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Gregory A. Jones

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Gregory A. Jones
Dept.of Wildlife Ecology and Conservation
Institute of Food and Agricultural Sciences
University of Florida
303 Newins-Ziegler Hall
PO Box 110430
Gainesville, FL 32611-0430
Gaj0@gnv.ifas.ufl.edu

ABSTRACT

Latin American mature citrus groves have been found to be attractive to wintering Neotropical migrants. Citrus groves compose nearly half the agricultural acreage in the state of Florida representing a substantial proportion of habitat available to birds in many parts of the state. Considering the rapid development of Florida's natural areas, citrus groves, currently covering over 348,000 ha in the state, may represent increasingly critical habitat for many resident and wintering species. These groves may also function as suitable stopover sites for Neotropical landbird migrants ranked as in need of conservation attention. During the fall of 1998, I surveyed birds utilizing a 16.2 ha commercial citrus grove in Florida's Central Ridge Citrus Region located at the University of Florida's Citrus Research and Education Center near Lake Alfred, Polk County. This pilot study confirms that fall Neotropical landbird migrants can be found in Florida's commercial citrus groves and may be utilizing these areas as stopover habitat. Therefore, citrus groves may represent important potential feeding and resting sites for Neotropical landbird migrants as urban and residential development continues at a rapid pace in Florida.

INTRODUCTION

A need for research focusing upon the situations faced by Neotropical migrants during migration has been recognized (Finch 1991, Moore and Simons 1992, Russell et al. 1994). Events during migration may cause mortality and affect resultant physical condition, ultimately impacting the numbers of passerines that successfully arrive on summer breeding grounds (Ketterson and Nolan 1982, Martin and Karr 1986, Lindstrom 1990, Kuenzi et al. 1991, Owen and Black 1991, Russell et al. 1994). Many avian migrants are physically incapable of accomplishing lengthy migrations without frequent stopover periods to replenish needed energy stores (see Berthold 1975, Cherry 1982, Graber and Graber 1983, Bairlein 1985, Safriel and Lavee 1988, Loria and Moore 1990). Recently, conservation has focused on the importance of protecting migratory "stopover sites." A stopover site can be defined as any site at which nocturnal migrant birds stop during the day to rest and/or feed. In light of concern over declining populations of many passerine species, a need exists for further study of stopover ecology of Neotropical and temperate landbird migration (Hagan et al. 1992).

Increasingly, there is recognition that protected reserves alone will not suffice to conserve biodiversity in the long term. Therefore, methods of integrating conservation and productive use must be achieved (Hobbs and Norton 1996). Agriculture is the dominant form of land management in the continental U.S. (Gall and Orians 1992), and in Florida represents over 690,000 ha (FDACS 1994). Citrus groves, in particular, compose nearly half the agricultural acreage in the state of Florida (FDACS 1994) representing a substantial proportion of habitat available to birds in many parts of the state (Mitchell et al. 1996). Birds in agricultural systems use cropped areas, non-cropped areas, or both for many types of activities: foraging, nesting, brooding, singing, preening, etc. (Rodenhouse et al. 1995). Past studies have documented the presence and use of Florida's citrus groves by a variety of bird species both during the summer and winter seasons (Lohrer 1990, 1991a, 1991b, Crowe 1992, Champe 1993, Mitchell et al. 1995). Robbins et al. (1989) found mature citrus groves in Belize, Jamaica, and Costa Rica provided attractive habitat to wintering Neotropical migrants. Considering the rapid development of Florida's natural areas, citrus groves, currently covering over 348,000 ha in the state (FDACS 1996), may represent increasingly critical habitat for many resident and wintering species. These groves may also function as suitable stopover sites for Neotropical landbird migrants ranked as in need of conservation attention in Florida by the Game and Freshwater Fish Commission. Parts of Florida host huge numbers of

migrant birds during spring (Feb-June) and fall (Jul-Dec) migration periods (Pranty 1996). However, little is known of the utilization of citrus groves as stopover habitat by migrant passerines as they pass through the state.

During the fall of 1998, I surveyed birds utilizing a 16.2 ha commercial citrus grove in Florida's Central Ridge Citrus Region located at the University of Florida's Citrus Research and Education Center near Lake Alfred, Polk County. Birds were surveyed by point counts and mist netting sessions between 18 September and 18 October. This short pilot study was conducted to investigate whether Neotropical migrants utilized this grove as stopover habitat during this fall migratory period.

METHODS

Study Site — The University of Florida's Citrus Research and Education Center (CREC) is located near Lake Alfred in Polk County, Florida. The center includes over 91.1 ha of commercial citrus groves utilized for the investigation of citrus problems and production research. This study was conducted in the northernmost 16.2 ha grove maintained by the center.

