp.	**Nn**	----	----	----	----	----	----	**0.03 (0.02)**
		----	----	----	----	----	----	**0.0 - 1.52**
Conyza canadensis	Nn	0.07 (0.07)	----	----	----	----	----	----
		0.0 – 3.03	----	----	----	----	----	----
Total: *Conyza* sp.	**Nn**	**0.07 (0.07)**	----	----	----	----	----	----
		0.0 – 3.03	----	----	----	----	----	----
Grasses								
Andropogon gerardii	N	0.14 (0.14)	----	----	----	----	----	----
		0.0 – 6.06	----	----	----	----	----	----
Andropogon sp.	N	18.33 (3.67)	0.49 (0.32)	5.83 (2.06)	17.32 (6.19)	18.41 (9.38)	36.98 (7.01)	29.21 (3.43)
		0.0 – 100.00	0.0 – 7.58	0.0 - 40.91	0.0 - 87.12	0.0 - 96.21	0.0 - 91.67	0.0 - 100.00
Andropogon virginicus	N	0.05 (0.05)	----	----	----	----	----	----
		0.0 – 2.27	----	----	----	----	----	----
Total: *Andropogon* sp.	**N**	**18.52 (3.66)**	**0.49 (0.32)**	**5.83 (2.06)**	**17.32 (6.19)**	**18.41 (9.38)**	**36.98 (7.01)**	**29.21 (3.43)**
		0.0 – 100.00	**0.0 – 7.58**	**0.0 - 40.91**	**0.0 - 87.12**	**0.0 - 96.21**	**0.0 - 91.67**	**0.0 - 100.00**
Aristida beyrichiana	N	----	----	1.20 (1.07)	----	----	----	0.22 (0.13)
		----	----	0.0 - 31.06	----	----	----	0.0 - 7.58
Aristida sp.	N	0.49 (0.21)	----	----	----	----	7.78 (4.53)	4.11 (1.39)
		0.0 – 7.58	----	----	----	----	0.0 - 84.09	0.0 - 78.79
Aristida stricta	N	1.70 (0.78)	----	----	0.20 (0.14)	19.09 (6.28)	3.86 (1.17)	14.29 (2.94)
		0.0 – 28.79	----	----	0.0 - 1.52	0.0 - 50.76	0.0 - 21.97	0.0 - 100.00
Total: *Aristida* sp.	**N**	**2.19 (0.78)**	----	**1.20 (1.07)**	**0.20 (0.14)**	**19.09 (6.28)**	**11.64 (4.67)**	**18.61 (3.07)**
		0.0 – 28.79	----	**0.0 - 31.06**	**0.0 - 1.52**	**0.0 - 50.76**	**0.0 - 91.67**	**0.0 - 100.00**
Arundinaria gigantea	N	----	----	----	0.05 (0.05)	----	----	----
		----	----	----	0.0 - 0.76	----	----	----
Total: *Arundinaria* sp.	**N**	----	----	----	**0.05 (0.05)**	----	----	----
		----	----	----	**0.0 - 0.76**	----	----	----
Brachiaria platyphylla	N	----	----	----	----	----	1.86 (1.86)	----
		----	----	----	----	----	0.0 - 40.91	----
Total: *Brachiaria* sp.	**N**	----	----	----	----	----	**1.86 (1.86)**	----
		----	----	----	----	----	**0.0 - 40.91**	----
Chasmanthium sessiliflorum	N	----	----	----	----	----	1.17 (1.17)	0.43 (0.29)
		----	----	----	----	----	0.0 - 25.76	0.0 - 24.24
Chasmanthium sp.	N	0.91 (0.45)	----	0.31 (0.31)	----	----	----	0.12 (0.07)
		0.0 – 15.15	----	0.0 - 9.09	----	----	----	0.0 - 4.55

Table B.1 (Continued)

Total: *Chasmanthium* sp.	**N**	**0.91 (0.45)**	**----**	**0.31 (0.31)**	**----**	**----**	**1.17 (1.17)**	**0.55 (0.29)**
		0.0 – 15.15	**----**	**0.0 - 9.09**	**----**	**----**	**0.0 - 25.76**	**0.0 - 24.24**
Ctenium aromaticum	N	----	----	----	0.25 (0.25)	0.15 (0.15)	0.17 (0.17)	0.19 (0.14)
		----	----	----	0.0 - 3.79	0.0 - 1.52	0.0 - 3.79	0.0 - 11.36
Total: *Ctenium* sp.	**N**	**----**	**----**	**----**	**0.25 (0.25)**	**0.15 (0.15)**	**0.17 (0.17)**	**0.19 (0.14)**
		----	**----**	**----**	**0.0 - 3.79**	**0.0 - 1.52**	**0.0 - 3.79**	**0.0 - 11.36**
Danthonia sericea	N	----	----	----	----	----	----	0.10 (0.10)
		----	----	----	----	----	----	0.0 - 9.09
Total: *Danthonia* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.10 (0.10)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 - 9.09**
Dichanthelium aciculare	N	1.75 (1.60)	----	----	----	----	----	0.04 (0.03)
		0.0 – 71.97	----	----	----	----	----	0.0 - 2.27
Dichanthelium acuminatum	N	0.42 (0.42)	----	----	----	----	----	----
		0.0 – 18.94	----	----	----	----	----	----
Dichanthelium ciliare	N	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 - 0.76
Dichanthelium commutatum	N	0.42 (0.30)	----	----	----	----	----	0.03 (0.03)
		0.0 – 11.36	----	----	----	----	----	0.0 - 2.27
Dichanthelium scoparium	N	0.15 (0.11)	----	0.31 (0.25)	----	----	----	----
		0.0 – 4.55	----	0.0 - 6.82	----	----	----	----
Dichanthelium sp.	N	20.49 (3.11)	0.06 (0.04)	3.03 (0.87)	6.11 (3.04)	16.21 (5.34)	27.93 (4.09)	8.02 (1.67)
		0.0 – 72.73	0.0 – 0.76	0.0 - 16.67	0.0 - 35.61	0.0 - 53.03	0.76 - 78.79	0.0 - 100.00
Total: *Dichanthelium* sp.	**N**	**23.23 (3.49)**	**0.06 (0.04)**	**3.34 (0.91)**	**6.11 (3.04)**	**16.21 (5.34)**	**27.93 (4.09)**	**8.10 (1.67)**
		0.0 – 99.24	**0.0 – 0.76**	**0.0 - 16.67**	**0.0 - 35.61**	**0.0 - 53.03**	**0.76 - 78.79**	**0.0 - 100.00**
Eragrostis hirsute	N	----	----	----	----	----	----	0.09 (0.09)
		----	----	----	----	----	----	0.0 - 8.33
Eragrostis sp.	N	0.20 (0.14)	----	----	----	----	0.07 (0.07)	0.09 (0.09)
		0.0 – 5.30	----	----	----	----	0.0 - 1.52	0.0 - 8.33
Total: *Eragrostis* sp.	**N**	**0.20 (0.14)**	**----**	**----**	**----**	**----**	**0.07 (0.07)**	**0.19 (0.13)**
		0.0 – 5.30	**----**	**----**	**----**	**----**	**0.0 - 1.52**	**0.0 - 8.33**
Panicum virgatum	N	0.08 (0.05)	----	----	----	----	----	0.06 (0.06)
		0.0 – 1.52	----	----	----	----	----	0.0 - 5.30
Total: *Panicum* sp.	**N**	**0.08 (0.05)**	**----**	**----**	**----**	**----**	**----**	**0.06 (0.06)**
		0.0 – 1.52	**----**	**----**	**----**	**----**	**----**	**0.0 - 5.30**
Paspalum floridanum	N	0.32 (0.17)	----	----	----	----	0.62 (0.38)	----
		0.0 – 6.06	----	----	----	----	0.0 - 6.82	----
Total: *Paspalum* sp.	**N**	**0.32 (0.17)**	**----**	**----**	**----**	**----**	**0.62 (0.38)**	**----**
		0.0 – 6.06	**----**	**----**	**----**	**----**	**0.0 - 6.82**	**----**
Saccharum giganteum	N	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 - 0.76

Table B.1 (Continued)

Saccharum sp.	N	----	----	----	----	----	----	0.05 (0.05)
		----	----	----	----	----	----	0.0 - 4.55
Total: *Saccharum* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.06 (0.05)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 - 4.55**
Schizachyrium scoparium	N	28.13 (4.34)	----	1.23 (1.10)	----	37.50 (11.05)	10.88 (3.68)	7.17 (1.90)
		0.0 – 95.46	----	0.0 - 31.82	----	0.0 - 87.88	0.0 - 56.82	0.0 - 92.42
Schizachyrium sp.	N	----	----	----	----	----	----	0.03 (0.03)
		----	----	----	----	----	----	0.0 - 2.27
Total: *Schizachyrium* sp.	**N**	**28.13 (4.34)**	**----**	**1.23 (1.10)**	**----**	**37.50 (11.05)**	**10.88 (3.68)**	**7.19 (1.89)**
		0.0 – 95.46	**----**	**0.0 - 31.82**	**----**	**0.0 - 87.88**	**0.0 - 56.82**	**0.0 - 92.42**
Tridens sp.	N	0.08 (0.08)	----	----	----	----	----	0.02 (0.02)
		0.0 – 3.79	----	----	----	----	----	0.0 - 1.52
Total: *Tridens* sp.	**N**	**0.08 (0.08)**	**----**	**----**	**----**	**----**	**----**	**0.02 (0.02)**
		0.0 – 3.79	**----**	**----**	**----**	**----**	**----**	**0.0 - 1.52**
Cynodon dactylon	Nn	----	----	----	----	----	----	0.34 (0.23)
		----	----	----	----	----	----	0.0 - 15.15
Total: *Cynodon* sp.	**Nn**	**----**	**----**	**----**	**----**	**----**	**----**	**0.34 (0.23)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 - 15.15**
Digitaria ciliaris	Nn	----	----	----	----	0.91 (0.91)	----	----
		----	----	----	----	0.0 - 9.09	----	----
Digitaria sp.	Nn	2.04 (0.90)	----	----	----	----	----	----
		0.0 – 32.58	----	----	----	----	----	----
Total: *Digitaria* sp.	**Nn**	**2.04 (0.90)**	**----**	**----**	**----**	**0.91 (0.91)**	**----**	**----**
		0.0 – 32.58	**----**	**----**	**----**	**0.0 - 9.09**	**----**	**----**
Imperata cylindrica	Nn	----	----	0.86 (0.57)	0.05 (0.05)	25.53 (13.08)	0.48 (0.48)	0.59 (0.46)
		----	----	0.0 - 13.64	0.0 - 0.76	0.0 - 100.00	0.0 - 10.61	0.0 - 37.88
Total: *Imperata* sp.	**Nn**	**----**	**----**	**0.86 (0.57)**	**0.05 (0.05)**	**25.53 (13.08)**	**0.48 (0.48)**	**0.59 (0.46)**
		----	**----**	**0.0 - 13.64**	**0.0 - 0.76**	**0.0 - 100.00**	**0.0 - 10.61**	**0.0 - 37.88**
Panicum repens	Nn	0.02 (0.02)	----	----	----	----	----	0.02 (0.02)
		0.0 – 0.76	----	----	----	----	----	0.0 - 1.52
Total: *Panicum* sp.	**Nn**	**0.02 (0.02)**	**----**	**----**	**----**	**----**	**----**	**0.02 (0.02)**
		0.0 – 0.76	**----**	**----**	**----**	**----**	**----**	**0.0 - 1.52**
Paspalum dilatatum	Nn	----	----	----	----	----	----	0.13 (0.09)
		----	----	----	----	----	----	0.0 - 7.58
Paspalum notatum	Nn	----	----	2.46 (2.46)	----	----	----	----
		----	----	0.0 - 71.21	----	----	----	----
Total: *Paspalum* sp.	**Nn**	**----**	**----**	**2.46 (2.46)**	**----**	**----**	**----**	**0.13 (0.09)**
		----	**----**	**0.0 - 71.21**	**----**	**----**	**----**	**0.0 - 7.58**
Sorghum halepense	Nn	0.12 (0.12)	----	----	----	----	----	----
		0.0 – 5.30	----	----	----	----	----	----

Table B.1 (Continued)

Total: *Sorghum* sp.	**Nn**	**0.12 (0.12)**	----	----	----	----	----	----
		0.0 – 5.30	----	----	----	----	----	----
Panicum sp.	Unk	0.66 (0.50)	----	0.08 (0.08)	----	0.15 (0.15)	2.93 (1.29)	0.95 (0.27)
		0.0 - 21.97	----	0.0 - 2.27	----	0.0 - 1.52	0.0 - 24.24	0.0 - 11.36
Total: *Panicum* sp.	**Unk**	**0.66 (0.50)**	----	**0.08 (0.08)**	----	**0.15 (0.15)**	**2.93 (1.29)**	**0.95 (0.27)**
		0.0 - 21.97	----	**0.0 - 2.27**	----	**0.0 - 1.52**	**0.0 - 24.24**	**0.0 - 11.36**
Paspalum sp.	Unk	0.20 (0.11)	----	----	----	----	0.31 (0.22)	0.09 (0.06)
		0.0 – 3.79	----	----	----	----	0.0 - 4.55	0.0 - 3.79
Total: *Paspalum* sp.	**Unk**	**0.20 (0.11)**	----	----	----	----	**0.31 (0.22)**	**0.09 (0.06)**
		0.0 – 3.79	----	----	----	----	**0.0 - 4.55**	**0.0 - 3.79**
Grass-likes								
Carex sp.	N	0.32 (0.23)	0.36 (0.27)	0.84 (0.63)	0.96 (0.85)	1.14 (0.63)	0.52 (0.21)	0.45 (0.12)
		0.0 – 9.85	0.0 – 6.06	0.0 - 17.42	0.0 - 12.88	0.0 - 6.06	0.0 - 3.79	0.0 - 5.30
Total: *Carex* sp.	**N**	**0.32 (0.23)**	**0.36 (0.27)**	**0.84 (0.63)**	**0.96 (0.85)**	**1.14 (0.63)**	**0.52 (0.21)**	**0.45 (0.12)**
		0.0 – 9.85	**0.0 – 6.06**	**0.0 - 17.42**	**0.0 - 12.88**	**0.0 - 6.06**	**0.0 - 3.79**	**0.0 - 5.30**
Juncus sp.	N	----	0.18 (0.18)	----	----	----	----	----
		----	0.0 – 4.55	----	----	----	----	----
Total: *Juncus* sp.	**N**	----	**0.18 (0.18)**	----	----	----	----	----
		----	**0.0 – 4.55**	----	----	----	----	----
Rhynchospora sp.	N	0.05 (0.04)	----	----	0.20 (0.20)	----	----	1.04 (0.82)
		0.0 – 1.52	----	----	0.0 - 3.03	----	----	0.0 - 68.94
Total: *Rhynchospora* sp.	**N**	**0.05 (0.04)**	----	----	**0.20 (0.20)**	----	----	**1.04 (0.82)**
		0.0 – 1.52	----	----	**0.0 - 3.03**	----	----	**0.0 - 68.94**
Scleria sp.	N	----	----	----	1.21 (0.88)	----	----	0.01 (0.01)
		----	----	----	0.0 - 12.12	----	----	0.0 - 0.76
Total: *Scleria* sp.	**N**	----	----	----	**1.21 (0.88)**	----	----	**0.01 (0.01)**
		----	----	----	**0.0 - 12.12**	----	----	**0.0 - 0.76**
Legumes								
Baptisia sp.	N	----	----	----	----	----	----	0.02 (0.01)
		----	----	----	----	----	----	0.0 - 0.76
Total: *Baptisia* sp.	**N**	----	----	----	----	----	----	**0.02 (0.01)**
		----	----	----	----	----	----	**0.0 - 0.76**
Centrosema sp.	N	----	----	----	----	----	0.07 (0.07)	0.01 (.01)
		----	----	----	----	----	0.0 - 1.52	0.0 - 0.76
Centrosema virginianum	N	----	----	----	----	----	----	0.03 (0.02)
		----	----	----	----	----	----	0.0 - 0.76

Table B.1 (Continued)

