

**DIFFERENT RESPONSES OF MIGRATING BIRDS TO TWO MISSISSIPPI
ALLUVIAL VALLEY STOPOVER SITES: EARLY-SUCCESSIONAL UPLAND
AND EARLY-SUCCESSIONAL BOTTOMLAND**

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Introduction

The habitat requirements of Nearctic-Neotropical migratory birds (NMBs) along their annual migration routes are poorly known, and the relative importance of early-successional stopover habitats to migrating populations is undetermined (Moore and Simons 1992). Most current research focuses on the reproduction period in North America and on the over-wintering ecology during the non-breeding season in the tropics (Hagan *et al.* 1992). However, it is likely that NMBs have specific habitat requirements when using stopover habitat during migration. If these requirements cannot be met, then managing for their breeding habitats could

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become of little consequence in altering declining trends in NMB populations (Loria and Moore 1990, Morris *et al.* 1994).

Declines for some species are linked to shifts in regional availability of early-successional (shrubby) vegetation (Witham and Hunter 1992). This type of habitat has been conventionally maintained by fire, insect irruptions, disease, or climatic events (Rotenberry *et al.* 1992). However, natural disturbances have been successfully controlled (e.g., wildfire suppression) and largely replaced by clearcutting, which provides a major source of shrublands. Recently, clearcutting has been eliminated in the Ouachita National Forest and sharply curtailed in the Ozark-St. Francis National Forest (however, seedtree harvests continue in both forests). Therefore, most current shrubland habitat that was generated by clearcutting in these areas will revert to old fields within 5-15 yrs. This loss of shrublands may exacerbate declines in NMB species that use early-successional habitats for stopover sites.

The key question I address here is: how do vegetation structure, vegetation composition, and site location influence the abundance of NMBs using early-successional habitats as stopover sites? Answers could be useful in developing management recommendations that promote the conservation of these birds.

In this paper, I present habitat variables associated with the abundance of both NMB and resident bird species in early-successional stopover sites during fall migration.

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STUDY SITES

I conducted research within the St. Francis National Forest. While 5-15 yr old clearcuts were considered optimal for this project, no cuts that are that young exist in the St. Francis National Forest today (K. Tinkle, pers. comm.). Therefore, I chose: (1) a 25 yr old upland clearcut (T1N, R4E, S28, SE ¼) with roadbed disturbance and (2) a seasonally flooded bottomland area (T1S, R4E, S8, NE ¼) with an established wildlife food plot, which supports shrubby vegetation, especially along edges. The use of replicate sites was not logistically feasible during this study.

METHODS

Bird Abundance Sampling Techniques

Birds were trapped by mist-netting (Karr 1979) at the upland site on 26-27 August 1995, and at the bottomland site on 2-3 September 1995. I recorded species, age and sex, mass, fat class, degree of skull pneumatization, unflattened wing chord, degree of molt, minimum stopover length, and habitat type. This paper focuses on the relative abundance at the two sites of two bird groups: (1) NMBs and (2) total birds (all sampled birds: NMBs + resident birds).

Habitat Structure Sampling Techniques

Following the general guidelines of James and Shugart (1970), Kellner et al. (1990), and Martin (1994), I used a series of six circular plots per study area for sampling. Plots were sampled for vegetation structure and composition after the mist-nets were closed for the day. In addition, representative plant species from both upland and bottomland were collected, identified, pressed, and deposited at the Arkansas State University Herbarium.

At each plot, I visually estimated percentages for green cover, leaf litter, coarse woody debris, and bare ground. Additionally, I measured both species and numbers (via individual counts) in various size classes (using dbh tape) for: (1) shrubs (both < and >2.5 cm at 10-cm ht), (2) saplings

(<2.5-cm dbh), (3) poles (>2.5-cm dbh), (4) trees (8-23-cm dbh; 23-28-cm dbh; and >38-cm dbh), and (5) snags (>12-cm dbh at >1.5-m ht). Finally, I measured canopy cover (using a densiometer), litter depth (with a wire gauge), and canopy height (with a clinometer).

