FINAL PERFORMANCE REPORT

FEDERAL AID GRANT NO. T-31-P-1

STATUS AND HABITAT FOR CERULEAN WARBLERS AND OTHER FOREST BIRDS IN EASTERN OKLAHOMA

OKLAHOMA DEPARTMENT OF WILDLIFE CONSERVATION

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State: Oklahoma **Grant Number:** T-31-P-1

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Principle Investigator: Timothy O'Connell

Project Leader (ODWC): Mark Howery

Abstract – In 2006 and 2007, we conducted point counts at 150 sites within the historic range of the Cerulean Warbler (*Dendroica cerulea*) in eastern Oklahoma. Cerulean Warblers were documented at five (3.3%) of the sites surveyed. These sites were located in LeFlore County on north-facing slopes in the Ouachita Mountains, near ridge tops between 641 and 721 meters in elevation. We encountered eight adult males and four adult females at these five sites and confirmed breeding from separate observations of pairs feeding fledglings in June 2006 on Lynn Mountain, and in June 2007 on Rich Mountain. Compared to sites where we did not encounter Cerulean Warblers, sites where they were detected supported a taller and more densely vegetated canopy, a more densely vegetated understory, and were restricted to the north-facing slopes of the region's highest ridges. The number of birds we observed represents a minimum population estimate, and additional pockets of breeding Cerulean Warblers may occupy other forested ridgetops that we were not able to survey. We recommend that these high elevation forests in the Ouachita Mountains be managed to maximize forest patch size, canopy height, and canopy closure. Data also were recorded for all other songbirds found at the Cerulean Warbler surveys to assess avian community structure and the habitat relationships of other forest songbirds of conservation concern. Based upon these analyses, the Ouachita Mountains, likely owing to their higher elevation and larger tracts of contiguous mature forest, provided habitat for a larger spectrum of eastern forest songbirds than did the lower and more fragmented Ozark Plateau. Breeding densities for multiple species at the edges of their geographic ranges in eastern Oklahoma forests were similar to estimates from the cores of these species' distributions in the Appalachains, Midwest and Northeast. Forest bird conservation in the region should focus on maintenance of large contiguous forest patches, especially mesic forests in bottomlands and along north-facing slopes.

Objective:

Conduct generalized surveys for forest songbirds in riparian and upland slope forest habitats in eastern Oklahoma, with targeted surveys for the Cerulean Warbler to determine its status as a breeding bird in Oklahoma. If breeding Cerulean Warblers are documented, derive estimate of population size, quantify habitat affinity, and delineate occurrence area.

Results and Discussion:

The four attached appendices constitute the Final Report and will eventually be presented as a Graduate Thesis at Oklahoma State University by Vincent S. Cavalieri:

Appendix I, "The distribution of breeding Cerulean Warblers (*Dendroica cerulea*) in Oklahoma,"

Appendix II, "A bird community on the edge: habitat use of forest songbirds in eastern Oklahoma,"

Appendix III, "Information about each of the surveyed sites," and

Appendix IV, "Maps of avian species of special concern and other selected species.

Appendices I and II have been prepared for submission to scientific journals. Appendix I was prepared for submission to the *Southeastern Naturalist*, and Appendix II was prepared for submission to the *Wilson Journal of Ornithology*.

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Appendix I

The distribution of breeding Cerulean Warblers (*Dendroica cerulea*) in Oklahoma

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[1]*U.S. Geological Survey, Oklahoma Cooperative Fish and Wildlife Research Unit and Department of Natural Resource Ecology and Management, Oklahoma State University, Stillwater, OK 74078*

Abstract – Recent field work for Oklahoma's Breeding Bird Atlas failed to locate the Cerulean Warbler, raising concerns of range contraction for this formerly uncommon breeder. In 2006 and 2007, we conducted point counts at 150 sites throughout the species' historical range in Oklahoma. We located Cerulean Warblers at five (3.3%) of the sites surveyed. These sites were located on north slopes in the Ouachita Mountains, near ridge tops between 641 and 721 m elevation. We encountered eight adult males and four adult females at the five sites. We confirmed breeding from separate observations of pairs feeding fledglings in June 2006 on Lynn Mountain, and in June 2007 on Rich Mountain, both locations in LeFlore County. Compared to sites where we did not encounter Cerulean Warblers, sites where they were detected supported a taller and more densely vegetated canopy and were restricted to the region's highest ridges. The number of birds we observed represents a minimum population estimate, and other forested ridgetops we were not able to survey may harbor additional pockets of breeding Cerulean Warblers. We recommend these high elevation forests in the Ouachita Mountains be managed to maximize forest patch size, canopy height, and canopy closure.

INTRODUCTION

The Cerulean Warbler (*Dendroica cerulea*) is a small, insectivorous wood warbler that breeds in deciduous forests of eastern North America. Nearctic-Neotropical migrants, Cerulean Warblers make annual migrations between breeding areas concentrated in the east-central United States and wintering areas in northern South America (Hamel 2000a, Hamel 2000b). The species occupies a discontinuous breeding range from the eastern Great Plains to the Atlantic Coastal Plain, including areas from southern Arkansas to southern Quebec (Hamel 2000a). Population density varies greatly over the breeding distribution, with population centers in the central Appalachians of Ohio, West Virginia, and Kentucky, as well as in southern Wisconsin, southwestern Michigan, southern Missouri, and northwestern Arkansas (Hamel 2000b, Rosenberg et al. 2000). Cerulean Warblers winter primarily in the Andes Mountains in northern South America (Hamel 2000a), including parts of Colombia, Venezuela, Ecuador, Peru, and Bolivia (Hamel 2000a).

Based on data from the North American Breeding Bird Survey, the Cerulean Warbler has declined faster than almost any other species in North America (Hamel 2000a), suffering annual losses of at least 3% since 1966 (Link and Sauer 2002). The Cerulean Warbler is one of the highest conservation priorities for Partners in Flight (Rich et al. 2000, Jones et al. 2004) and was recently considered for listing under the Endangered Species Act (USFWS 2006). Investigative work for the Endangered Species Act has driven much of the recent research on this species (Hamel et al. 2004, Jones et al. 2004, Hamel 2005, Rogers 2006), including a rangewide assessment of distribution and abundance (Rosenberg et al. 2000).

Cerulean Warblers generally require large forested tracts for breeding (Robbins et al., 1992, Hamel 2000a, Hamel 2000b). They normally are found in forests with relatively closed canopies, though the importance of canopy gaps has been noted (Robbins et al. 1992, Oliarnyk and Robinson 1996, Hyde et al. 2000, Hamel 2000a, Wood et al. 2005). Habitat selection can vary throughout the breeding range, with forested slopes at relatively high elevation (>1000m) used in some areas (e.g., Hamel 2000a, Hyde et al. 2000), and bottomland hardwood forest used in others (e.g., Robbins et al. 1992). Wintering habitat in the Neotropics includes mature broad-leaf and second growth forest, as well as shade coffee plantations (Terborgh 1989, Robbins et al. 1992, Degraaf and Rappole 1995, Jones and Robertson 1997).

Loss of mature streamside and bottomland deciduous forest in the United States, whether to logging or to reservoir development, is thought to be a major cause of the decline of the Cerulean Warbler (Hamel 2000a). Significant areas of former breeding habitat have also been lost to surface mining operations in the Appalachians. Habitat loss on the wintering grounds as well as mortality in migration may also contribute to the decline (Hamel 2000a).

Despite the overall trend of a rangewide decline, the Cerulean Warbler has actually expanded its breeding range in recent years (Oliarnyk and Robertson 1996, Hamel 2000a), particularly in the Northeast. This apparent range expansion may be reclamation of former breeding range, as regenerating forests in the region mature. The expansion illustrates that conservation of this species may require attention to the edges of its range, as well as the population center.

At the southwestern edge of its range, the Cerulean Warbler was formerly a widespread and locally abundant breeder in bottomland forests along the Arkansas River and its tributaries in eastern Oklahoma (Tomer 1992, Sutton 1967). Carter (1967) determined that there were 2.9

pairs/40 ha in bottomland forest along the Mountain Fork River on the McCurtain County Wilderness Area. The population in the state declined; however, following several reservoir construction projects that inundated former breeding areas. Isolated encounters were reported in the 1990s (e.g., Couch 1996), all restricted to a single county (LeFlore). Despite multiple years of field effort for Oklahoma's Breeding Bird Atlas (Reinking 2004), no Cerulean Warblers were reported. Because the rangewide Cerulean Warbler Atlas Project (Rosenberg et al. 2000) did not include Oklahoma, it was not known if the lack of Cerulean Warblers indicated that the species had been extirpated.

Due to the incomplete state of knowledge regarding the population size and distribution of Cerulean Warbler at the edge of its range in Oklahoma, we endeavored to conduct targeted surveys for this declining species within the state. Especially considering the propensity for the species to reclaim former areas of its breeding range, we considered several counties in eastern Oklahoma as potentially providing breeding habitat for the species. Our objectives were to identify populations and confirm the breeding of Cerulean Warblers in Oklahoma, and to characterize its occupied habitat.

METHODS

STUDY AREA

We focused field surveys on areas within the historical range of Ceruleans Warblers that support large tracts of forested land, primarily the Ouachita Mountains and the Ozark Highlands (Fig. 1). The Ouachita Mountains are characterized by a series of east-west ridges in western Arkansas and southeastern Oklahoma. The mountains occupy approximately 54,000

km^2 in 26 counties in Arkansas and 10 counties in Oklahoma (Rafferty and Catau 1991). The Ouachita region remains one of the largest and most contiguously forested areas in the eastern United States. More than 3,200 km^2 in this region are managed for mature or old-growth type forests (Chipley et al. 2003). Habitats in this area consist of upland sites containing shortleaf and loblolly pines, mixed pine-hardwood, and oak-hickory forests. Bottomland sites in the Ouachitas are dominated by oak-gum cypress or elm-ash-cottonwood forests (Chipley et al. 2003).

The Ozark Highlands occupy parts of southern Missouri, northern Arkansas, and northeast Oklahoma and cover approximately 21,000 km^2 (Brye et al. 2004). The region consists of low mountains that are dominated by oak-hickory forests (Brye et al. 2004). This area contains some of the most extensive forests in central North America (Chipley et al. 2003).

CERULEAN WARBLER SURVEYS

Within the study area, we targeted survey sites with the greatest potential to harbor Cerulean Warblers and general survey sites to represent a gradient of forested cover and different forest types. We specifically visited historical locations for the species identified in the Cerulean Warbler Atlas Project (Rosenberg et al. 2000) and other sources. Prior to the start of field work, we used Terrain Navigator software to construct maps of sites to survey based on the presence of historical locations for Ceruleans, as well as sites that represented different characteristics of slope, aspect, and extent of forest cover. We specifically populated our surveys with multiple forested sites at high elevation and mature bottomland hardwood forest, the typical habitats used by the species elsewhere in its range. We also selected many sites in the field, following site reconnaissance that revealed desirable cover types to sample such as

riparian forest, second-growth hardwoods, pine plantation forestry, agricultural areas, and urban/suburban areas

Each survey site consisted of four plots spaced 250 meters apart on a 1-km transect (Fig. 2). We placed plots 250 meters apart because the radius between counts was then generally outside the area of detectability for many species of small land birds (Hutto et al. 1986). We sampled birds at each of the plots using six-minute, 100 meter fixed-radius point counts. We split the six-minute counts into three equal bands of two minutes each to facilitate the application of *post-hoc* removal models to aid in the calculation of species-specific detection probabilities (Farnsworth et al. 2002). Counts took place between sunrise and approximately 1030 hrs CDT (Hutto et al. 1986, Ralph et al. 1995).

At the conclusion of each point count, we broadcast Cerulean Warbler song from a portable compact disk player and external speaker song for one minute, and listened for a response for an additional minute (Rosenberg et al. 2000). If Cerulean Warblers were detected in response to the song broadcast, we invested additional time to determine if breeding could be confirmed based on observation of an active nest, fledglings, or an adult carrying food (Reinking 2004). We also recorded multiple GPS locations for each male Cerulean Warbler encountered to attempt to delimit the territory. We surveyed 75 sites in 2006 and 75 sites in 2007.

HABITAT SAMPLING

We quantified site characteristics from three 5-m circular plots 15 m from point count center at 0, 120, and 240 degrees (N = 12 plots/site) (Fig. 1). We used a modified version of the vegetation sampling protocol described in Martin et al. (1997). Within each plot, we estimated

percent slope using a clinometer and recorded elevation from a hand-held GPS unit. For overstory trees, we visually estimated percent cover, measured canopy height with a clinometer, and estimated basal area using an angle gauge from the center of each plot. To determine tree species dominance, we identified to species and counted the number of stems > 10 cm dbh within each plot. We visually estimated the percent cover of low (< 2 m) and high (> 2 m) woody shrubs and trees < 10 cm dbh. We also visually estimated the relative percent ground cover occupied by grasses, forbs, and leaves in each plot. For all percent cover estimates, we used a standardized cover template for direct comparison. All variables estimated at the plots were summarized as averages for the site.

To characterize general cover types in a larger area around each site, we first recorded the location of each point count in the field with a GPS unit and obtained coordinates for the midpoint of each sampling transect. From the midpoint, we created a 1-km buffer in ArcMap 9.2. We used a land-cover layer developed for the Oklahoma Gap Analysis Project (Fisher and Gregory 2001) to identify patches of forest and used Hawth's tools in ArcMap to calculate land-cover metrics within each buffer. For each site, we calculated the percent cover of mature forest, regenerating forest and shrubland, pasture and cropland, and urban land use within the 1-km buffer.

Statistical analyses involved the *post-hoc* identification of vegetation, land cover, and site condition differences between sites where we detected Cerulean Warblers and sites where we did not. Because of the great disparity in sample size between those two categories, we were not able to apply standard parametric statistical tests. We instead present 95% confidence intervals for the variables compared and descriptions as appropriate.

RESULTS

We detected Cerulean Warblers at five of 150 (3.3%) of the sites surveyed (Fig. 3). All fives sites were located in the Ouachita National Forest on the north slopes of Lynn and Rich mountains, both in Leflore County, Oklahoma. We encountered Cerulean Warblers exclusively near the near ridge tops between 641–721 m in forested stands.

We detected a total of eight Cerulean Warbler males. In addition we observed 4 female Cerulean Warblers. Monitoring of these Cerulean Warblers in 2006 resulted in observations of one pair on Lynn Mountain carrying food. This same pair was later seen feeding fledglings, confirming breeding for that area. During the 2007 field season a pair of Cerulean Warblers were observed feeding fledglings on Rich Mountain, confirming breeding for that location as well. Using our small sample size, our estimated detection probability for Cerulean Warbler in was 2006 was 0.9978 and for 2007 it was 1.00. Using these probabilities we estimate densities at these sites ranged from 7.97 to 15.95 singing males per 100 ha. However, typically a much larger sample size ($n > 100$) is needed to properly apply detection probabilities.

Mean canopy cover for our Cerulean Warbler sites was 70% ± SD of 6. Mean forest cover within the 1-km buffer for our Cerulean Warbler sites was 99.75% ± SD of 0.005. For low and high understory cover the means were 60% ± SD of 8 and 28% ± SD of 17 respectively. The mean for elevation was 691.1m ± SD of 30 and the mean for slope was 29.85% ± of 12. Average canopy height ranged from 16 to 21with a mean of 18 ± SD of 2.

We counted all canopy tree stems greater than 10 cm dbh for each site with Cerulean Warblers. Average stem counts for sites on Lynn Mountain were mockernut hickory (*Carya tomentosa*) n=27, black walnut (*Juglans nigra*) n=21, white oak (*Quercus alba*) n=17, and northern red oak (*Quercus rubra*) n=9. On the Rich Mountain site stem counts for the site were

mockernut hickory (*Carya tomentosa*) n=23, white oak (*Quercus alba*) n=19, black gum (*Nyssa sylvatica*) n=11, and sugar maple n=11 (*Acer saccharum*).

Even after discounting sites with less than 50% forest cover within the 1-km buffer around each site, sites where we had Cerulean Warblers had six habitat variables that were outside the 95% confidence intervals of non-Cerulean Warbler sites. These habitat variables included canopy cover, canopy height, elevation, forest cover, slope and understory cover less than two meters (Table 1).

DISCUSSION

Much of the recent research on forest songbirds has been focused on habitat conditions and other potential sources of decline (Rappole and McDonald 1994, Peterjohn and Rice 1991, Robinson et al. 1995, Donovan et al. 2002). One important cause for declines in forest songbirds is forest loss or fragmentation. Fragmentation can result in increased amounts of nest predation from various predators as well as increased brood parasitism by the Brown-headed Cowbird within an area (Hoover et al. 1995, Robinson et al. 1995, Darr et al. 1998, Ortega 1998, Rogers 2006). Certain species seem to be especially sensitive to forest fragmentation. These forest interior species seem to be more severely effected by fragmentation and some may disappear when forests no longer have the necessary amounts of interior. Some of these forest interior species include species that reach their southwestern limit in Oklahoma including the Ovenbird (*Seiurus aurocapillus*), Kentucky Warbler (*Oporornis formosus*), Hooded Warbler (*Wilsonia citrine*), Worm-eating Warbler (*Helmitheros vermivora*), Acadian Flycatcher (*Empidonax virescens*) and the Cerulean Warbler (Kroodsma 1984).

Though undoubtedly there are others causes, such as mortality during migration, that are contributing to the decline of the Cerulean Warbler (Hamel 2000a), numerous sources implicate forest fragmentation on the breeding ground as at least partially responsible for this decline (Robbins et al. 1992, Hamel 2000a, Roth and Islam 2008). This is especially true with a certain type of habitat favored by Cerulean Warblers in parts of their breeding range - bottomland hardwood forest. Agricultural areas in the Midwest and the Mississippi Alluvial Valley have lost much of their remaining mature bottomland hardwood forest (Robbins et al. 1992, Roth and Islam 2008).

Several sources indicate that Cerulean Warblers once used bottomland habitats in Oklahoma (Tomer 1992, Carter 1967, Sutton 1967). Many of our survey areas were located within current/former areas of extensive bottomland forests, including Little River NWR and along the Arkansas River in Sequoyah NWR, a site at least near the historical location discovered by Woodhouse. We also surveyed bottomland hardwood forests along Spavinaw Creek, another historical location. We did not find any Cerulean Warblers in these areas however and in most of them the forests had disappeared or were heavily fragmented. We could not survey the historical location along the Mountain Fork River where Carter (1967) studied in the 1960s because it now lies underneath Broken Bow Lake.

Cerulean Warblers still occur on the Ozark Plateau in Arkansas and Missouri and this area has been described as an area of high density for the species (Hamel 2000a). We did not, however, locate any Cerulean Warblers on the Oklahoma side of the Ozark Plateau. The apparent lack of Cerulean Warblers on the Ozark Plateau in Oklahoma may be due to the highly fragmented forest cover there (Fig. 4).

The high elevation ridge tops where we located Cerulean Warblers are structurally similar to habitats described from West Virginia and other areas in the Appalachian region (Robbins et al. 1992, Hamel 2000a, Hamel 2000b, Weakland 2005). Our Cerulean Warbler sites were also similar to Cerulean Warbler breeding habitat described in other parts of the species range in that it had higher canopy cover, canopy height and a higher slope than other forested sites in the region (Roth and Islam 2008).

Our results indicate that suitable breeding habitat for Cerulean Warblers is limiting in Oklahoma. Relative to 145 surveyed sites in forested landscapes where we did not encounter them, the five sites that supported Cerulean Warblers exhibited greater forest cover at the site scale, a taller more closed forest canopy, higher elevation, and higher percent slope. Of the 150 total sites surveyed, only nine supported the combination of environmental variables in the 95% confidence interval of sites where we encountered Cerulean Warblers. The fact that we found the species at five of nine sites with suitable habitat conditions points to a relatively high occupancy rate (55.6%) and indicates that the species may very well be limited by the amount of available habitat in Oklahoma.

In Oklahoma the Cerulean Warbler was reported to be an abundant species along the Arkansas River in the 1800s (Sutton 1967). Other reports indicate that Cerulean Warblers were at least locally common in McCurtain County and other areas of the state into the 1960s (Kuhnert 2004). Fragmentation and clearing of most of the mature deciduous forests however; seem to have eliminated the Cerulean Warbler from most of its historical range in Oklahoma (Kuhnert 2004). Results from our field work lend support to the widespread disappearance of Cerulean Warblers from most of their historic range in Oklahoma. Most of the forest lands in

Oklahoma have been changed or eliminated, leaving only a small percentage suitable for Cerulean Warblers (Kuhnert 2004).

Although we consider our Cerulean Warbler search to be thorough, it is difficult to completely search an entire region of a state and naturally due to time or other constraints there are areas that we could not get to that perhaps hold potential for Cerulean Warbler occurrence. Two of these areas include Blue Bouncer Mountain and Black Fork Mountain in Leflore County: both of these areas contain high elevation forest and extensive north-facing slope areas. We were unable to survey these areas due to challenges of access. Lynn and Rich mountains also include areas of suitable habitat that were not included in our surveys. There were several other areas that we did survey and did not find Cerulean Warblers but that met some of the minimum requirements for suitable Cerulean Warbler habitat as described in Table 1. These areas include Cucumber Creek Nature Preserve in Leflore County, Little River NWR in McCurtain County, Cookson Hills WMA in Cherokee and Adair Counties, and Spavinaw WMA in Delaware County. Our high detection probability for Cerulean Warbler makes it unlikely that we missed Cerulean Warblers while surveying these areas but continued monitoring of these areas could perhaps turn up breeding Cerulean Warblers in the future.

Figure 5 illustrates potential habitat for Cerulean Warblers in Oklahoma, based on the site characteristics associated with their occurrence at the sites where we found them in 2006–2007. Future surveys for the species in the state should target these areas specifically, and could lead to a more complete population assessment than was possible in this study. Such an assessment will be necessary to inform conservation action for Cerulean Warblers in Oklahoma.

We determined in this study that Cerulean Warblers still occur in Oklahoma forests, and that they successfully fledged young in 2006 and 2007. In advance of additional demographic information on population demographics, we perceive any habitat used by a declining species like the Cerulean Warbler to be a conservation priority. We recommend that the shaded areas in Fig. 5 be managed for maximum canopy height and canopy closure in native hardwoods.

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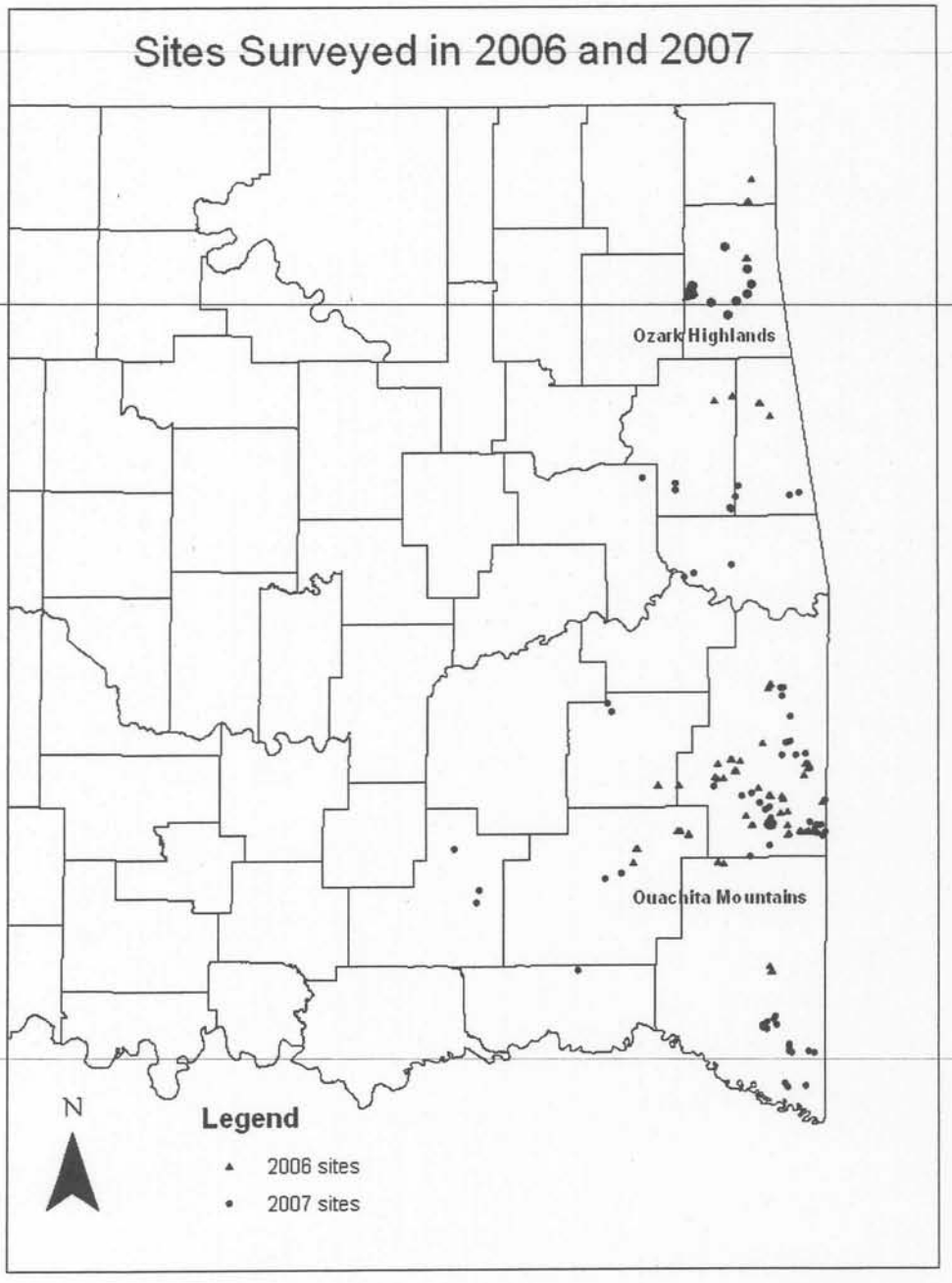

Figure 1. Location of sites surveyed in eastern Oklahoma 2006–2007.