Total: *Centrosema* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**0.07 (0.07)**	**0.03 (0.02)**
		----	**----**	**----**	**----**	**----**	**0.0 - 1.52**	**0.0 - 0.76**
Chamaecrista fasciculata	N	0.02 (0.02)	----	0.10 (0.07)	----	0.08 (0.08)	0.03 (0.03)	0.06 (0.03)
		0.0 – 0.76	----	0.0 - 1.52	----	0.0 - 0.76	0.0 - 0.76	0.0 - 2.27
Chamaecrista sp.	N	0.02 (0.02)	0.03 (0.03)	----	----	----	----	----
		0.0 – 0.76	0.0 – 0.76	----	----	----	----	----
Total: *Chamaecrista* sp.	**N**	**0.03 (0.02)**	**0.03 (0.03)**	**0.10 (0.07)**	**----**	**0.08 (0.08)**	**0.03 (0.03)**	**0.06 (0.03)**
		0.0 – 0.76	**0.0 – 0.76**	**0.0 - 1.52**	**----**	**0.0 - 0.76**	**0.0 - 0.76**	**0.0 - 2.27**
Clitoria mariana	N	----	----	0.16 (0.09)	----	----	----	0.01 (0.01)
		----	----	0.0 - 2.27	----	----	----	0.0 - 0.76
Total: *Clitoria* sp.	**N**	**----**	**----**	**0.16 (0.09)**	**----**	**----**	**----**	**0.01 (0.01)**
		----	**----**	**0.0 - 2.27**	**----**	**----**	**----**	**0.0 - 0.76**
Desmodium ciliare	N	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 - 0.76
Desmodium lineatum	N	0.02 (0.02)	----	----	----	0.15 (0.15)	0.10 (0.10)	----
		0.0 – 0.76	----	----	----	0.0 - 1.52	0.0 - 2.27	----
Desmodium obtusum	N	----	----	0.03 (0.03)	----	----	----	----
		----	----	0.0 - 0.76	----	----	----	----
Desmodium rotundifolium	N	----	----	----	----	----	----	0.03 (0.02)
		----	----	----	----	----	----	0.0 - 1.52
Desmodium sp.	N	0.14 (0.14)	----	----	----	----	0.03 (0.03)	0.25 (0.07)
		0.0 – 6.06	----	----	----	----	0.0 - 0.76	0.0 - 3.03
Total: *Desmodium* sp.	**N**	**0.15 (0.14)**	**----**	**0.03 (0.03)**	**----**	**0.15 (0.15)**	**0.14 (0.11)**	**0.28 (0.08)**
		0.0 – 6.06	**----**	**0.0 - 0.76**	**----**	**0.0 - 1.52**	**0.0 - 2.27**	**0.0 - 3.03**
Galactia regularis	N	0.02 (0.02)	----	----	----	----	----	----
		0.0 – 0.76	----	----	----	----	----	----
Galactia sp.	N	----	----	0.05 (0.05)	----	----	----	0.07 (0.04)
		----	----	0.0 - 1.52	----	----	----	0.0 - 2.27
Total: *Galactia* sp.	**N**	**0.02 (0.02)**	**----**	**0.05 (0.05)**	**----**	**----**	**----**	**0.07 (0.04)**
		0.0 – 0.76	**----**	**0.0 - 1.52**	**----**	**----**	**----**	**0.0 - 2.27**
Lespedeza hirta	N	----	----	0.13 (0.13)	----	----	----	----
		----	----	0.0 - 3.78	----	----	----	----
Lespedeza procumbens	N	----	----	----	----	----	----	0.03 (0.03)
		----	----	----	----	----	----	0.0 - 2.27
Lespedeza repens	N	----	----	----	----	----	0.28 (0.21)	0.06 (0.04)
		----	----	----	----	----	0.0 - 4.55	0.0 - 2.27
Lespedeza virginica	N	0.02 (0.02)	----	0.03 (0.03)	----	----	----	0.01 (0.01)
		0.0 – 0.76	----	0.0 - 3.79	----	----	----	0.0 - 0.76

Table B.1 (Continued)

Total: *Lespedeza* sp.	**N**	**0.02 (0.02)**	----	**0.16 (0.13)**	----	----	**0.28 (0.21)**	**0.10 (0.04)**
		0.0 – 0.76	----	**0.0 - 3.79**	----	----	**0.0 - 4.55**	**0.0 - 2.27**
Mimosa microphylla	N	0.02 (0.02)	----	0.08 (0.06)	0.05 (0.05)	----	----	0.01 (0.01)
		0.0 – 0.76	----	0.0 - 1.52	0.0 - 0.76	----	----	0.0 - 0.76
Total: *Mimosa* sp.	**N**	**0.02 (0.02)**	----	**0.08 (0.06)**	**0.05 (0.05)**	----	----	**0.01 (0.01)**
		0.0 – 0.76	----	**0.0 - 1.52**	**0.0 - 0.76**	----	----	**0.0 - 0.76**
Rhynchosia reniformis	N	----	----	0.05 (0.04)	----	----	----	0.09 (0.04)
		----	----	0.0 - 0.76	----	----	----	0.0 - 3.03
Rhynchosia sp.	N	----	----	----	----	----	----	0.02 (0.02)
		----	----	----	----	----	----	0.0 - 1.52
Total: *Rhynchosia* sp.	**N**	----	----	**0.05 (0.04)**	----	----	----	**0.11 (0.06)**
		----	----	**0.0 - 0.76**	----	----	----	**0.0 - 4.55**
Strophostyles umbellata	N	0.03 (0.03)	----	----	----	----	----	----
		0.0 – 1.52	----	----	----	----	----	----
Total: *Strophostyles* sp.	**N**	**0.03 (0.03)**	----	----	----	----	----	----
		0.0 – 1.52	----	----	----	----	----	----
Stylosanthes biflora	N	0.39 (0.14)	----	0.10 (0.07)	----	0.30 (0.23)	0.31 (0.21)	0.44 (0.13)
		0.0 5.30	----	0.0 - 1.52	----	0.0 - 2.27	0.0 - 4.55	0.0 - 9.09
Total: *Stylosanthes* sp.	**N**	**0.39 (0.14)**	----	**0.10 (0.07)**	----	**0.30 (0.23)**	**0.31 (0.21)**	**0.44 (0.13)**
		0.0 5.30	----	**0.0 - 1.52**	----	**0.0 - 2.27**	**0.0 - 4.55**	**0.0 - 9.09**
Tephrosia sp.	N	----	----	----	----	----	----	0.17 (0.08)
		----	----	----	----	----	----	0.0 - 6.06
Tephrosia spicata	N	0.03 (0.03)	----	0.18 (0.12)	----	0.30 (0.23)	0.21 (0.10)	0.47 (0.14)
		0.0 – 1.52	----	0.0 - 3.03	----	0.0 - 2.27	0.0 - 1.52	0.0 - 7.58
Tephrosia virginiana	N	0.32 (0.22)	----	0.26 (0.15)	0.15 (0.11)	----	0.03 (0.03)	0.11 (0.05)
		0.0 – 7.58	----	0.0 - 3.79	0.0 - 1.52	----	0.0 - 0.76	0.0 - 3.03
Total: *Tephrosia* sp.	**N**	**0.35 (0.23)**	----	**0.44 (0.20)**	**0.15 (0.11)**	**0.30 (0.23)**	**0.24 (0.13)**	**0.75 (0.17)**
		0.0 - 7.58	----	**0.0 - 4.55**	**0.0 - 1.52**	**0.0 - 2.27**	**0.0 - 2.27**	**0.0 - 7.58**
Crotalaria sp.	Unk	----	----	----	----	----	0.03 (0.03)	0.01 (0.01)
		----	----	----	----	----	0.0 - 0.76	0.0 - 0.76
Total: *Crotalaria* sp.	**Unk**	----	----	----	----	----	**0.03 (0.03)**	**0.01 (0.01)**
		----	----	----	----	----	**0.0 - 0.76**	**0.0 - 0.76**
Lespedeza sp.	Unk	----	----	0.16 (0.13)	----	----	0.07 (0.07)	0.06 (0.03)
		----	----	0.0 - 3.79	----	----	0.0 - 1.52	0.0 - 1.52
Total: *Lespedeza* sp.	**Unk**	----	----	**0.16 (0.13)**	----	----	**0.07 (0.07)**	**0.06 (0.03)**
		----	----	**0.0 - 3.79**	----	----	**0.0 - 1.52**	**0.0 - 1.52**
Mosses								
Cladonia sp.	N	----	----	----	0.46 (0.30)	----	----	0.35 (0.28)
		----	----	----	0.0 - 4.55	----	----	0.0 - 23.49

Table B.1 (Continued)

Total: *Cladonia* sp.	**N**	**----**	**----**	**----**	**0.46 (0.30)**	**----**	**----**	**0.35 (0.28)**
		----	**----**	**----**	**0.0 - 4.55**	**----**	**----**	**0.0 - 23.49**
Shrubs								
Baccharis halimifolia	N	0.02 (0.02)	----	----	----	----	----	----
		0.0 – 0.76	----	----	----	----	----	----
Total: *Baccharis* sp.	**N**	**0.02 (0.02)**	**----**	**----**	**----**	**----**	**----**	**----**
		0.0 – 0.76	**----**	**----**	**----**	**----**	**----**	**----**
Callicarpa americana	N	0.12 (0.09)	0.30 (0.13)	0.05 (0.05)	----	----	----	0.02 (0.02)
		0.0 – 3.79	0.0 – 2.27	0.0 - 1.52	----	----	----	0.0 - 1.52
Total: *Callicarpa* sp.	**N**	**0.12 (0.09)**	**0.30 (0.13)**	**0.05 (0.05)**	**----**	**----**	**----**	**0.02 (0.02)**
		0.0 – 3.79	**0.0 – 2.27**	**0.0 - 1.52**	**----**	**----**	**----**	**0.0 - 1.52**
Ceanothus americanus	N	----	----	0.13 (0.11)	----	----	----	0.09 (0.06)
		----	----	0.0 - 3.03	----	----	----	0.0 - 4.55
Total: *Ceanothus* sp.	**N**	**----**	**----**	**0.13 (0.11)**	**----**	**----**	**----**	**0.09 (0.06)**
		----	**----**	**0.0 - 3.03**	**----**	**----**	**----**	**0.0 - 4.55**
Crataegus sp.	N	----	----	0.03 (0.03)	----	----	----	----
		----	----	0.0 - 0.76	----	----	----	----
Crataegus marshallii	N	----	----	0.03 (0.03)	----	----	----	----
		----	----	0.0 - 0.76	----	----	----	----
Total: *Crataegus* sp.	**N**	**----**	**----**	**0.05 (0.04)**	**----**	**----**	**----**	**----**
		----	**----**	**0.0 - 0.76**	**----**	**----**	**----**	**----**
Cyrilla racemiflora	N	----	----	0.78 (0.73)	----	----	----	----
		----	----	0.0 - 21.21	----	----	----	----
Total: *Cyrilla* sp.	**N**	**----**	**----**	**0.78 (0.73)**	**----**	**----**	**----**	**----**
		----	**----**	**0.0 - 21.21**	**----**	**----**	**----**	**----**
Gaylussacia dumosa	N	0.15 (0.09)	----	0.16 (0.16)	----	0.99 (0.77)	0.14 (0.08)	3.06 (1.12)
		0.0 – 3.03	----	0.0 - 4.55	----	0.0 - 7.58	0.0 - 1.52	0.0 - 87.88
Gaylussacia frondosa	N	----	----	----	----	----	0.03 (0.03)	----
		----	----	----	----	----	0.0 - 0.76	----
Gaylussacia sp.	N	----	----	----	1.36 (1.21)	----	----	0.96 (0.36)
		----	----	----	0.0 - 18.18	----	----	0.0 - 16.67
Total: *Gaylussacia* sp.	**N**	**0.15 (0.09)**	**----**	**0.16 (0.16)**	**1.36 (1.21)**	**0.99 (0.77)**	**0.17 (0.09)**	**4.02 (1.16)**
		0.0 – 3.03	**----**	**0.0 - 4.55**	**0.0 - 18.18**	**0.0 - 7.58**	**0.0 - 1.52**	**0.0 - 87.88**
Hypericum hypericoides	N	0.27 (0.15)	----	----	0.05 (0.05)	----	----	----
		0.0 – 4.55	----	----	0.0 - 0.76	----	----	----
Hypericum sp.	N	0.35 (0.19)	----	0.13 (0.11)	----	----	----	0.06 (0.03)
		0.0 – 7.58	----	0.0 - 3.03	----	----	----	0.0 - 2.27

Table B.1 (Continued)

Total: *Hypericum* sp.	**N**	**0.62 (0.27)**	----	**0.13 (0.11)**	**0.05 (0.05)**	----	----	**0.06 (0.03)**
		0.0 – 9.85	----	**0.0 - 3.03**	**0.0 - 0.76**	----	----	**0.0 - 2.27**
Ilex coriacea	N	----	----	0.42 (0.35)	----	----	----	0.08 (0.06)
		----	----	0.0 - 9.85	----	----	----	0.0 - 3.79
Ilex glabra	N	8.92 (3.04)	----	6.77 (2.52)	0.35 (0.15)	0.15 (0.15)	0.21 (0.14)	0.34 (0.11)
		0.0 – 79.55	----	0.0 - 53.79	0.0 - 1.52	0.0 - 1.52	0.0 - 3.03	0.0 - 7.58
Ilex vomitoria	N	1.25 (0.46)	0.79 (0.35)	0.68 (0.22)	2.42 (0.90)	----	0.31 (0.17)	0.69 (0.24)
		0.0 – 16.67	0.0 – 7.58	0.0 - 5.30	0.0 - 9.85	----	0.0 - 3.03	0.0 - 16.67
Total: *Ilex* sp.	**N**	**10.17 (3.22)**	**0.79 (0.35)**	**7.86 (2.58)**	**2.78 (0.95)**	**0.15 (0.15)**	**0.52 (0.23)**	**1.12 (0.27)**
		0.0 – 79.55	**0.0 – 7.58**	**0.0 - 53.79**	**0.0 - 11.36**	**0.0 - 1.52**	**0.0 - 3.03**	**0.0 - 16.67**
Licania michauxii	N	----	----	----	----	0.53 (0.53)	----	0.23 (0.14)
		----	----	----	----	0.0 - 5.30	----	0.0 - 11.36
Total: *Licania* sp.	**N**	----	----	----	----	**0.53 (0.53)**	----	**0.23 (0.14)**
		----	----	----	----	**0.0 - 5.30**	----	**0.0 - 11.36**
Lyonia fruticosa	N	----	----	----	----	----	----	0.04 (0.03)
		----	----	----	----	----	----	0.0 - 1.52
Total: *Lyonia* sp.	**N**	----	----	----	----	----	----	**0.04 (0.03)**
		----	----	----	----	----	----	**0.0 - 1.52**
Myrica cerifera	N	0.22 (0.09)	----	0.76 (0.37)	0.15 (0.11)	0.15 (0.15)	----	0.43 (0.12)
		0.0 – 2.27	----	0.0 - 9.85	0.0 - 1.52	0.0 - 1.52	----	0.0 - 5.30
Total: *Myrica* sp.	**N**	**0.22 (0.09)**	----	**0.76 (0.37)**	**0.15 (0.11)**	**0.15 (0.15)**	----	**0.43 (0.12)**
		0.0 – 2.27	----	**0.0 - 9.85**	**0.0 - 1.52**	**0.0 - 1.52**	----	**0.0 - 5.30**
Rhus copallinum	N	----	----	0.13 (0.08)	----	----	0.10 (0.06)	0.41 (0.11)
		----	----	0.0 - 1.52	----	----	0.0 - 0.76	0.0 - 6.82
Rhus glabra	N	----	----	----	----	----	----	0.03 (0.02)
		----	----	----	----	----	----	0.0 - 1.52
Total: *Rhus* sp.	**N**	----	----	**0.13 (0.08)**	----	----	**0.10 (0.06)**	**0.44 (0.11)**
		----	----	**0.0 - 1.52**	----	----	**0.0 - 0.76**	**0.0 - 6.82**
Toxicodendron pubescens	N	----	----	0.42 (0.30)	----	----	----	0.65 (0.22)
		----	----	0.0 - 7.58	----	----	----	0.0 - 12.88
Total: *Toxicodendron* sp.	**N**	----	----	**0.42 (0.30)**	----	----	----	**0.65 (0.22)**
		----	----	**0.0 - 7.58**	----	----	----	**0.0 - 12.88**
Vaccinium arboretum	N	0.32 (0.15)	----	0.63 (0.29)	0.05 (0.05)	----	----	0.14 (0.06)
		0.0 – 4.55	----	0.0 - 5.30	0.0 - 0.76	----	----	0.0 - 4.55
Vaccinium elliottii	N	0.12 (0.05)	----	1.12 (0.29)	0.30 (0.12)	----	0.03 (0.03)	0.31 (0.11)
		0.0 – 1.52	----	0.0 - 6.06	0.0 - 1.52	----	0.0 - 0.76	0.0 - 6.82
Vaccinium myrsinites	N	1.08 (0.47)	----	0.18 (0.16)	1.01 (0.91)	0.15 (0.10)	0.48 (0.28)	4.13 (1.26)
		0.0 – 17.42	----	0.0 - 4.55	0.0 - 13.63	0.0 - 0.76	0.0 - 5.30	0.0 - 79.55
Vaccinium sp.	N	0.30 (0.13)	----	----	0.10 (0.07)	----	0.14 (0.08)	0.04 (0.03)
		0.0 – 4.55	----	----	0.0 - 0.76	----	0.0 - 1.52	0.0 - 2.27

Table B.1 (Continued)