Statistical Analyses

Linear regression (Kellner et al. 1990) was used to determine the habitat variables that were correlated with numbers of NMBs and resident species sampled. I used *t*-tests (Neter and Wasserman 1974) to determine whether significant ($P < 0.05$) differences existed between sites for selected habitat variables.

RESULTS

Canopy cover was a significant ($P < 0.05$) and strong predictor of abundance for both NMBs ($R^2 = 0.9414$, $P = 0.0001$) and total birds ($R^2 = 0.9415$, $P = 0.0001$) (Table 1). The presence of forbs was moderately ($R^2 = 0.5011$) successful as a habitat predictor for NMBs and was statistically significant ($P = 0.01$) (Table 1).

Table 1. Important habitat variables for abundance of Nearctic-Neotropical migrant birds and total* birds.

| Class | P | R ² | Habitat | |
|-------------|--------|----------------|--------------|-------------|
| | | | Variable | Coefficient |
| MIGRANTS | 0.0100 | 0.5011 | Forb | 0.21 |
| | 0.0001 | 0.9414 | Canopy cover | 0.96 |
| TOTAL BIRDS | 0.0001 | 0.9415 | Canopy cover | 0.19 |

*NMBs + resident species

The *t*-tests revealed significant ($P < 0.05$) differences between sites for percentage of the ground covered by all green vegetation (ALLGREEN) from ground level to 50 cm above ground level (Table 2). Also, significant ($P < 0.05$) differences between sites for both shrub density and canopy height were observed (Table 2). Habitat variables showing no ($P > 0.05$) significant difference between sites were: (1) leaf litter depth; (2) percentages for leaf litter, coarse woody debris, bare ground, and canopy cover; and (3) presence and/or density of saplings, poles, trees, and snags.

Table 2. Significant ($P < 0.05$) differences in vegetative structure and composition between upland and bottomland sites.

| Variable | UPLAND | | BOTTOMLAND | | P* |
|--------------------------|--------|------|------------|------|--------|
| | mean | SD | mean | SD | |
| | n = 6 | | n = 6 | | |
| ALLGREEN (%) | 26.2 | 14.6 | 59.0 | 26.9 | 0.0315 |
| SHRUB DENSITY (per plot) | 9.5 | 11.1 | 4.8 | 1.7 | 0.0093 |
| CANOPY HEIGHT (m) | 6.8 | 1.5 | 11.8 | 6.8 | 0.0039 |

*P determined by *t*-test.

DISCUSSION

Although abundance levels for both NMBs and total birds were not ($P > 0.05$) significantly different between sites, more birds were trapped at the bottomland habitat (mean = 5.3 migrants per net per day; mean = 6.0 total birds per net per day) than the upland habitat (mean = 1.5 migrants per net per day; mean = 2.8 total birds per net per day). This trend could be due to several reasons other than significant ($P < 0.05$) differences in vegetation structure and vegetation composition (Bairlein 1992). Weather frequently drives birds to stopover, when they would have preferred to continue migrating. It is possible that weather may have grounded birds

(Rappole and Warner 1976, Bairlein 1992) in the bottomlands, when I sampled them on 2-3 September 1995. Alternatively, birds may use the Mississippi River as their migrational flyway, simply because its path contains few ecological barriers to migration. Therefore, habitat preference may be a minor factor in stopover habitat use (Safriel and Lavee 1988). Further research on these topics is indicated.

However, because of the strong, significant ($P < 0.05$), positive correlations between canopy cover and the abundance of both NMBs and total birds (Table 1), and the large, significant ($P < 0.05$) difference between sites for canopy height (Table 2), it is reasonable to surmise that canopy height and canopy cover are influencing bird abundance. Therefore, in the future, canopy-related questions should require that greater attention be placed on the types of data to be collected. Ultimately, a food habits study for NMB species should be performed to more accurately define the relationships between the birds and vegetation at stopover sites.

There is a clear and present need for rapid assessment and implementation of management plans that create or enhance habitats for NMB species that stopover at early-successional habitats. This report provides some preliminary data (G. R. Thomas, unpubl. data). However, any relationships presented here represent data collected during one year only and are not replicated. Therefore, cause-effect relationships have not been established.

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