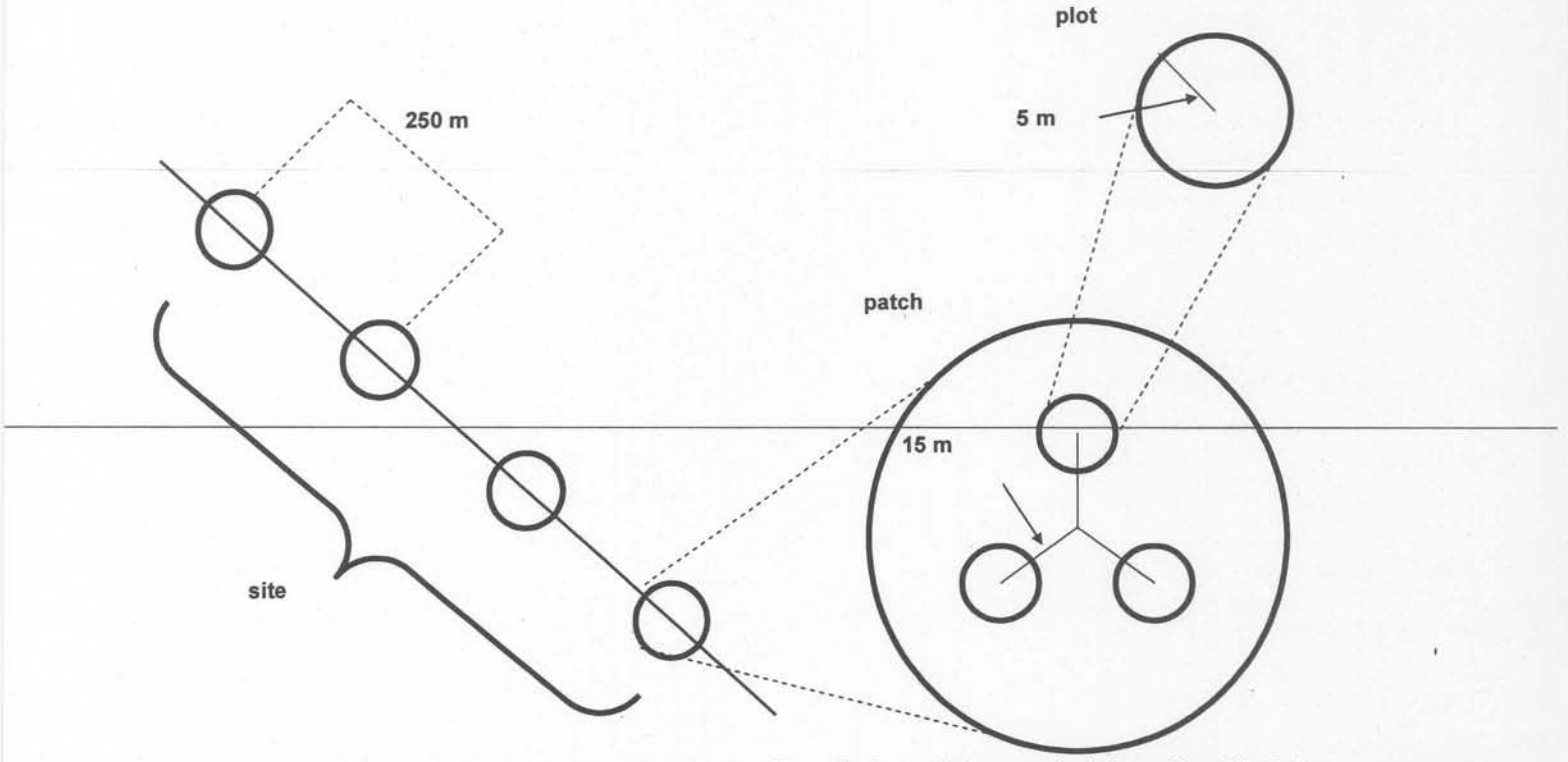

Figure 2. Schematic representation of field sampling design. We sampled breeding birds in four patches along a 1-km transect. Within a patch, we characterized vegetation and site parameters from 3, 5-m radius plots.

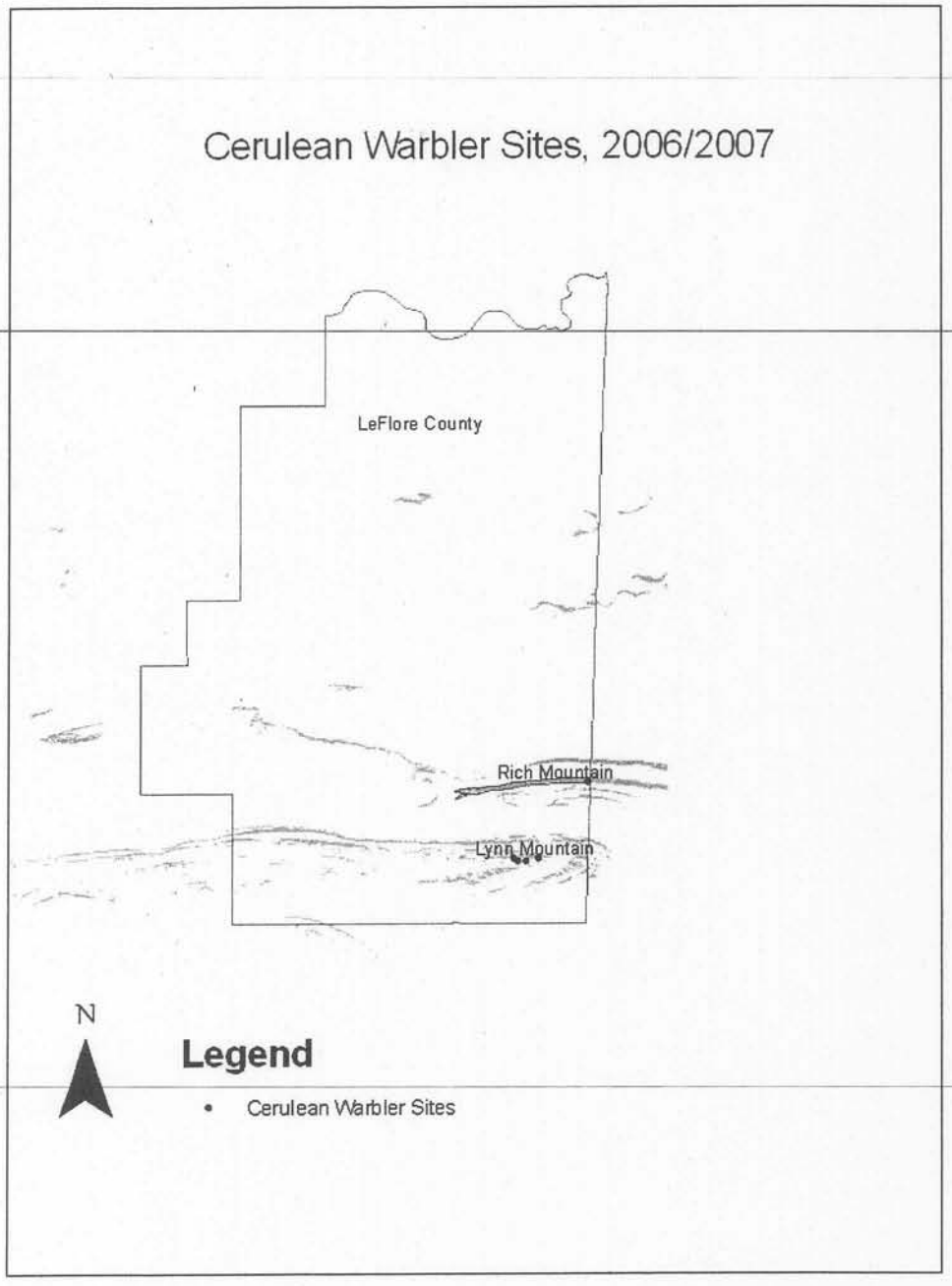

Figure 3. Locations of Cerulean Warbler Sites in Oklahoma, Rich and Lynn Mountains in LeFlore County.

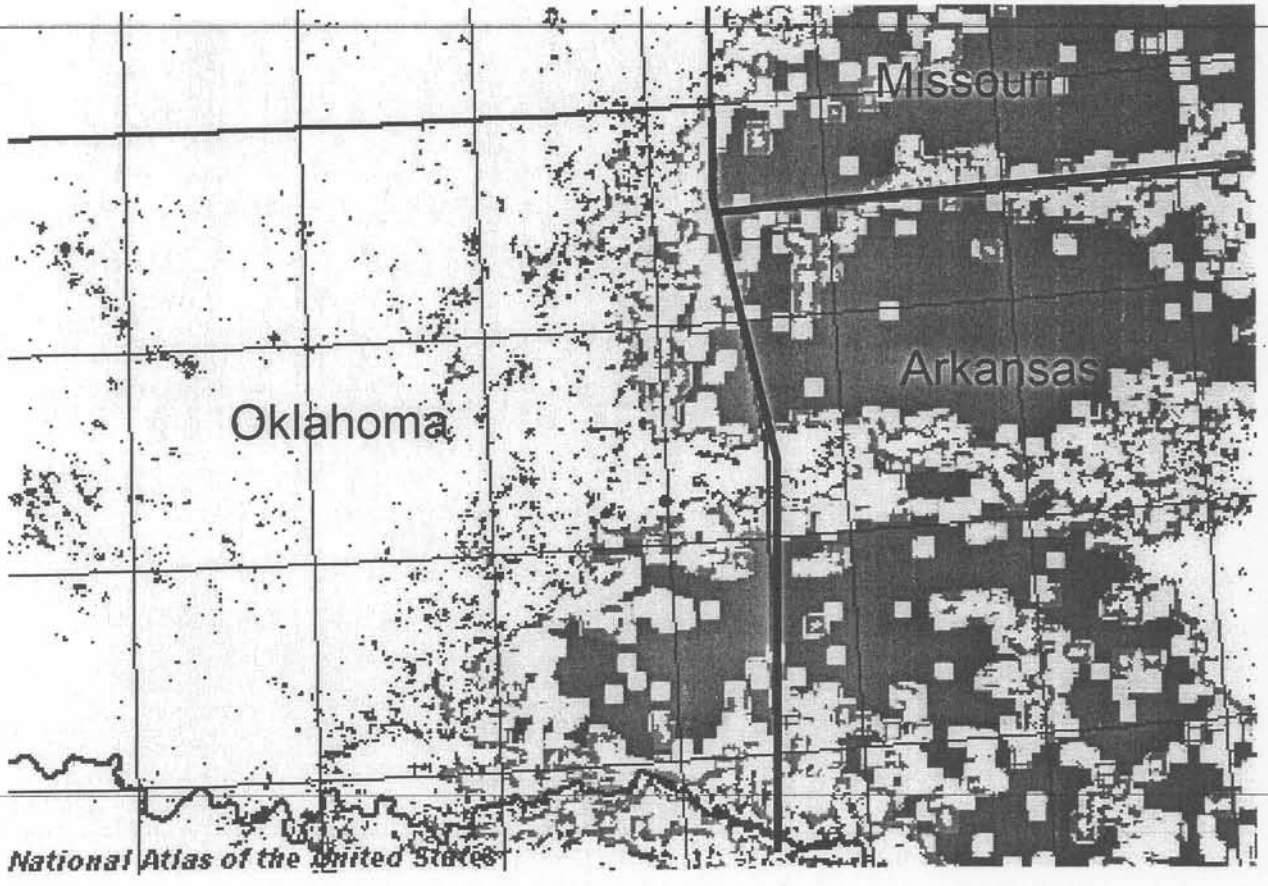

Figure 4. Forest fragmentation map from the National Atlas (National Atlas of the United States 2008), areas in Green are areas of lower fragmentation and those in yellow are areas of higher fragmentation. Much of the forest land in northeastern Oklahoma has been highly fragmented.

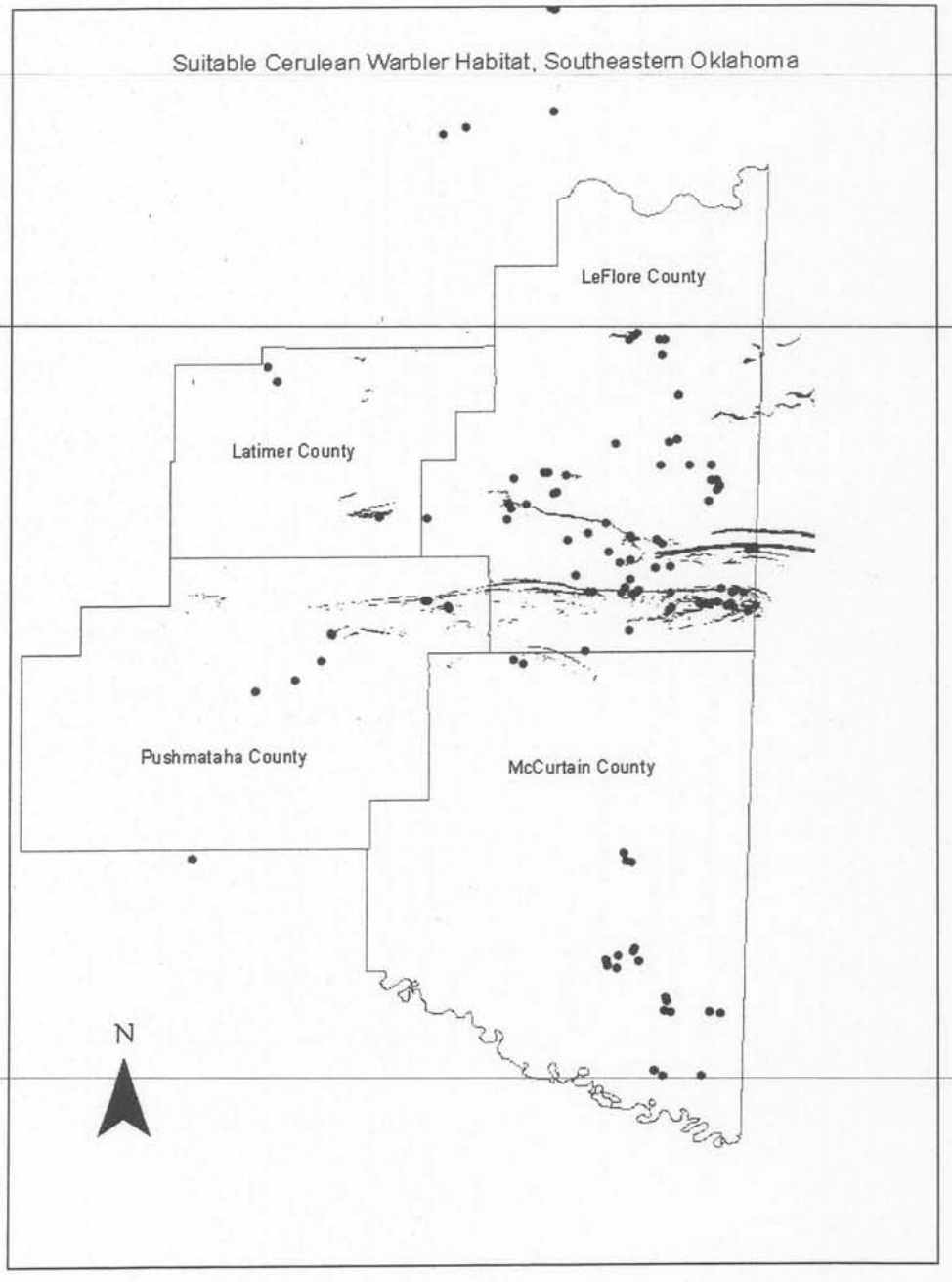

Figure 5. The dark gray areas indicate areas over 500m in elevation with a north facing slope. These are probable minimum requirements for supporting Cerulean Warblers in this region. The dots indicate our survey sites.

Environmental Variable	Sites without CERW	Sites with CERW
Basal Area (m2/ha)	72.6 – 84.03	71.69 – 86.64
Canopy Cover %	54.8 – 60.73	64.14 – 75.13
Canopy Height (m)	13.22 – 14.6	16.36 – 19.75
Elevation (m)	332.8 – 386.02	665.03 – 717.17
Forest Cover %	80.1 – 84.46	99.31 – 100.00
Grass Cover %	11.35 – 15.36	6.28 – 36.46
Herbaceous Cover %	6.12 – 8.46	6.75 – 8.32
Leaf Cover %	58.28 – 64.14	39.04 – 72.51
Slope %	9.49 – 12.62	19.75 – 39.96
Understory Cover % > 2 m	23.76 – 28.9	13.44 – 43.00
Understory Cover % < 2 m	36.35 – 41.44	52.68 – 66.56

Table 1. Comparing sites where we found territorial Cerulean Warblers to non-Cerulean Warbler sites. Each environmental variable shows a range of 95% confidence intervals around a mean value. The lower end of the 95% confidence interval for sites with CERW could be viewed as minimum requirements for Cerulean Warbler occupancy for Oklahoma habitats.

Appendix II

FOREST BIRDS IN EASTERN OKLAHOMA, A BIRD COMMUNITY ON THE EDGE: HABITAT USE OF FOREST SONGBIRDS IN EASTERN OKLAHOMA

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Abstract. Several species of forest songbirds reach a western limit of their respective distributions in eastern Oklahoma. The relative influence of habitat variables on patterns of occurrence in this region may differ from those same influences in the core of species' ranges. We examined the influence of 16 habitat variables on the occurrence and density of a suite of forest songbirds. We sampled breeding birds with four, fixed radius point counts along 1-km transects at 75 forested sites in eastern Oklahoma in 2006 and 75 additional sites in 2007. Forest cover at fine scales varied by numerous structural characteristics (e.g., canopy cover) as well as species composition (e.g., pines vs. hardwoods). To examine bird-habitat relationships, we performed both Detrended Correspondence Analysis (DCA) and Canonical Correspondence Analysis (CCA) ordinations using 16 environmental variables and 40 bird species. Forward Selection in CCA indicated that the most important structural variables affecting bird habitat relationships were percent broad-scale forest cover, canopy height, and elevation. We found that the Ouachita Mountains, likely owing to their higher elevation and larger areas of contiguous mature forest, provided habitat for a larger spectrum of eastern forest songbirds than did the lower and more fragmented Ozarks. Breeding densities for multiple species at the edge of their distribution in eastern Oklahoma forests were similar to estimates for the core of species distributions in the Appalachians, Midwest, and Northeast. Conservation in the region should focus on maintenance of large contiguous forest patches, especially mesic forests in bottomlands and along the ridgetops and north-facing slopes of the Ouachita Mountains.
Key Words: Canonical Correspondence Analysis, distribution, forest songbirds, Oklahoma, Ouachitas, Ozarks

INTRODUCTION

Partners in Flight's (PIF) strategic planning for conservation has focused on developing objective criteria for ranking priority species and developing ecoregion-specific management prescriptions for those species (Bonney et al. 1999, Beissinger et al. 2000, Carter et al. 2000). Many species of forest birds in eastern North America occur predominantly in large forest tracts (e.g., Galli et al. 1976, Robbins et al. 1989, Freemark et al. 1995). Rich et al. (2004) identified an "Eastern Avifaunal Biome" in which 17 of 44 species of continental importance were dependent on mature deciduous forest. They called for "comprehensive forest planning on all public lands" to maintain these species (Rich et al. 2004). Broad conservation objectives for species at regional and continental scales, however, can be difficult to translate to the finer scale where land use decisions are typically made, (e.g. municipal and regional planning offices).

Management prescriptions for forest birds have been provided by Whitcomb et al. (1981), Lynch and Whigham (1984), Robbins et al. (1989), and Freemark and Collins (1992). Due to variability across the area over which forest birds breed in the eastern United States, however, it is difficult to generalize across entire species distributions, and untenable to assume that a relationship determined in one ecoregion can be assumed to apply to another. In some studies (e.g., Rodewald and Yahner 2000, Hagan and Meehan 2002, Lee et al. 2002), variability in stand-level characteristics, weather conditions, or food availability exerted a greater influence on forest bird populations than did forest cover in the local landscape. In other studies (e.g., Hall 1984, Holmes and Sherry 1988, Rotenberry et al. 1995, Nagy and Holmes 2005), broad scale forest area, isolation, or forest pattern were important to maintaining quality habitat for forest birds. O'Connell et al. (2000) described qualitative changes in forest

bird communities related to forest extent in the local matrix, and Rodewald (2002, 2003) and Hagan and Meehan (2002) stressed the importance of considering the influence of the disturbance matrix type (e.g., agricultural or silvicultural) in non-forested landscapes. Even within a species, it is difficult to apply general management guidelines everywhere it occurs. For example, Trine (1998) surmised that Wood Thrush (*Hylocichla mustelina*) might need forested tracts >2,500 ha to support "source" populations in the Midwest, but Hoover et al. (1995) demonstrated high rates of nest success over a wide range of areas (approximately 127 to >10,000 ha) in forested tracts in Pennsylvania.

Approximately 30 forest birds from the eastern United States reach a western range limit in Oklahoma. These include such Partners In Flight priority species as the Kentucky Warbler (*Oporornis formosus*), Hooded Warbler (*Wilsonia citrine*), Worm-eating Warbler (*Helmitheros vermivora*), Acadian Flycatcher (*Empidonax virescens*) and Cerulean Warbler (*Dendroica cerulea*) (Reinking 2004, Rich et al. 2004). These species are largely confined to the easternmost counties while others (e.g., Black-and-White Warbler (*Mniotilta varia*), Northern Parula (*Parula Americana*), and Louisiana Waterthrush (*Seiurus motacilla*) breed > 400 km farther west (Reinking 2004). There are no widely published studies that specifically focus on habitat relationships of forest songbirds in Oklahoma, and the ability of these species to occur in fragmented forests on the periphery of their breeding ranges illustrates that habitat use can be different from that found closer to the core of their ranges. It is important to understand these relationships in the broad zone where eastern forests transition to western grasslands. Effective management for forest songbirds in Oklahoma requires a better understanding of the influence of broad- and fine-scale habitat attributes in Oklahoma ecoregions.

We studied the influence of 16 environmental variables on the distribution and abundance of forest songbirds in eastern Oklahoma. Our objectives were to describe specific elements of vegetation structure and composition that provide suitable conditions for multiple forest-breeding songbirds.

METHODS

STUDY AREA

We studied forest songbirds in the Ouachita Mountains and Ozark Highlands of eastern Oklahoma (Fig. 1). The Ouachita Mountains occupy approximately 54,000 km^2, including portions of 26 Arkansas and 10 Oklahoma counties (Rafferty and Catau 1991). The range is characterized by an east to west orientation, with multiple ridges extending approximately 362 km east to west and 160 km north and south. The Ouachita region remains one of the largest and most contiguous forested areas in the eastern United States. More than 3,200 km^2 in this region are managed for mature or old-growth type forests (Chipley et al. 2003). Habitats in this area consist of upland shortleaf (*Pinus echinata*) and loblolly pine (*P. taeda*), mixed pine-hardwood, and oak (*Quercus*)-hickory (*Carya*) forests. Bottomland forests are characterized by oak (*Quercus*)-gum (*Nissa*)-cypress (*Taxodium*) or elm (*Ulmus*)-ash (*Fraxinus*)-cottonwood (*Populus*) forests (Chipley et al. 2003). The unusual orientation of the ridges results in markedly different communities on either side of the ridgeline (mesic on north faces; xeric on south faces).

The Ozark Highlands occupy a wide region in southern Missouri, Arkansas, and northeastern Oklahoma. The region consists of mountains that are dominated by oak-hickory forests (Brye et al. 2004). This area contains some of the most extensive forests in central North

America (Chipley et al. 2003); the Oklahoma portion makes up the western edge of this approximately 21,000 km^2 ecoregion. (Brye et al. 2004).

BIRD SURVEYS

We selected and surveyed 75 forested sites in 2006 and an additional 75 sites in 2007. Each site consisted of four plots spaced 250m apart on a 1-km transect. We intentionally sampled from bottomland hardwoods, ridgetops, and slopes of different aspect so that we could address structural and compositional differences among forest types in our analyses.

We sampled birds once at each of the plots using 6-min, 100m fixed-radius point counts. These counts took place from local sunrise to approximately 1030 h CDT (Hutto et al. 1986, Ralph et al. 1995). During point counts, we counted all singing males within 100 m of plot center and noted the time of first detection for each individual as within the first, middle, or final two minutes of the 6-minute count. Recording data on singing males in discrete time bands allowed us to apply *post-hoc* removal models to the data (Farnsworth et al. 2002, *online supplement*) to calculate an observer-specific probability of detection for each species. We then divided the raw number of each species detected on a count by the observer specific detection probability to derive a detection-adjusted estimate of abundance that would permit direct comparison among species and observers. We calculated breeding density at a site by dividing the detection-adjusted abundance by the total area sampled per site (13 ha).

SITE CHARATERISTICS

We quantified site characteristics from the four sampling points per site, and from three, 5-m circular plots established 15 m from each point count center at 0, 120, and 240 degrees (*N*

= 12 plots/site). We used a modified version of the vegetation sampling protocol described in Martin et al. (1997) to collect data on 16 environmental variables. Average percent canopy cover was assessed at each plot as a total percentage of leaf cover in the canopy and then averaged across all plots ($N = 12$) for each site. We used an angle gauge (BAF 10) to estimate basal area of canopy trees using a plotless sample (Stoddard and Stoddard 1987) from the four point count center points at each site. We estimated canopy height at each plot (N = 12) using either a clinometer or laser range finder. We identified all stems > 10 cm dbh to species and characterized plots according to the most abundant species. This resulted in five nominal categories: pine, cross timbers oak, hickory, oak-hickory, and "other" (included plots where the most abundant species were non-oak-hickory hardwood species). We estimated elevation and slope at each plot with a hand-held GPS unit and clinometer, respectively. We visually estimated percent cover of low (< 2 m) and high (> 2 m) understory cover, as well as ground cover in grasses forbs, and leaves in each plot.