Vaccinium stamineum	N	0.17 (0.14)	----	0.31 (0.17)	0.05 (0.05)	0.30 (0.23)	0.03 (0.03)	0.46 (0.16)
		0.0 – 6.06	----	0.0 - 3.79	0.0 - 0.76	0.0 - 2.27	0.0 - 0.76	0.0 - 9.85
Total: *Vaccinium* sp.	**N**	**1.99 (0.61)**	**----**	**2.25 (0.43)**	**1.52 (0.94)**	**0.46 (0.23)**	**0.69 (0.32)**	**5.08 (1.29)**
		0.0 – 18.18	**----**	**0.0 - 7.58**	**0.0 - 14.39**	**0.0 - 2.27**	**0.0 - 6.06**	**0.0 - 80.30**
Ligustrum sinense	Nn	----	0.61 (0.31)	0.16 (0.16)	----	----	----	----
		----	0.0 – 7.58	0.0 - 4.55	----	----	----	----
Total: *Ligustrum* sp.	**Nn**	**----**	**0.61 (0.31)**	**0.16 (0.16)**	**----**	**----**	**----**	**----**
		----	**0.0 – 7.58**	**0.0 - 4.55**	**----**	**----**	**----**	**----**
Rosa sp.	Unk	----	----	----	----	----	----	0.30 (0.12)
		----	----	----	----	----	----	0.0 - 6.06
Total: *Rosa* sp.	**Unk**	**----**	**----**	**----**	**----**	**----**	**----**	**0.30 (0.12)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 - 6.06**
Trees								
Acer rubrum	N	0.14 (0.07)	----	1.18 (0.37)	0.05 (0.05)	----	----	----
		0.0 – 2.27	----	0.0 - 6.82	0.0 - 0.76	----	----	----
Total: *Acer* sp.	**N**	**0.14 (0.07)**	**----**	**1.18 (0.37)**	**0.05 (0.05)**	**----**	**----**	**----**
		0.0 – 2.27	**----**	**0.0 - 6.82**	**0.0 - 0.76**	**----**	**----**	**----**
Carya sp.	N	0.02 (0.02)	----	----	----	----	----	----
		0.0 – 0.76	----	----	----	----	----	----
Carya tomentosa	N	0.03 (0.03)	----	0.08 (0.06)	----	----	----	0.01 (0.01)
		0.0 – 1.52	----	0.0 - 1.52	----	----	----	0.0 - 0.76
Total: *Carya* sp.	**N**	**0.05 (0.04)**	**----**	**0.08 (0.06)**	**----**	**----**	**----**	**0.01 (0.01)**
		0.0 – 1.52	**----**	**0.0 - 1.52**	**----**	**----**	**----**	**0.0 - 0.76**
Cornus florida	N	----	----	----	----	----	0.10 (0.10)	0.08 (0.04)
		----	----	----	----	----	0.0 - 2.27	0.0 - 3.03
Total: *Cornus* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**0.10 (0.10)**	**0.08 (0.04)**
		----	**----**	**----**	**----**	**----**	**0.0 - 2.27**	**0.0 - 3.03**
Diospyros virginiana	N	0.03 (0.03)	----	0.29 (0.18)	----	----	0.03 (0.03)	0.23 (0.07)
		0.0 – 1.52	----	0.0 - 3.79	----	----	0.0 - 0.76	0.0 - 3.79
Total: *Diospyros* sp.	**N**	**0.03 (0.03)**	**----**	**0.29 (0.18)**	**----**	**----**	**0.03 (0.03)**	**0.23 (0.07)**
		0.0 – 1.52	**----**	**0.0 - 3.79**	**----**	**----**	**0.0 - 0.76**	**0.0 - 3.79**
Hamamelis virginiana	N	----	----	0.03 (0.03)	----	----	----	----
		----	----	0.0 - 0.76	----	----	----	----
Total: *Hamamelis* sp.	**N**	**----**	**----**	**0.03 (0.03)**	**----**	**----**	**----**	**----**
		----	**----**	**0.0 - 0.76**	**----**	**----**	**----**	**----**
Liquidambar styraciflua	N	0.05 (0.04)	----	0.94 (0.34)	----	----	0.34 (0.20)	0.02 (0.02)
		0.0 – 1.52	----	0.0 - 8.33	----	----	0.0 - 3.79	0.0 - 1.52

Table B.1 (Continued)

Total: *Liquidambar* sp.	**N**	**0.05 (0.04)**	----	**0.94 (0.34)**	----	----	**0.34 (0.20)**	**0.02 (0.02)**
		0.0 – 1.52	----	**0.0 - 8.33**	----	----	**0.0 - 3.79**	**0.0 - 1.52**
Magnolia virginiana	N	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 - 0.76
Total: *Magnolia* sp.	**N**	----	----	----	----	----	----	**0.01 (0.01)**
		----	----	----	----	----	----	**0.0 - 0.76**
Nyssa sylvatica	N	----	----	0.26 (0.17)	----	----	----	0.03 (0.03)
		----	----	0.0 - 4.55	----	----	----	0.0 - 3.03
Total: *Nyssa* sp.	**N**	----	----	**0.26 (0.17)**	----	----	----	**0.03 (0.03)**
		----	----	**0.0 - 4.55**	----	----	----	**0.0 - 3.03**
Osmanthus americanus	N	----	----	----	0.56 (0.56)	----	----	----
		----	----	----	0.0 - 8.33	----	----	----
Total: *Osmanthus* sp.	**N**	----	----	----	**0.56 (0.56)**	----	----	----
		----	----	----	**0.0 - 8.33**	----	----	----
Pinus palustris	N	1.01 (0.25)	----	0.24 (0.24)	----	----	0.79 (0.37)	1.33 (0.34)
		0.0 – 6.06	----	0.0 - 6.82	----	----	0.0 - 6.06	0.0 - 15.91
Pinus sp.	N	----	----	----	----	----	----	0.03 (0.02)
		----	----	----	----	----	----	0.0 - 1.52
Pinus taeda	N	0.07 (0.03)	0.30 (0.19)	0.16 (0.07)	----	----	----	0.02 (0.02)
		0.0 – 0.76	0.0 – 3.79	0.0 - 1.52	----	----	----	0.0 - 1.52
Total: *Pinus* sp.	**N**	**1.08 (0.24)**	**0.30 (0.19)**	**0.39 (0.24)**	----	----	**0.79 (0.37)**	**1.37 (0.34)**
		0.0 - 6.06	**0.0 – 3.79**	**0.0 - 6.82**	----	----	**0.0 - 6.06**	**0.0 - 15.91**
Prunus serotina	N	----	----	0.03 (0.03)	----	----	----	0.03 (0.03)
		----	----	0.0 - 0.76	----	----	----	0.0 - 3.03
Total: *Prunus* sp.	**N**	----	----	**0.03 (0.03)**	----	----	----	**0.03 (0.03)**
		----	----	**0.0 - 0.76**	----	----	----	**0.0 - 3.03**
Quercus alba	N	----	----	0.37 (0.22)	----	----	----	----
		----	----	0.0 - 4.55	----	----	----	----
Quercus falcata	N	0.34 (0.21)	0.21 (0.15)	0.10 (0.10)	0.10 (0.07)	----	----	0.15 (0.08)
		0.0 – 6.82	0.0 – 3.79	0.0 - 3.03	0.0 - 0.76	----	----	0.0 - 6.06
Quercus incana	N	----	----	0.29 (0.18)	----	----	----	0.07 (0.04)
		----	----	0.0 - 4.55	----	----	----	0.0 - 3.03
Quercus laevis	N	----	----	----	----	----	----	0.03 (0.02)
		----	----	----	----	----	----	0.0 - 1.52
Quercus margaretta	N	----	----	----	----	----	----	0.66 (0.52)
		----	----	----	----	----	----	0.0 - 43.94
Quercus marilandica	N	----	----	----	----	----	----	0.11 (0.09)
		----	----	----	----	----	----	0.0 - 8.33
Quercus nigra	N	----	0.03 (0.03)	0.29 (0.14)	0.10 (0.07)	----	----	0.05 (0.04)
		----	0.0 – 0.76	0.0 - 3.03	0.0 - 0.76	----	----	0.0 - 3.03

Table B.1 (Continued)

Quercus phellos	N	----	----	----	----	----	----	0.02 (0.02)
		----	----	----	----	----	----	0.0 - 1.52
Quercus sp.	N	0.07 (0.04)	----	1.05 (0.38)	----	----	0.03 (0.03)	0.37 (0.19)
		0.0 – 1.52	----	0.0 - 9.85	----	----	0.0 - 0.76	0.0 - 14.39
Quercus stellate	N	1.11 (1.11)	----	----	----	----	----	0.04 (0.04)
		0.0 – 50.00	----	----	----	----	----	0.0 - 3.79
Total: *Quercus* sp.	**N**	**1.52 (1.12)**	**0.24 (0.15)**	**2.09 (0.53)**	**0.20 (0.12)**	**----**	**0.03 (0.03)**	**1.51 (0.61)**
		0.0 – 50.00	**0.0 - 3.03**	**0.0 - 11.36**	**0.0 - 1.52**	**----**	**0.0 - 0.76**	**0.0 - 45.46**
Sassafras albidum	N	----	----	0.08 (0.08)	0.05 (0.05)	----	----	0.04 (0.02)
		----	----	0.0 - 2.27	0.0 - 0.76	----	----	0.0 - 1.52
Total: *Sassafras* sp.	**N**	**----**	**----**	**0.08 (0.08)**	**0.05 (0.05)**	**----**	**----**	**0.04 (0.02)**
		----	**----**	**0.0 - 2.27**	**0.0 - 0.76**	**----**	**----**	**0.0 - 1.52**
Symplocos tinctoria	N	----	----	0.65 (0.34)	----	----	0.07 (0.07)	0.05 (0.04)
		----	----	0.0 - 6.82	----	----	0.0 - 1.52	0.0 - 3.79
Total: *Symplocos* sp.	**N**	**----**	**----**	**0.65 (0.34)**	**----**	**----**	**0.07 (0.07)**	**0.05 (0.04)**
		----	**----**	**0.0 - 6.82**	**----**	**----**	**0.0 - 1.52**	**0.0 - 3.79**
Viburnum dentatum	N	----	----	0.03 (0.03)	----	----	----	----
		----	----	0.0 - 0.76	----	----	----	----
Total: *Viburnum* sp.	**N**	**----**	**----**	**0.03 (0.03)**	**----**	**----**	**----**	**----**
		----	**----**	**0.0 - 0.76**	**----**	**----**	**----**	**----**
Vines								
Bignonia capreolata	N	0.03 (0.03)	----	0.60 (0.35)	----	----	----	----
		0.0 – 1.52	----	0.0 - 7.58	----	----	----	----
Total: *Bignonia* sp.	**N**	**0.03 (0.03)**	**----**	**0.60 (0.35)**	**----**	**----**	**----**	**----**
		0.0 – 1.52	**----**	**0.0 - 7.58**	**----**	**----**	**----**	**----**
Campsis radicans	N	----	0.06 (0.06)	----	----	----	----	----
		----	0.0 – 1.52	----	----	----	----	----
Total: *Campsis* sp.	**N**	**----**	**0.06 (0.06)**	**----**	**----**	**----**	**----**	**----**
		----	**0.0 – 1.52**	**----**	**----**	**----**	**----**	**----**
Cocculus carolinus	N	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 - 0.76
Total: *Cocculus* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.01 (0.01)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 - 0.76**
Gelseminium sempervirens	N	0.96 (0.55)	0.46 (0.25)	10.92 (4.89)	3.28 (1.43)	0.38 (0.38)	0.21 (0.21)	4.64 (1.23)
		0.0 – 22.73	0.0 – 5.30	0.0 - 100.00	0.0 - 18.94	0.0 - 3.79	0.0 - 4.55	0.0 - 69.69
Total: *Gelsemium* sp.	**N**	**0.96 (0.55)**	**0.46 (0.25)**	**10.92 (4.89)**	**3.28 (1.43)**	**0.38 (0.38)**	**0.21 (0.21)**	**4.64 (1.23)**
		0.0 – 22.73	**0.0 – 5.30**	**0.0 - 100.00**	**0.0 - 18.94**	**0.0 - 3.79**	**0.0 - 4.55**	**0.0 - 69.69**
Mitchella repens	N	0.03 (0.03)	----	0.10 (0.08)	----	----	0.10 (0.10)	0.10 (0.07)
		0.0 – 1.52	----	0.0 - 2.27	----	----	0.0 - 2.27	0.0 - 4.55

Table B.1 (Continued)

Total: *Mitchella* sp.	**N**	**0.03 (0.03)**	**----**	**0.10 (0.08)**	**----**	**----**	**0.10 (0.10)**	**0.10 (0.07)**
		0.0 – 1.52	**----**	**0.0 - 2.27**	**----**	**----**	**0.0 - 2.27**	**0.0 - 4.55**
Parthenocissus quinquefolia	N	0.25 (0.10)	1.97 (0.72)	1.65 (0.81)	----	----	0.55 (0.38)	0.24 (0.12)
		0.0 – 3.03	0.0 – 11.36	0.0 - 19.69	----	----	0.0 - 6.06	0.0 - 7.58
Total: *Parthenocissus* sp.	**N**	**0.25 (0.10)**	**1.97 (0.72)**	**1.65 (0.81)**	**----**	**----**	**0.55 (0.38)**	**0.24 (0.12)**
		0.0 – 3.03	**0.0 – 11.36**	**0.0 - 19.69**	**----**	**----**	**0.0 - 6.06**	**0.0 - 7.58**
Passiflora incarnata	N	0.02 (0.02)	----	----	----	----	----	----
		0.0 – 0.76	----	----	----	----	----	----
Total: *Passiflora* sp.	**N**	**0.02 (0.02)**	**----**	**----**	**----**	**----**	**----**	**----**
		0.0 – 0.76	**----**	**----**	**----**	**----**	**----**	**----**
Rubus sp.	N	6.57 (1.88)	23.36 (5.96)	5.98 (1.59)	0.35 (0.22)	10.38 (4.15)	1.41 (0.47)	2.01 (0.43)
		0.0 – 78.03	0.0 – 100.00	0.0 - 25.76	0.0 - 3.03	0.76 - 45.46	0.0 - 8.33	0.0 - 24.24
Rubus trivialis	N	0.10 (0.10)	0.52 (0.52)	----	----	----	----	----
		0.0 – 4.55	0.0 – 12.88	----	----	----	----	----
Total: *Rubus* sp.	**N**	**6.67 (1.89)**	**23.88 (6.07)**	**5.98 (1.59)**	**0.35 (0.22)**	**10.38 (4.15)**	**1.41 (0.47)**	**2.01 (0.43)**
		0.0 – 78.03	**0.0 – 100.00**	**0.0 - 25.76**	**0.0 - 3.03**	**0.76 - 45.46**	**0.0 - 8.33**	**0.0 - 24.24**
Smilax bona-nox	N	----	0.06 (0.04)	----	0.05 (0.05)	----	----	0.06 (0.03)
		----	0.0 – 0.76	----	0.0 - 0.76	----	----	0.0 - 2.27
Smilax glabra	N	----	----	----	----	----	----	0.02 (0.01)
		----	----	----	----	----	----	0.0 - 0.76
Smilax glauca	N	0.19 (0.08)	0.09 (0.07)	0.10 (0.05)	0.40 (0.26)	----	----	0.29 (0.08)
		0.0 – 2.27	0.0 – 1.52	0.0 - 0.76	0.0 - 3.79	----	----	0.0 - 3.79
Smilax laurifolia	N	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 - 0.76
Smilax pumila	N	0.02 (0.02)	----	1.31 (1.23)	2.68 (1.34)	----	0.14 (0.11)	4.07 (1.19)
		0.0 – 0.76	----	0.0 - 35.61	0.0 - 18.18	----	0.0 - 2.27	0.0 - 66.67
Smilax rotundifolia	N	0.03 (0.03)	----	----	----	----	----	----
		0.0 – 1.52	----	----	----	----	----	----
Smilax sp.	N	0.07 (0.04)	----	0.78 (0.27)	0.05 (0.05)	0.61 (0.32)	1.34 (0.37)	0.09 (0.03)
		0.0 – 1.52	----	0.0 - 6.06	0.0 - 0.76	0.0 - 3.03	0.0 - 6.06	0.0 - 1.52
Total: *Smilax* sp.	**N**	**0.30 (0.09)**	**0.15 (0.08)**	**2.19 (1.22)**	**3.18 (1.33)**	**0.61 (0.32)**	**1.48 (0.38)**	**4.55 (1.19)**
		0.0 – 2.27	**0.0 - 1.52**	**0.0 - 35.61**	**0.0 - 18.18**	**0.0 - 3.03**	**0.0 - 6.06**	**0.0 - 66.67**
Toxicodendron radicans	N	0.24 (0.19)	1.18 (0.46)	2.59 (1.55)	0.05 (0.05)	0.08 (0.08)	1.14 (0.68)	0.11 (0.06)
		0.0 – 8.33	0.0 – 8.33	0.0 - 34.09	0.0 - 0.76	0.0 - 0.76	0.0 - 13.64	0.0 - 3.79
Total: *Toxicodendron* sp.	**N**	**0.24 (0.19)**	**1.18 (0.46)**	**2.59 (1.55)**	**0.05 (0.05)**	**0.08 (0.08)**	**1.14 (0.68)**	**0.11 (0.06)**
		0.0 – 8.33	**0.0 – 8.33**	**0.0 - 34.09**	**0.0 - 0.76**	**0.0 - 0.76**	**0.0 - 13.64**	**0.0 - 3.79**
Vitis rotundifolia	N	2.54 (0.99)	13.00 (4.81)	2.38 (1.32)	0.46 (0.35)	----	1.41 (0.87)	6.09 (1.74)
		0.0 – 28.79	0.0 – 99.24	0.0 - 37.12	0.0 - 5.30	----	0.0 - 18.18	0.0 - 90.15

Table B.1 (Continued)

Total: *Vitis* sp.	**N**	**2.54 (0.99)**	**13.00 (4.81)**	**2.38 (1.32)**	**0.46 (0.35)**	----	**1.41 (0.87)**	**6.09 (1.74)**
		0.0 – 28.79	**0.0 – 99.24**	**0.0 - 37.12**	**0.0 - 5.30**	----	**0.0 - 18.18**	**0.0 - 90.15**
Lonicera japonica	Nn	----	4.00 (3.66)	3.95 (3.13)	----	----	----	----
		----	0.0 – 91.67	0.0 - 90.15	----	----	----	----
Total: *Lonicera* sp.	**Nn**	----	**4.00 (3.66)**	**3.95 (3.13)**	----	----	----	----
		----	**0.0 – 91.67**	**0.0 - 90.15**	----	----	----	----
Lygodium japonicum	Nn	0.07 (0.04)	2.30 (0.78)	0.60 (0.60)	----	----	----	0.01 (0.01)
		0.0 – 1.52	0.0 – 15.91	0.0 - 17.42	----	----	----	0.0 - 0.76
Total: *Lygodium* sp.	**Nn**	**0.07 (0.04)**	**2.30 (0.78)**	**0.60 (0.60)**	----	----	----	**0.01 (0.01)**
		0.0 – 1.52	**0.0 – 15.91**	**0.0 - 17.42**	----	----	----	**0.0 - 0.76**
Lonicera sp.	Unk	----	----	----	----	0.08 (0.08)	----	----
		----	----	----	----	0.0 - 0.76	----	----
Total: *Lonicera* sp.	**Unk**	----	----	----	----	**0.08 (0.08)**	----	----
		----	----	----	----	**0.0 - 0.76**	----	----
Midstory (≥ 0.3 m - ≤1 m in height)								
Forbs								
Acalypha gracilens	N	----	----	----	----	----	----	0.03 (0.02)
		----	----	----	----	----	----	0.0 - 1.52
Total: *Acalypha* sp.	**N**	----	----	----	----	----	----	**0.03 (0.02)**
		----	----	----	----	----	----	**0.0 - 1.52**
Ambrosia artemisiifolia	N	0.99 (0.63)	----	----	----	----	----	----
		0.0 – 24.24	----	----	----	----	----	----
Ambrosia sp.	N	0.03 (0.03)	----	----	----	----	----	----
		0.0 – 1.52	----	----	----	----	----	----
Total: *Ambrosia* sp.	**N**	**1.03 (0.63)**	----	----	----	----	----	----
		0.0 – 24.24	----	----	----	----	----	----
Asplenium platyneuron	N	----	1.97 (1.24)	----	----	----	----	----
		----	0.0 – 30.30	----	----	----	----	----
Total: *Asplenium* sp.	**N**	----	**1.97 (1.24)**	----	----	----	----	----
		----	**0.0 – 30.30**	----	----	----	----	----
Aster dumosus	N	----	----	----	----	0.99 (0.99)	----	0.13 (0.06)
		----	----	----	----	0.0 - 9.85	----	0.0 - 3.79
Aster linariifolius	N	----	----	----	----	----	----	0.02 (0.02)
		----	----	----	----	----	----	0.0 - 1.52
Aster patens	N	----	----	----	----	----	----	0.03 (0.03)
		----	----	----	----	----	----	0.0 - 2.27
Aster sp.	N	2.24 (0.57)	----	----	----	4.39 (1.61)	3.27 (0.94)	0.82 (0.33)
		0.0 – 13.64	----	----	----	0.0 - 12.88	0.0 - 15.91	0.0 - 20.46

Table B.1 (Continued)

Total: *Aster* sp.	**N**	**2.24 (0.57)**	----	----	----	**5.38 (1.62)**	**3.27 (0.94)**	**0.99 (0.34)**
		0.0 – 13.64	----	----	----	**0.0 - 12.88**	**0.0 - 15.91**	**0.0 - 20.46**
Collinsonia canadensis	N	----	----	----	----	----	----	0.21 (0.21)
		----	----	----	----	----	----	0.0 - 18.18
Total: *Collinsonia* sp.	**N**	----	----	----	----	----	----	**0.21 (0.21)**
		----	----	----	----	----	----	**0.0 - 18.18**
Coreopsis major	N	0.08 (0.07)	----	----	----	----	----	0.05 (0.04)
		0.0 – 3.03	----	----	----	----	----	0.0 - 3.79
Coreopsis sp.	N	0.07 (0.05)	----	----	----	----	0.03 (0.03)	----
		0.0 – 1.52	----	----	----	----	0.0 - 0.76	----
Total: *Coreopsis* sp.	**N**	**0.15 (0.08)**	----	----	----	----	**0.03 (0.03)**	**0.05 (0.04)**
		0.0 – 3.03	----	----	----	----	**0.0 - 0.76**	**0.0 - 3.79**
Croton capitatus	N	3.45 (1.38)	----	----	----	----	----	----
		0.0 – 47.73	----	----	----	----	----	----
Croton sp.	N	0.07 (0.05)	----	----	----	----	----	----
		0.0 – 2.27	----	----	----	----	----	----
Total: *Croton* sp.	**N**	**3.52 (1.38)**	----	----	----	----	----	----
		0.0 – 47.73	----	----	----	----	----	----
Diodia sp.	N	0.30 (0.19)	----	----	----	0.15 (0.15)	----	----
		0.0 – 8.33	----	----	----	0.0 - 1.52	----	----
Total: *Diodia* sp.	**N**	**0.30 (0.19)**	----	----	----	**0.15 (0.15)**	----	----
		0.0 – 8.33	----	----	----	**0.0 - 1.52**	----	----
Elephantopus tomentosus	N	----	----	----	----	----	0.10 (0.08)	0.03 (0.02)
		----	----	----	----	----	0..0 - 1.52	0.0 - 0.76
Total: *Elephantopus* sp.	**N**	----	----	----	----	----	**0.10 (0.08)**	**0.03 (0.02)**
		----	----	----	----	----	**0..0 - 1.52**	**0.0 - 0.76**
Erechtites hieracifolia	N	2.46 (1.96)	0.52 (0.32)	----	----	----	----	0.06 (0.06)
		0.0 – 87.88	0.0 – 7.58	----	----	----	----	0.0 - 5.30
Total: *Erechtites* sp.	**N**	**2.46 (1.96)**	**0.52 (0.32)**	----	----	----	----	**0.06 (0.06)**
		0.0 – 87.88	**0.0 – 7.58**	----	----	----	----	**0.0 - 5.30**
Eryngium yuccifolium	N	----	----	----	----	----	----	0.03 (0.03)
		----	----	----	----	----	----	0.0 - 3.03
Total: *Eryngium* sp.	**N**	----	----	----	----	----	----	**0.03 (0.03)**
		----	----	----	----	----	----	**0.0 - 3.03**
Eupatorium capillifolium	N	0.94 (0.35)	1.00 (0.36)	----	----	0.30 (0.30)	----	0.12 (0.06)
		0.0 – 10.61	0.0 – 6.06	----	----	0.0 - 3.03	----	0.0 - 3.03
Eupatorium hyssopifolium	N	0.07 (0.03)	----	----	----	----	----	0.38 (0.36)
		0.0 – 0.76	----	----	----	----	----	0.0 - 31.82
Eupatorium rotundifolia	N	2.54 (0.51)	----	----	0.15 (0.11)	4.32 (1.80)	1.96 (0.56)	0.65 (0.17)
		0.0 – 12.88	----	----	0.0 - 1.52	0.0 - 16.67	0.0 - 9.09	0.0 - 8.33

Table B.1 (Continued)

Eupatorium serotinum	N	0.07 (0.07)	----	----	----	----	----	----
		0.0 – 3.03	----	----	----	----	----	----
Eupatorium sp.	N	1.95 (0.86)	0.18 (0.18)	0.03 (0.03)	0.10 (0.07)	1.36 (0.76)	0.38 (0.28)	0.27 (0.11)
		0.0 – 35.61	0.0 – 4.55	0.0 - 0.76	0.0 - 0.76	0.0 - 7.58	0.0 - 6.06	0.0 - 6.82
Total: *Eupatorium* sp.	**N**	**5.57 (1.00)**	**1.18 (0.48)**	**0.03 (0.03)**	**0.25 (0.18)**	**5.99 (1.89)**	**2.34 (0.56)**	**1.42 (0.48)**
		0.0 – 35.61	**0.0 – 9.85**	**0.0 - 0.76**	**0.0 - 2.27**	**0.0 - 16.67**	**0.0 -9.09**	**0.0 - 37.89**
Euphorbia pubentissima	N	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 - 0.76
Euphorbia sp.	N	0.40 (0.15)	----	----	----	0.46 (0.32)	1.24 (0.47)	0.16 (0.06)
		0.0 – 4.55	----	----	----	0.0 - 3.03	0.0 - 9.09	0.0 - 3.03
Total: *Euphorbia* sp.	**N**	**0.40 (0.15)**	**----**	**----**	**----**	**0.46 (0.32)**	**1.24 (0.47)**	**0.17 (0.06)**
		0.0 – 4.55	**----**	**----**	**----**	**0.0 - 3.03**	**0.0 - 9.09**	**0.0 - 3.03**
Euthamia sp.	N	----	----	----	----	0.08 (0.08)	----	----
		----	----	----	----	0.0 - 0.76	----	----
Euthamia tenuifolia	N	2.37 (0.86)	0.12 (0.09)	----	0.10 (0.10)	5.23 (3.70)	0.31 (0.21)	0.11 (0.06)
		0.0 – 27.27	0.0 – 2.27	----	0.0 - 1.52	0.0 - 37.88	0.0 - 4.55	0.0 - 3.79
Total: *Euthamia* sp.	**N**	**2.37 (0.86)**	**0.12 (0.09)**	**----**	**0.10 (0.10)**	**5.30 (3.69)**	**0.31 (0.21)**	**0.11 (0.06)**
		0.0 – 27.27	**0.0 – 2.27**	**----**	**0.0 - 1.52**	**0.0 - 37.88**	**0.0 - 4.55**	**0.0 - 3.79**
Helianthus sp.	N	1.72 (0.87)	----	----	----	----	0.14 (0.11)	0.03 (0.02)
		0.0 – 27.27	----	----	----	----	0.0 - 2.27	0.0 - 1.52
Total: *Helianthus* sp.	**N**	**1.72 (0.87)**	**----**	**----**	**----**	**----**	**0.14 (0.11)**	**0.03 (0.02)**
		0.0 – 27.27	**----**	**----**	**----**	**----**	**0.0 - 2.27**	**0.0 - 1.52**
Hibiscus aculeatus	N	----	----	----	----	----	----	0.56 (0.42)
		----	----	----	----	----	----	0.0 - 36.36
Hibiscus sp.	N	1.52 (0.79)	----	0.13 (0.13)	----	----	2.48 (1.28)	----
		0.0 – 28.03	----	0.0 - 3.79	----	----	0.0 - 22.73	----
Total: *Hibiscus* sp.	**N**	**1.52 (0.79)**	**----**	**0.13 (0.13)**	**----**	**----**	**2.48 (1.28)**	**0.56 (0.42)**
		0.0 – 28.03	**----**	**0.0 - 3.79**	**----**	**----**	**0.0 - 22.73**	**0.0 - 36.36**
Hypericum gentianoides	N	0.10 (0.10)	----	----	----	----	----	0.43 (0.37)
		0.0 – 4.55	----	----	----	----	----	0.0 - 31.82
Total: *Hypericum* sp.	**N**	**0.10 (0.10)**	**----**	**----**	**----**	**----**	**----**	**0.43 (0.37)**
		0.0 – 4.55	**----**	**----**	**----**	**----**	**----**	**0.0 - 31.82**
Osmunda regalis	N	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 - 0.76
Total: *Osmunda* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.01 (0.01)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 - 0.76**
Phytolacca americana	N	----	0.27 (0.19)	----	----	----	----	----
		----	0.0 – 4.55	----	----	----	----	----

Table B.1 (Continued)

Total: *Phytolacca* sp.	**N**	----	**0.27 (0.19)**	----	----	----	----	----
		----	**0.0 – 4.55**	----	----	----	----	----
Pityopsis graminifolia	N	0.19 (0.19)	----	----	----	----	----	----
		0.0 – 8.33	----	----	----	----	----	----
Total: *Pityopsis* sp.	**N**	**0.19 (0.19)**	----	----	----	----	----	----
		0.0 – 8.33	----	----	----	----	----	----
Polygonum sp.	N	----	1.42 (0.65)	----	----	----	----	----
		----	0.0 – 9.85	----	----	----	----	----
Total: *Polygonum* sp.	**N**	----	**1.42 (0.65)**	----	----	----	----	----
		----	**0.0 – 9.85**	----	----	----	----	----
Polypremum procumbens	N	0.25 (0.14)	----	----	----	----	----	----
		0.0 – 5.30	----	----	----	----	----	----
Total: *Polypremum* sp.	**N**	**0.25 (0.14)**	----	----	----	----	----	----
		0.0 – 5.30	----	----	----	----	----	----
Pteridium aquilinum	N	2.49 (1.44)	----	----	0.35 (0.35)	0.23 (0.23)	4.65 (3.54)	2.79 (1.13)
		0.0 – 56.82	----	----	0.0 - 5.30	0.0 - 2.27	0.0 - 76.52	0.0 - 78.03
Total: *Pteridium* sp.	**N**	**2.49 (1.44)**	----	----	**0.35 (0.35)**	**0.23 (0.23)**	**4.65 (3.54)**	**2.79 (1.13)**
		0.0 – 56.82	----	----	**0.0 - 5.30**	**0.0 - 2.27**	**0.0 - 76.52**	**0.0 - 78.03**
Pycnanthemum incanum	N	0.07 (0.07)	----	----	----	----	0.28 (0.17)	----
		0.0 – 3.03	----	----	----	----	0.0 - 3.03	----
Total: *Pycnanthemum* sp.	**N**	**0.07 (0.07)**	----	----	----	----	**0.28 (0.17)**	----
		0.0 – 3.03	----	----	----	----	**0.0 - 3.03**	----
Rhexia alifanus	N	----	----	----	----	----	----	0.19 (0.09)
		----	----	----	----	----	----	0.0 - 5.30
Rhexia sp.	N	0.02 (.02)	----	----	----	----	0.48 (0.27)	0.37 (0.13)
		0.0 – 0.76	----	----	----	----	0.0 - 5.30	0.0 - 0\7.58
Total: *Rhexia* sp.	**N**	**0.02 (.02)**	----	----	----	----	**0.48 (0.27)**	**0.57 (0.15)**
		0.0 – 0.76	----	----	----	----	**0.0 - 5.30**	**0.0 - 7.58**
Scutellaria intefrifolia	N	0.05 (0.05)	----	----	----	----	----	----
		0.0 – 2.27	----	----	----	----	----	----
Total: *Scutellaria* sp.	**N**	**0.05 (0.05)**	----	----	----	----	----	----
		0.0 – 2.27	----	----	----	----	----	----
Solidago odora	N	4.48 (1.23)	----	----	1.06 (0.75)	7.05 (2.29)	2.58 (0.63)	1.09 (0.23)
		0.0 – 43.94	----	----	0.0 - 11.36	0.0 - 22.73	0.0 - 11.36	0.0 - 11.36
Solidago sp.	N	0.14 (0.07)	0.09 (0.09)	----	0.05 (0.05)	----	0.17 (0.12)	0.06 (0.04)
		0.0 – 2.27	0.0 – 2.27	----	0.0 - 0.76	----	0.0 - 2.27	0.0 - 2.27
Total: *Solidago* sp.	**N**	**4.61 (1.22)**	**0.09 (0.09)**	----	**1.11 (0.75)**	**7.05 (2.29)**	**2.76 (0.64)**	**1.15 (0.24)**
		0.0 – 43.94	**0.0 – 2.27**	----	**0.0 - 11.36**	**0.0 - 22.73**	**0.0 - 11.36**	**0.0 - 11.36**
Vernonia sp.	N	----	0.03 (0.03)	----	----	----	----	0.06 (0.04)
		----	0.0 – 0.76	----	----	----	----	0.0 - 3.03

Table B.1 (Continued)