In addition to site and vegetation data collected from the ground, we characterized forest cover in the local landscape surrounding each site. We used a hand-held GPS unit to obtain coordinates for the midpoint of each sampling transect. From the midpoint, we created a 1-km buffer in ArcMap 9.2. We overlaid a land-cover layer developed for the Oklahoma Gap Analysis Project (Fisher and Gregory 2001) to identify patches of forest and used Hawth's tools in ArcMap to calculate land-cover metrics within each buffer. For each site, we calculated the percent cover of mature forest, regenerating forest, urban development, and agricultural/ herbaceous land within the 1-km buffer.

STATISTICAL ANALYSIS

We used CANOCO (ter Braak and Smilaur 1988) to explore relationships among bird densities and habitat variables with Detrended Correspondence Analysis (DCA) and Canonical Correspondence Analysis (CCA). Detrended Correspondence Analysis is an ordination technique that can be used for mapping species data along different environmental gradients. It can then be interpreted using known habitat associations and other cues (Kirk and Hobson 2001). Canonical Correspondence Analysis is a multivariate ordination technique for comparing species abundance data with multiple environmental factors (ter Braak 1986). We selected CCA for this analysis because it is an exploratory tool that is robust to analysis with multiple correlated variables (Palmer 1993) and provides a biplot for ease in visualization of relationships (MacFaden and Capen 2002). For the CCA we included 16 environmental variables, of which 11 were continuous and five (tree species identifiers) were nominal. With the exception of the rare and declining Cerulean Warbler, we excluded from analysis all species with fewer than 10 detections in the 150 X 4 = 600 total point counts. We ultimately included detection-adjusted abundance and density estimates of 37 species in the DCA and CCA.

We were interested in the overall importance of each of the environmental variables in explaining bird species habitat relationships. To determine the relative importance of the variables, we used forward step-wise selection during the CCA in CANOCO. This process tested individual effects of each of the environmental variables (marginal effects) and the effect that each variable had in addition to the variables that had already been selected (conditional effects) (Leps and Smilauer 2003). To assess deviation from a randomly generated distribution, we applied Monte Carlo estimation (499 permutations) to the forward selection procedure (Leps and Smilauer 2003).

RESULTS

OVERVIEW

The sampled sites exhibited a range of forested condition from mature oak-hickory forests on north-facing slopes in the Ozark and Ouachita Mountains to bottomland hardwood-cypress forests in extreme southeastern Oklahoma to short rotation pine plantation forestry in McCurtain, Pushmataha, and LeFlore counties. Some sites included forest edges with other land uses (e.g., pasture, residential development) represented. Elevation ranged from 135 m at Beaver's Bend State Park in McCurtain County to 716 m on Lynn Mountain in LeFlore County. Forest cover in each of the buffers varied from 18–100%. In sampled plots, canopy cover ranged from 14–75% and canopy height from 5–22 m.

We encountered 74 species during point counts at 75 sites in 2006. The five most abundant species were Red-eyed Vireo (*Vireo olivaceus*) (416), Indigo Bunting (*Passerina cyanea*) (208), Tufted Titmouse (*Baeolophys bicolor*) (154), Pine Warbler (*Dendroica pinus*) (133), and Carolina Chickadee (*Poecile atricapilla*) (111).

In 2007 we encountered 83 species at 75 sites. The five most abundant species were Red-eyed Vireo (*Vireo olivaceus*) (333), Tufted Titmouse (*Baeolophys bicolor*) (183), Indigo Bunting (*Passerina cyanea*) (150), Northern Cardinal (*Cardinalis cardinalis*) (132), and Blue-gray Gnatcatcher (*Polioptila caerulea*) (100).

DETRENDED CORRESPONDENCE ANALYSIS

Detrended Correspondence Analysis indicated gradients of species abundance across both axes (Fig. 2). Axis 1 sorted species according to reliance on forest cover, with forest

species such as Scarlet Tanager (*Piranga olivacea*), Ovenbird (*Seiurus aurocapillus*), and Cerulean Warbler on the left grading to grassland and shrubland species such as Eastern Meadowlark (*Sturnella magna*) and Field Sparrow (*Spizella pusilla*) on the right. Axis 2 was not readily interpretable but may have been driven by moisture (e.g. soil moisture or relative humidity). A group of species associated with the larger trees and more mesic forests of riparian habitats such as Yellow-throated Warbler (*Dendroica dominica*), Acadian Flycatcher, and Kentucky Warbler occurs at the top left of the DCA, while a group more closely associated with more xeric habitats such as Yellow-breasted Chat (*Icteria virens*) and Prairie Warbler (*Dendroica discolor*) occur on the bottom right.

CANONICAL CORRESPONDENCE ANALYSIS

Canonical Correspondence Analysis indicated that 32.5% of the variance in species abundance was explained by 16 environmental variables. Eleven of those variables, representing a mix of site- and plot-scale vegetation structure, produced significant conditional effects (Tab. 3). Tree canopy cover explained a greater proportion of the variance in forest bird abundance than any other variable.

The CCA biplot (Fig. 3) illustrated primary axes related to gradients of forest cover and moisture. Species such as Ovenbird, Hooded Warbler, Cerulean Warbler, and Scarlet Tanager tended to co-occur and were positively associated with elevation and forest cover. In contrast, Yellow-breasted Chat, Prairie Warbler, and Common Yellowthroat were positively associated with grass and herbaceous cover. The cluster of Prothonotary Warber, Swainson's Warbler, Kentucky Warbler, Acadian Flycatcher, Yellow-throated Warbler, and Northern Parula was

associated with bottomland hardwood forests, which tended to exhibit high plot-scale canopy cover and the highest canopy heights (> 20 m) of any sites surveyed.

DISCUSSION

To examine differences or similarities between select species of forest species at the edge of their respective ranges here in Oklahoma when compared to other areas, we compared densities of singing/territorial males between our sites and those found in the literature. We compared the densities of four species of greatest conservation need in Oklahoma; Kentucky Warbler, Worm-eating Warbler, Swainson's Warbler (*Limnothlypis swainsonii*), Hooded Warbler and another species that reaches the limit of its range in eastern Oklahoma, the Scarlet Tanager, with densities reported in the literature from other areas.

In general we found our densities to be comparable to those found in other parts of these species ranges. Our calculated density for Worm-eating Warbler was 4.4 singing males/40 ha (1.1/10 ha). This was higher than the 3.1/40 ha calculated for the species in Illinois but lower than the 2.2/10 ha reported in Maryland (Hanners et al 1998). Our calculated density for Hooded Warbler was 0.2 males/ha. This number was within the range of densities reported from both New York (0.1 - 0.3/ha) and Ontario (0.1 - 0.3/ha). It was lower than the numbers reported in Pennsylvania (0.4 - 0.7/ha) and Maryland (0.2/ha) (Ogden and Stuchberry 1994). We calculated a density for Kentucky Warbler of 1.8/10 ha. This falls within the range reported from Missouri of 0.9 – 1.8/10 ha (McDonald 1998). Our calculated density for Swainson's Warbler was 5.1/40 ha. This falls within the range of a study of Swainson's Warbler densities between different habitat types, being higher than the 3.0/40 ha reported for mature oak-gum-cypress forest but lower than the 8.8/40 ha and 17.0/40 ha for cove hardwood forest and sapling oak-gum-cypress forest respectively (Brown and Dickson 1994). Of the

species we examined, only the breeding density of Scarlet Tanager was consistently lower than other examples in the literature. Our estimate of 1.6/10 ha was lower than the 4.2/10 ha reported from New Hampshire and 5.2/10 ha reported from West Virginia, though it approached the densities reported from New York and Illinois, 1.8 – 3.0/10 ha and 1.7 - 3.8/10 ha, respectively (Mowbray 1999).

These calculated densities indicate that, at least within appropriate habitat, neotropical forest songbirds in Oklahoma occur in similar breeding densities to similar habitats near the core areas of these species' distributions. This result is contrary to the prediction (Lomolino et al. 2006) that abundance within a species' distribution exhibits internal structure such that peripheral areas function as population sinks (Pulliam 1988). Future research on forest birds in Oklahoma should focus on features of demographics (e.g., reproductive success, annual variability in abundance, site fidelity) that would inform interpretations of these populations as sources or sinks.

Partners in Flight have developed a Bird Conservation Plan for the Ozark/Ouachitas with a list of conservation priority species for the region (Fitzgerald and Pashley 2000). Our study provides information about bird habitat relationships that has management implications for a number of these species. For example, several species in this region have strong relationships with high-elevation forests. Some of these species such as the Cerulean Warbler, Ovenbird, and Worm-eating Warbler are considered high conservation priorities for this region. Our results indicate that in eastern Oklahoma, the combination of high forest cover and high elevation is an important predictor of the occurrence and abundance of these species. Integrated management for PIF conservation priorities in the region should reflect this

relationship, and we recommend prescriptions geared toward large blocks of contiguous, mature forest at the highest elevations.

Our findings draw attention to concern that global warming could impact the future ranges of bird species in this region. These high-elevation species are found in areas that are comparatively cool and moist compared with surrounding lowland areas. These conditions allow for more mesic forests that are more commonly found farther east and north where conditions are cooler and wetter. Such mature mesic forests support these high-priority songbirds. Some global warming forecasts predict that Oklahoma will be warmer and drier in the future (American Bird Conservancy 2006). This could mean an end to the conditions responsible for the growth of high-elevation mature mesic forests in Oklahoma and in turn for some of these high-elevation bird species in the state (American Bird Conservancy 2006).

In contrast to the high elevation warblers, occurrence and abundance of Kentucky Warbler and Acadian Flycatcher, also high priority species for this region, was positively associated with canopy height and canopy closure, but negatively associated with elevation. They also had a strong relationship toward the wetter end of the moisture gradient, suggesting their need for low-elevation mature deciduous forests, such as those found in bottomlands.

Our general study area in eastern Oklahoma contained diverse forested landscapes in the Ozark and Ouachita mountains. The presence of blocks of mature forest appears to be the most important factor driving habitat use by multiple conservation priority songbirds in this region of Oklahoma. The areas supporting the highest breeding density of specific priority species can be further characterized as forested landscapes at high elevations and in bottomlands. These two ends of an elevational gradient in the region should be the top priorities for maintenance of large blocks of tall, closed canopy hardwood forest.

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Table 1. Plot- and site-level environmental variable included in the CCA.

Environmental variable	Abbreviation
Average percent canopy cover	Av Pr CC
Basal area	BASAR
Canopy height	Canht
Cross timber oak forest	cross
Elevation	elev
Hickory forest	hick
Oak-hickory forest	oakhick
Other type of hardwood forest	other
Percent forest cover	per Fc
Percent grass ground cover	pergrco
Percent herbaceous ground cover	perheco
Percent high understory cover	hunco
Percent leaf ground cover	perleco
Percent low understory cover	pr lunco
Pine	pine
Slope	slope

Table 2. List of 40 species included in the CCA in descending order from most detections to least.

Species	Scientific Name	Alpha Code
Red-eyed Vireo	*Vireo olivaceus*	REVI
Indigo Bunting	*Passerina cyanea*	INBU
Tufted Titmouse	*Baeolophys bicolor*	TUTI
Pine Warbler	*Dendroica pinus*	PIWA
Carolina Chickadee	*Poecile atricapilla*	CACH
Ovenbird	*Seiurus aurocapillus*	OVEN
Summer Tanager	*Piranga rubra*	SUTA
Black-and-White Warbler	*Mniotilta varia*	BAWW
Carolina Wren	*Thryothorus ludovicianus*	CARW
Northern Cardinal	*Cardinalis cardinalis*	NOCA
Blue-gray gnatcatcher	*Polioptilla caerulea*	BGGN
Yellow-breasted Chat	*Icteria virens*	YBCH
Northern Parula	*Parula americana*	NOPA
Scarlet Tanager	*Piranga olivacea*	SCTA
Eastern Wood-pewee	*Contopus virens*	EWPE
White-eyed Vireo	*Vireo griseus*	WEVI
Kentucky Warbler	*Oporornis formosus*	KEWA
Acadian Flycatcher	*Empidonax virescens*	ACFL
White-breasted Nuthatch	*Sitta carolinensis*	WBNU
Prairie Warbler	*Dendroica discolor*	PRWA
Red-bellied Woodpecker	*Melanerpes carolinus*	RBWO
Yellow-billed Cuckoo	*Coccyzus americanus*	YBCU
Common Yellowthroat	*Geothlypis trichas*	COYE
Hooded Warbler	*Wilsonia citrina*	HOWA
Field Sparrow	*Spizella pusilla*	FISP
Brown-headed Cowbird	*Molothrus ater*	BHCO
Northern Bobwhite	*Colinus virginianus*	NOBO
Yellow-throated Warbler	*Dendroica dominica*	YTWA
American Goldfinch	*Carduelis tristis*	AMGO
Great Crested Flycatcher	*Myiarchus crinitus*	GCFL
Blue Jay	*Cyanocitta cristata*	BLJA
Pileated Woodpecker	*Dryocopus pileatus*	PIWO
Downy Woodpecker	*Picoides pubescens*	DOWO
Chipping Sparrow	*Spizella passerina*	CHSP
Eastern Meadowlark	*Sturnella magna*	EAME
Worm-eating Warbler	*Helmitheros vermivora*	WEWA
Louisiana Waterthrush	*Seiurus motacilla*	LOWA
Prothonotary Warbler	*Protonotaria citria*	PROW
Swainson's Warbler	*Limnothlypis swainsonii*	SWWA
Cerulean Warbler	*Dendroica cerulea*	CERW

Table 3. Conditional effects from Monte Carlo estimation of forward selection in CCA. The CCA explained 38 percent of total variance in abundance of 37 bird species.

Variable	Order in model	Eigenvalue	F	P	explained variance (%)
Canopy Cover %	1	0.24	12.72	0.002	26
Elevation (m)	5	0.16	8.93	0.002	17
Grass Cover %	13	0.09	5.26	0.002	10
Pine overstory %	6	0.08	4.46	0.002	9
Shrub cover (< 2m) %	3	0.07	4.14	0.002	8
Forest cover %	2	0.04	2.86	0.004	4
Leaf litter cover %	15	0.05	3.03	0.002	5
Other sp. overstory %	10	0.05	2.67	0.002	5
Basal area (m^2/plot)	16	0.03	2.34	0.004	3
Shrub cover (> 2m) %	4	0.04	2.23	0.002	4
Mean slope %	11	0.02	1.28	0.15	2
Oak-Hick overstory %	8	0.02	1.19	0.216	2
Cross-timb overstory %	7	0.03	2.18	0.006	3
Hickory overstory %	9	0.03	2.05	0.004	3
Herbaceous cover %	14	0.02	1.21	0.172	2
Canopy height (m)	12	0.02	1.03	0.32	2

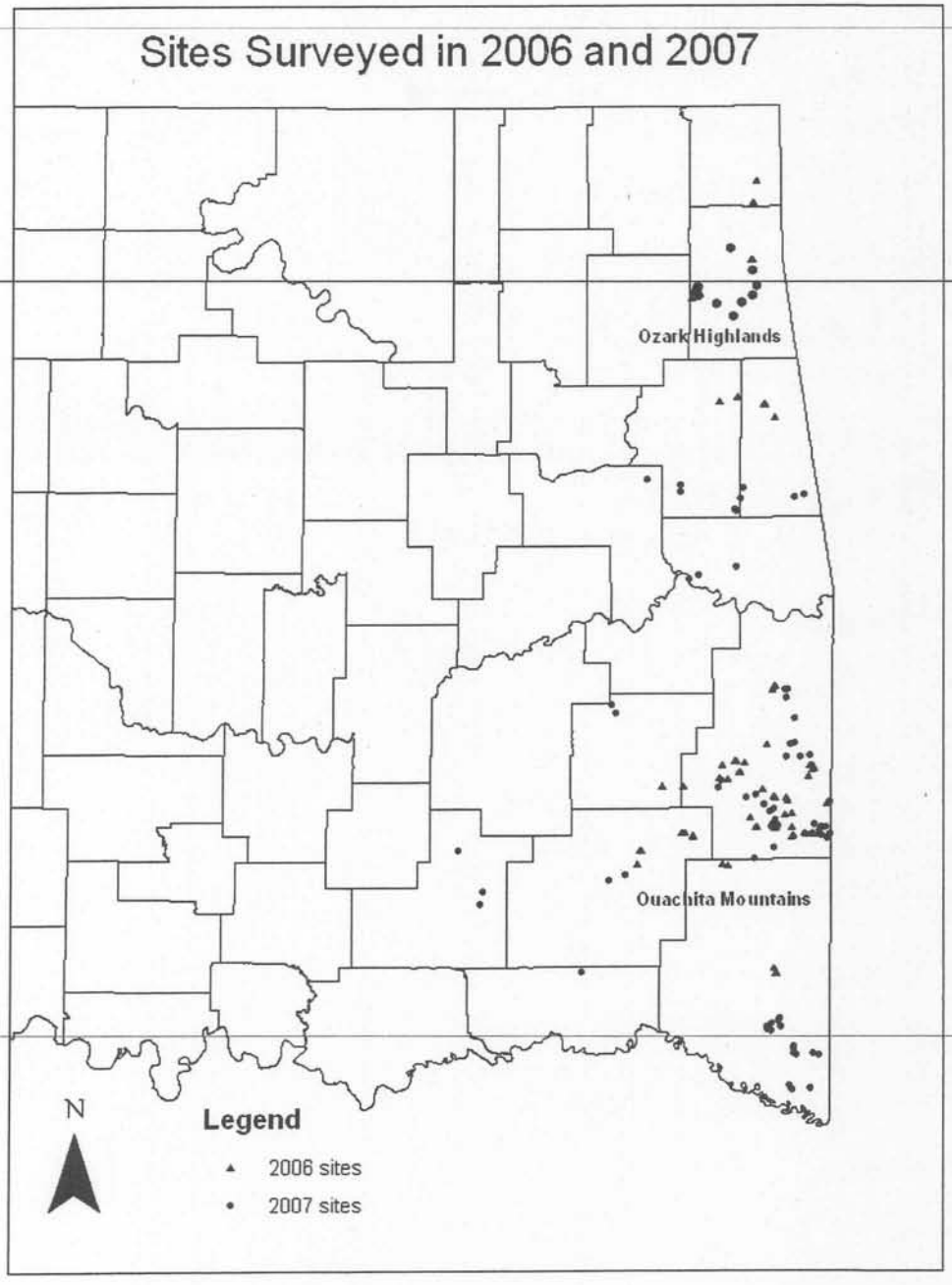


Figure 1. Map of the study area in Eastern Oklahoma.

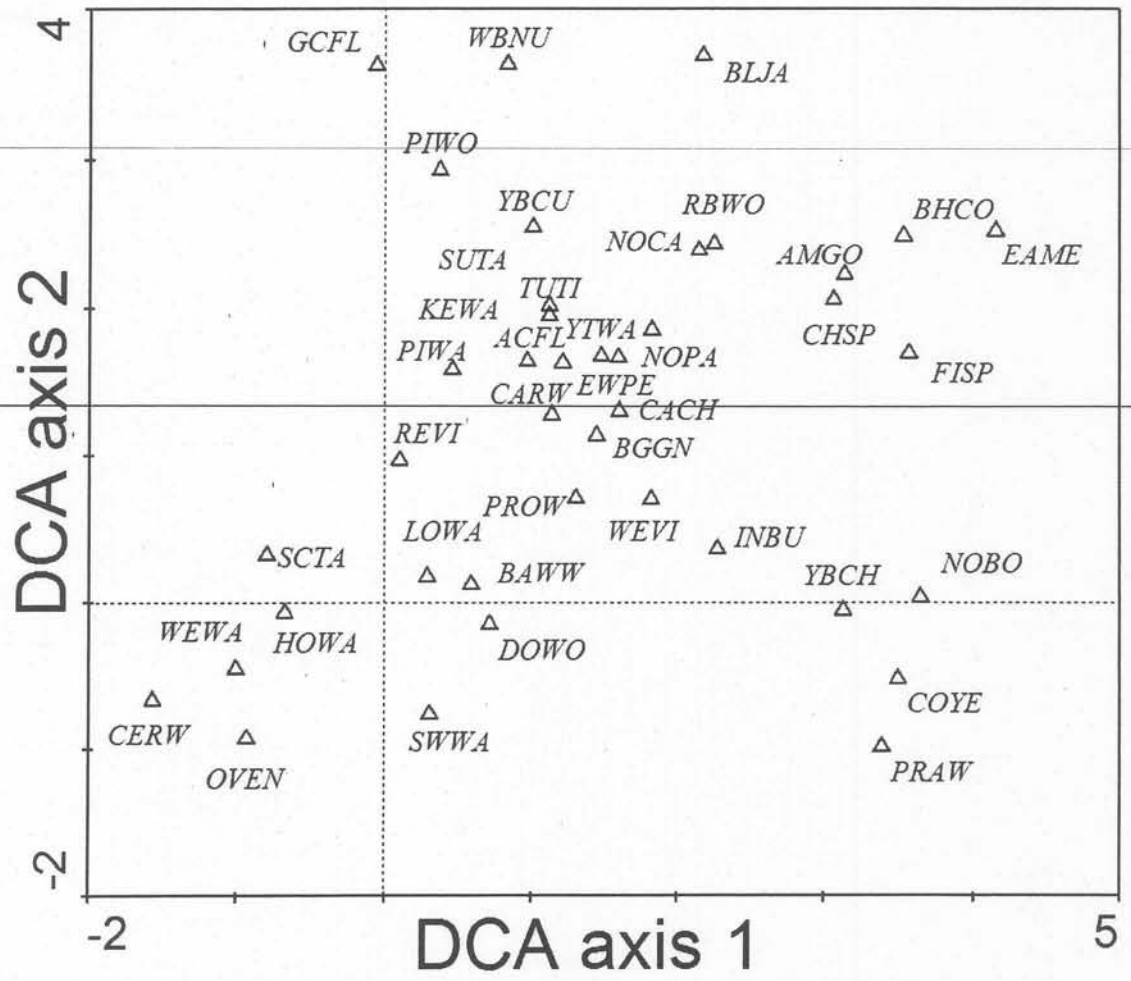


Figure 2. Biplot of bird species abundance data. Alpha codes for species names are listed in Table 2.

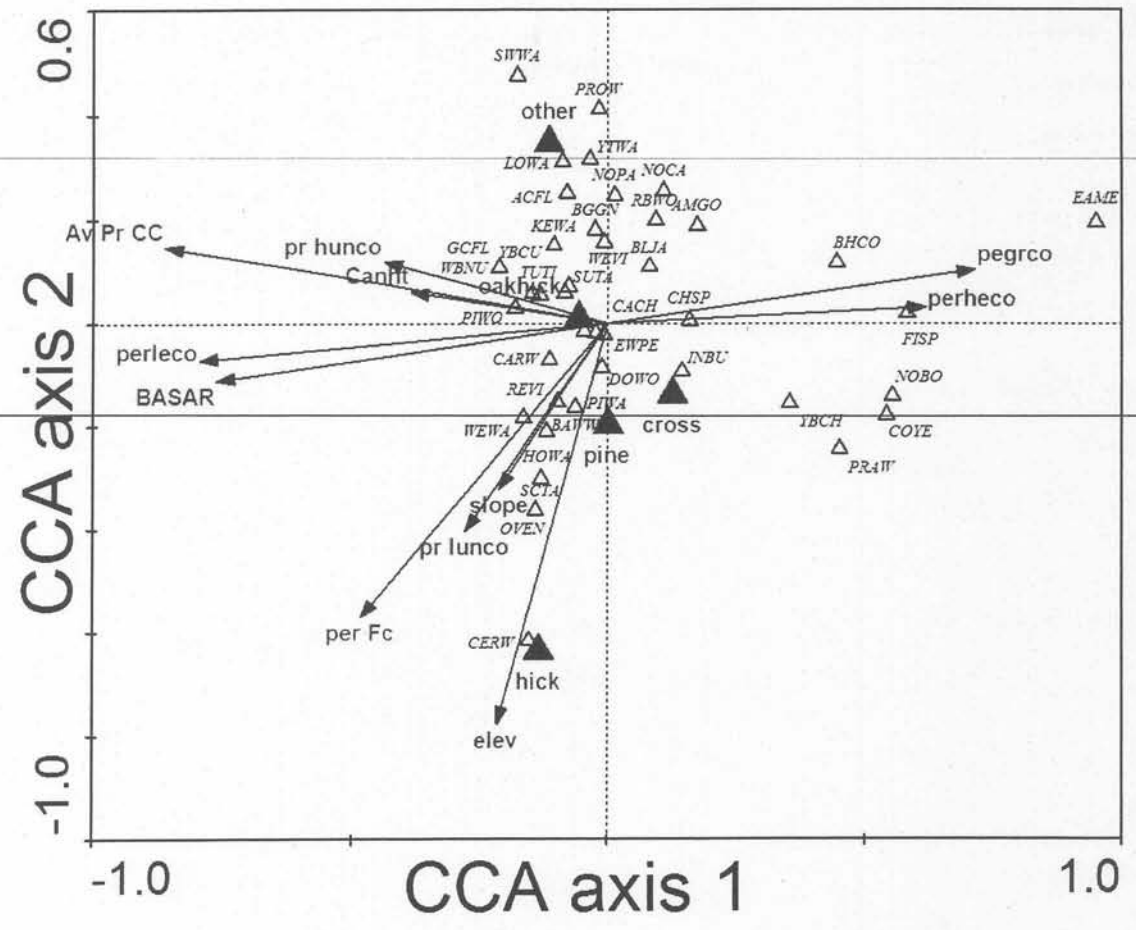


Figure 3. Biplot of ordination between bird species abundance and 16 environmental variables. Abbreviations for environmental variables are listed in Table 1.

Appendix III

Information about each of the surveyed sites.

Each site description includes a site name, GPS coordinates given in UTM, a brief site description giving more specific location information and a general description of land cover type, and finally a table with the species and count for each species seen or heard doing the four point counts at each site.

Site Information

Site 2006 - 1

GPS Location: 0322187 3852247

Site Description: Mature hillside oak-hickory and pine mixed forest in the Ouachita National Forest north of Talihina in LeFlore County.