Total: *Vernonia* sp.	**N**	----	**0.03 (0.03)**	----	----	----	----	**0.06 (0.04)**
		----	**0.0 – 0.76**	----	----	----	----	**0.0 - 3.03**
Conyza canadensis	Nn	0.59 (0.33)	----	----	----	----	----	----
		0.0 – 14.39	----	----	----	----	----	----
Total: *Conyza* sp.	**Nn**	**0.59 (0.33)**	----	----	----	----	----	----
		0.0 – 14.39	----	----	----	----	----	----
Verbena sp.	Nn	0.02 (0.02)	----	----	----	----	----	----
		0.0 – 0.76	----	----	----	----	----	----
Total: *Verbena* sp.	**Nn**	**0.02 (0.02)**	----	----	----	----	----	----
		0.0 – 0.76	----	----	----	----	----	----
Solanum sp.	Unk	0.02 (0.02)	0.06 (0.06)	----	----	----	----	----
		0.0 – 0.76	0.0 – 1.52	----	----	----	----	----
Total: *Solanum* sp.	**Unk**	**0.02 (0.02)**	**0.06 (0.06)**	----	----	----	----	----
		0.0 – 0.76	**0.0 – 1.52**	----	----	----	----	----
Grasses								
Andropogon sp.	N	----	----	----	----	----	----	0.19 (0.11)
		----	----	----	----	----	----	0.0 - 6.82
Total: *Andropogon* sp.	**N**	----	----	----	----	----	----	**0.19 (0.11)**
		----	----	----	----	----	----	**0.0 - 6.82**
Arundinaria gigantea	N	----	----	----	0.10 (0.10)	----	----	----
		----	----	----	0.0 - 1.52	----	----	----
Total: *Arundinaria* sp.	**N**	----	----	----	**0.10 (0.10)**	----	----	----
		----	----	----	**0.0 - 1.52**	----	----	----
Dichanthelium scoparium	N	2.36 (1.30)	----	----	----	----	----	0.12 (0.12)
		0.0 – 47.73	----	----	----	----	----	0.0 - 10.61
Total: *Dichanthelium* sp.	**N**	**2.36 (1.30)**	----	----	----	----	----	**0.12 (0.12)**
		0.0 – 47.73	----	----	----	----	----	**0.0 - 10.61**
Saccharum giganteum	N	0.07 (0.07)	----	----	----	----	----	0.11 (0.11)
		0.0 – 3.03	----	----	----	----	----	9.85
Total: *Saccharum* sp.	**N**	**0.07 (0.07)**	----	----	----	----	----	**0.11 (0.11)**
		0.0 – 3.03	----	----	----	----	----	**9.85**
Tridens sp.	N	0.17 (0.14)	----	----	----	----	----	----
		0.0 – 6.06	----	----	----	----	----	----
Total: *Tridens* sp.	**N**	**0.17 (0.14)**	----	----	----	----	----	----
		0.0 – 6.06	----	----	----	----	----	----
Digitaria ciliaris	Nn	----	----	----	----	0.30 (0.30)	----	----
		----	----	----	----	0.0 - 3.03	----	----

Table B.1 (Continued)

Total: *Digitaria* sp.	**Nn**	----	----	----	----	**0.30 (0.30)**	----	----
		----	----	----	----	**0.0 - 3.03**	----	----
Grass-likes								
Carex sp.	N	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 - 0.76
Total: *Carex* sp.	**N**	----	----	----	----	----	----	**0.01 (0.01)**
		----	----	----	----	----	----	**0.0 - 0.76**
Xyris sp.	N	----	----	----	0.05 (0.05)	----	----	----
		----	----	----	0.0 - 0.76	----	----	----
Total: *Xyris* sp.	**N**	----	----	----	**0.05 (0.05)**	----	----	----
		----	----	----	**0.0 - 0.76**	----	----	----
Legumes								
Centrosema sp.	N	----	----	----	----	----	0.10 (0.10)	----
		----	----	----	----	----	0.0 - 2.27	----
Total: *Centrosema* sp.	**N**	----	----	----	----	----	**0.10 (0.10)**	----
		----	----	----	----	----	**0.0 - 2.27**	----
Chamaecrista fasciculata	N	0.08 (0.06)	----	----	----	----	0.03 (0.03)	----
		0.0 – 2.27	----	----	----	----	0.0 - 0.76	----
Total: *Chamaecrista* sp.	**N**	**0.08 (0.06)**	----	----	----	----	**0.03 (0.03)**	----
		0.0 – 2.27	----	----	----	----	**0.0 - 0.76**	----
Clitoria mariana	N	----	----	0.03 (0.03)	----	----	----	----
		----	----	0.0 - 0.76	----	----	----	----
Total: *Clitoria* sp.	**N**	----	----	**0.03 (0.03)**	----	----	----	----
		----	----	**0.0 - 0.76**	----	----	----	----
Crotalaria purshii	N	0.03 (0.03)	----	----	----	----	----	----
		0.0 – 1.52	----	----	----	----	----	----
Total: *Crotalaria* sp.	**N**	**0.03 (0.03)**	----	----	----	----	----	----
		0.0 – 1.52	----	----	----	----	----	----
Desmodium ciliare	N	0.14 (0.14)	----	----	----	----	----	0.04 (0.04)
		0.0 – 6.06	----	----	----	----	----	0.0 - 3.03
Desmodium sp.	N	0.17 (0.12)	----	0.08 (0.08)	----	----	0.07 (0.05)	0.08 (0.04)
		0.0 – 5.30	----	0.0 - 2.27	----	----	0.0 - 0.76	0.0 - 3.03
Total: *Desmodium* sp.	**N**	**0.30 (0.25)**	----	**0.08 (0.08)**	----	----	**0.07 (0.05)**	**0.12 (0.06)**
		0.0 – 11.36	----	**0.0 - 2.27**	----	----	**0.0 - 0.76**	**0.0 - 3.79**
Galactia regularis	N	0.02 (0.02)	----	----	----	----	----	----
		0.0 – 0.76	----	----	----	----	----	----
Galactia sp.	N	0.10 (0.06)	----	----	----	----	----	----
		0.0 – 2.27	----	----	----	----	----	----

Table B.1 (Continued)

Total: *Galactia* sp.	**N**	**0.12 (0.06)**	----	----	----	----	----	----
		0.0 – 2.27	----	----	----	----	----	----
Lespedeza angustifolia	N	0.05 (0.04)	----	----	----	----	----	----
		0.0 – 1.52	----	----	----	----	----	----
Lespedeza procumbens	N	0.02 (0.02)	----	----	----	----	----	----
		0.0 – 0.76	----	----	----	----	----	----
Lespedeza repens	N	0.08 (0.07)	----	----	----	----	----	----
		0.0 – 3.03	----	----	----	----	----	----
Lespedeza virginica	N	0.07 (0.05)	----	----	----	----	----	0.01 (0.01)
		0.0 – 2.27	----	----	----	----	----	0.0 - 0.76
Total: *Lespedeza* sp.	**N**	**0.22 (0.09)**	----	----	----	----	----	**0.01 (0.01)**
		0.0 – 3.03	----	----	----	----	----	**0.0 - 0.76**
Mimosa microphylla	N	0.07 (0.05)	----	----	----	----	----	0.08 (0.07)
		0.0 – 1.52	----	----	----	----	----	0.0 - 6.06
Total: *Mimosa* sp.	**N**	**0.07 (0.05)**	----	----	----	----	----	**0.08 (0.07)**
		0.0 – 1.52	----	----	----	----	----	**0.0 - 6.06**
Rhynchosia sp.	N	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 - 0.76
Total: *Rhynchosia* sp.	**N**	----	----	----	----	----	----	**0.01 (0.01)**
		----	----	----	----	----	----	**0.0 - 0.76**
Strophostyles umbellata	N	0.02 (0.02)	----	----	----	----	----	----
		0.0 – 0.76	----	----	----	----	----	----
Total: *Strophostyles* sp.	**N**	**0.02 (0.02)**	----	----	----	----	----	----
		0.0 – 0.76	----	----	----	----	----	----
Stylosanthes biflora	N	0.37 (0.12)	----	----	----	----	0.45 (0.35)	0.34 (0.17)
		0.0 – 3.03	----	----	----	----	0.0 - 7.58	0.0 - 11.36
Total: *Stylosanthes* sp.	**N**	**0.37 (0.12)**	----	----	----	----	**0.45 (0.35)**	**0.34 (0.17)**
		0.0 – 3.03	----	----	----	----	**0.0 - 7.58**	**0.0 - 11.36**
Tephrosia sp.	N	----	----	----	----	----	----	0.13 (0.07)
		----	----	----	----	----	----	0.0 - 4.55
Tephrosia spicata	N	0.17 (0.08)	----	----	----	0.15 (0.10)	0.24 (0.10)	0.16 (0.09)
		0.0 – 3.03	----	----	----	0.0 - 0.76	0.0 - 1.52	0.0 - 6.06
Tephrosia virginiana	N	0.14 (0.08)	----	0.18 (0.18)	0.05 (0.05)	----	0.48 (0.29)	1.09 (0.37)
		0.0 – 3.03	----	0.0 - 5.30	0.0 - 0.76	----	0.0 - 5.30	0.0 - 25.00
Total: *Tephrosia* sp.	**N**	**0.30 (0.11)**	----	**0.18 (0.18)**	**0.05 (0.05)**	**0.15 (0.10)**	**0.72 (0.29)**	**1.37 (0.39)**
		0.0 - 3.03	----	**0.0 - 5.30**	**0.0 - 0.76**	**0.0 - 0.76**	**0.0 - 5.30**	**0.0 -25.00**
Lespedeza sp.	Unk	0.07 (0.05)	----	----	----	----	0.03 (0.03)	0.01 (0.01)
		0.0 – 2.27	----	----	----	----	0.0 - 0.76	0.0 - 0.76

Table B.1 (Continued)

Total: *Lespedeza* sp.	**Unk**	**0.07 (0.05)** **0.0 – 2.27**	---- ----	---- ----	---- ----	---- ----	**0.03 (0.03)** **0.0 - 0.76**	**0.01 (0.01)** **0.0 - 0.76**
Shrubs								
Aesculus pavia	N	0.29 (0.17) 0.0 – 5.30	---- ----	---- ----	---- ----	---- ----	---- ----	---- ----
Total: *Aesculus* sp.	**N**	**0.29 (0.17)** **0.0 – 5.30**	---- ----	---- ----	---- ----	---- ----	---- ----	---- ----
Aralia spinosa	N	---- ----	---- ----	---- ----	---- ----	---- ----	---- ----	0.16 (0.16) 0.0 - 13.64
Total: *Aralia* sp.	**N**	---- ----	---- ----	---- ----	---- ----	---- ----	---- ----	**0.16 (0.16)** **0.0 - 13.64**
Aronia sp.	N	---- ----	---- ----	---- ----	---- ----	---- ----	---- ----	0.09 (0.09) 0.0 - 8.33
Total: *Aronia* sp.	**N**	---- ----	---- ----	---- ----	---- ----	---- ----	---- ----	**0.09 (0.09)** **0.0 - 8.33**
Baccharis halimifolia	N	0.08 (0.06) 0.0 – 2.27	0.12 (0.06) 0.0 – 0.76	---- ----	---- ----	---- ----	---- ----	---- ----
Total: *Baccharis* sp.	**N**	**0.08 (0.06)** **0.0 – 2.27**	**0.12 (0.06)** **0.0 – 0.76**	---- ----	---- ----	---- ----	---- ----	---- ----
Callicarpa americana	N	3.62 (1.15) 0.0 – 37.12	2.94 (1.10) 0.0 – 17.42	1.09 (0.97) 0.0 - 28.03	---- ----	0.15 (0.15) 0.0 - 1.52	0.79 (0.56) 0.0 - 12.12	0.45 (0.17) 0.0 - 11.36
Total: *Callicarpa* sp.	**N**	**3.62 (1.15)** **0.0 – 37.12**	**2.94 (1.10)** **0.0 – 17.42**	**1.09 (0.97)** **0.0 - 28.03**	---- ----	**0.15 (0.15)** **0.0 - 1.52**	**0.79 (0.56)** **0.0 - 12.12**	**0.45 (0.17)** **0.0 - 11.36**
Ceanothus americanus	N	0.20 (0.10) 0.0 – 3.79	---- ----	---- ----	---- ----	---- ----	0.34 (0.18) 0.0 - 3.03	0.02 (0.02) 0.0 - 1.52
Total: *Ceanothus* sp.	**N**	**0.20 (0.10)** **0.0 – 3.79**	---- ----	---- ----	---- ----	---- ----	**0.34 (0.18)** **0.0 - 3.03**	**0.02 (0.02)** **0.0 - 1.52**
Crataegus sp.	N	0.03 (0.03) 0.0 – 1.52	---- ----	0.24 (0.24) 0.0 - 6.82	---- ----	---- ----	---- ----	---- ----
Crataegus marshallii	N	---- ----	---- ----	0.03 (0.03) 0.0 - 0.76	---- ----	---- ----	---- ----	---- ----
Total: *Crataegus* sp.	**N**	**0.03 (0.03)** **0.0 – 1.52**	---- ----	**0.26 (0.24)** **0.0 - 6.82**	---- ----	---- ----	---- ----	---- ----
Cyrilla racemiflora	N	---- ----	---- ----	0.24 (0.21) 0.0 - 6.06	---- ----	---- ----	---- ----	---- ----
Total: *Cyrilla* sp.	**N**	---- ----	---- ----	**0.24 (0.21)** **0.0 - 6.06**	---- ----	---- ----	---- ----	---- ----
Gaylussacia dumosa	N	0.12 (0.09) 0.0 – 3.79	---- ----	---- ----	---- ----	2.80 (2.41) 0.0 - 24.24	0.79 (0.48) 0.0 - 9.09	1.41 (0.53) 0.0 - 35.61

Table B.1 (Continued)

Gaylussacia sp.	N	----	----	----	----	----	0.03 (0.03)	0.18 (0.18)
		----	----	----	----	----	0.0 - 0.76	0.0 - 15.91
Total: *Gaylussacia* sp.	**N**	**0.12 (0.09)**	**----**	**----**	**----**	**2.80 (2.41)**	**0.83 (0.48)**	**1.59 (0.56)**
		0.0 – 3.79	**----**	**----**	**----**	**0.0 - 24.24**	**0.0 - 9.09**	**0.0 - 35.61**
Hypericum hypericoides	N	0.25 (0.12)	0.09 (0.09)	0.18 (0.16)	0.61 (0.61)	----	----	0.01 (0.01)
		0.0 – 3.03	0.0 – 2.27	0.0 - 4.55	0.0 - 9.09	----	----	0.0 - 0.76
Hypericum sp.	N	0.32 (0.15)	----	----	----	0.38 (0.38)	0.45 (0.17)	0.03 (0.02)
		0.0 – 4.55	----	----	----	0.0 - 3.79	0.0 - 3.03	0.0 - 0.76
Total: *Hypericum* sp.	**N**	**0.57 (0.22)**	**0.09 (0.09)**	**0.18 (0.16)**	**0.61 (0.61)**	**0.38 (0.38)**	**0.45 (0.17)**	**0.04 (0.02)**
		0.0 – 7.58	**0.0 – 2.27**	**0.0 - 4.55**	**0.0 - 9.09**	**0.0 - 3.79**	**0.0 - 3.03**	**0.0 - 0.76**
Ilex coriacea	N	----	----	----	----	----	----	0.03 (0.03)
		----	----	----	----	----	----	0.0 - 2.27
Ilex glabra	N	8.72 (2.94)	----	13.48 (3.96)	12.42 (3.77)	6.44 (3.54)	23.86 (5.76)	15.40 (2.32)
		0.0 – 74.24	----	0.0 - 71.21	0.0 - 43.18	0.0 - 31.06	0.0 - 73.49	0.0 - 84.85
Ilex opaca	N	----	----	----	0.15 (0.15)	----	----	0.03 (0.03)
		----	----	----	0.0 - 2.27	----	----	0.0 - 2.27
Ilex vomitoria	N	2.93 (0.89)	3.09 (1.13)	6.14 (1.51)	24.69 (8.26)	3.71 (1.63)	4.20 (1.36)	4.18 (0.95)
		0.0 – 28.79	0.0 – 20.46	0.0 - 26.52	0.0 - 100.00	0.0 - 15.91	0.0 - 22.73	0.0 - 39.39
Total: *Ilex* sp.	**N**	**11.65 (2.95)**	**3.09 (1.13)**	**19.62 (3.70)**	**37.27 (8.27)**	**10.15 (5.04)**	**28.07 (6.42)**	**19.64 (2.59)**
		0.0 – 76.52	**0.0 – 20.46**	**0.0 - 72.73**	**0.0 - 100.00**	**0.0 - 40.91**	**0.0 - 87.88**	**0.0 - 93.18**
Licania michauxii	N	----	----	----	----	----	----	0.06 (0.04)
		----	----	----	----	----	----	0.0 - 3.79
Total: *Licania* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.06 (0.04)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 - 3.79**
Lyonia fruticosa	N	----	----	----	----	----	----	0.04 (0.04)
		----	----	----	----	----	----	0.0 - 3.79
Total: *Lyonia* sp.	**N**	**----**	**----**	**----**	**----**	**----**	**----**	**0.04 (0.04)**
		----	**----**	**----**	**----**	**----**	**----**	**0.0 - 3.79**
Myrica cerifera	N	0.57 (0.22)	----	1.46 (0.61)	1.11 (0.76)	0.53 (0.36)	3.13 (1.48)	1.59 (0.37)
		0.0 – 7.58	----	0.0 - 15.15	0.0 - 11.36	0.0 - 3.03	0.0 - 25.76	0.0 - 18.94
Myrica heterophylla	N	----	----	----	----	----	----	0.04 (0.04)
		----	----	----	----	----	----	0.0 - 3.79
Total: *Myrica* sp.	**N**	**0.57 (0.22)**	**----**	**1.46 (0.61)**	**1.11 (0.76)**	**0.53 (0.36)**	**3.13 (1.48)**	**1.64 (0.37)**
		0.0 – 7.58	**----**	**0.0 - 15.15**	**0.0 - 11.36**	**0.0 - 3.03**	**0.0 - 25.76**	**0.0 - 18.94**
Rhus copallinum	N	0.29 (0.17)	----	0.65 (0.38)	0.46 (0.40)	0.53 (0.39)	0.34 (0.22)	2.36 (0.62)
		0.0 – 6.82	----	0.0 - 9.85	0.0 - 6.06	0.0 - 3.79	0.0 - 3.79	0.0 - 35.61
Rhus glabra	N	0.07 (0.07)	----	----	----	----	----	----
		0.0 – 3.03	----	----	----	----	----	----
Rhus sp.	N	----	----	----	----	----	----	0.01 (0.01)
		----	----	----	----	----	----	0.0 - 0.76