Bird Survey Results:

BAWW	1
BLJA	3
GCFL	1
INBU	2
NOBO	1
NOCA	2
NOFL	2
PIWA	4
REVI	9
SUTA	4
TUTI	4
WBNU	1
YBCU	1

Site 2006 – 2

GPS Location: 0326023 3850186

Site Description: South facing slope of Winding Stair Mountain in the Ouachita National Forest, LeFlore County. Principally mature pine and "cross-timber" oak forest.

Bird Survey Results:

BAWW	4
BLJA	2
CACH	2
CHSP	1
EATO	1
INBU	1
NOCA	1
OVEN	3
REVI	8
SCTA	2
TUTI	3

Site 2006 – 3

GPS Location: 0328763 3849377

Site Description: North facing slope of Winding Stair Mountain in the Ouachita National Forest, LeFlore County. Principally mature oak-hickory forest but some pine component as well.

Bird Survey Results:

BGGN	2
CARW	2
DOWO	1
GCFL	1
INBU	5
NOBO	1
OVEN	4
PIWA	3
REVI	5
SCTA	2
TUTI	1
WEVI	1

Site 2006 – 4

GPS Location: 0342043 3845366

Site Description: North facing slope of Winding Stair Mountain in the Ouachita National Forest, LeFlore County. Principally mature oak-hickory forest but some pine component as well.

Bird Survey Results:

BAWW	1
CHSP	1
DOWO	1
REVI	7

Site 2006 – 5

GPS Location: 0346215 3842533

Site Description: North facing slope of Winding Stair Mountain in the Ouachita National Forest, LeFlore County. Principally mature oak-hickory forest but some pine component as well.

Bird Survey Results:

CACH	2
CARW	1
FICR	1
OVEN	5
PIWA	2
REVI	3
SCTA	1

Site 2006 – 6

GPS Location: 0346111 3842787

Site Description: South facing slope of Winding Stair Mountain in the Ouachita National Forest, LeFlore County. This site is mainly mature pine.

Bird Survey Results:

BAWW	3
CACH	1
OVEN	2
PIWA	2
REVI	9
SCTA	2
LOWA	1
NOCA	2
RBWO	1
REVI	9
SUTA	3
TUTI	3
WAVI	1
WBNU	1
WEVI	1
WEWA	1

Site 2006 – 7

GPS Location: 0365714 3839641

Site Description: This site is located on the south slope of Rich Mountain, very close to the Arkansas border in LeFlore County. Although it is a south slope this location is one of the wettest in all of Oklahoma and is dominated by mature oak-hickory and Black Gum forest.

Bird Survey Results:

BAWW	4
BLJA	3
CARW	1
INBU	1
NOCA	1
OVEN	4
PIWA	1
PIWO	1
RBGR	4
REVI	8
SCTA	2
TUTI	1
WOTH	1

Site 2006 – 8

GPS Location: 0336881 3835449

Site Description: Mature bottomland forest along a small creek south of the Kiamichi River in LeFlore County; composed principally of Sycamore, Bitternut Hickory, Sugar Maple and Sweet Gum.

Bird Survey Results:

BAWW	2
BGGN	5
BTNW	1
HOWA	1
KEWA	2

Site 2006 – 9

GPS Location: 0349846 3836280

Site Description: This site is located in the Ouachita National Forest in the valley between Rich Mountain to the north and the Kiamichi Ridge to the south in LeFlore County. It is primarily mature Short-leaf Pine with some oak-hickory

Bird Survey Results:

BAWW	2
INBU	2
OVEN	4
PIWA	7
REVI	10
SUTA	2
TUTI	1

Site 2006 – 10

GPS Location: 0327277 3854845

Site Description: This site is located in the Ouachita National Forest in what is known locally as the "Holson Valley" in LeFlore County. This site is dominated by mature Short-leaf Pine with a smaller component of "cross-timbers" oaks.

Bird Survey Results:

AMRO	1
BAWW	1
CARW	1
DOWO	1
INBU	1
NOCA	1
OVEN	4
PIWA	8
RBWO	1
REVI	6
SUTA	4

Site 2006 – 11

GPS Location: 0351408 3841109

Site Description: This site is located within the Robert S. Kerr Botanical Reserve within the Ouachita National Forest, located between Rich Mountain and Winding Stair Mountain in LeFlore County. It is a mature mixed Black Gum, oak-hickory and pine forest.

Bird Survey Results:

CACH	4
CEDW	2
LEFL	1
OVEN	3
PIWA	3
RBGR	2
REVI	8
SUTA	2
TUTI	1

Site 2006 – 12

GPS Location: 0350159 3842150

Site Description: This site is located in the Ouachita National Forest in LeFlore County and is composed mostly of mature Short-leaf Pine.

Bird Survey Results:

BLJA	2
CACH	1
CARW	1
CEDW	1
DOWO	1
HOWA	1
OVEN	3
PIWA	6
REVI	4
SCTA	1
SUTA	1

Site 2006 – 13

GPS Location: 0344182 3861504

Site Description: This site is located on the Wister WMA in LeFlore County. In low areas this site is dominated by Sweet Gum and White Oak, while in drier areas it is primarily composed of cross-timbers oaks.

Bird Survey Results:

ACFL	3
BAOW	1
BGGN	5
CACH	1
COYE	1
EWPE	1
FISP	3
INBU	5
KEWA	1
LOWA	1
NOCA	6
PIWO	2
RBWO	1
REVI	2
SUTA	2
TUTI	3
WEVI	1
WODU	1
YBCH	2
YBCU	1

Site 2006 – 14

GPS Location: 0344502 3777815

Site Description: This site is located in Beaver's Bend State Park in McCurtain County and is heavily covered in mature pine forest, with smaller amounts of oak-hickory forests.

Bird Survey Results:

AMGO	1
BAWW	3
BGGN	2
CACH	6
CARW	1
GCFL	1
PIWA	6
PIWO	1
REVI	5
SUTA	4
TUTI	4
WEWA	1

Site 2006 – 15

GPS Location: 0345198 3777843

Site Description: This is another site located within Beaver's Bend State Park in McCurtain County, this site however is a more even mix of Short-leaf Pine and hardwood species such as Sweet Gum, White Oak and Mockernut Hickory

Bird Survey Results:

BGGN	5
CACH	5
INBU	2
KEWA	1
NOPA	4
PIWA	2
REVI	4
SUTA	2
TUTI	3
WBNU	1
WEWA	1

Site 2006 – 16

GPS Location: 0343940 3779614

Site Description: The final site surveyed at Beaver's Bend State Park in McCurtain County. This site was more heavily dominated by Short-leaf Pine with smaller amounts of hardwood species. It should be noted that proximity to the Mountain Fork River made it difficult to hear birds singing during surveys.

Bird Survey Results:

BWWA	1
CARW	3
NOPA	3
REVI	9

Site 2006 – 17

GPS Location: 0327038 3818551

Site Description: This site located in northwest McCurtain County, is composed almost entirely of pine but is relatively open and savannah like.

Bird Survey Results:

BAWW	2
CARW	2
COYE	3
FISP	1
GCFL	1
INBU	5
OVEN	3
PIWA	5
PRAW	5
REVI	2
SUTA	2
YBCH	3
YBCU	1

Site 2006 – 18

GPS Location: 0328225 3817622

Site Description: This site located on the north slope of a smaller mountain in northwest McCurtain County is primarily mature Oak-hickory forest with smaller amounts of Sugar Maple and pine. There was is a nearby clear-cut that was in part of the count circle.

Bird Survey Results:

ACFL	1
BAWW	5
BGGN	3
CACH	3
CARW	2
FISP	1
HOWA	3
INBU	2
KEWA	1
NOBO	1
NOCA	4
NOPA	1
OVEN	1
PIWA	1
PRAW	1
REVI	5
TUTI	1
WEVI	2
YBCH	2
YBCU	1

Site 2006 – 19

GPS Location: 0357298 3828952

Site Description: This site is located on the north slope of Lynn Mountain in LeFlore County. It is composed of mature oak-hickory forest with no pine component on a very steep slope.

Bird Survey Results:

ACFL	1
BAWW	2
BGGN	1
CACH	2
CARW	2
CERW	2
DOWO	1
EWPE	5
HAWO	1
HOWA	4
INBU	2
NOFL	1
OVEN	10
REVI	8
SCTA	2
TUTI	2
YBCH	1

Site 2006 – 20

GPS Location: 0357495 3828956

Site Description: This site is located on the north slope of Lynn Mountain in LeFlore County. It is composed of mature oak-hickory forest with no pine component on a very steep slope.

Bird Survey Results:

BAWW	1
BTNW	1
CACH	3
CARW	2
CERW	1
COYE	1
EWPE	4
GRCA	1
HOWA	2
INBU	4
OVEN	4
REVI	6
SUTA	1
TUTI	2
WBNU	2
WEVI	1
YBCH	3

Site 2006 – 21

GPS Location: 0362533 3829195

Site Description: This site is located in a valley between Lynn Mountain to the west and Cow Creek Mountain to the east in LeFlore County. It is a mature mixed pine-hardwood forest with a fairly even component of pine and hardwood species like White Oak, Post Oak and Sweet Gum.

Bird Survey Results:

ACFL	2
AMGO	3
BGGN	4
BHCO	1
CACH	2
CARW	1
EWPE	1
FISP	1
INBU	3
KEWA	1
NOCA	2
NOPA	2
PRAW	1
REVI	1
SCTA	1
SUTA	1
TUTI	3
WEVI	3
YBCH	4

Site 2006 – 22

GPS Location: 0362559 3831324

Site Description: This site is located on the north face of Cow Creek Mountain in eastern LeFlore County. It is composed primarily of hardwood species like Black Walnut, White Oak and Black Gum.

Bird Survey Results:

BAWW	1
HOWA	1
INBU	5
NOBO	2
OVEN	3
REVI	10
SCTA	3
TUTI	6
WEVI	1
WEWA	1

Site 2006 – 23

GPS Location: 0360307 3853751

Site Description: This site located on Walker Mountain in eastern LeFlore County is composed mostly of mature pine-oak forest.

Bird Survey Results:

BAWW	2
BGGN	1
CACH	2
INBU	4
PIWA	3
PRAW	1
REVI	5
SUTA	3
YBCH	2
YBCU	2

Site 2006 – 24

GPS Location: 0359961 3853702

Site Description: This site located on Walker Mountain in eastern LeFlore County is composed mostly of mature pine-oak forest.

Bird Survey Results:

AMCR	1
BAWW	3
CARW	2
EWPE	2
GCFL	1
INBU	3
PIWA	7
PIWO	2
PRAW	3
REVI	3
SUTA	1
TUTI	1
YBCH	1
YBCU	1

Site 2006 – 25

GPS Location: 0360795 3852596

Site Description: This site located south of Hontubby in eastern LeFlore County, is composed primarily of mature pine-oak forest.

Bird Survey Results:

BAWW	4
BGGN	1
CACH	3
GCFL	1
INBU	3
KEWA	1
OVEN	1
PIWA	3
PIWO	1
PRAW	3
REVI	7
RTHU	1
SUTA	1
TUTI	2
WEVI	1
YBCH	4
YBCU	1

Site 2006 – 26

GPS Location: 0346560 3831365

Site Description: This site located near the ridge line on Kiamichi Mountain in southern LeFlore County is a mixed forest composed of stunted oak-hickory and a smaller amount of mature pine.

Bird Survey Results:

BGGN	2
CARW	2
DOWO	1
GCFL	1
INBU	5
NOBO	1
OVEN	4
PIWA	3
REVI	5
SCTA	2
TUTI	1
WEVI	1

Site 2006 – 27

GPS Location: 0346436 3831267

Site Description: This site located near the ridge line on Kiamichi Mountain in southern LeFlore County is a mixed forest composed of stunted oak-hickory and a smaller amount of mature pine.

Bird Survey Results:

BAWW	1
CARW	1
HOWA	2
INBU	2
OVEN	3
PIWA	1
REVI	5
SCTA	1
YBCU	1

Site 2006 – 28

GPS Location: 0339119 3831873

Site Description: This site located near the ridge line on Kiamichi Mountain in southern LeFlore County is a mixed forest composed of stunted oak-hickory and a smaller amount of mature pine.

Bird Survey Results:

ACFL	1
BAWW	1
CACH	1
COYE	2
INBU	4
OVEN	2
REVI	7
SCTA	2
TUTI	2

Site 2006 – 29

GPS Location: 0339395 3831850

Site Description: This site located near the ridge line on Kiamichi Mountain in southern LeFlore County is a mixed forest composed of stunted oak-hickory and a smaller amount of mature pine.

Bird Survey Results:

BAWW	3
CARW	1
COYE	1
INBU	3
OVEN	2
REVI	7
SCTA	1

Site 2006 – 30

GPS Location: 0304873 3847566

Site Description: This site is located on Buffalo Mountain in eastern Latimer County. It is composed primarily of oak-hickory forest with smaller amounts of pine.

Bird Survey Results:

BAWW	2
BHCO	1
BLJA	1
CACH	7
GCFL	1
INBU	3
MODO	3
PRAW	1
REVI	5
SCTA	1
SUTA	2
TUTI	2
YBCU	2

Site 2006 – 31

GPS Location: 0304879 3847749

Site Description: This site is located on Buffalo Mountain in eastern Latimer County. It is composed primarily of oak-hickory forest with smaller amounts of pine.

Bird Survey Results:

BAWW	2
BHCO	1
BLJA	1
CARW	3
DOWO	1
INBU	2
OVEN	1
PIWO	1
RBGR	1
REVI	10
SCTA	2
SUTA	1
WBNU	1
YBCU	1

Site 2006 – 32

GPS Location: 0312390 3847150

Site Description: This site is actually within the municipality of Talihena, LeFlore County. It consists of suburban backyard habitats with shade trees backing up along a large hayfield.

Bird Survey Results:

AMCR	1
AMRO	2
BAWW	1
BGGN	2
BRTH	2
CACH	5
CARW	3
CEDW	1
DICK	2
EAME	2
ECDO	1
EUST	1
FICR	1
GCFL	2
HOFI	2
NOCA	4
NOMO	4
PUMA	1
RBWO	1
TUTI	3
WEVI	1

Site 2006 – 33

GPS Location: 0296033 3824425

Site Description: This site is located on Cripple Mountain in northwestern Pushmataha County. It consists primarily of mature pine-oak forest.

Bird Survey Results:

AMCR	1
BAWW	4
CACH	2
CARW	1
INBU	2
NOBO	3
PIWA	4
REVI	5
TUTI	3
YBCH	1
YBCU	2

Site 2006 – 34

GPS Location: 0296203 3824292

Site Description: This site is located on Cripple Mountain in northwestern Pushmataha County. It was recently clear-cut but had some standing mature pine.

Bird Survey Results:

AMCR	1
BAWW	3
CARW	2
COYE	1
FISP	2
INBU	1
NOCA	2
PRAW	6
REVI	2
WEVI	3
WITU	1
YBCH	5

Site 2006 – 35

GPS Location: 0294492 3819511

Site Description: This site was located along Cripple Creek in northwest Pushmataha County. It consists of a mix of Short-leaf Pine away from the creek and Sweet Gum and oak species closer to the creek.

Bird Survey Results:

AMRO	1
BAWW	1
BHCO	1
CARW	2
COYE	2
EAKI	1
EAPH	2
EWPE	1
INBU	5
NOCA	3
PIWO	1
RBWO	1
REVI	1
SUTA	3
TUTI	3
WEVI	3
YBCH	3
YBCU	1

Site 2006 – 36

GPS Location: 0333663 3851904

Site Description: This site in central LeFlore County was located partly in an early successional old field and partly in a mature pine-oak forest.

Bird Survey Results:

ACFL	1
AMCR	2
BAWW	1
BGGN	2
BHCO	1
CARW	1
COYE	1
EAME	2
EAPH	1
HOWA	1
INBU	3
NOBO	2
NOCA	3
NOPA	1
PIWO	1
RBWO	1
REVI	3
TUTI	1
WEVI	2
YBCH	3
YBCU	3

Site 2006 – 37

GPS Location: 0334126 3851946

Site Description: This site in central LeFlore County was located partly in an early successional old field and partly in a mature pine-oak forest.

Bird Survey Results:

BAWW	1
BEWR	1
BHCO	1
CACH	1
CARW	2
EAPH	2
GCFL	1
INBU	2
KEWA	1
NOPA	1
PIWA	4
REVI	8
SUTA	2
TUTI	2
WBNU	2
YBCH	2

Site 2006 – 38

GPS Location: 0332020 3855616

Site Description: This site located on the steep north face of Blue Mountain in central LeFlore County is composed of mature pine-oak forest.

Bird Survey Results:

BAWW	1
CACH	3
INBU	3
PIWA	4
REVI	9
SCTA	2
SUTA	3
TUTI	3
WEWA	1
YBCU	1

Site 2006 – 39

GPS Location: 0332454 3855671

Site Description: This site located on the steep north face of Blue Mountain in central LeFlore County is composed of mature pine-oak forest.

Bird Survey Results:

BAWW	2
BLJA	1
EWPE	1
INBU	4
NOCA	1
PIWA	2
RBWO	2
REVI	5
SUTA	2
TUTI	4
WBNU	1
YBCU	5

Site 2006 – 40

GPS Location: 0335403 3855136

Site Description: This site located on the steep north face of Blue Mountain in central LeFlore County is composed of mature pine-oak forest.

Bird Survey Results:

BAWW	4
CARW	1
GCFL	1
HAWO	2
HOWA	1
INBU	5
OVEN	6
PIWA	7
REVI	8
SCTA	5
TUTI	2
WBNU	1

Site 2006 – 41

GPS Location: 0311970 3830614

Site Description: This site is located in northwest Pushmataha County and consists of a mature pine-oak forest.

Bird Survey Results:

BAWW	5
CACH	6
INBU	4
PIWA	4
REVI	4
SUTA	3
TUTI	3

Site 2006 – 42

GPS Location: 0312272 3830630

Site Description: This site is located in northwest Pushmataha County and consists of a mature pine-oak forest.

Bird Survey Results:

CACH	3
CARW	1
COYE	2
INBU	3
NOBO	1
NOCA	1
PIWA	4
PRAW	2
RBWO	2
REVI	3
TUTI	1
YBCH	3
YBCU	1

Site 2006 – 43

GPS Location: 0315815 3829131

Site Description: This site is located in northwest Pushmataha County and consists of a large clear-cut bordering on a mature pine-oak forest.

Bird Survey Results:

AMRO	1
BAWW	1
BRTH	1
CACH	3
CARW	2
CHSP	1
COYE	3
EABL	2
FISP	1
INBU	2
PRAW	3
REVI	2
TUTI	2
WBNU	1
WEVI	1
YBCH	4

Site 2006 – 44

GPS Location: 0315826 3829277

Site Description: This site is located in northwest Pushmataha County and consists of a recent clear-cut bordering on a mature oak-hickory forest.

Bird Survey Results:

AMCR	1
BGGN	2
CACH	3
COYE	5
EWPE	1
INBU	3
OVEN	2
PIWA	1
PRAW	4
RBWO	1
REVI	3
SUTA	1
WBNU	1
WEVI	1
YBCH	5
YTVI	1

Site 2006 – 45

GPS Location: 0352449 3836307

Site Description: This site located in eastern LeFlore County consists of mature pine-oak forest.

Bird Survey Results:

BAWW	1
CACH	2
CARW	2
DOWO	1
INBU	1
OVEN	7
PIWA	6
REVI	7
SCTA	1
SUTA	2
TUTI	4
WEWA	3
WOTH	4

Site 2006 – 46

GPS Location: 352755 3831302

Site Description: This site on the steep north face of Lynn Mountain in LeFlore County consists of mature oak-hickory forest.

Bird Survey Results:

BAWW	1
CARW	2
HOWA	4
INBU	1
OVEN	5
REVI	10
WEVI	1
YBCH	1

Site 2006 – 47

GPS Location: 0361778 3828593

Site Description: This site on the south slope of Lynn Mountain in LeFlore County consists of mature pine-oak forest.

Bird Survey Results:

BAWW	1
BGGN	1
CACH	4
CARW	1
EWPE	1
INBU	3
NOBO	1
OVEN	4
PIWA	8
REVI	7
SUTA	4
TUTI	4

Site 2006 – 48

GPS Location: 0360442 3828814

Site Description: This site on the steep north face of Lynn Mountain in LeFlore County, consists of mature oak-hickory forest.

Bird Survey Results:

BTNW	1
CACH	1
CARW	2
CERW	2
DOWO	1
EWPE	1
HOWA	3
INBU	3
KEWA	4
OVEN	3
PRAW	1
REVI	5
SCTA	1
WEVI	2
YBCH	1

Site 2006 – 49

GPS Location: 0358504 3828573

Site Description: This site on the steep north face of Lynn Mountain in LeFlore County consists of mature oak-hickory forest.

Bird Survey Results:

BAWW	3
CACH	1
CARW	1
CERW	1
HOWA	2
INBU	3
KEWA	2
NOCA	1
OVEN	2
PIWO	1
REVI	7
SCTA	2
TUTI	2
WBNU	1
WOTH	2

Site 2006 – 50

GPS Location: 0360613 3852070

Site Description: This site located in eastern LeFlore County north of Haw Creek is primarily a mature pine-oak forest.

Bird Survey Results:

AMRO	1
BAWW	3
BGGN	3
CACH	5
CARW	1
INBU	4
KEWA	1
OVEN	1
PIWA	6
REVI	10
SUTA	5
TUTI	3
WEVI	1
YBCH	2

Site 2006 – 51

GPS Location: 0359118 3849876

Site Description: This site located on Haw Creek in eastern LeFlore County consists primarily of bottomland hardwood species like Sycamore, Ash species and Sweet Gum. This site also bordered some pastureland.

Bird Survey Results:

BHCO	1
CACH	1
CARW	1
COYE	3
DICK	1
EAME	1
INBU	3
KEWA	1
LOWA	1
NOBO	1
NOCA	3
PIWO	1
REVI	4
STFL	1
SUTA	1
TUTI	2
WEVI	3
YBCU	1

Site 2006 – 52

GPS Location: 0346742 3882020

Site Description: This site located on top of Cavanal Hill north of Poteau in LeFlore County is fairly open with scattered oaks and Black Walnuts.

Bird Survey Results:

AMRO	1
BAWW	2
BHCO	2
BLGR	1
CARW	1
DOWO	1
EWPE	2
GRCA	1
HAWO	1
INBU	7
NOCA	2
OVEN	1
REVI	4
SCTA	2
YBCH	5
YBCU	1

Site 2006 – 53

GPS Location: 0347133 3882622

Site Description: This site located on top of Cavanal Hill north of Poteau in LeFlore County is fairly open with scattered oaks and Black Walnuts.

Bird Survey Results:

BAWW	2
CARW	2
INBU	8
NOCA	1
REVI	8
SCTA	2
TUTI	1
YBCU	2

Site 2006 – 54

GPS Location: 0347865 3883685

Site Description: This site located on the north slope of Cavanal Hill north of Poteau in northern LeFlore County consists primarily of mature pine-oak forest.

Bird Survey Results:

BAWW	2
CACH	2
INBU	4
NOCA	1
PIWA	2
PIWO	1
RBWO	2
REVI	6
SCTA	4
SUTA	1
TUTI	4
WEWA	1

Site 2006 – 55

GPS Location: 0351929 3827621

Site Description: This site located in the Nature Conservancy's Cucumber Creek Preserve in LeFlore County, consists of mature oak-hickory and very large Sweet Gums.

Bird Survey Results:

ACFL	1
BAWW	1
BGGN	1
BTNW	2
CACH	1
CARW	1
DOWO	1
EWPE	1
HOWA	2
KEWA	1
OVEN	3
REVI	10
SCTA	1
TUTI	3

Site 2006 – 56

GPS Location: 0352467 3828006

Site Description: This site located in the Nature Conservancy's Cucumber Creek Preserve in LeFlore County, consists of mature oak-hickory and very large Sweet Gums.

Bird Survey Results:

ACFL	2
BAWW	1
BGGN	4
CACH	2
INBU	1
KEWA	1
NOCA	1
NOPA	2
OVEN	5
REVI	13
TUTI	2
YTVI	1

Site 2006 – 57

GPS Location: 0347092 4068823

Site Description: This site located in Ottawa County was located along the shore of Grand Lake and consists of mature oak, ash and Sycamores.

Bird Survey Results:

ACFL	3
AMGO	3
BGGN	4
BHCO	1
CACH	1
CARW	3
GCFL	1
INBU	2
KEWA	3
LOWA	1
NOCA	1
NOPA	4
RBWO	2
REVI	1
RTHU	2
SUTA	1
TUTI	7
WBNU	2
WEVI	1
YTVI	1

Site 2006 – 58

GPS Location: 0345254 4060984

Site Description: This site located in south-central Ottawa County near the Grand Lake consists of mature hardwood species including several different oak and ash species.

Bird Survey Results:

AMGO	3
BGGN	3
EWPE	2
GCFL	1
INBU	2
NOCA	2
NOPA	2
PIWO	1
REVI	5
SUTA	2
TUTI	5
WBNU	1
YTVI	1

Site 2006 – 59

GPS Location: 0345469 4061035

Site Description: This site located in south-central Ottawa County near the Grand Lake consists of mature hardwood species like several different oak species.

Bird Survey Results:

ACFL	2
BHCO	1
CACH	1
CARW	1
EWPE	3
INBU	3
NOCA	1
NOPA	1
RBWO	1
REVI	2
RTHU	1
SUTA	3
TUTI	4
TUVU	1
WBNU	1

Site 2006 – 60

GPS Location: 0344154 4039919

Site Description: This site located in Delaware County south of Grove, consists of a fragmented forest of Sycamore and Oak species intermixed with pasture lands.

Bird Survey Results:

ACFL	1
AMCR	3
BAWW	1
BGGN	1
BHCO	1
BLJA	1
CACH	2
CARW	4
DOWO	1
EAME	1
EWPE	1
FICR	1
INBU	4
LOWA	1
NOCA	6
NOPA	2
RBWO	2
TUTI	1
YBCU	2
YTWA	1

Site 2006 – 61

GPS Location: 0344457 4039917

Site Description: This site located in Delaware County south of Grove, consists of a fragmented forest of Sycamore and Oak species intermixed with pasture lands.

Bird Survey Results:

ACFL	2
BGGN	2
BLJA	1
CACH	1
CARW	1
CHSP	2
DICK	2
DOWO	1
EABL	1
EAME	4
EAPH	1
EWPE	2
FISP	2
GCFL	1
GRSP	1
INBU	3
NOCA	4
NOFL	1
NOMO	1
RBWO	3
REVI	3
SUTA	3
TUTI	6
WBNU	3
YBCU	2

Site 2006 – 62

GPS Location: 0324405 4028386

Site Description: This site is located within Spavinaw WMA in Delaware County and consists primarily of mature oak-hickory forest with a smaller component of pine.

Bird Survey Results:

ACFL	3
BGGN	5
BHCO	1
CACH	3
CARW	1
CHSP	1
EWPE	1
INBU	3
KEWA	3
NOCA	1
NOPA	4
RBWO	2
REVI	3
SUTA	4
TUTI	3
WEVI	1
YTWA	1

Site 2006 – 63

GPS Location: 0324480 4028168

Site Description: This site is located within Spavinaw WMA in Delaware County and consists primarily of mature oak-hickory forest.

Bird Survey Results:

ACFL	2
BHCO	1
CACH	1
CARW	2
CHSP	1
EWPE	1
GCFL	2
INBU	9
KEWA	2
NOCA	3
NOPA	4
RBWO	1
REVI	2
SUTA	2
TUTI	2
WBNU	1
WEVI	2

Site 2006 – 64

GPS Location: 323323 4027080

Site Description: This site is located within Spavinaw WMA in Delaware County and consists primarily of mature oak-hickory forest.

Bird Survey Results:

ACFL	1
AMGO	1
BAWW	1
BGGN	2
CACH	1
CARW	1
CHSP	1
COYE	2
EWPE	2
INBU	4
KEWA	2
NOCA	3
NOPA	5
REVI	9
SUTA	2
WBNU	1
WEVI	2
YTWA	1

Site 2006 – 65

GPS Location: 0323620 4027065

Site Description: This site is located within Spavinaw WMA in Delaware County and consists primarily of mature oak-hickory forest with a smaller component of pine.

Bird Survey Results:

BHCO	1
BLJA	1
CACH	2
CARW	1
EWPE	1
INBU	3
NOPA	1
PIWA	2
RBWO	3
REVI	6
RTHU	1
SCTA	2
SUTA	3
TUTI	2
WBNU	3
YTWA	2

Site 2006 – 66

GPS Location: 0322116 4028665

Site Description: This site is located within Spavinaw WMA in Delaware County and consists primarily of mature oak-hickory forest with a smaller component of pine.

Bird Survey Results:

ACFL	1
BGGN	1
BHCO	1
CACH	1
CARW	3
EWPE	3
INBU	4
KEWA	1
MODO	1
NOPA	1
PIWA	4
RBWO	2
REVI	3
SCTA	1
SUTA	3
TUTI	5
WBNU	3

Site 2006 – 67

GPS Location: 0322235 4028451

Site Description: This site is located within Spavinaw WMA in Delaware County and consists primarily of mature oak-hickory forest with a smaller component of pine.

Bird Survey Results:

ACFL	3
BHCO	1
CARW	2
EWPE	1
NOCA	1
NOFL	1
NOPA	4
PIWA	1
RBWO	3
REVI	5
SCTA	2
SUTA	3
TUTI	4
WBNU	4
YBCU	1
YTWA	2

Site 2006 – 68

GPS Location: 0321177 4026827

Site Description: This site is located within Spavinaw WMA in Delaware County and consists primarily of mature oak-hickory forest with a large component of bottomland hardwoods like Sycamore and ash species.

Bird Survey Results:

ACFL	3
AMGO	2
CACH	2
CARW	1
INBU	4
KEWA	5
NOCA	1
NOPA	4
REVI	8
SUTA	3
TUTI	2
WBNU	2
WEVI	2
YTWA	4

Site 2006 – 69

GPS Location: 0321021 4026636

Site Description: This site is located within Spavinaw WMA in Delaware County and consists primarily of mature oak-hickory forest with a smaller component of pine.

Bird Survey Results:

ACFL	3
BHCO	1
CARW	2
EWPE	1
NOCA	1
NOFL	1
NOPA	4
PIWA	1
RBWO	3
REVI	5
SCTA	2
SUTA	3
TUTI	4
WBNU	4
YBCU	1
YTWA	2

Site 2006 – 70

GPS Location: 0337226 3989294

Site Description: This site is located within the Nature Conservancy's Nickel's Preserve in Cherokee county. It consists of a savannah like mix of old field and large Black Walnuts and oak species.

Bird Survey Results:

ACFL	1
AMGO	1
BHCO	3
CHSP	2
COGR	1
COYE	4
DICK	1
EABL	3
EAKI	1
EAME	1
EATO	2
EWPE	1
FISP	5
INBU	6
KEWA	1
MODO	1
NOBO	1
NOPA	2
OROR	2
PRAW	3
RBWO	1
SUTA	1
YBCH	6
YTWA	1

Site 2006 – 71

GPS Location: 0336989 3989405

Site Description: This site is located within the Nature Conservancy's Nickel's Preserve in Cherokee county. This site is fairly open with a scattering of mature pine, oaks and hickories.

Bird Survey Results:

AMGO	1
BGGN	1
CACH	1
CARW	2
CHSP	1
COYE	4
DICK	1
EABL	1
EAPH	1
EWPE	1
FISP	2
INBU	8
KEWA	1
NOBO	4
NOCA	1
NOPA	2
PIWA	1
PRAW	2
REVI	1
RTHU	1
TUTI	1
WEVI	1
YBCH	4
YBCU	1
YTWA	1

Site 2006 – 72

GPS Location: 0330630 3988173

Site Description: This site is located within the Nature Conservancy's Nickel's Preserve in Cherokee county. It consists of mature oak-hickory forest.

Bird Survey Results:

ACFL	1
BGGN	2
EWPE	1
HAWO	1
NOPA	5
PIWO	1
RBWO	1
REVI	8
RTHU	1
SUTA	3
WBNU	1
YTVI	2
YTWA	2

Site 2006 – 73

GPS Location: 0346846 3986512

Site Description: This site is located in central Adair County. It consists of mature oak-hickory forest.

Bird Survey Results:

ACFL	2
AMGO	3
BGGN	4
BHCO	1
CACH	2
CARW	1
EWPE	1
FISP	1
INBU	3
KEWA	1
NOCA	2
NOPA	2
PRAW	1
REVI	1
SCTA	1
SUTA	1
TUTI	3
WEVI	3
YBCH	4

Site 2006 – 74

GPS Location: 0347003 3986382

Site Description: This site is located in central Adair County. It consists of mature oak-hickory forest.
Bird Survey Results:

ACFL	2
BAWW	1
BGGN	1
CACH	3
CARW	2
FISP	3
GCFL	1
INBU	6
KEWA	1
NOCA	2
NOPA	2
PRAW	1
RBWO	1
SUTA	2
TUTI	5
WEVI	2
YBCH	3
YBCU	1

Site 2006 – 75

GPS Location: 0350818 3981638

Site Description: This site is located in central Adair County. It consists of a mix of fragmented mature oak-hickory forest amid old fields.
Bird Survey Results:

AMGO	2
BGGN	2
CARW	1
EABL	1
EWPE	1
FISP	2
INBU	3
KEWA	2
NOCA	6
NOPA	2
RBWO	3
REVI	6
RHWO	1
RTHU	1
SUTA	2
TUTI	2
WEVI	1
WITU	1
YBCH	1
YBCU	1
YTVI	1

Site 2007 – 1

GPS Location: 0349193 4038952

Site Description: This site is located in central Delaware County and consists of mature oak-hickory forest.

Bird Survey Results:

ACFL	4
AMCR	1
AMGO	2
BAWW	2
BGGN	5
BHCO	1
BLJA	1
CACH	1
CARW	3
EWPE	3
FICR	1
INBU	4
KEWA	1
NOCA	2
NOPA	4
PIWO	1
REVI	3
SUTA	3
TUTI	6
WEVI	1
YBCH	1

Site 2007 – 2

GPS Location: 0345145 405145

Site Description: This site is located in central Delaware County and consists of mature oak-hickory forest with a smaller component of sapling aged pine.

Bird Survey Results:

AMGO	2
BGGN	2
BHCO	6
CHSP	1
EAKI	1
EAME	2
EWPE	3
FISP	1
GCFL	2
INBU	3
NOCA	3
NOMO	2
NOPA	2
RBWO	2
REVI	1
SUTA	2
TUTI	6
YBCH	2

Site 2007 – 3

GPS Location: 0344293 4035796

Site Description: This site is located in central Delaware County and consists of a mixed of well-managed pastureland intermixed with sapling aged forest.

Bird Survey Results:

AMGO	1
AMRO	1
BHCO	6
CACH	1
CHSP	2
EABL	1
EAKI	1
EAME	2
EAPH	1
EUST	2
EWPE	1
FISP	4
GRSP	1
INBU	3
KEWA	1
NOCA	3
NOMO	3
RBWO	1
YBCH	1

Site 2007 – 4

GPS Location: 0336248 4044526

Site Description: This site is located in central Delaware County and consists of mature pine-oak forest.

Bird Survey Results:

ACFL	2
AMGO	1
BAWW	3
BGGN	3
CARW	1
CEDW	6
EWPE	4
GCFL	1
NOPA	2
PIWA	3
REVI	4
SUTA	2
TUTI	7
YTWA	1

Site 2007 – 5

GPS Location: 0336513 4019247

Site Description: This site located in southern Delaware County and consists of mature pine-oak forest.

Bird Survey Results:

AMGO	1
BAWW	2
BGGN	3
BHCO	1
CARW	1
EWPE	2
GCFL	3
INBU	3
KEWA	1
NOPA	1
PIWA	5
REVI	5
SUTA	4
TUTI	1
WBNU	1

Site 2007 – 6

GPS Location: 0330080 4024279

Site Description: This site is located in southern Delaware County and consists of both mature and pine-oak forest and areas of regenerating pine forest.

Bird Survey Results:

ACFL	1
AMGO	1
BAWW	2
BGGN	2
CACH	1
CEDW	2
EWPE	3
FISP	3
GCFL	1
INBU	1
KEWA	1
NOCA	2
OVEN	1
PIWA	4
PRAW	3
REVI	3
SUTA	4
TUTI	3
WBNU	1
WEVI	1
YBCH	2
YTWA	1

Site 2007 – 7

GPS Location: 0339982 4024383

Site Description: This site located in southern Delaware County along Spavinaw Creek consists of mature bottomland hardwood species like Sycamore and ash.

Bird Survey Results:

BAWW	1
BGGN	6
CACH	1
CARW	1
CEDW	1
COYE	1
DOWO	1
GCFL	1
INBU	3
KEWA	1
LOWA	1
PIWA	1
PROW	1
REVI	4
WEVI	4
YTWA	1

Site 2007 – 8

GPS Location: 0343778 4026909

Site Description: This site located in southern Delaware County along and near Spavinaw Creek consists of mature bottomland hardwood species like Sycamore and ash as well as mature oak-hickory forest.

Bird Survey Results:

AMGO	2
BGGN	3
BHCO	1
CACH	1
CARW	1
GCFL	1
KEWA	2
NOCA	1
NOPA	2
PIWA	1
PROW	1
RBWO	2
REVI	2
SUTA	5
TUTI	5
WEVI	3
YBCH	1
YTWA	1

Site 2007 – 9

GPS Location: 0323553 4030653

Site Description: This site located in southern Delaware County along Spavinaw Creek consists of mature bottomland hardwood species like Sycamore and ash.

Bird Survey Results:

ACFL	1
AMRE	6
BAOR	1
BGGN	2
BHCO	1
CACH	1
CARW	1
CEDW	5
DOWO	1
EAKI	1
EAPH	1
EWPE	2
GCFL	1
INBU	2
KEWA	4
LOWA	1
NOCA	8
NOPA	5
PROW	6
RBWO	1
REVI	5
SUTA	2
WEVI	4
YBCH	1
YTWA	5

Site 2007 – 10

GPS Location: 323827 4030520

Site Description: This site located in southern Delaware County along Spavinaw Creek consists of mature bottomland hardwood species like Sycamore and ash.

Bird Survey Results:

ACFL	1
AMRE	2
BAWW	1
BGGN	6
CARW	1
EWPE	1
GCFL	2
INBU	1
KEWA	1
LOWA	1
NOCA	3
NOPA	2
PIWA	1
RBWO	2
REVI	2
SUTA	1
TUTI	5
WEVI	2

Site 2007 – 11

GPS Location: 0360720 3832399

Site Description: This site located northeast of Lynn Mountain in LeFlore County consists of mature forest of Black Gum, oak-hickory and some mature pine.

Bird Survey Results:

ACFL	4
BAWW	2
BGGN	1
CARW	3
HOWA	1
INBU	1
KEWA	2
LOWA	2
NOPA	1
OVEN	5
PIWA	5
REVI	9
SCTA	1
TUTI	1
WEVI	1
WOTH	1

Site 2007 – 12

GPS Location: 0362584 3831354

Site Description: This site is located on the north face of Cow Creek Mountain in eastern LeFlore County. It consists of mature oak-hickory forest with a large component of Black Walnut.

Bird Survey Results:

BTNW	1
CACH	1
CARW	1
EWPE	2
HOWA	4
INBU	5
KEWA	3
OVEN	3
REVI	5
SCTA	3
TUTI	2
WEVI	1
WOTH	1
YBCH	3

Site 2007 – 13

GPS Location: 0364225 3831057

Site Description: This site is located on Walnut Mountain in eastern LeFlore County. It consists of mature oak-hickory forest with a large component of Black Walnut and Black Gum.

Bird Survey Results:

ACFL	1
BAWW	1
BGGN	1
DOWO	1
EWPE	3
HOWA	5
INBU	1
KEWA	3
OVEN	7
REVI	12
SCTA	2

Site 2007 – 14

GPS Location: 0366575 3828804

Site Description: This site is located on the south slope of Walnut Mountain in eastern LeFlore County. It consists of a mature oak-hickory forest with a smaller component of mature pine.

Bird Survey Results:

BAWW	1
EWPE	2
HOWA	3
INBU	7
KEWA	1
NOCA	2
OVEN	5
PIWA	1
REVI	12
RTHU	1
SCTA	5
TUTI	1

Site 2007 – 15

GPS Location: 0314563 3958096

Site Description: This site is located in Cherokee WMA in Cherokee County. It consists of mature oak-hickory and Sycamore along Greenleaf Creek.

Bird Survey Results:

ACFL	3
BAWW	2
BGGN	5
BHCO	1
CARW	1
EAPH	1
INBU	1
LOWA	2
NOCA	3
NOPA	8
PIWO	1
PROW	1
REVI	6
RTHU	1
SUTA	3
TUTI	2
WBNU	1
WEVI	2
YBCU	1
YTVI	1
YTWA	2

Site 2007 – 16

GPS Location: 0314792 3955451

Site Description: This site is located in Cherokee WMA in Cherokee County. It consists of mature oak-hickory forest.

Bird Survey Results:

ACFL	2
AMGO	1
BAWW	2
BGGN	4
DOWO	1
GCFL	1
INBU	1
KEWA	1
NOPA	1
REVI	4
SUTA	1
TUTI	2
WEVI	1
YBCU	1

Site 2007 – 17

GPS Location: 0320749 3924566

Site Description: The site is located in the Sequoyah NWR in Sequoyah County. It consists of bottomland hardwoods like Sycamore, Water Oak and ash species.

Bird Survey Results:

BAWW	1
BGGN	1
BHCO	1
CACH	1
CARW	2
EAPH	1
EWPE	1
GCFL	2
INBU	5
NOCA	5
NOPA	1
PROW	1
REVI	5
RWBL	1
SUTA	1
TUTI	2
YTWA	1

Site 2007 – 18

GPS Location: 316564 3923792

Site Description: The site is located in the Sequoyah NWR in Sequoyah County. It is a mix of mature bottomland hardwoods like Sycamore and Eastern Cottonwood and old fields.

Bird Survey Results:

BAOR	1
BAWW	1
BGGN	4
BLGR	1
CARW	1
FISP	2
INBU	7
NOCA	3
NOPA	4
RBWO	3
STFL	1
SUTA	1
YBCH	1
YBCU	2

Site 2007 – 19

GPS Location: 0334573 3947995

Site Description: This site is located in Cookson Hills WMA in Cherokee County. It is a mature oak-hickory forest.

Bird Survey Results:

ACFL	5
BAWW	1
BGGN	2
BHCO	2
CARW	3
DOWO	1
INBU	3
KEWA	1
LOWA	1
NOCA	2
NOPA	4
OVEN	1
RBWO	1
REVI	3
SCTA	1
SUTA	2
TUTI	6
WBNU	1
WEVI	3
YBCH	1
YBCU	1
YTVI	2
YTWA	1

Site 2007 – 20

GPS Location: 0342594 3759544

Site Description: This site is located in Little River NWR in McCurtain County. It consists of one of the most intact mature bottomland hardwood forests in Oklahoma.

Bird Survey Results:

ACFL	3
AMGO	1
BAWW	2
BGGN	5
CACH	2
CARW	1
DOWO	1
EWPE	1
HOWA	2
INBU	2
KEWA	3
NOCA	4
PIWO	1
RBWO	2
REVI	4
TUTI	5
WEVI	5
YBCH	1
YBCU	1
YTVI	1

Site 2007 – 21

GPS Location: 0340911 3758105

Site Description: This site is located in Little River NWR in McCurtain County. It consists of one of the most intact mature bottomland hardwood forests in Oklahoma.

Bird Survey Results:

ACFL	2
BAWW	1
BGGN	3
CACH	3
CARW	1
DOWO	2
HOWA	2
KEWA	1
NOCA	3
NOPA	1
PROW	1
REVI	10
SUTA	1
SWWA	1
TUTI	4
WEVI	5
YBCU	2
YTWA	1

Site 2007 – 22

GPS Location: 0340942 3756973

Site Description: This site is located in Little River NWR in McCurtain County. It consists of one of the most intact mature bottomland hardwood forests in Oklahoma.

Bird Survey Results:

ACFL	2
BGGN	7
CACH	1
CARW	2
GCFL	2
HOWA	2
INBU	2
KEWA	2
NOCA	4
NOPA	2
REVI	9
SUTA	2
SWWA	1
TUTI	5
WEVI	7
YTWA	1

Site 2007 – 23

GPS Location: 0345558 3759789

Site Description: This site is located near Little River NWR in southern McCurtain County. It consists of a mature Loblolly Pine plantation.

Bird Survey Results:

BAWW	1
BGGN	3
BHCO	1
CARW	2
COYE	1
DOWO	1
EWPE	2
INBU	2
NOCA	2
PIWA	9
PRAW	1
REVI	4
SUTA	5
TUTI	1
YBCH	2
YBCU	2

Site 2007 – 24

GPS Location: 0345395 3761055

Site Description: This site is located near Little River NWR in southern McCurtain County. It is a large clear-cut area.

Bird Survey Results:

BGGN	1
BHCO	2
CACH	1
CARW	3
COYE	3
FISP	4
INBU	7
NOCA	2
PRAW	5
REVI	1
YBCH	9

Site 2007 – 25

GPS Location: 345909 3758146

Site Description: This site is located in Little River NWR in McCurtain County. It consists of one of the most intact mature bottomland hardwood forests in Oklahoma.

Bird Survey Results:

ACFL	2
BGGN	7
CACH	5
CARW	1
DOWO	1
HOWA	1
INBU	1
KEWA	2
LOWA	3
NOCA	3
NOPA	1
PROW	1
REVI	8
SUTA	2
SWWA	3
TUTI	3
WEVI	5
YTWA	3

Site 2007 – 26

GPS Location: 0342577 3756604

Site Description: This site is located in Little River NWR in McCurtain County. It consists of one of the most intact mature bottomland hardwood forests in Oklahoma.

Bird Survey Results:

ACFL	3
BGGN	1
CACH	1
CARW	3
DOWO	1
HOWA	1
INBU	3
KEWA	3
NOCA	2
NOPA	1
PROW	1
RBWO	1
REVI	10
SUTA	1
SWWA	2
TUTI	1
WEVI	3
WOTH	1
YTVI	1
YTWA	1

Site 2007 – 27

GPS Location: 0365443 3827449

Site Description: This site is composed of mature pine-oak forest.

Bird Survey Results:

BAWW	2
CARW	2
DOWO	1
HOWA	1
INBU	5
KEWA	1
NOCA	1
OVEN	1
PIWA	3
REVI	10
SCTA	6
TUTI	1
WEVI	3
YBCU	1

Site 2007 – 28

GPS Location: 0363296 3828256

Site Description: This site is primarily a mature oak-hickory forest but has a pine component as well.

Bird Survey Results:

BGGN	2
CARW	2
HOWA	5
KEWA	1
LOWA	1
NOPA	1
OVEN	1
REVI	11
SCTA	4
YTVI	1

Site 2007 – 29

GPS Location: 0366646 3840135

Site Description: This site is located on the steep north slope of Rich Mountain in eastern LeFlore County. It consists of mature oak-hickory forest.

Bird Survey Results:

BAWW	3
BTNW	3
CACH	4
CERW	2
DOWO	1
HOWA	5
INBU	1
KEWA	2
OVEN	2
REVI	8
SCTA	2

Site 2007 – 30

GPS Location: 0346026 3824101

Site Description: This site is located north of Octavia in southern LeFlore County. It consists of a large clear-cut and some adjacent mature pine forest.

Bird Survey Results:

AMGO	1
BLGR	1
COYE	5
INBU	4
LASP	1
NOBO	1
NOCA	1
NOPA	1
PIWA	1
PRAW	3
REVI	2
TUTI	2
WEVI	2
YBCH	7

Site 2007 – 31

GPS Location: 0335431 3927838

Site Description: This site is located west of Sallisaw in Sequoyah County. It consists of managed pasture lands.

Bird Survey Results:

AMGO	1
BHCO	2
BRTH	1
DICK	1
EABL	4
EAKI	2
EAME	5
GTGR	2
HOSP	1
LASP	2
LOSH	1
NOBO	1
NOMO	5
RWBL	1
STFL	3
YBCU	1

Site 2007 – 32

GPS Location: 0351466 3881528

Site Description: This site was a residential neighborhood in Heavener, LeFlore County.

Bird Survey Results:

AMRO	4
BLJA	4
CACH	1
CEDW	3
EAPH	1
ECDO	2
EUST	23
GRCA	1
HOFI	2
HOSP	9
NOCA	5
NOMO	5

Site 2007 – 33

GPS Location: 0352202 3882004

Site Description: This site was a residential neighborhood in Heavener, LeFlore County.

Bird Survey Results:

AMRO	6
BGGN	2
BLJA	2
CACH	2
COGR	1
ECDO	2
EUST	5
EWPE	1
HOSP	5
MODO	1
NOCA	5
NOMO	6
PUMA	2
TUTI	2

Site 2007 – 34

GPS Location: 0351819 3879228

Site Description: This site was a residential neighborhood in Poteau, LeFlore County.

Bird Survey Results:

AMRO	5
BHCO	1
BLJA	1
CACH	1
CEDW	1
COGR	3
COHA	1
ECDO	1
EUST	10
HOSP	12
INBU	2
MODO	1
NOCA	4
NOMO	6
STFL	1
TUTI	1
WEKI	1

Site 2007 – 35

GPS Location: 0352776 3861814

Site Description: This site was a residential neighborhood in Poteau, LeFlore County.

Bird Survey Results:

AMRO	6
BAOR	1
BLJA	3
ECDO	5
EUST	9
GRCA	1
HOSP	7
NOCA	2
NOMO	5
RBWO	1
TUTI	1

Site 2007 – 36

GPS Location: 0354140 3861576

Site Description: This site was a residential neighborhood in Poteau, LeFlore County.

Bird Survey Results:

AMRO	3
BLJA	1
COGR	5
EAPH	2
ECDO	4
EUST	11
HOSP	8
NOCA	4
NOMO	7
STFL	1

Site 2007 – 37

GPS Location: 0354878 3871003

Site Description: This site is located in eastern LeFlore County and consists of pasturelands.

Bird Survey Results:

AMGO	1
AMRO	1
BASW	1
BHCO	1
BLGR	1
BLJA	2
COGR	1
DICK	1
EABL	2
EAKI	1
EAME	8
EUST	11
MODO	1
NOBO	1
NOCA	1
NOMO	6
STFL	2

Site 2007 – 38

GPS Location: 0356267 3856461

Site Description: This site is located in eastern LeFlore County and consists of pasturelands.

Bird Survey Results:

AMRO	4
BHCO	1
BLGR	2
BLJA	1
CACH	2
COGR	2
DICK	3
EABL	1
EAME	5
EAPH	2
ECDO	2
EUST	5
NOBO	1
NOMO	5
RWBL	1
STFL	1

Site 2007 – 39

GPS Location: 0359613 3856515

Site Description: This site is located in eastern LeFlore County and consists of pasturelands.

Bird Survey Results:

AMRO	2
BHCO	2
BLGR	1
CACH	2
COGR	1
COYE	2
DICK	2
EABL	1
EAKI	2
EAME	4
EAPH	1
FISP	2
HOSP	3
INBU	2
MODO	3
NOBO	3
NOMO	8
PABU	1
PIWA	2
STFL	1

Site 2007 – 40

GPS Location: 0351543 3857092

Site Description: This site was located near Hodgen, LeFlore County and consists of mature bottomland hardwood forest along the Poteau River.

Bird Survey Results:

BGGN	1
BHCO	1
BLJA	1
CACH	2
CARW	2
COYE	2
EAPH	1
HOWA	1
KEWA	4
NOCA	5
NOPA	1
PIWO	1
REVI	2
SUTA	2
TUTI	2
WEVI	3

Site 2007 – JT1

GPS Location: 0346392 3838331

Site Description: This site was located on Rough Mountain in LeFlore County. It consists of mature pine-oak forest.