Table B.1 (Continued)

Total: *Rhus* sp.	**N**	**0.35 (0.18)**	**----**	**0.65 (0.38)**	**0.46 (0.40)**	**0.53 (0.39)**	**0.34 (0.22)**	**2.37 (0.62)**
		0.0 – 6.82	**----**	**0.0 - 9.85**	**0.0 - 6.06**	**0.0 - 3.79**	**0.0 - 3.79**	**0.0 - 35.61**
Toxicodendron pubescens	N	----	----	0.21 (0.21)	----	----	0.17 (0.14)	0.02 (0.01)
		----	----	0.0 - 6.06	----	----	0.0 - 3.03	0.0 - 0.76
Total: *Toxicodendron* sp.	**N**	**----**	**----**	**0.21 (0.21)**	**----**	**----**	**0.17 (0.14)**	**0.02 (0.01)**
		----	**----**	**0.0 - 6.06**	**----**	**----**	**0.0 - 3.03**	**0.0 - 0.76**
Vacciniun arboreum	N	0.40 (0.24)	----	1.46 (0.44)	0.76 (0.58)	----	----	1.19 (0.44)
		0.0 – 8.33	----	0.0 - 7.58	0.0 - 8.33	----	----	0.0 - 31.82
Vaccinium elliottii	N	0.40 (0.31)	----	2.25 (0.66)	3.43 (1.43)	0.61 (0.53)	0.62 (0.42)	1.24 (0.26)
		0.0 – 13.64	----	0.0 - 15.15	0.0 - 19.69	0.0 - 5.30	0.0 - 8.33	0.0 - 9.09
Vaccinium myrsinites	N	0.07 (0.05)	----	----	----	0.83 (0.49)	1.93 (0.57)	0.47 (0.21)
		0.0 – 1.52	----	----	----	0.0 - 4.55	0.0 - 9.09	0.0 - 12.88
Vaccinium sp.	N	0.89 (0.39)	----	----	1.36 (0.92)	2.65 (0.99)	1.65 (0.59)	0.85 (0.28)
		0.0 – 16.67	----	----	0.0 - 12.88	0.0 - 8.33	0.0 - 9.85	0.0 - 17.42
Vaccinium stamineum	N	0.03 (0.03)	----	----	0.40 (0.31)	0.46 (0.32)	0.48 (0.22)	0.39 (0.13)
		0.0 – 1.52	----	----	0.0 - 4.55	0.0 - 3.03	0.0 - 3.03	0.0 - 7.58
Total: *Vaccinium* sp.	**N**	**1.80 (0.55)**	**----**	**3.71 (0.93)**	**5.96 (2.09)**	**4.55 (1.81)**	**4.68 (0.91)**	**4.15 (0.62)**
		0.0 – 16.67	**----**	**0.0 - 22.73**	**0.0 - 25.00**	**0.0 - 16.67**	**0.0 - 13.64**	**0.0 - 31.82**
Lespedeza bicolor	Nn	0.03 (0.03)	----	----	----	----	----	0.01 (0.01)
		0.0 – 1.52	----	----	----	----	----	0.0 - 0.76
Total: *Lespedeza* sp.	**Nn**	**0.03 (0.03)**	**----**	**----**	**----**	**----**	**----**	**0.01 (0.01)**
		0.0 – 1.52	**----**	**----**	**----**	**----**	**----**	**0.0 - 0.76**
Ligustrum sinense	Nn	----	1.67 (0.87)	0.24 (0.24)	----	----	0.03 (0.03)	----
		----	0.0 – 20.46	0.0 - 6.82	----	----	0.0 - 0.76	----
Total: *Ligustrum* sp.	**Nn**	**----**	**1.67 (0.87)**	**0.24 (0.24)**	**----**	**----**	**0.03 (0.03)**	**----**
		----	**0.0 – 20.46**	**0.0 - 6.82**	**----**	**----**	**0.0 - 0.76**	**----**
Rosa sp.	Unk	0.03 (0.03)	----	----	----	----	----	----
		0.0 – 1.52	----	----	----	----	----	----
Total: *Rosa* sp.	**Unk**	**0.03 (0.03)**	**----**	**----**	**----**	**----**	**----**	**----**
		0.0 – 1.52	**----**	**----**	**----**	**----**	**----**	**----**
Trees								
Acer rubrum	N	0.51 (0.24)	----	0.99 (0.33)	----	----	----	0.57 (0.34)
		0.0 – 9.09	----	0.0 - 6.82	----	----	----	0.0 - 28.03
Total: *Acer* sp.	**N**	**0.51 (0.24)**	**----**	**0.99 (0.33)**	**----**	**----**	**----**	**0.57 (0.34)**
		0.0 – 9.09	**----**	**0.0 - 6.82**	**----**	**----**	**----**	**0.0 - 28.03**
Carya tomentosa	N	0.27 (0.12)	----	0.63 (0.44)	----	----	----	0.10 (0.08)
		0.0 – 3.79	----	0.0 - 9.85	----	----	----	0.0 - 6.06

Table B.1 (Continued)

Total: *Carya* sp.	**N**	**0.27 (0.12)**	----	**0.63 (0.44)**	----	----	----	**0.10 (0.08)**
		0.0 – 3.79	----	**0.0 - 9.85**	----	----	----	**0.0 - 6.06**
Castanea sp.	N	----	----	----	0.20 (0.20)	----	----	0.08 (0.07)
		----	----	----	0.0 - 3.03	----	----	0.0 - 6.06
Total: *Castanea* sp.	**N**	----	----	----	**0.20 (0.20)**	----	----	**0.08 (0.07)**
		----	----	----	**0.0 - 3.03**	----	----	**0.0 - 6.06**
Cornus florida	N	----	----	----	----	----	----	0.18 (0.10)
		----	----	----	----	----	----	0.0 - 6.82
Total: *Cornus* sp.	**N**	----	----	----	----	----	----	**0.18 (0.10)**
		----	----	----	----	----	----	**0.0 - 6.82**
Diospyros virginiana	N	1.48 (0.39)	0.06 (0.06)	1.75 (0.72)	0.10 (0.10)	0.91 (0.55)	1.07 (0.73)	1.58 (0.42)
		0.0 – 10.61	0.0 – 1.52	0.0 - 13.64	0.0 - 1.52	0.0 - 5.30	0.0 - 15.91	0.0 - 30.30
Total: *Diospyros* sp.	**N**	**1.48 (0.39)**	**0.06 (0.06)**	**1.75 (0.72)**	**0.10 (0.10)**	**0.91 (0.55)**	**1.07 (0.73)**	**1.58 (0.42)**
		0.0 – 10.61	**0.0 – 1.52**	**0.0 - 13.64**	**0.0 - 1.52**	**0.0 - 5.30**	**0.0 - 15.91**	**0.0 - 30.30**
Hamamelis virginiana	N	----	----	----	----	----	----	0.03 (0.03)
		----	----	----	----	----	----	0.0 - 2.27
Total: *Hamamelis* sp.	**N**	----	----	----	----	----	----	**0.03 (0.03)**
		----	----	----	----	----	----	**0.0 - 2.27**
Liquidambar styraciflua	N	0.52 (0.23)	----	3.50 (1.06)	----	----	2.20 (1.19)	0.97 (0.37)
		0.0 – 6.82	----	0.0 - 21.97	----	----	0.0 - 21.97	0.0 - 25.76
Total: *Liquidambar* sp.	**N**	**0.52 (0.23)**	----	**3.50 (1.06)**	----	----	**2.20 (1.19)**	**0.97 (0.37)**
		0.0 – 6.82	----	**0.0 - 21.97**	----	----	**0.0 - 21.97**	**0.0 - 25.76**
Magnolia virginiana	N	----	----	0.05 (0.05)	----	----	----	0.17 (0.15)
		----	----	0.0 - 1.52	----	----	----	0.0 - 12.88
Total: *Magnolia* sp.	**N**	----	----	**0.05 (0.05)**	----	----	----	**0.17 (0.15)**
		----	----	**0.0 - 1.52**	----	----	----	**0.0 - 12.88**
Nyssa sylvatica	N	----	----	0.39 (0.39)	1.92 (1.92)	----	----	0.05 (0.05)
		----	----	0.0 - 11.36	0.0 - 28.79	----	----	0.0 - 4.55
Total: *Nyssa* sp.	**N**	----	----	**0.39 (0.39)**	**1.92 (1.92)**	----	----	**0.05 (0.05)**
		----	----	**0.0 - 11.36**	**0.0 - 28.79**	----	----	**0.0 - 4.55**
Osmanthus americanus	N	----	----	----	0.71 (0.71)	----	----	----
		----	----	----	0.0 - 10.61	----	----	----
Total: *Osmanthus* sp.	**N**	----	----	----	**0.71 (0.71)**	----	----	----
		----	----	----	**0.0 - 10.61**	----	----	----
Persea borbonia	N	----	----	----	----	----	----	0.03 (0.02)
		----	----	----	----	----	----	0.0 - 1.52
Persea sp.	N	----	----	0.26 (0.19)	----	----	----	0.02 (0.02)
		----	----	0.0 - 5.30	----	----	----	0.0 - 1.52

Table B.1 (Continued)

Total: *Persea* sp.	**N**	**----**	**----**	**0.26 (0.19)**	**----**	**----**	**----**	**0.04 (0.03)**
		----	**----**	**0.0 - 5.30**	**----**	**----**	**----**	**0.0 - 1.52**
Pinus palustris	N	0.08 (0.08)	----	0.08 (0.08)	----	0.30 (0.30)	----	0.22 (0.11)
		0.0 – 3.79	----	0.0 - 2.27	----	0.0 - 3.03	----	0.0 - 6.82
Pinus taeda	N	0.57 (0.22)	0.79 (0.73)	0.03 (0.03)	3.38 (3.17)	----	----	0.52 (0.52)
		0.0 – 7.58	0.0 – 18.18	0.0 - 0.76	0.0 - 47.73	----	----	0.0 - 45.46
Total: *Pinus* sp.	**N**	**0.66 (0.23)**	**0.79 (0.73)**	**0.10 (0.08)**	**3.38 (3.17)**	**0.30 (0.30)**	**----**	**0.73 (0.53)**
		0.0 – 7.58	**0.0 – 18.18**	**0.0 - 2.27**	**0.0 - 47.73**	**0.0 - 3.03**	**----**	**0.0 - 45.46**
Prunus serotina	N	0.07 (0.07)	----	0.05 (0.05)	----	0.46 (0.32)	----	0.16 (0.08)
		0.0 – 3.03	----	0.0 - 1.52	----	0.0 - 3.03	----	0.0 - 4.55
Total: *Prunus* sp.	**N**	**0.07 (0.07)**	**----**	**0.05 (0.05)**	**----**	**0.46 (0.32)**	**----**	**0.16 (0.08)**
		0.0 – 3.03	**----**	**0.0 - 1.52**	**----**	**0.0 - 3.03**	**----**	**0.0 - 4.55**
Quercus alba	N	----	----	0.65 (0.34)	----	----	----	0.13 (0.13)
		----	----	0.0 - 7.58	----	----	----	0.0 - 11.36
Quercus falcate	N	1.03 (0.33)	----	0.97 (0.37)	1.26 (0.66)	----	0.59 (0.42)	0.92 (0.32)
		0.0 – 9.85	----	0.0 - 8.33	0.0 - 7.58	----	0.0 - 8.33	0.0 - 15.91
Quercus incana	N	0.02 (0.02)	----	0.24 (0.16)	----	----	0.38 (0.34)	0.26 (0.11)
		0.0 – 0.76	----	0.0 - 4.55	----	----	0.0 - 7.58	0.0 - 6.82
Quercus laevis	N	----	----	----	----	----	----	0.08 (0.08)
		----	----	----	----	----	----	0.0 - 6.82
Quercus margaretta	N	----	----	----	----	----	----	0.19 (0.12)
		----	----	----	----	----	----	0.0 - 8.33
Quercus marilandica	N	0.20 (0.14)	----	0.10 (0.08)	----	----	----	0.35 (0.19)
		0.0 – 6.06	----	0.0 - 2.27	----	----	----	0.0 - 12.88
Quercus nigra	N	0.22 (0.16)	0.06 (0.06)	1.52 (0.60)	4.55 (4.44)	----	----	0.48 (0.17)
		0.0 – 6.82	0.0 – 1.52	0.0 - 14.39	0.0 - 66.67	----	----	0.0 - 12.12
Quercus pagoda	N	----	----	----	----	----	----	0.08 (0.06)
		----	----	----	----	----	----	0.0 - 4.55
Quercus phellos	N	----	0.06 (0.06)	0.31 (0.31)	----	----	----	0.12 (0.09)
		----	0.0 – 1.52	0.0 - 9.09	----	----	----	0.0 - 8.33
Quercus sp.	N	0.19 (0.13)	0.06 (0.06)	0.16 (0.12)	----	0.38 (0.38)	0.03 (0.03)	0.14 (0.05)
		0.0 – 4.55	0.0 – 1.52	0.0 - 3.03	----	0.0 - 3.79	0.0 - 0.76	0.0 - 3.03
Quercus stellate	N	0.05 (0.05)	----	----	----	----	----	0.19 (0.11)
		0.0 – 2.27	----	----	----	----	----	0.0 - 9.09
Total: *Quercus* sp.	**N**	**1.70 (0.51)**	**0.18 (0.10)**	**3.95 (1.07)**	**5.81 (4.81)**	**0.38 (0.38)**	**0.99 (0.74)**	**2.94 (0.62)**
		0.0 – 16.67	**0.0 – 1.52**	**0.0 - 23.49**	**0.0 - 72.73**	**0.0 - 3.79**	**0.0 - 15.91**	**0.0 - 34.85**
Sassafras albidum	N	----	----	0.03 (0.03)	----	----	0.07 (0.07)	0.05 (0.03)
		----	----	0.0 - 0.76	----	----	0.0 - 1.52	0.0 - 2.27

Table B.1 (Continued)

Total: *Sassafras* sp.	**N**	----	----	**0.03 (0.03)**	----	----	**0.07 (0.07)**	**0.05 (0.03)**
		----	----	**0.0 - 0.76**	----	----	**0.0 - 1.52**	**0.0 - 2.27**
Symplocos tinctoria	N	0.03 (0.02)	----	2.14 (1.02)	1.21 (0.94)	----	1.14 (0.63)	1.47 (0.58)
		0.0 – 0.76	----	0.0 - 26.52	0.0 - 13.64	----	0.0 - 12.88	0.0 - 40.91
Total: *Symplocos* sp.	**N**	**0.03 (0.02)**	----	**2.14 (1.02)**	**1.21 (0.94)**	----	**1.14 (0.63)**	**1.47 (0.58)**
		0.0 – 0.76	----	**0.0 - 26.52**	**0.0 - 13.64**	----	**0.0 - 12.88**	**0.0 - 40.91**
Viburnum dentatum	N	----	----	0.16 (0.16)	----	----	----	----
		----	----	0.0 - 4.55	----	----	----	----
Total: *Viburnum* sp.	**N**	----	----	**0.16 (0.16)**	----	----	----	----
		----	----	**0.0 - 4.55**	----	----	----	----
Triadica sebifera	Nn	----	0.12 (0.12)	----	----	----	----	----
		----	0.0 – 3.03	----	----	----	----	----
Total: *Triadica* sp.	**Nn**	----	**0.12 (0.12)**	----	----	----	----	----
		----	**0.0 – 3.03**	----	----	----	----	----
Vines								
Bignonia capreolata	N	----	----	0.05 (0.05)	----	----	----	----
		----	----	0.0 - 1.52	----	----	----	----
Total: *Bignonia* sp.	**N**	----	----	**0.05 (0.05)**	----	----	----	----
		----	----	**0.0 - 1.52**	----	----	----	----
Campsis radicans	N	----	0.15 (0.15)	----	----	----	----	----
		----	0.0 – 3.79	----	----	----	----	----
Total: *Campsis* sp.	**N**	----	**0.15 (0.15)**	----	----	----	----	----
		----	**0.0 – 3.79**	----	----	----	----	----
Gelsemium sempervirens	N	0.14 (0.06)	----	1.91 (0.92)	0.30 (0.25)	----	----	0.48 (0.15)
		0.0 – 1.52	----	0.0 - 21.21	0.0 - 3.79	----	----	0.0 - 6.82
Total: *Gelsemium* sp.	**N**	**0.14 (0.06)**	----	**1.91 (0.92)**	**0.30 (0.25)**	----	----	**0.48 (0.15)**
		0.0 – 1.52	----	**0.0 - 21.21**	**0.0 - 3.79**	----	----	**0.0 - 6.82**
Parthenocissus quinquefolia	N	----	----	0.16 (0.09)	----	----	----	0.02 (0.02)
		----	----	0.0 - 2.27	----	----	----	0.0 - 1.52
Total: *Parthenocissus* sp.	**N**	----	----	**0.16 (0.09)**	----	----	----	**0.02 (0.02)**
		----	----	**0.0 - 2.27**	----	----	----	**0.0 - 1.52**
Passifloria incarnata	N	0.47 (0.24)	----	----	----	----	----	----
		0.0 – 9.85	----	----	----	----	----	----
Passiflora lutea	N	0.08 (0.08)	----	----	----	----	----	----
		0.0 – 3.79	----	----	----	----	----	----
Total: *Passiflora* sp.	**N**	**0.56 (0.27)**	----	----	----	----	----	----
		0.0 – 9.85	----	----	----	----	----	----
Rubus sp.	N	8.32 (2.33)	21.82 (6.16)	1.23 (0.44)	----	9.24 (5.63)	7.40 (2.08)	0.93 (0.35)
		0.0 – 63.64	0.0 – 97.73	0.0 - 9.85	----	0.0 - 58.33	0.0 - 37.12	0.0 - 28.03