Bird Survey Results:

BLJA	1
CACH	3
GCFL	1
HAWO	1
INBU	1
MODO	3
PIWA	3
REVI	6
TUTI	3
YBCU	4

Site 2007 – JT2

GPS Location: 0343879 3837040

Site Description: This site was located near Simmons Mountain in LeFlore County. It consists of mature pine and oak-hickory forest.

Bird Survey Results:

BGGN	1
CACH	3
CARW	2
INBU	1
NOCA	1
PIWA	4
REVI	6
RTHU	1
SCTA	2
TUTI	1

Site 2007 – JT3

GPS Location: 0342642 3839709

Site Description: This site was located near Carver Mountain in LeFlore County. It consists of mature pine and oak-hickory forest.

Bird Survey Results:

AMCR	1
CACH	1
HAWO	1
INBU	3
PIWA	1
PIWO	1
REVI	8
SCTA	1
SUTA	1
YBCU	2

Site 2007 – JT4

GPS Location: 0338596 3843691

Site Description: This site is located on the south slope of Winding Stair Mountain in LeFlore County. It consists of mature pine and oak-hickory forest.

Bird Survey Results:

GCFL	1
HOWA	1
PIWA	1
REVI	6
SCTA	2
TUTI	2
YBCU	1

Site 2007 – JT5

GPS Location: 0335341 3842587

Site Description: This site is located on the south slope of Winding Stair Mountain in LeFlore County. It consists of mature pine and oak-hickory forest.

Bird Survey Results:

BLGR	1
CACH	3
GCFL	1
PIWA	4
PIWO	1
REVI	5
SCTA	1
TUTI	2

Site 2007 – JT6

GPS Location: 0325879 3846512

Site Description: This site is located on the south slope of Winding Stair Mountain in LeFlore County. It consists of mature pine and oak-hickory forest.

Bird Survey Results:

BLJA	1
BWWA	1
GCFL	1
INBU	2
MODO	2
NOCA	1
OVEN	1
PIWA	7
REVI	4
SCTA	1
SUTA	2
TUTI	3
YBCU	1

Site 2007 – JT7

GPS Location: 0326620 3849024

Site Description: This site is located on the south slope of Winding Stair Mountain in LeFlore County. It consists of mature pine and oak-hickory forest.

Bird Survey Results:

BGGN	1
CACH	2
HAWO	2
INBU	2
OVEN	2
PIWA	2
PIWO	1
REVI	2
SCTA	1
SUTA	4
TUTI	2

Site 2007 – JT8

GPS Location: 0344627 3832499

Site Description: This site is located on the north slope of the Kiamichi Ridge in LeFlore County. It consists of mature oak-hickory with a smaller pine component.

Bird Survey Results:

BLJA	1
BWWA	2
CARW	1
CHSW	2
HOWA	1
INBU	1
MODO	1
PIWA	1
PIWO	3
REVI	7
SCTA	2
SUTA	1

Site 2007 – JT9

GPS Location: 0346385 3834174

Site Description: This site is located on the north slope of the Kiamichi Ridge in LeFlore County. It consists of mature oak-hickory with a smaller pine component.

Bird Survey Results:

BWHA	1
BWWA	1
CACH	2
CARW	2
GCFL	2
INBU	1
KEWA	1
NOCA	2
OVEN	2
PIWA	4
PIWO	2
REVI	5
SCTA	1
SUTA	2
TUTI	2
WEVI	3
YBCH	2
YBCU	2

Site 2007 – JT10

GPS Location: 0344017 3831542

Site Description: This site is located on the Kiamichi Ridge in LeFlore County. It consists of mature oak-hickory with a smaller pine component.

Bird Survey Results:

BLJA	1
CACH	2
CARW	3
CHSW	2
COYE	1
INBU	5
KEWA	1
MODO	3
OVEN	2
REVI	4
RTHU	1
SCTA	1
TUTI	2
WEVI	2

Site 2007 – JT11

GPS Location: 0347699 3831373

Site Description: This site is located on the Kiamichi Ridge in LeFlore County. It consists of mature oak-hickory with a smaller pine component.

Bird Survey Results:

CACH	1
CARW	1
COYE	1
HOWA	1
INBU	4
KEWA	1
PRAW	1
REVI	5
WEVI	2
YBCH	3

Site 2007 – JT12

GPS Location: 0288610 3874925

Site Description: This site is located in Robber's Cave WMA in Latimer County. It consists of mature pine and oak-hickory forest.

Bird Survey Results:

AMCR	2
BLJA	2
CARW	1
GCFL	1
INBU	1
KEWA	1
NOCA	1
PIWA	1
PIWO	1
REVI	1
RWBL	1
SUTA	2
TUTI	2
WBNU	2
YBCU	1

Site 2007 – JT13

GPS Location: 0286278 3878507

Site Description: This site is located in Robber's Cave WMA in Latimer County. It consists of mature pine and oak-hickory forest.

Bird Survey Results:

BGGN	1
BLJA	1
BWWA	1
CACH	3
INBU	2
NOCA	1
PIWA	4
REVI	4
TUTI	10
TUVU	1
YBCU	2

Site 2007 – JT14

GPS Location: 0338147 3956714

Site Description: This site is located in Cookson Hills WMA in Cherokee County. It consists of mature oak-hickory forest.

Bird Survey Results:

BWWA	2
CARW	3
INBU	1
KEWA	2
NOCA	1
NOPA	1
REVI	9
SCTA	1
TUTI	4
TUVU	1

Site 2007 – JT15

GPS Location: 0335226 3947510

Site Description: This site is located in Cookson Hills WMA in Cherokee County. It consists of mature oak-hickory forest.

Bird Survey Results:

BGGN	1
BWWA	1
CACH	4
CARW	3
EWPE	2
INBU	2
KEWA	1
REVI	2
SUTA	1
TUTI	6
WEVI	1

Site 2007 – JT16

GPS Location: 0338527 3819755

Site Description: This site is located southwest of Octavia on the LeFlore/McCurtain County line. It consists of mature pine and oak-hickory forest.

Bird Survey Results:

AMCR	3
BGGN	1
BLJA	4
BWWA	1
CARW	1
EWPE	1
GCFL	1
HOWA	2
OVEN	1
REVI	9
SCTA	2
TUTI	1
WBNU	1
YBCH	1

Site 2007 – JT17

GPS Location: 0358943 3747311

Site Description: This site is located near Caney Creek in south McCurtain County. It consists of areas of mature pine and also areas with mature bottomland hardwood species like Water Oak, Sweet Gum and other oak and hickory species.

Bird Survey Results:

ACFL	2
AMCR	1
HOWA	3
NOCA	3
OVEN	1
PIWA	1
REVI	10
TUTI	2
WEVI	1
YBCU	2

Site 2007 – JT18

GPS Location: 0357135 3747879

Site Description: This site is located near Caney Creek in south McCurtain County. It consists of areas of mature pine and also areas with mature bottomland hardwood species like Water Oak, Sweet Gum and other oak and hickory species.

Bird Survey Results:

AMCR	1
CARW	3
DOWO	1
EWPE	1
HOWA	4
INBU	3
KEWA	2
MODO	5
NOCA	1
PIWA	3
PIWO	1
REVI	5
SUTA	3
TUTI	4
WEVI	1
YBCH	3
YBCU	4

Site 2007 – JT19

GPS Location: 0348611 3736257

Site Description: This site is located within Red Slough WMA. It consists of a mature pine forest intermixed with bottomland hardwood species.

Bird Survey Results:

ACFL	4
AMCR	1
BGGN	1
CACH	1
EWPE	1
GCFL	1
HERON	2
KEWA	2
MODO	2
NOCA	3
PIWO	3
RBWO	1
REVI	10
SUTA	1
TUTI	6
WEVI	4
YBCU	4

Site 2007 – JT20

GPS Location: 0349584 3735190

Site Description: This site is located with Red Slough WMA. It consists of mature bottomland hardwoods.

Bird Survey Results:

AMCR	3
BWWA	1
CACH	1
CARW	1
DOWO	1
GCFL	1
KEWA	2
NOCA	10
PIWO	2
REVI	5
SUTA	2
TUTI	7
WEVI	6
YBCU	2
YTVI	2

Site 2007 – JT21

GPS Location: 0356029 3735445

Site Description: This site is located near Tom in southern McCurtain County. It consists of a mature pine forest intermixed with bottomland hardwood species.

Bird Survey Results:

ACFL	1
CARW	3
COYE	1
EWPE	2
HOWA	1
INBU	2
KEWA	2
MODO	3
NOCA	3
PIWA	1
RBWO	1
REVI	4
SUTA	2
TUTI	1
YBCH	1

Site 2007 – JT22

GPS Location: 0236345 3811403

Site Description: This site is located in McGee Creek WMA in Atoka County. It consists of a mixed mature pine and oak-hickory forest.

Bird Survey Results:

AMCR	1
BLJA	4
CACH	2
CARW	1
GCFL	1
MODO	1
NODO	1
PIWA	2
PIWO	3
RBWO	2
REVI	1
RSHA	1
SUTA	2
WBNU	2
YBCU	1

Site 2007 – JT23

GPS Location: 0234665 3806837

Site Description: Site Description: This site is located in McGee Creek WMA in Atoka County. It consists of a mixed mature pine and oak-hickory forest.

Bird Survey Results:

BLJA	1
CARW	1
MODO	2
NOBO	1
NOCA	1
PIWA	2
SUTA	2
TUTI	5
YBCU	1

Site 2007 – JT24

GPS Location: 0290447 3815534

Site Description: This site is located in Honobia Creek WMA on north slopes south of Nashoba in Pushmataha County. It consists of mixed mature pine and oak-hickory forest.

Bird Survey Results:

BLJA	1
CARW	1
GCFL	1
MODO	1
PIWO	1
REVI	9
RSHA	1
SCTA	1
SUTA	2

Site 2007 – JT25

GPS Location: 0283911 3818671

Site Description: This site is located in Honobia Creek WMA on north slopes south of Nashoba in Pushmataha County. It consists of mixed mature pine and oak-hickory forest.

Bird Survey Results:

BGGN	1
CARW	3
CHSW	1
INBU	1
KEWA	1
MODO	3
NOCA	5
PIWO	1
REVI	5
SUTA	1
SWALLOW	2
TUTI	4
WEVI	2
YBCH	5
YTVI	1

Site 2007 – JT26

GPS Location: 0226604 3826285

Site Description: This site is located in Atoka WMA in Atoka County. It consists of mature bottomland hardwood forest.

Bird Survey Results:

ACFL	2
AMCR	1
CARW	3
GCFL	1
KEWA	1
NOPA	2
REVI	7
RSHA	1
TUTI	5
YBCU	1
YTVI	2

Site 2007 – JT27

GPS Location: 0272583 3779460

Site Description: This site is located in Hugo WMA in Choctaw County. It consists of mature bottomland hardwood forest.

Bird Survey Results:

ACFL	2
AMCR	1
BGGN	4
BLJA	1
CACH	5
DOWO	1
EWPE	1
GCFL	1
INBU	3
KEWA	2
NOCA	4
PROW	1
REVI	3
SUTA	3
SWWA	1
TUTI	12
WEVI	1
YBCH	1
YBCU	4
YTVI	1

Site 2007 – JT28

GPS Location: 0357436 3951882

Site Description: This site is located on Kester Mountain in southern Adair County. It consists of mature oak-hickory forest.

Bird Survey Results:

ACFL	1
AMCR	6
BGGN	1
INBU	2
REVI	6
SUTA	1
TUTI	5
YBCH	1
YTVI	1

Site 2007 – JT29

GPS Location: 0360364 3953005

Site Description: This site is located in Ozark Plateau WMA in southern Adair County. It consists of mature oak-hickory forest.

Bird Survey Results:

BGGN	2
BLGR	2
CAWR	1
EAPH	1
FISP	1
INBU	3
NOCA	1
PIWO	1
REVI	3
SCTA	1
SUTA	1
TUTI	4
WEVI	1
YBCH	2

Site 2007 – JT30

GPS Location: 0302058 3960397

Site Description:

Bird Survey Results: This site is located in Gruber WMA in Muskogee County. It consists of mature oak-hickory forest.

ACFL	1
BGGN	2
CARW	3
INBU	1
KEWA	2
NOCA	5
OVEN	1
REVI	3
RSHA	1
SUTA	3
TUTI	4
TUVU	2
WEVI	4
YBCH	1
YBCU	1
YTVI	1

Site 2007 – JT31

GPS Location: 0336604 3951834

Site Description: This site is located in Cookson hills WMA near the Cherokee and Adair County line. It consists of mature oak-hickory forest.

Bird Survey Results:

BGGN	2
BLJA	1
CARW	1
EWPE	4
INBU	3
MODO	1
NOCA	1
REVI	3
SUTA	2
TUTI	5
TUVU	1
YBCU	1
YTVI	1

Site 2007 – TO1

GPS Location: 0350858 3747855

Site Description: This site is located in southern McCurtain County and consists of a mixed age Loblolly Pine plantation.

Bird Survey Results:

AMCR	1
BHCO	1
BLJA	2
COYE	1
HOWA	3
KEWA	1
MODO	1
NOBO	1
PIWA	4
PRAW	1
RBWO	1
REVI	4
WEVI	3
YBCH	3
YBCU	1

Site 2007 – TO2

GPS Location: 0349822 3748469

Site Description: This site is located in southern McCurtain County and consists of a mixed age Loblolly Pine plantation.

Bird Survey Results:

BHCO	2
BLGR	1
CARW	1
COYE	6
DICK	2
DOWO	2
EAKI	1
FISP	2
INBU	4
MODO	3
NOBO	1
NOCA	1
NOMO	1
PRAW	3
REVI	2
WEVI	2
YBCH	9

Site 2007 – TO3

GPS Location: 350539 3750053

Site Description: This site is located in southern McCurtain County and consists of a mixed age Loblolly Pine plantation.

Bird Survey Results:

BLGR	4
COYE	4
FISP	3
INBU	12
NOMO	2
PRAW	7
YBCH	6

Site 2007 – TO4

GPS Location: 0350310 370233

Site Description: This site is located in southern McCurtain County and consists of recent clear-cut.

Bird Survey Results:

BLGR	3
COYE	5
DICK	5
EAKI	1
FISP	2
INBU	10
MODO	2
NOBO	4
NOCA	1
OROR	1
PRAW	3
WEVI	1
YBCH	6

Appendix IV

Maps of Species of Special Concern and other Selected Species

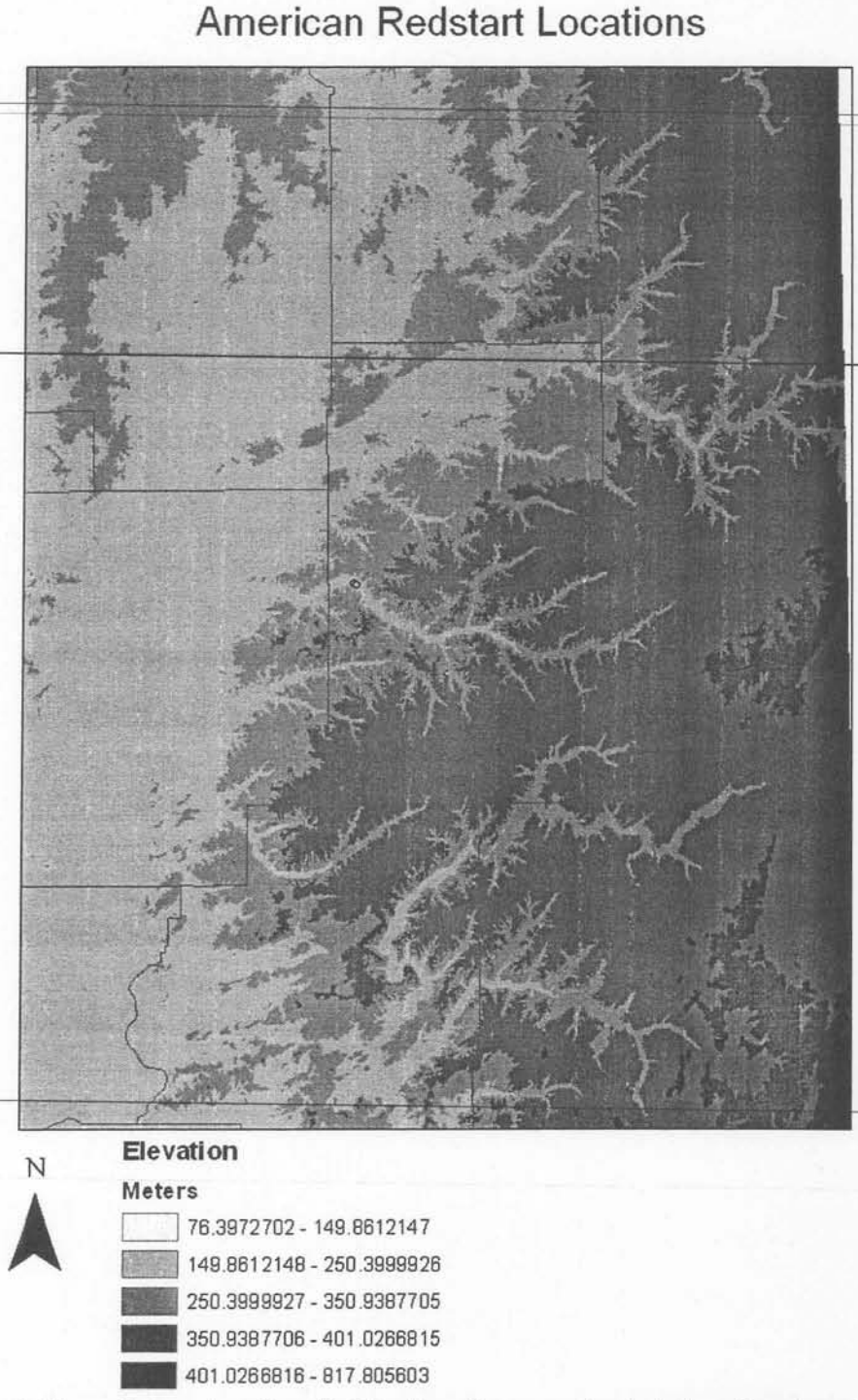


Figure 4. Our only two American Redstart locations were located along Spavinaw Creek between Spavinaw Lake and Lake Eucha. This appears to be the location listed in the Oklahoma Breeding Bird Atlas for a nesting confirmation prior to the atlas.

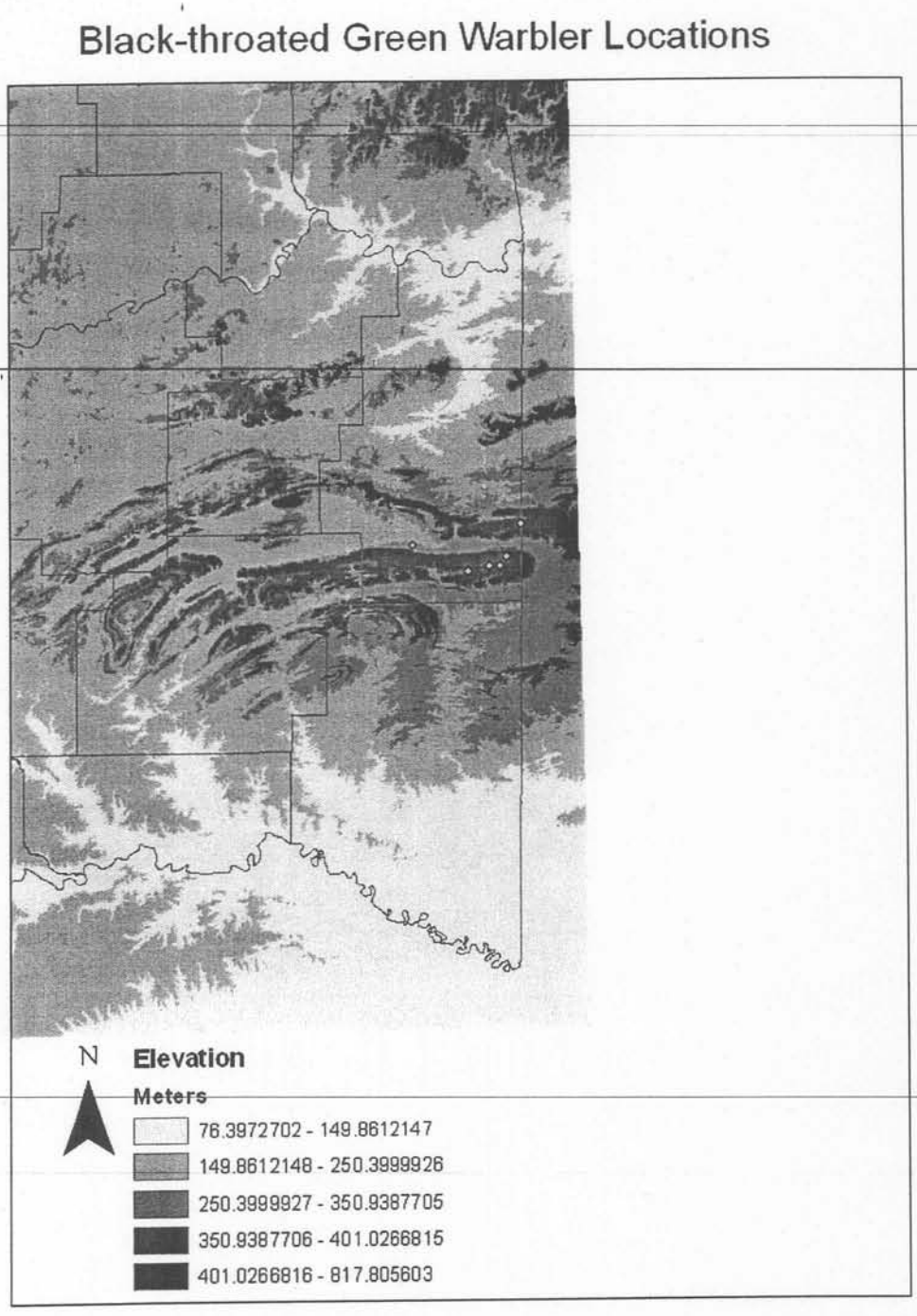


Figure 5. The Black-throated Green Warbler appears to be a new addition to the breeding birds of Oklahoma. All of our Black-throated Green records come from mature deciduous forests at high elevations in LeFlore County.

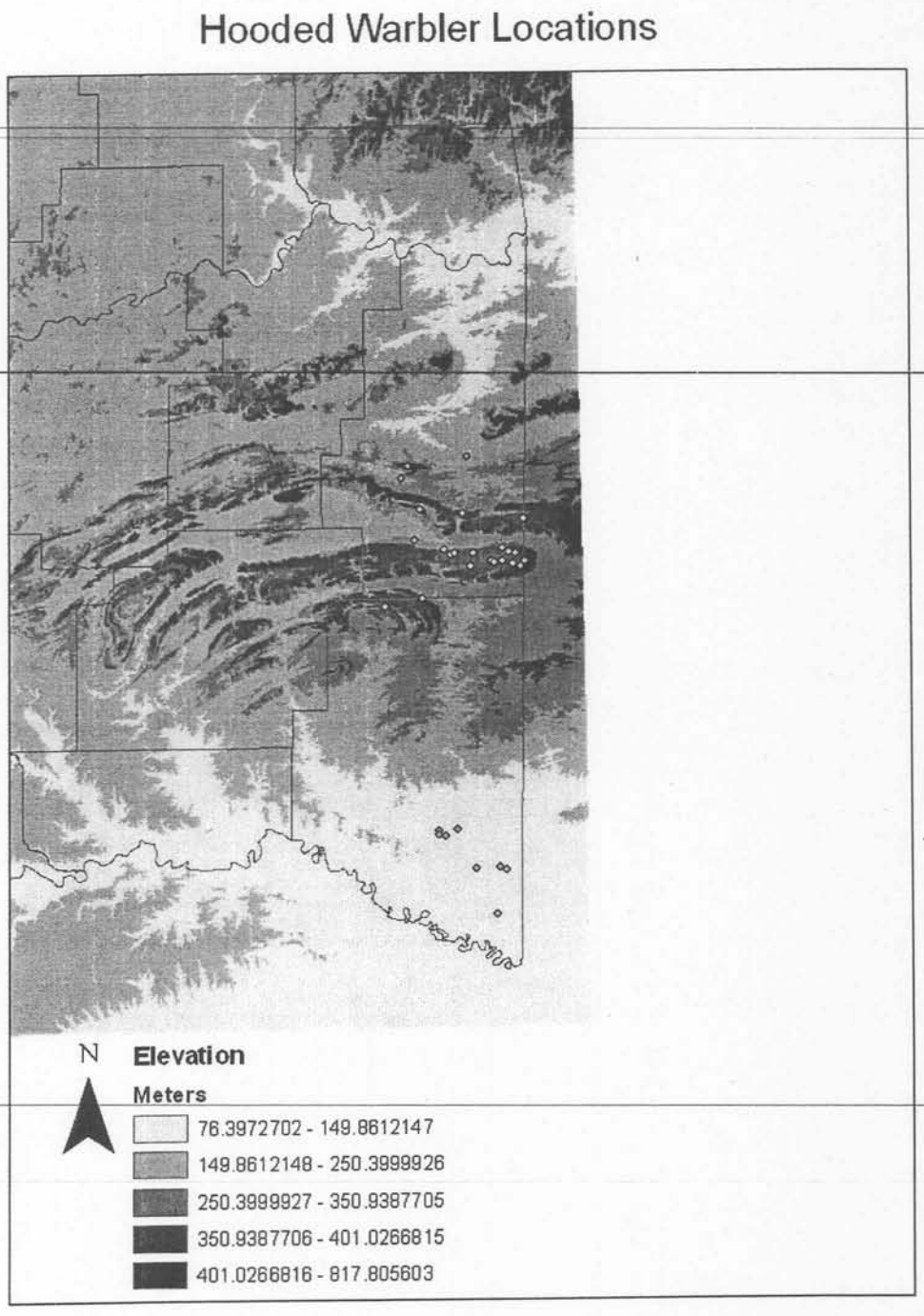


Figure 6. Hooded Warblers were widespread in southeastern Oklahoma but absent from northeastern areas. They were located in both mature deciduous forests at high elevations and within mature bottomland hardwood forests at places like Little River NWR. It seemed like Hooded Warblers were more intolerant of forest fragmentation than Kentucky Warbler.

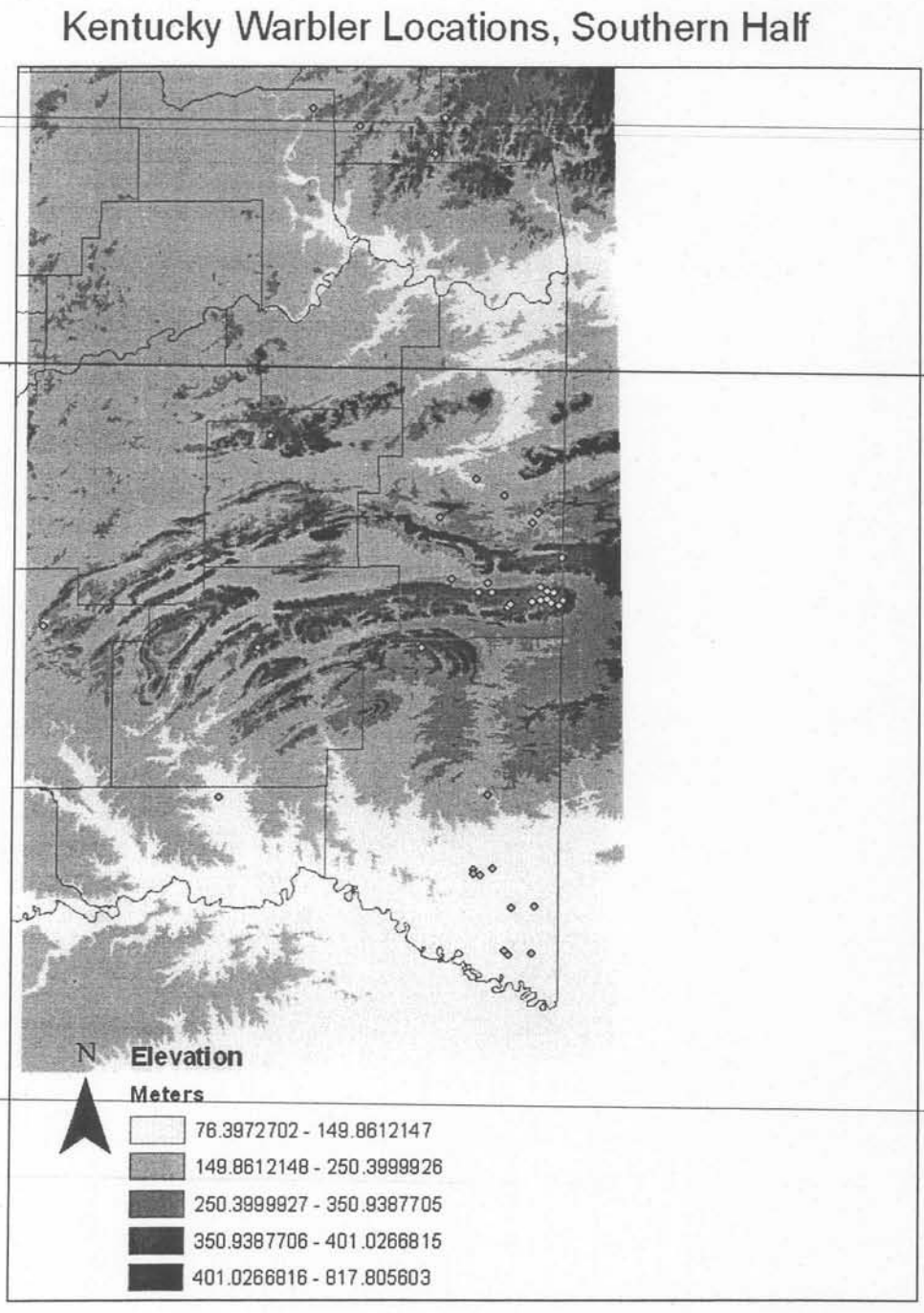
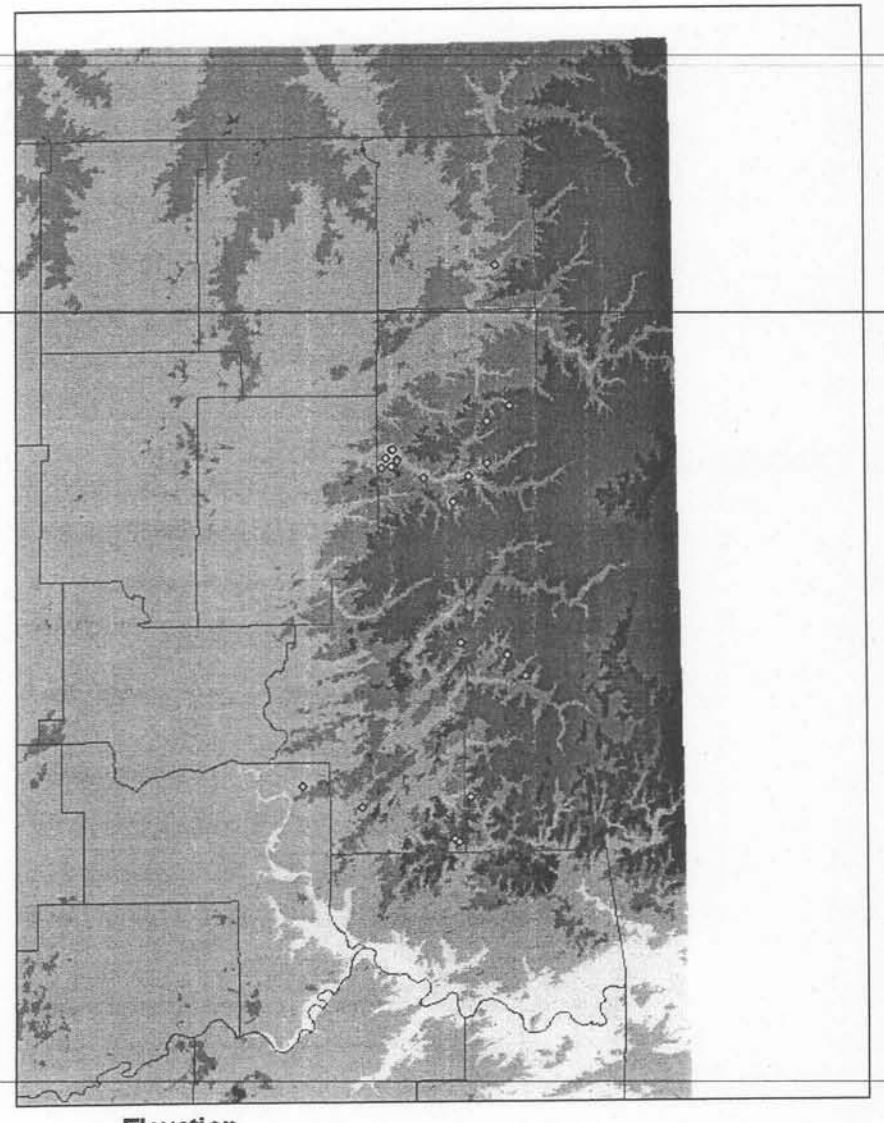


Figure 7. Kentucky Warblers were the most widespread of the species of concern found at nearly half of sites surveyed. Kentucky Warblers were found at many fragmented sites and also sites with a higher pine component than Hooded Warblers.

Kentucky Warbler Locations, Northern Half



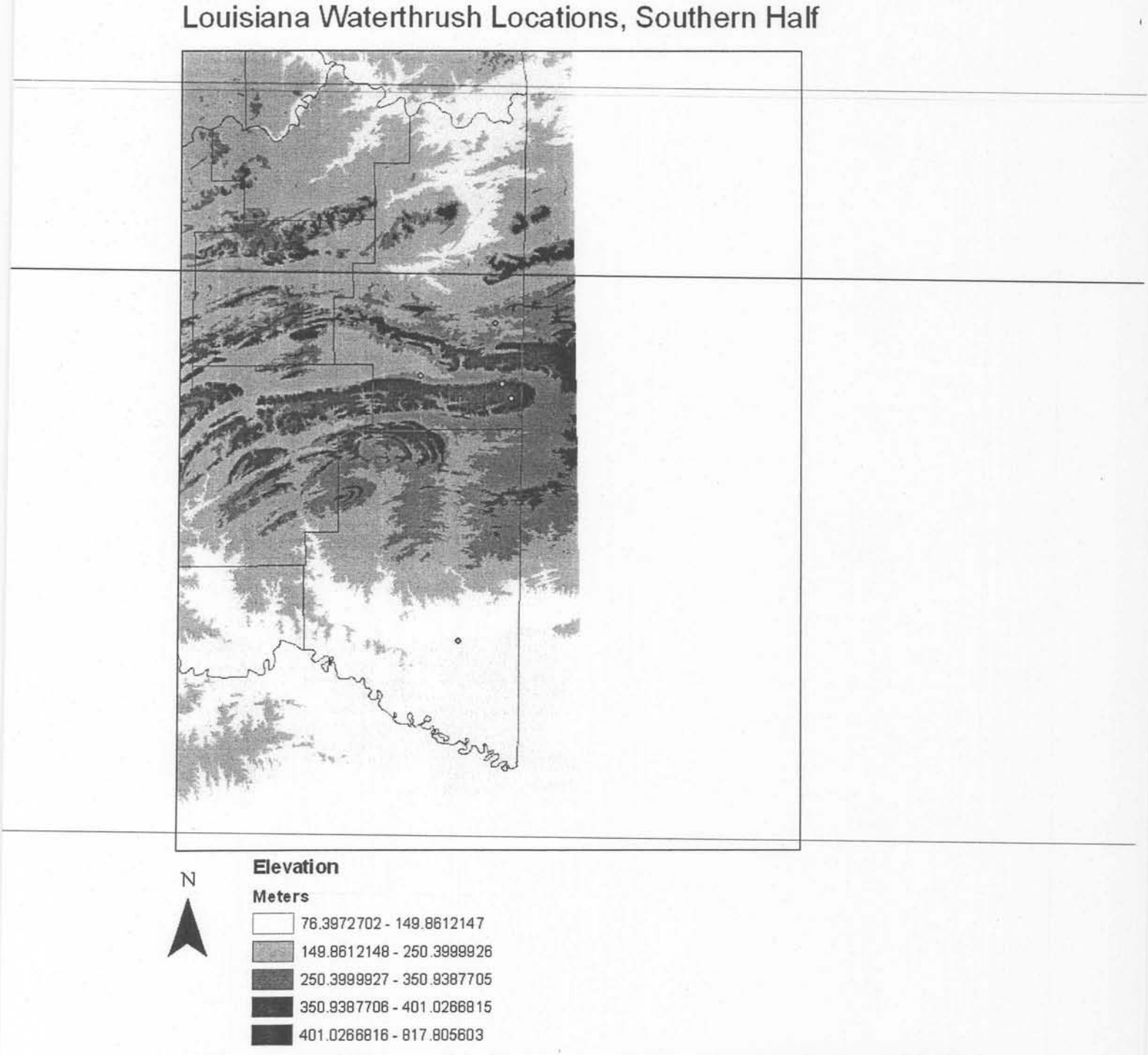
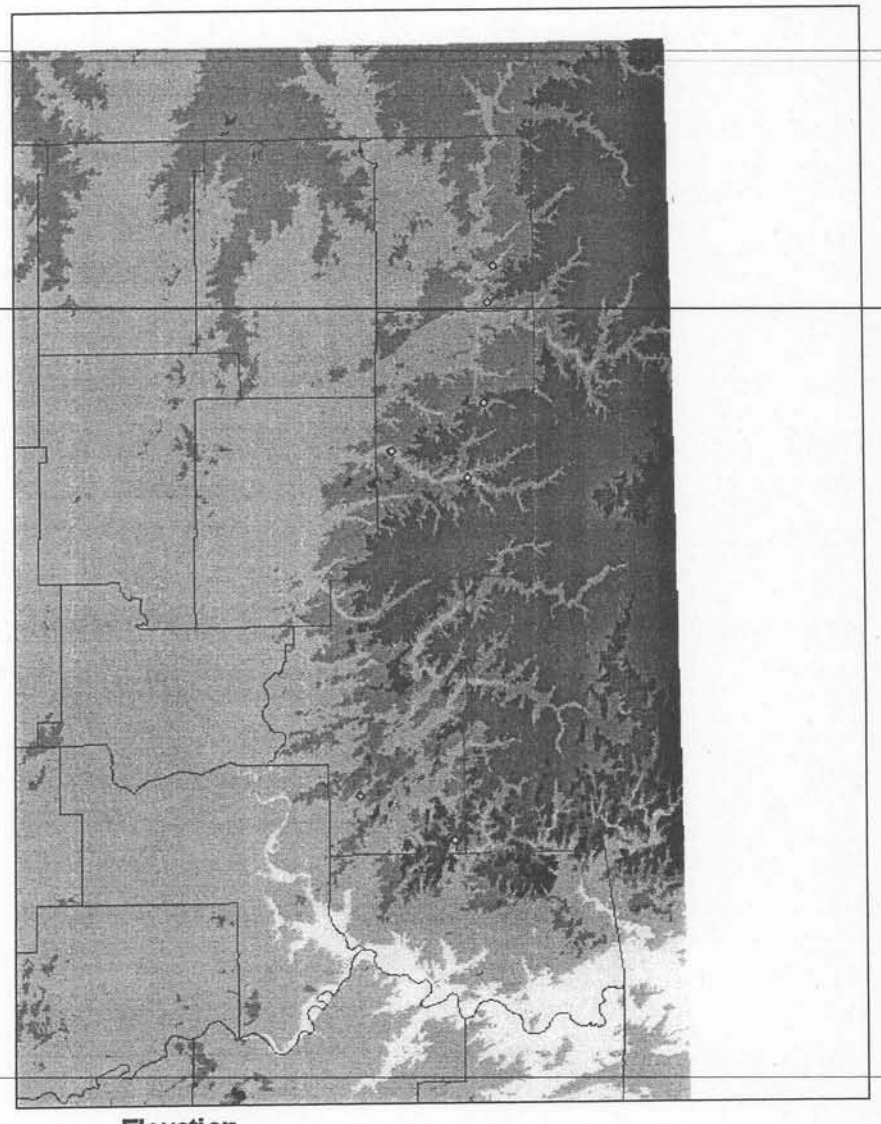


Figure 8. Louisiana Waterthrushes were found throughout the study area. They were primarily limited to sites near permanent streams and rivers.

Louisiana Waterthrush Locations, Northern Half



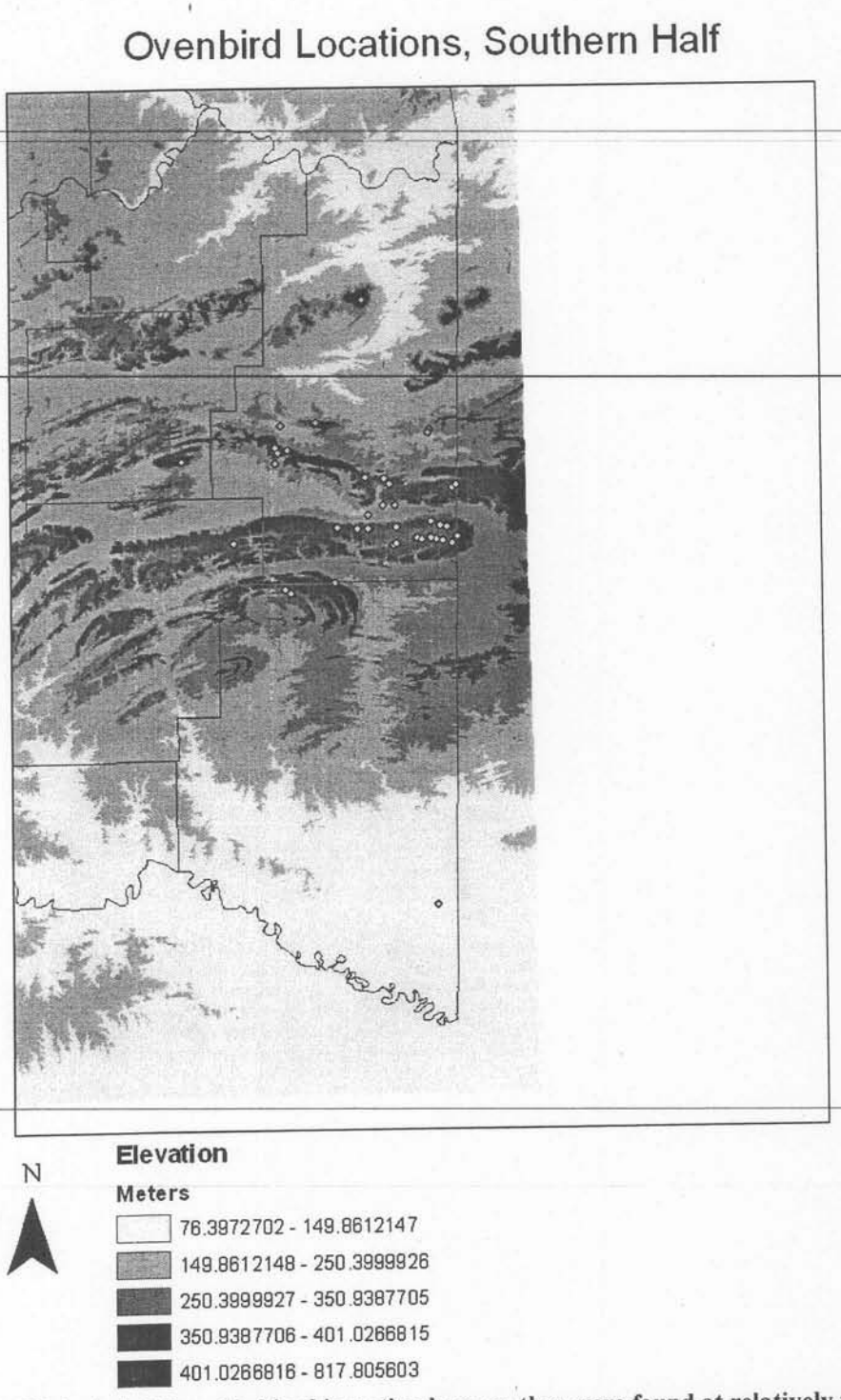
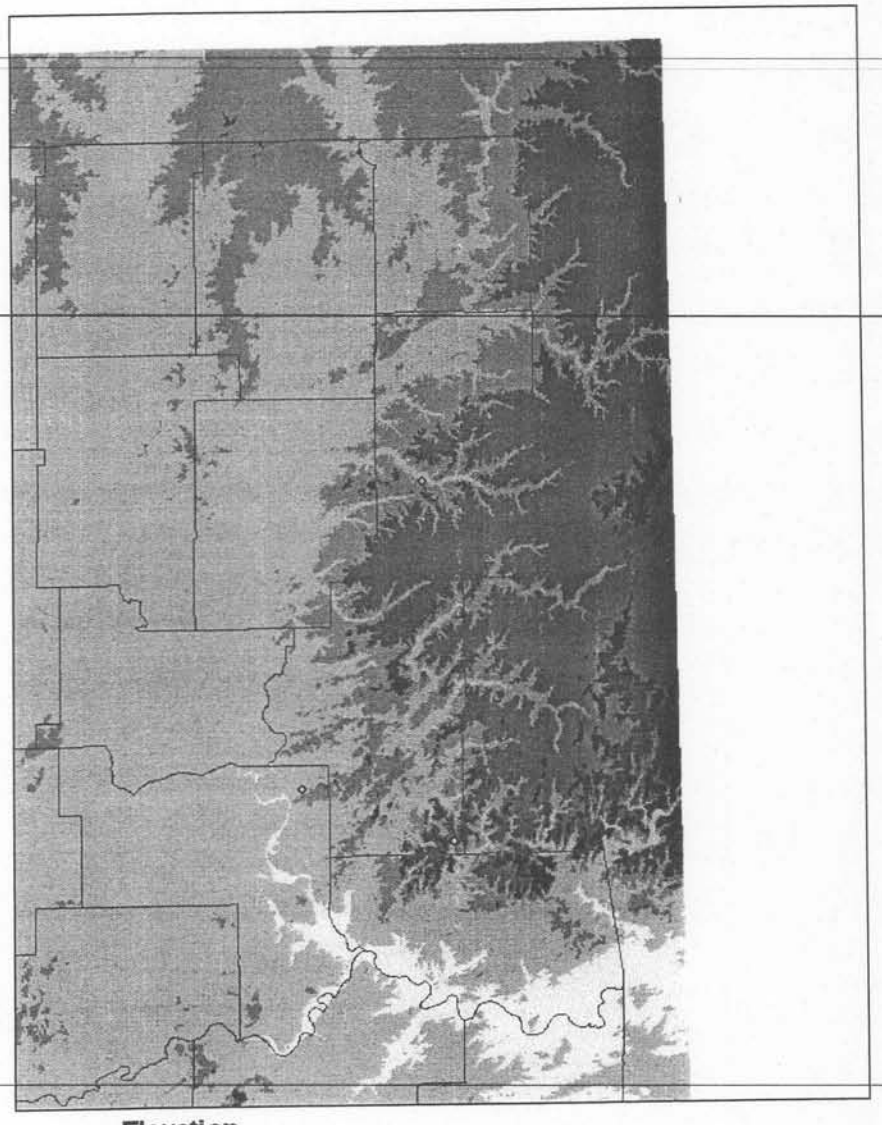


Figure 9. We included Ovenbird in this section because they were found at relatively few sites during the Breeding Bird Atlas period. We found them to be one of the most common species at higher elevation sites in the Ouachita Mountains.

Ovenbird Locations, Northern Half



N

Elevation

Meters

- 76.3972702 - 149.8612147
- 149.8612148 - 250.3999926
- 250.3999927 - 350.9387705
- 350.9387706 - 401.0266815
- 401.0266816 - 817.805603

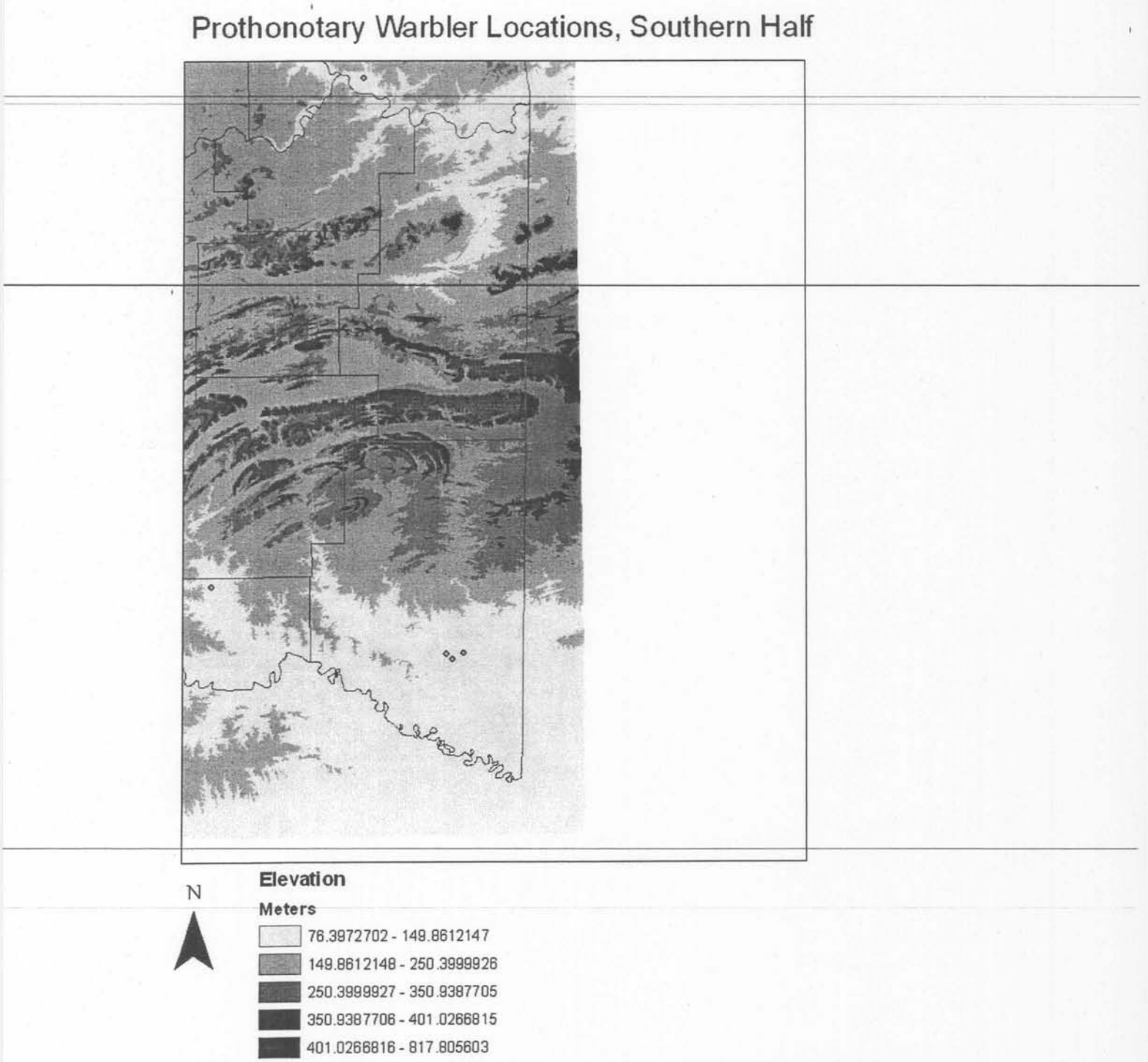
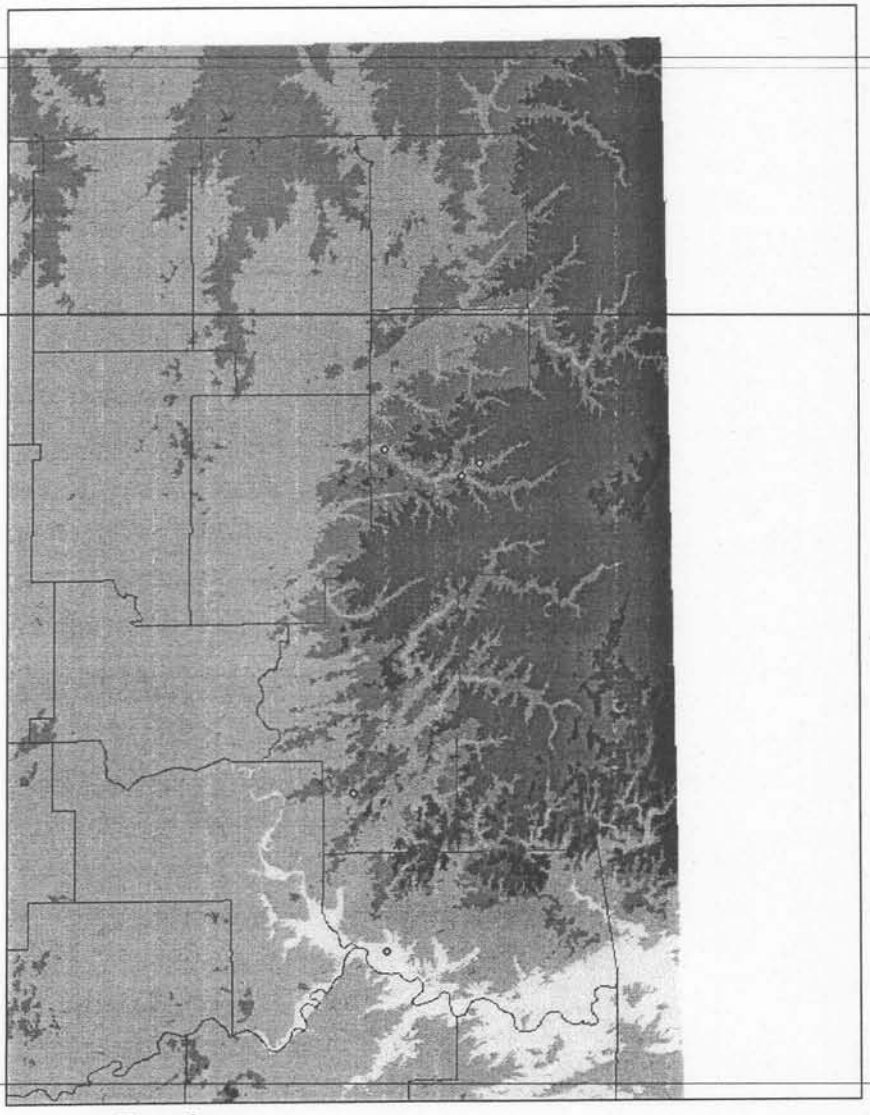


Figure 10. We found Prothonotary Warblers at sites with bottomland hardwood forests such as Little River NWR, Hugo WMA, Sequoyah NWR and along Spavinaw Creek.