Table B.1 (Continued)

Total: *Rubus* sp.	**N**	**8.32 (2.33)**	**21.82 (6.16)**	**1.23 (0.44)**	**----**	**9.24 (5.63)**	**7.40 (2.08)**	**0.93 (0.35)**
		0.0 – 63.64	**0.0 – 97.73**	**0.0 - 9.85**	**----**	**0.0 - 58.33**	**0.0 - 37.12**	**0.0 - 28.03**
Smilax bona-nox	N	----	----	----	0.10 (0.10)	----	----	----
		----	----	----	0.0 - 1.52	----	----	----
Smilax glauca	N	0.03 (0.02)	----	0.10 (0.07)	----	----	----	0.03 (0.02)
		0.0 – 0.76	----	0.0 - 1.52	----	----	----	0.0 - 1.52
Smilax laurifolia	N	----	----	----	----	----	----	0.13 (0.11)
		----	----	----	----	----	----	0.0 - 9.09
Smilax pumila	N	----	----	0.44 (0.44)	----	----	----	0.09 (0.04)
		----	----	0.0 - 12.88	----	----	----	0.0 - 2.27
Smilax rotundifolia	N	----	----	----	0.56 (0.56)	----	----	0.02 (0.02)
		----	----	----	0.0 - 8.33	----	----	0.0 - 1.52
Smilax sp.	N	0.30 (0.15)	----	0.10 (0.08)	----	0.08 (0.08)	1.52 (0.60)	0.08 (0.04)
		0.0 – 6.06	----	0.0 - 2.27	----	0.0 - 0.76	0.0 - 9.85	0.0 - 3.03
Total: *Smilax* sp.	**N**	**0.34 (0.15)**	**----**	**0.65 (0.45)**	**0.66 (0.56)**	**0.08 (0.08)**	**1.52 (0.60)**	**0.35 (0.12)**
		0.0 – 6.06	**----**	**0.0 - 12.88**	**0.0 - 8.33**	**0.0 - 0.76**	**0.0 - 9.85**	**0.0 - 9.09**
Toxicodendron radicans	N	----	----	1.25 (1.12)	----	0.91 (0.69)	0.34 (0.20)	0.08 (0.04)
		----	----	0.0 - 32.58	----	0.0 - 6.82	0.0 - 3.79	0.0 - 2.27
Total: *Toxicodendron* sp.	**N**	**----**	**----**	**1.25 (1.12)**	**----**	**0.91 (0.69)**	**0.34 (0.20)**	**0.08 (0.04)**
		----	**----**	**0.0 - 32.58**	**----**	**0.0 - 6.82**	**0.0 - 3.79**	**0.0 - 2.27**
Vitis aestivalis	N	----	----	0.21 (0.21)	----	----	----	----
		----	----	0.0 - 6.06	----	----	----	----
Vitis rotundifolia	N	1.09 (0.53)	6.85 (3.74)	2.69 (1.05)	0.35 (0.35)	----	2.62 (1.25)	0.41 (0.14)
		0.0 – 19.69	0.0 – 93.18	0.0 - 18.18	0.0 - 5.30	----	0.0 - 19.69	0.0 - 7.58
Total: *Vitis* sp.	**N**	**1.09 (0.53)**	**6.85 (3.74)**	**2.90 (1.05)**	**0.35 (0.35)**	**----**	**2.62 (1.25)**	**0.41 (0.14)**
		0.0 – 19.69	**0.0 – 93.18**	**0.0 - 18.18**	**0.0 - 5.30**	**----**	**0.0 - 19.69**	**0.0 - 7.58**
Lonicera japonica	Nn	----	0.30 (0.23)	1.20 (1.20)	----	----	----	----
		----	0.0 – 5.30	0.0 - 34.85	----	----	----	----
Total: *Lonicera* sp.	**Nn**	**----**	**0.30 (0.23)**	**1.20 (1.20)**	**----**	**----**	**----**	**----**
		----	**0.0 – 5.30**	**0.0 - 34.85**	**----**	**----**	**----**	**----**
Lygodium japonicum	Nn	----	2.33 (1.01)	----	----	----	----	0.01 (0.01)
		----	0.0 – 21.21	----	----	----	----	0.0 - 0.76
Total: *Lygodium* sp.	**Nn**	**----**	**2.33 (1.01)**	**----**	**----**	**----**	**----**	**0.01 (0.01)**
		----	**0.0 – 21.21**	**----**	**----**	**----**	**----**	**0.0 - 0.76**
Lonicera sp.	Unk	----	----	----	----	0.08 (0.08)	----	----
		----	----	----	----	0.0 - 0.76	----	----
Total: *Lonicera* sp.	**Unk**	**----**	**----**	**----**	**----**	**0.08 (0.08)**	**----**	**----**
		----	**----**	**----**	**----**	**0.0 - 0.76**	**----**	**----**

Table B.1 (Continued)

Upper Story (> 1 m in height)								
Forbs								
Erechtites hieracifolia	N	0.02 (0.02)	----	----	----	----	----	----
		0.0 – 0.76	----	----	----	----	----	----
Total: *Erechtites* sp.	**N**	**0.02 (0.02)**	**----**	**----**	**----**	**----**	**----**	**----**
		0.0 – 0.76	**----**	**----**	**----**	**----**	**----**	**----**
Eupatorium capillifolium	N	0.30 (0.30)	2.03 (1.14)	----	----	----	----	----
		0.0 – 13.64	0.0 – 21.21	----	----	----	----	----
Eupatorium serotinum	N	1.39 (1.39)	----	----	----	----	----	----
		0.0 – 62.88	----	----	----	----	----	----
Eupatorium sp.	N	0.02 (0.02)	----	----	----	----	----	----
		0.0 – 0.76	----	----	----	----	----	----
Total: *Eupatorium* sp.	**N**	**1.72 (1.70)**	**2.03 (1.14)**	**----**	**----**	**----**	**----**	**----**
		0.0 – 76.52	**0.0 – 21.21**	**----**	**----**	**----**	**----**	**----**
Phytolacca americana	N	0.44 (0.25)	0.61 (0.61)	----	----	----	----	----
		0.0 – 7.58	0.0 – 15.15	----	----	----	----	----
Total: *Phytolacca* sp.	**N**	**0.44 (0.25)**	**0.61 (0.61)**	**----**	**----**	**----**	**----**	**----**
		0.0 – 7.58	**0.0 – 15.15**	**----**	**----**	**----**	**----**	**----**
Solidago sp.	N	0.03 (0.02)	----	----	----	----	----	----
		0.0 – 0.76	----	----	----	----	----	----
Total: *Solidago* sp.	**N**	**0.03 (0.02)**	**----**	**----**	**----**	**----**	**----**	**----**
		0.0 – 0.76	**----**	**----**	**----**	**----**	**----**	**----**
Conyza canadensis	Nn	2.17 (1.65)	----	----	----	----	----	----
		0.0 – 71.21	----	----	----	----	----	----
Total: *Conyza* sp.	**Nn**	**2.17 (1.65)**	**----**	**----**	**----**	**----**	**----**	**----**
		0.0 – 71.21	**----**	**----**	**----**	**----**	**----**	**----**
Legumes								
Lespedeza sp.	Unk	0.02 (0.02)	----	----	----	----	----	----
		0.0 – 0.76	----	----	----	----	----	----
Total: *Lespedeza* sp.	**Unk**	**0.02 (0.02)**	**----**	**----**	**----**	**----**	**----**	**----**
		0.0 – 0.76	**----**	**----**	**----**	**----**	**----**	**----**
Shrubs								
Baccharis halimifolia	N	----	----	0.05 (0.05)	----	----	----	----
		----	----	0.0 - 1.52	----	----	----	----

Table B.1 (Continued)

Total: *Baccharis* sp.	**N**	**----**	**----**	**0.05 (0.05)**	**----**	**----**	**----**	**----**
		----	**----**	**0.0 - 1.52**	**----**	**----**	**----**	**----**
Callicarpa americana	N	1.58 (0.93)	10.03 (2.95)	1.52 (1.02)	----	----	----	0.03 (0.03)
		0.0 – 34.85	0.0 – 50.76	0.0 - 21.97	----	----	----	0.0 - 2.27
Total: *Callicarpa* sp.	**N**	**1.58 (0.93)**	**10.03 (2.95)**	**1.52 (1.02)**	**----**	**----**	**----**	**0.03 (0.03)**
		0.0 – 34.85	**0.0 – 50.76**	**0.0 - 21.97**	**----**	**----**	**----**	**0.0 - 2.27**
Crataegus sp.	N	----	----	0.13 (0.13)	----	----	----	----
		----	----	0.0 - 3.79	----	----	----	----
Total: *Crataegus* sp.	**N**	**----**	**----**	**0.13 (0.13)**	**----**	**----**	**----**	**----**
		----	**----**	**0.0 - 3.79**	**----**	**----**	**----**	**----**
Cyrilla racemiflora	N	----	----	1.39 (0.91)	----	----	----	----
		----	----	0.0 - 19.69	----	----	----	----
Total: *Cyrilla* sp.	**N**	**----**	**----**	**1.39 (0.91)**	**----**	**----**	**----**	**----**
		----	**----**	**0.0 - 19.69**	**----**	**----**	**----**	**----**
Gaylussacia sp.	N	----	----	0.21 (0.21)	----	----	----	----
		----	----	0.0 - 6.06	----	----	----	----
Total: *Gaylussacia* sp.	**N**	**----**	**----**	**0.21 (0.21)**	**----**	**----**	**----**	**----**
		----	**----**	**0.0 - 6.06**	**----**	**----**	**----**	**----**
Ilex decidua	N	----	----	0.58 (0.58)	----	----	----	----
		----	----	0.0 - 16.67	----	----	----	----
Ilex glabra	N	----	----	9.79 (4.10)	1.67 (1.14)	0.23 (0.23)	----	0.19 (0.15)
		----	----	0.0 - 95.46	0.0 - 12.88	0.0 - 2.27	----	0.0 - 12.12
Ilex opaca	N	----	----	2.09 (1.09)	----	----	----	0.03 (0.03)
		----	----	0.0 - 25.76	----	----	----	0.0 - 3.03
Ilex vomitoria	N	2.78 (1.20)	11.69 (3.64)	14.81 (3.13)	27.83 (7.08)	4.09 (2.79)	----	2.49 (0.81)
		0.0 – 37.12	0.0 – 59.09	0.0 - 59.85	0.0 - 71.97	0.0 - 24.24	----	0.0 - 42.42
Total: *Ilex* sp.	**N**	**2.78 (1.20)**	**11.69 (3.64)**	**27.27 (5.12)**	**29.49 (7.12)**	**4.32 (2.91)**	**----**	**2.73 (0.86)**
		0.0 – 37.12	**0.0 – 59.09**	**0.0 - 98.49**	**0.0 - 71.97**	**0.0 - 24.24**	**----**	**0.0 - 42.42**
Myrica cerifera	N	0.20 (0.15)	----	2.04 (0.89)	0.51 (0.33)	----	----	----
		0.0 – 6.06	----	0.0 - 20.46	0.0 - 4.55	----	----	----
Total: *Myrica* sp.	**N**	**0.20 (0.15)**	**----**	**2.04 (0.89)**	**0.51 (0.33)**	**----**	**----**	**----**
		0.0 – 6.06	**----**	**0.0 - 20.46**	**0.0 - 4.55**	**----**	**----**	**----**
Rhus copallinum	N	0.14 (0.11)	----	3.50 (1.75)	1.11 (1.11)	----	----	0.02 (0.02)
		0.0 – 4.55	----	0.0 - 49.24	0.0 - 16.67	----	----	0.0 - 1.52
Total: *Rhus* sp.	**N**	**0.14 (0.11)**	**----**	**3.50 (1.75)**	**1.11 (1.11)**	**----**	**----**	**0.02 (0.02)**
		0.0 – 4.55	**----**	**0.0 - 49.24**	**0.0 - 16.67**	**----**	**----**	**0.0 - 1.52**
Vaccinium arboreum	N	----	----	4.68 (2.12)	1.92 (0.80)	1.74 (1.74)	----	3.32 (0.98)
		----	----	0.0 - 47.73	0.0 - 9.09	0.0 - 17.42	----	0.0 - 45.46
Vaccinium elliottii	N	0.14 (0.09)	----	2.06 (0.79)	1.67 (1.07)	----	----	0.88 (0.34)
		0.0 – 3.79	----	0.0 - 15.91	0.0 - 15.15	----	----	0.0 - 19.69

Table B.1 (Continued)

Vaccinium sp.	N	0.02 (0.02)	----	0.13 (0.13)	0.51 (0.51)	----	----	0.53 (0.50)
		0.0 – 0.76	----	0.0 - 3.79	0.0 - 7.58	----	----	0.0 - 43.94
Vaccinium stamineum	N	----	----	----	----	0.23 (0.23)	----	----
		----	----	----	----	0.0 - 2.27	----	----
Total: *Vaccinium* sp.	**N**	**0.15 (0.09)**	**----**	**6.87 (2.37)**	**4.09 (1.22)**	**1.97 (1.73)**	**----**	**4.73 (1.38)**
		0.0 – 3.79	**----**	**0.0 - 47.73**	**0.0 - 15.15**	**0.0 - 17.42**	**----**	**0.0 - 62.12**
Lespedeza bicolor	Nn	0.47 (0.38)	----	----	----	----	----	----
		0.0 – 16.67	----	----	----	----	----	----
Total: *Lespedeza* sp.	**Nn**	**0.47 (0.38)**	**----**	**----**	**----**	**----**	**----**	**----**
		0.0 – 16.67	**----**	**----**	**----**	**----**	**----**	**----**
Ligustrum sinense	Nn	----	16.18 (5.88)	1.33 (1.18)	----	----	----	----
		----	0.0 – 100.00	0.0 - 34.09	----	----	----	----
Total: *Ligustrum* sp.	**Nn**	**----**	**16.18 (5.88)**	**1.33 (1.18)**	**----**	**----**	**----**	**----**
		----	**0.0 – 100.00**	**0.0 - 34.09**	**----**	**----**	**----**	**----**
Trees								
Acer rubrum	N	0.84 (0.62)	----	20.32 (4.86)	4.34 (3.74)	----	----	0.05 (0.05)
		0.0 – 26.52	----	0.0 - 81.82	0.0 - 56.06	----	----	0.0 - 4.55
Total: *Acer* sp.	**N**	**0.84 (0.62)**	**----**	**20.32 (4.86)**	**4.34 (3.74)**	**----**	**----**	**0.05 (0.05)**
		0.0 – 26.52	**----**	**0.0 - 81.82**	**0.0 - 56.06**	**----**	**----**	**0.0 - 4.55**
Carya tomentosa	N	0.08 (0.08)	----	1.49 (0.74)	----	----	----	0.54 (0.28)
		0.0 – 3.79	----	0.0 - 14.39	----	----	----	0.0 - 18.18
Total: *Carya* sp.	**N**	**0.08 (0.08)**	**----**	**1.49 (0.74)**	**----**	**----**	**----**	**0.54 (0.28)**
		0.0 – 3.79	**----**	**0.0 - 14.39**	**----**	**----**	**----**	**0.0 - 18.18**
Castanea pumila	N	----	----	0.73 (0.73)	----	----	----	----
		----	----	0.0 - 21.21	----	----	----	----
Total: *Castanea* sp.	**N**	**----**	**----**	**0.73 (0.73)**	**----**	**----**	**----**	**----**
		----	**----**	**0.0 - 21.21**	**----**	**----**	**----**	**----**
Cornus florida	N	----	----	1.65 (1.18)	2.48 (2.08)	----	1.24 (1.24)	3.86 (1.17)
		----	----	0.0 - 32.58	0.0 - 31.06	----	0.0 - 27.27	0.0 - 56.06
Total: *Cornus* sp.	**N**	**----**	**----**	**1.65 (1.18)**	**2.48 (2.08)**	**----**	**1.24 (1.24)**	**3.86 (1.17)**
		----	**----**	**0.0 - 32.58**	**0.0 - 31.06**	**----**	**0.0 - 27.27**	**0.0 - 56.06**
Diospyros virginiana	N	0.17 (0.13)	1.15 (0.79)	5.38 (2.02)	0.71 (0.71)	----	0.69 (0.41)	0.59 (0.32)
		0.0 – 5.30	0.0 – 15.15	0.0 - 47.73	0.0 - 10.61	----	0.0 - 7.58	0.0 - 21.21
Total: *Diospyros* sp.	**N**	**0.17 (0.13)**	**1.15 (0.79)**	**5.38 (2.02)**	**0.71 (0.71)**	**----**	**0.69 (0.41)**	**0.59 (0.32)**
		0.0 – 5.30	**0.0 – 15.15**	**0.0 - 47.73**	**0.0 - 10.61**	**----**	**0.0 - 7.58**	**0.0 - 21.21**
Hamamelis virginiana	N	----	----	2.09 (2.04)	----	----	----	----
		----	----	0.0 - 59.09	----	----	----	----
Total: *Hamamelis* sp.	**N**	**----**	**----**	**2.09 (2.04)**	**----**	**----**	**----**	**----**
		----	**----**	**0.0 - 59.09**	**----**	**----**	**----**	**----**