Prothonotary Warbler Locations, Northern Half



N

Elevation

Meters

- 76.3972702 - 149.8612147
- 149.8612148 - 250.3999926
- 250.3999927 - 350.9387705
- 350.9387706 - 401.0266815
- 401.0266816 - 817.805603

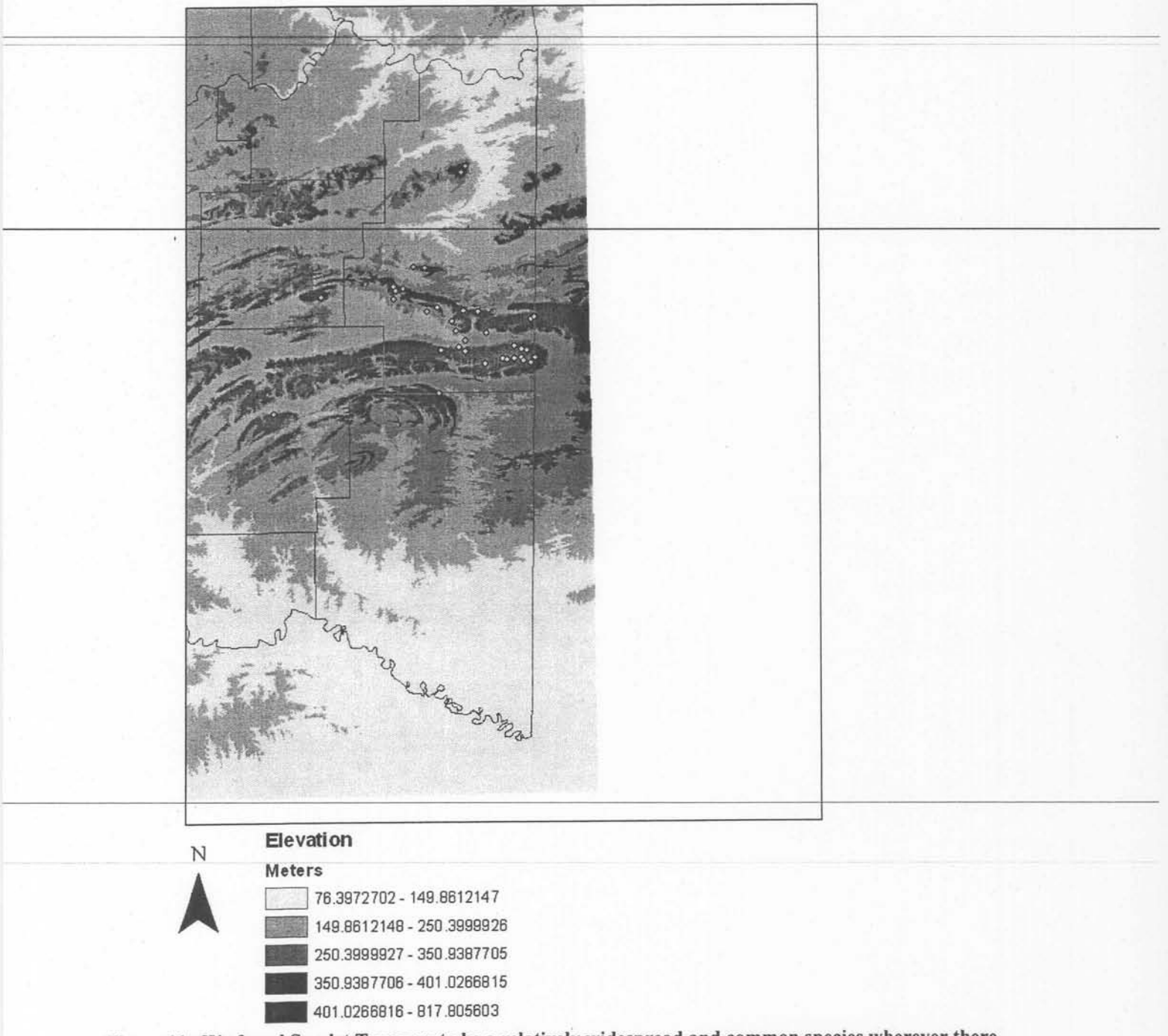
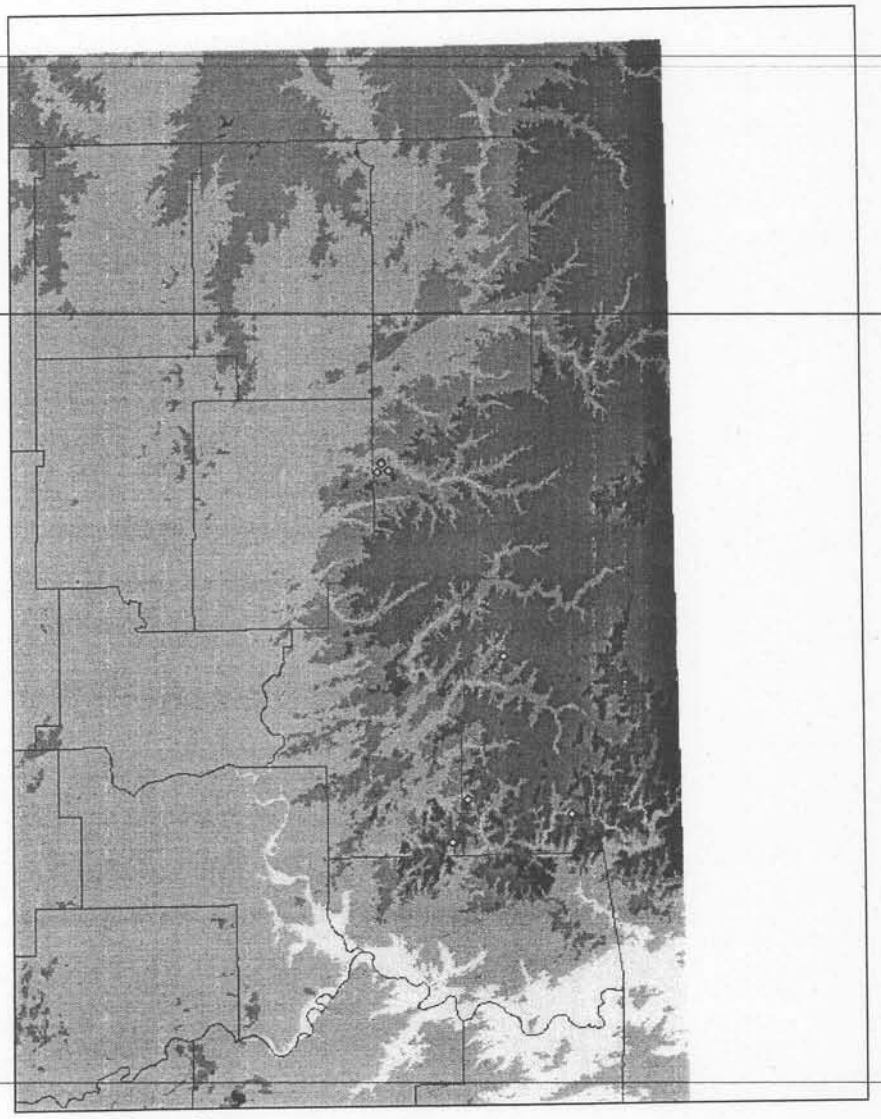


Figure 11. We found Scarlet Tanagers to be a relatively widespread and common species wherever there was mature oak-hickory forest.

Scarlet Tanager Locations, Northern Half



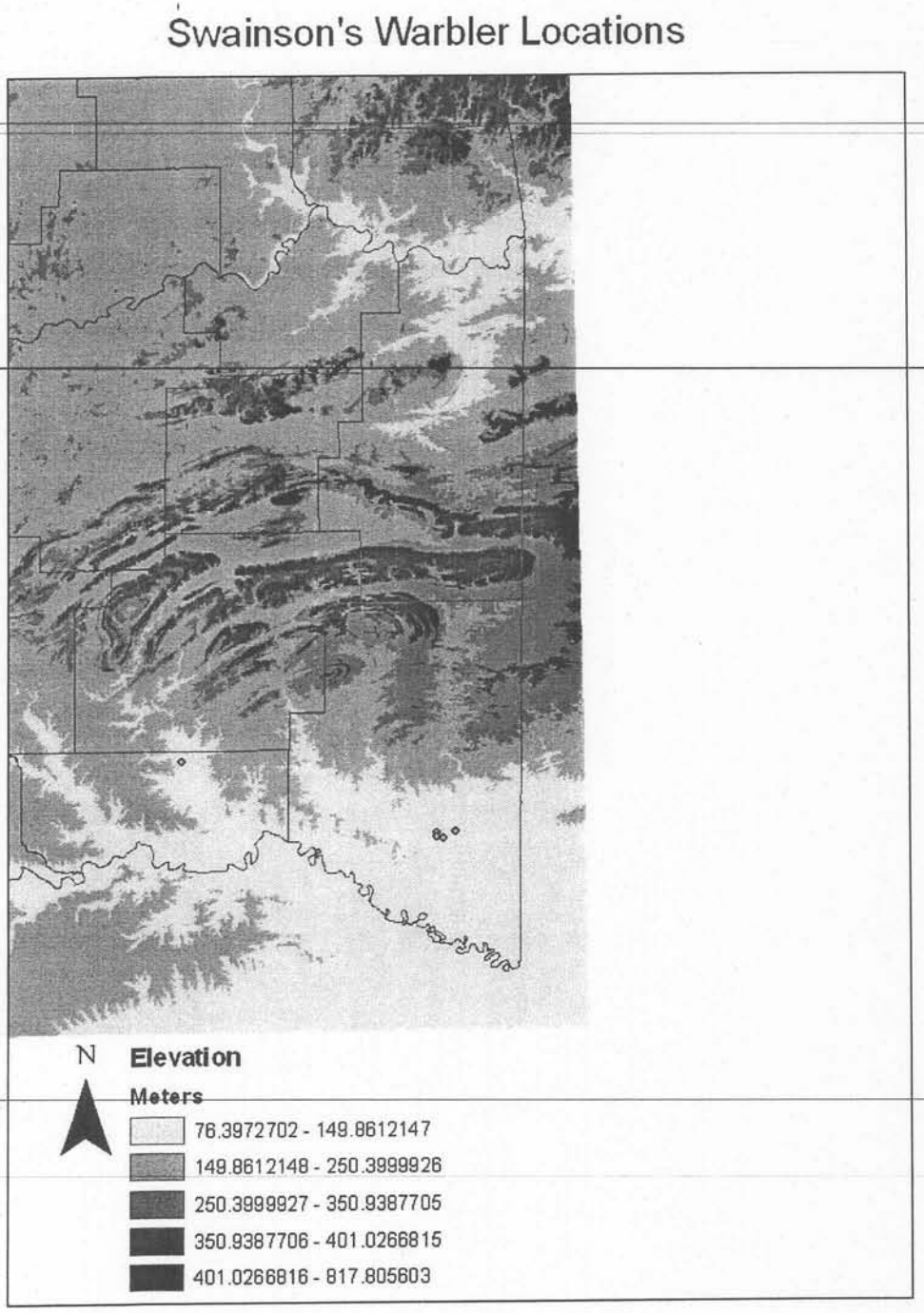


Figure 12. We found Swainson's Warblers to be locally common at Little River NWR and also found one at Hugo WMA in Choctaw County. We did not find any outside of these two relatively intact bottomland forest systems.

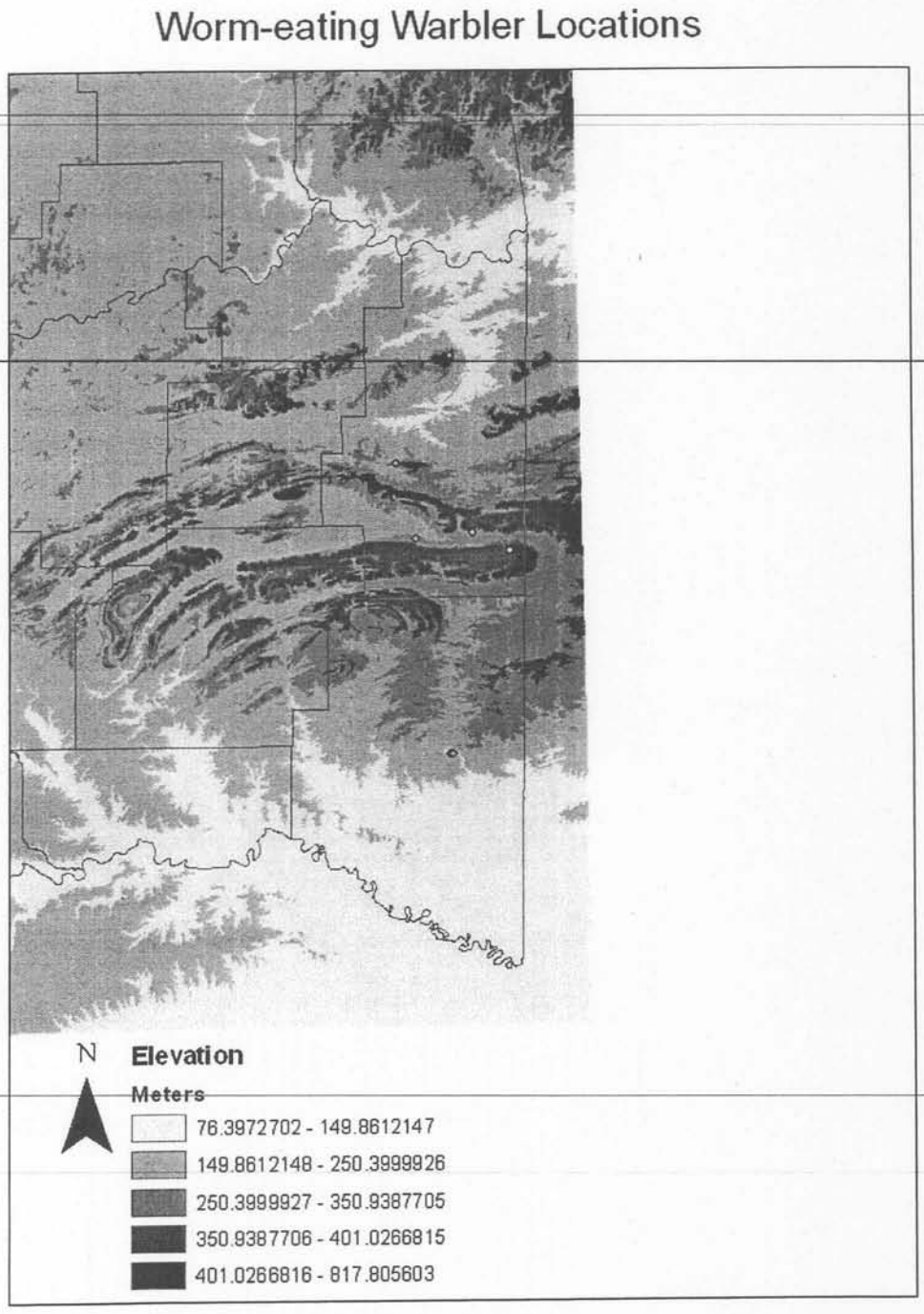


Figure 13. Very few Worm-eating Warblers were found during the Breeding Bird Atlas. Although still rare we found Worm-eating Warblers across much of LeFlore and McCurtain counties, especially in areas with high elevations and steep slopes

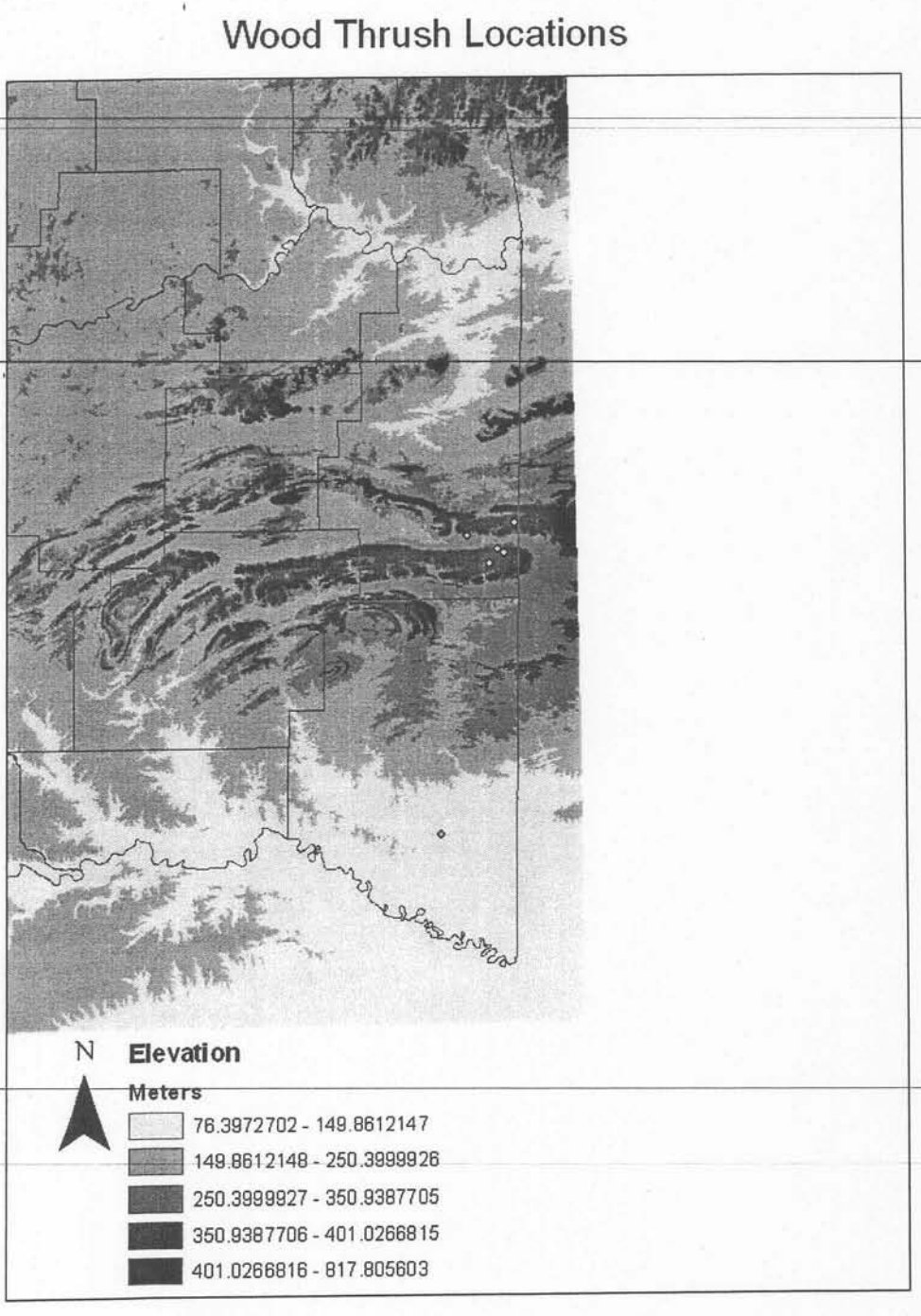


Figure 14. We found Wood Thrush at only six locations. Most of these were at high elevations in the Ouachita Mountains but we also had one at Little River NWR. This species seemed to be more widespread during the Breeding Bird Atlas project.

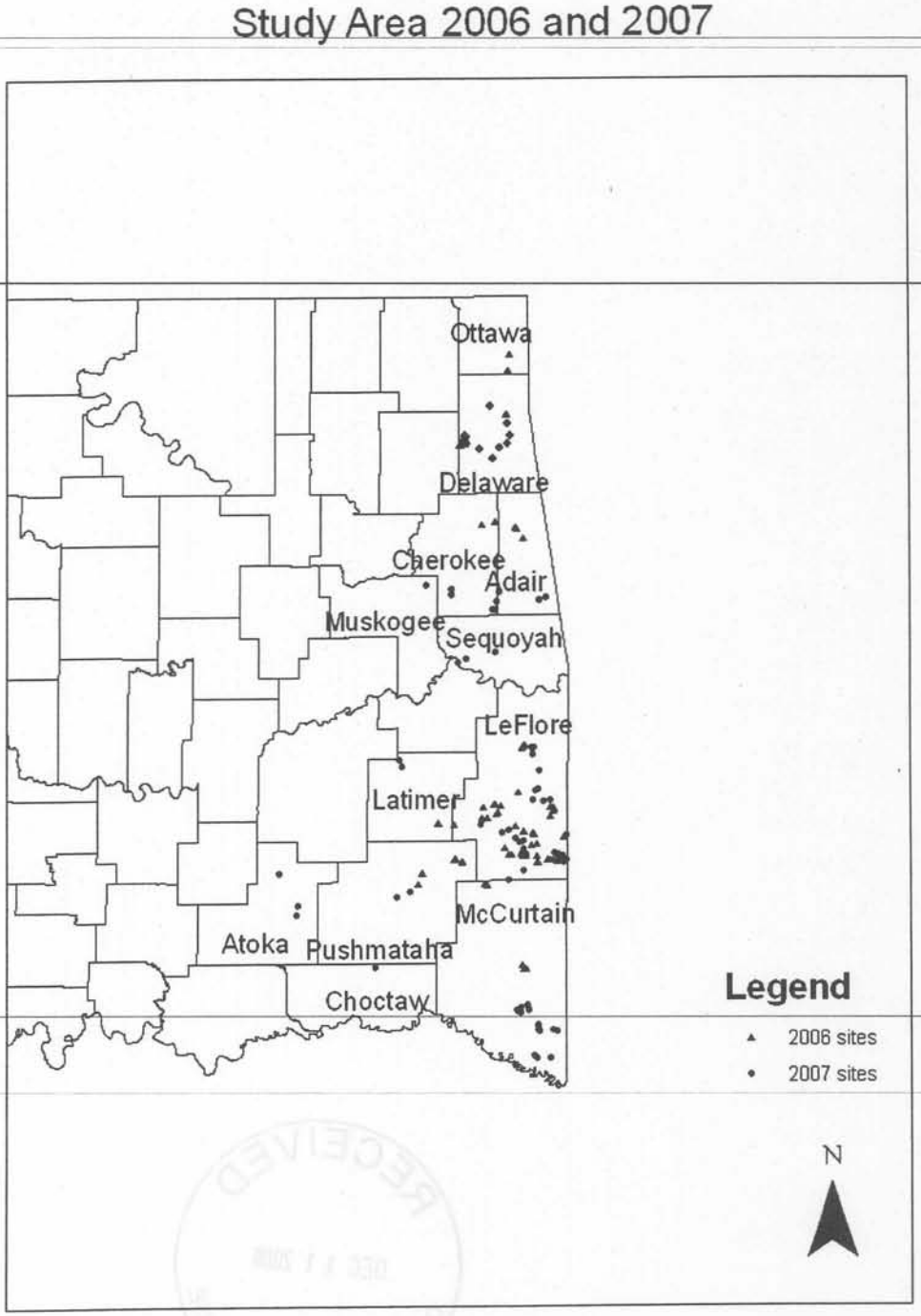


Figure 15. Map of the study area.