Table B.1 (Continued)

Liquidambar styraciflua	N	0.47 (0.27)	0.67 (0.67)	5.75 (2.08)	----	----	0.79 (0.69)	0.78 (0.37)
		0.0 – 9.09	0.0 – 16.67	0.0 - 46.21	----	----	0.0 - 15.15	0.0 - 23.49
Total: *Liquidambar* sp.	**N**	**0.47 (0.27)**	**0.67 (0.67)**	**5.75 (2.08)**	**----**	**----**	**0.79 (0.69)**	**0.78 (0.37)**
		0.0 – 9.09	**0.0 – 16.67**	**0.0 - 46.21**	**----**	**----**	**0.0 - 15.15**	**0.0 - 23.49**
Liriodendron tulipifera	N	----	----	0.63 (0.63)	----	----	----	----
		----	----	0.0 - 18.18	----	----	----	----
Total: *Liriodendron* sp.	**N**	**----**	**----**	**0.63 (0.63)**	**----**	**----**	**----**	**----**
		----	**----**	**0.0 - 18.18**	**----**	**----**	**----**	**----**
Magnolia virginiana	N	0.08 (0.08)	----	----	1.77 (1.33)	----	----	0.09 (0.09)
		0.0 – 3.79	----	----	0.0 - 18.94	----	----	0.0 - 8.33
Total: *Magnolia* sp.	**N**	**0.08 (0.08)**	**----**	**----**	**1.77 (1.33)**	**----**	**----**	**0.09 (0.09)**
		0.0 – 3.79	**----**	**----**	**0.0 - 18.94**	**----**	**----**	**0.0 - 8.33**
Nyssa sylvatica	N	----	----	9.67 (3.56)	6.16 (3.79)	----	0.38 (0.38)	0.60 (0.55)
		----	----	0.0 - 90.15	0.0 - 54.55	----	0.0 - 8.33	0.0 - 48.49
Total: *Nyssa* sp.	**N**	**----**	**----**	**9.67 (3.56)**	**6.16 (3.79)**	**----**	**0.38 (0.38)**	**0.60 (0.55)**
		----	**----**	**0.0 - 90.15**	**0.0 - 54.55**	**----**	**0.0 - 8.33**	**0.0 - 48.49**
Osmanthus americanus	N	----	----	----	0.61 (0.61)	----	----	----
		----	----	----	0.0 - 9.09	----	----	----
Total: *Osmanthus* sp.	**N**	**----**	**----**	**----**	**0.61 (0.61)**	**----**	**----**	**----**
		----	**----**	**----**	**0.0 - 9.09**	**----**	**----**	**----**
Persea sp.	N	----	----	2.51 (1.61)	----	----	----	0.04 (0.04)
		----	----	0.0 - 40.91	----	----	----	0.0 - 3.79
Total: *Persea* sp.	**N**	**----**	**----**	**2.51 (1.61)**	**----**	**----**	**----**	**0.04 (0.04)**
		----	**----**	**0.0 - 40.91**	**----**	**----**	**----**	**0.0 - 3.79**
Pinus echinata	N	----	----	----	----	----	----	0.16 (0.16)
		----	----	----	----	----	----	0.0 - 14.39
Pinus palustris	N	1.04 (0.56)	----	15.88 (4.80)	40.76 (8.44)	20.15 (4.64)	52.99 (5.71)	44.61 (3.18)
		0.0 – 22.73	----	0.0 - 87.21	0.0 - 100.00	0.0 - 40.91	0.0 - 89.39	0.0 - 100.00
Pinus taeda	N	6.03 (1.30)	91.55 (2.63)	31.22 (5.39)	19.85 (6.03)	----	8.37 (4.65)	2.63 (1.26)
		0.0 – 28.03	53.03 - 100.0	0.0 - 84.09	0.0 - 60.61	----	0.0 - 90.91	0.0 - 92.42
Total: *Pinus* sp.	**N**	**7.07 (1.36)**	**91.55 (2.63)**	**47.10 (5.80)**	**60.61 (9.77)**	**20.15 (4.64)**	**61.36 (7.05)**	**47.40 (3.28)**
		0.0 – 28.03	**53.03 - 100.0**	**0.0 - 104.55**	**0.0 - 103.03**	**0.0 - 40.91**	**0.0 - 163.64**	**0.0 - 123.49**
Prunus serotina	N	0.14 (0.14)	----	1.09 (0.61)	----	0.15 (0.15)	0.99 (0.61)	0.43 (0.28)
		0.0 – 6.06	----	0.0 - 13.64	----	0.0 - 1.52	0.0 - 12.12	0.0 - 21.97
Total: *Prunus* sp.	**N**	**0.14 (0.14)**	**----**	**1.09 (0.61)**	**----**	**0.15 (0.15)**	**0.99 (0.61)**	**0.43 (0.28)**
		0.0 – 6.06	**----**	**0.0 - 13.64**	**----**	**0.0 - 1.52**	**0.0 - 12.12**	**0.0 - 21.97**
Quercus alba	N	----	----	4.96 (2.07)	----	----	----	0.17 (0.17)
		----	----	0.0 - 42.42	----	----	----	0.0 - 15.15
Quercus falcata	N	0.40 (0.29)	----	3.84 (1.57)	11.77 (4.69)	1.36 (0.92)	----	5.86 (1.47)
		0.0 – 12.12	----	0.0 - 33.33	0.0 - 57.58	0.0 - 7.58	----	0.0 - 60.61

Table B.1 (Continued)

Quercus hemisphaerica	N	----	----	1.72 (1.72)	----	----	----	----
		----	----	0.0 - 50.00	----	----	----	----
Quercus incana	N	----	----	0.52 (0.52)	----	----	----	0.65 (0.38)
		----	----	0.0 - 15.15	----	----	----	0.0 - 22.73
Quercus laevis	N	----	----	0.63 (0.46)	----	----	----	1.03 (0.60)
		----	----	0.0 - 12.12	----	----	----	0.0 - 37.12
Quercus margaretta	N	0.07 (0.07)	----	1.18 (1.18)	----	----	----	2.46 (0.96)
		0.0 – 3.03	----	0.0 - 34.09	----	----	----	0.0 - 50.00
Quercus marilandica	N	0.03 (0.03)	----	3.32 (1.64)	4.55 (2.51)	----	----	1.15 (0.48)
		0.0 – 1.52	----	0.0 - 33.33	0.0 - 36.36	----	----	0.0 - 25.76
Quercus nigra	N	0.49 (0.30)	----	18.10 (4.13)	16.62 (6.49)	0.61 (0.61)	1.69 (1.23)	5.61 (1.55)
		0.0 – 10.61	----	0.0 - 68.18	0.0 - 83.33	0.0 - 6.06	0.0 - 26.52	0.0 - 89.39
Quercus pagoda	N	----	----	----	----	----	----	0.79 (0.56)
		----	----	----	----	----	----	0.0 - 46.97
Quercus phellos	N	----	----	2.17 (1.87)	----	----	----	----
		----	----	0.0 - 53.79	----	----	----	----
Quercus sp.	N	0.07 (0.07)	0.03 (0.03)	0.94 (0.94)	----	----	----	0.19 (0.19)
		0.0 – 3.03	0.0 - 0.76	0.0 - 27.27	----	----	----	0.0 - 16.67
Quercus stellata	N	----	----	3.11 (2.88)	----	----	----	1.05 (0.88)
		----	----	0.0 - 83.33	----	----	----	0.0 - 75.76
Quercus virginiana	N	----	----	0.73 (0.73)	----	0.91 (0.91)	----	0.19 (0.19)
		----	----	0.0 - 21.21	----	0.0 - 9.09	----	0.0 - 17.42
Total: *Quercus* sp.	**N**	**1.06 (0.43)**	**0.03 (0.03)**	**41.22 (6.98)**	**32.93 (9.96)**	**2.88 (1.64)**	**1.69 (1.23)**	**19.17 (3.32)**
		0.0 – 12.12	**0.0 - 0.76**	**0.0 - 118.18**	**0.0 - 110.61**	**0.0 - 15.15**	**0.0 - 26.52**	**0.0 - 118.18**
Sassafras albidum	N	----	----	----	0.25 (0.25)	----	----	----
		----	----	----	0.0 - 3.79	----	----	----
Total: *Sassafras* sp.	**N**	**----**	**----**	----	**0.25 (0.25)**	**----**	**----**	----
		----	**----**	----	**0.0 - 3.79**	**----**	**----**	----
Symplocos tinctoria	N	----	----	4.96 (1.87)	0.91 (0.91)	----	----	0.22 (0.22)
		----	----	0.0 - 43.18	0.0 - 13.64	----	----	0.0 - 18.94
Total: *Symplocos* sp.	**N**	**----**	**----**	**4.96 (1.87)**	**0.91 (0.91)**	**----**	**----**	**0.22 (0.22)**
		----	**----**	**0.0 - 43.18**	**0.0 - 13.64**	**----**	**----**	**0.0 - 18.94**
Viburnum dentatum	N	----	----	1.20 (0.75)	----	----	----	----
		----	----	0.0 - 18.18	----	----	----	----
Total: *Viburnum* sp.	**N**	**----**	**----**	**1.20 (0.75)**	**----**	**----**	**----**	**----**
		----	**----**	**0.0 - 18.18**	**----**	**----**	**----**	**----**
Vines								
Berchemia scandens	N	0.20 (0.20)	----	----	----	----	----	----
		0.0 – 9.09	----	----	----	----	----	----

Table B.1 (Continued)

Total: *Berchemia* sp.	**N**	**0.20 (0.20)**	**----**	**----**	**----**	**----**	**----**	**----**
		0.0 – 9.09	**----**	**----**	**----**	**----**	**----**	**----**
Bignonia capreolata	N	----	----	0.24 (0.16)	----	----	----	----
		----	----	0.0 - 3.79	----	----	----	----
Total: *Bignonia* sp.	**N**	**----**	**----**	**0.24 (0.16)**	**----**	**----**	**----**	**----**
		----	**----**	**0.0 - 3.79**	**----**	**----**	**----**	**----**
Gelsemium sempervirens	N	0.25 (0.25)	0.03 (0.03)	1.28 (0.61)	0.05 (0.05)	----	0.03 (0.03)	0.16 (0.09)
		0.0 – 11.36	0.0 - 0.76	0.0 - 12.88	0.0 - 0.76	----	0.0 - 0.76	0.0 - 6.06
Total: *Gelsemium* sp.	**N**	**0.25 (0.25)**	**0.03 (0.03)**	**1.28 (0.61)**	**0.05 (0.05)**	**----**	**0.03 (0.03)**	**0.16 (0.09)**
		0.0 – 11.36	**0.0 - 0.76**	**0.0 - 12.88**	**0.0 - 0.76**	**----**	**0.0 - 0.76**	**0.0 - 6.06**
Jacquemontia tamnifolia	N	----	0.03 (0.03)	----	----	----	----	----
		----	0.0 - 0.76	----	----	----	----	----
Total: *Jacquemontia* sp.	**N**	**----**	**0.03 (0.03)**	**----**	**----**	**----**	**----**	**----**
		----	**0.0 - 0.76**	**----**	**----**	**----**	**----**	**----**
Parthenocissus quinquefolia	N	0.03 (0.03)	0.24 (0.19)	0.31 (0.27)	----	----	----	----
		0.0 – 1.52	0.0 - 4.55	0.0 - 7.58	----	----	----	----
Total: *Parthenocissus* sp.	**N**	**0.03 (0.03)**	**0.24 (0.19)**	**0.31 (0.27)**	**----**	**----**	**----**	**----**
		0.0 – 1.52	**0.0 - 4.55**	**0.0 - 7.58**	**----**	**----**	**----**	**----**
Passiflora incarnata	N	0.02 (0.02)	----	----	----	----	----	----
		0.0 – 0.76	----	----	----	----	----	----
Total: *Passiflora* sp.	**N**	**0.02 (0.02)**	**----**	**----**	**----**	**----**	**----**	**----**
		0.0 – 0.76	**----**	**----**	**----**	**----**	**----**	**----**
Rubus sp.	N	0.24 (0.17)	3.45 (1.60)	0.05 (0.05)	----	0.53 (0.53)	----	----
		0.0 – 6.82	0.0 - 31.06	0.0 - 1.52	----	0.0 - 5.30	----	----
Total: *Rubus* sp.	**N**	**0.24 (0.17)**	**3.45 (1.60)**	**0.05 (0.05)**	**----**	**0.53 (0.53)**	**----**	**----**
		0.0 – 6.82	**0.0 - 31.06**	**0.0 - 1.52**	**----**	**0.0 - 5.30**	**----**	**----**
Smilax bona-nox	N	----	----	----	0.05 (0.05)	----	----	----
		----	----	----	0.0 - 0.76	----	----	----
Smilax glauca	N	----	----	----	0.25 (0.25)	----	----	----
		----	----	----	0.0 - 3.79	----	----	----
Smilax sp.	N	0.05 (0.05)	----	0.05 (0.05)	0.61 (0.61)	----	0.21 (0.17)	0.08 (0.08)
		0.0 – 2.27	----	0.0 - 1.52	0.0 - 9.09	----	0.0 - 3.79	0.0 - 6.82
Total: *Smilax* sp.	**N**	**0.05 (0.05)**	**----**	**0.05 (0.05)**	**0.91 (0.64)**	**----**	**0.21 (0.17)**	**0.08 (0.08)**
		0.0 – 2.27	**----**	**0.0 - 1.52**	**0.0 - 9.09**	**----**	**0.0 - 3.79**	**0.0 - 6.82**
Toxicodendron radicans	N	----	0.42 (0.42)	0.18 (0.118)	----	----	----	----
		----	0.0 - 10.61	0.0 - 5.30	----	----	----	----
Total: *Toxicodendron* sp.	**N**	**----**	**0.42 (0.42)**	**0.18 (0.118)**	**----**	**----**	**----**	**----**
		----	**0.0 - 10.61**	**0.0 - 5.30**	**----**	**----**	**----**	**----**
Vitis aestivalis	N	----	----	0.31 (0.31)	----	----	----	----
		----	----	0.0 - 9.09	----	----	----	----

Table B.1 (Continued)

Vitis rotundifolia	N	0.83 (0.48)	7.67 (2.74)	2.27 (1.09)	0.30 (0.30)	1.67 (1.67)	1.24 (0.91)	1.75 (1.07)
		0.0 – 17.42	0.0 - 49.49	0.0 - 24.24	0.0 - 4.55	0.0 - 16.67	0.0 - 19.69	0.0 - 89.39
Total: *Vitis* sp.	**N**	**0.83 (0.48)**	**7.67 (2.74)**	**2.59 (1.11)**	**0.30 (0.30)**	**1.67 (1.67)**	**1.24 (0.91)**	**1.75 (1.07)**
		0.0 – 17.42	**0.0 - 49.49**	**0.0 - 24.24**	**0.0 - 4.55**	**0.0 - 16.67**	**0.0 - 19.69**	**0.0 - 89.39**
Lonicera japonica	Nn	----	0.21 (0.21)	1.09 (0.94)	----	----	----	----
		----	0.0 - 5.30	0.0 - 27.27	----	----	----	----
Total: *Lonicera* sp.	**Nn**	**----**	**0.21 (0.21)**	**1.09 (0.94)**	**----**	**----**	**----**	**----**
		----	**0.0 - 5.30**	**0.0 - 27.27**	**----**	**----**	**----**	**----**
Lygodium japonicum	Nn	----	1.21 (0.93)	----	----	----	----	----
		----	0.0 - 22.73	----	----	----	----	----
Total: *Lygodium* sp.	**Nn**	**----**	**1.21 (0.93)**	**----**	**----**	**----**	**----**	**----**
		----	**0.0 - 22.73**	**----**	**----**	**----**	**----**	**----**