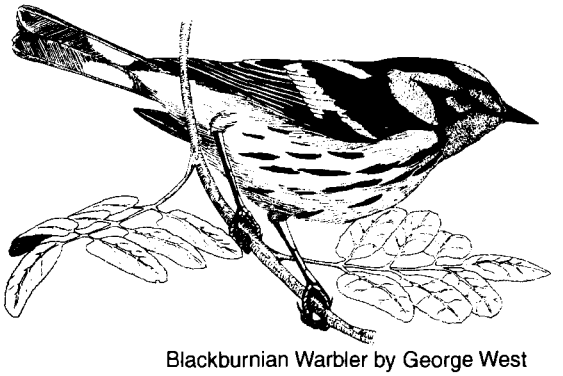
Census Surveys — Birds were sampled at this site utilizing the 50 m fixed radius point count method as described by Bibby et al. (1992). Sampling points sufficient in number to provide adequate coverage of the site were established randomly within the 16.2 ha grove area (a total of 7 count pts). To determine avian occurrence, diversity, and relative abundance, points were sampled in random order twice per week throughout the five-week study (5 min counts, 10 count pt for a total of 50 min/pt). At least once per week, four-hour walk-abouts were conducted in the area to possibly detect rare or cryptic species utilizing this grove. From these data, avian presence and abundance profiles were generated for the CREC grove site during this five-week, 1998 fall migratory period.

Mist Netting Surveys — Three mist netting sessions were conducted over the study period. Birds were caught with mist nets between sunrise and 1200 hr on three consecutive days during each session. A minimum of 10 (2 m x 10 m) mist nets were utilized each day of operation. Mist nets were positioned in locations near the perimeter and throughout the interior of the grove for maximum coverage and to ensure representative sampling of the entire grove. Only Neotropical migrants were selected for morphological examination and banding. Those species that are residents or known to winter in Florida were counted but not closely examined or banded.

The following data were recorded upon capture from Neotropical migrants: date, time of capture, species, sex and age (Pyle et al. 1987), weight to nearest 0.1 g with an Ohaus electronic digital balance within 10 min of capture, fat class (six-point scale developed by Helms and Drury 1960), and wing chord (unflattened). Morphological data were again recorded for individuals recaptured after their initial capture, and minimum stopover length calculated for these individuals during this study. However, no Neotropical migrants were recaptured.

RESULTS

Census Surveys — A total of 20 species of landbirds were found utilizing the grove. Most were year-round residents or newly arrived winter visitors. Once they arrived (after 1 October), Palm Warblers *(Dendroica palmarum)* were the most numerous species in the grove (12.4 ± 1.4 birds/10 ha), Prairie Warblers *(Dendroica discolor)* were the second most (10.7 ± 1.2 birds/10 ha) and Northern Mockingbirds *(Mimus polyglottos)* the third most (8.9 ± 1.0 birds/10 ha) abundant species surveyed. Two Wilson's Warblers *(Wilsonia pusilla)* were the only migrants potentially utilizing the grove as stopover habitat seen during these census surveys. All species seen or heard during census surveys are presented in Table 1.



Blackburnian Warbler by George West

Table 1. Avain species found utilizing the northernmost 16.2 ha (40-ac) citrus groves at the CREC, Lake Alfred, Florida, from 18 Sep through 18 Oct 1998.

Common Name	Individuals / 10 ha	
	Mean	SE
Red-shouldered Hawk *(Buteo lineatus)*	0.7	0.2
American Kestrel *(Falco sparverius)*	0.1	0.2
Sandhill Crane *(Grus canadensis)*	1.6	0.2
Killdeer *(Charadrius vociferus)*	0.7	0.1
Com. Ground-Dove *(Columbina passerina)*	5.3	0.5
Mourning Dove *(Zenaida macroura)*	2.3	0.3
Red-bel. Wdpecker *(Melanerpes carolinus)*	0.1	0.2
Downy Woodpecker *(Picoides pubescens)*	0.1	0.1
Blue Jay *(Cyanocitta cristata)*	2.7	0.3
Blue-gray Gnatctcher *(Polioptila caerulea)*	2.1	0.3
Gray Catbird *(Dumetella carolinensis)*	1.5	0.2
Northern Mockingbird *(Mimus polyglottos)*	8.9	1.0
Brown Thrasher *(Toxostoma rufum)*	0.1	0.2
Prairie Warbler *(Dendroica discolor)*	10.7	1.2
Palm Warbler *(Dendroica palmarum)*	12.4	1.4
Black-and-White Warbler *(Mniotilta varia)*	0.1	0.1
Wilson's Warbler *(Wilsonia pusilla)*	0.1	0.1
Common Yellowthroat *(Geothlypis trichas)*	1.5	0.2
Northern Cardinal *(Cardinalis cardinalis)*	5.6	0.6
Eastern Towhee *(Pipilo erythrophthalmus)*	0.1	0.2

Mist Netting Survey — A total of 239 individuals were captured during the mist netting sessions (450 total net hrs, .53 birds/net hr). Seven of these individuals, two American Redstarts *(Setophaga ruticilla)*, three Red-eyed Vireos *(Vireo olivaceus)*, and two Indigo Buntings *(Passerina cyanea)* were migrants potentially utilizing the grove as stopover habitat. None of these migrants were recaptured following their initial capture.

DISCUSSION

Many migratory landbirds require tree-dominated stopover habitats to rest and refuel during migratory periods (Moore et al. 1995). The fact that many resident and wintering species of birds have been documented utilizing Florida's commercial citrus groves to breed, forage, and brood suggests that food resources are available in these agroecosystems. Additionally, the current shift to more economic and "ecologically friendly" agricultural products in citrus production has resulted in increased bird use of groves utilizing these products (Frank Sullivan, Victory Groves, pers. com.). Also, grove management operations such as pruning or fungicide applications are at a minimum during the fall months when these migrants may be passing through (Tucker et al. 1994, Oswalt 1999). Therefore, Florida's commercial citrus groves may provide a relatively safe habitat for stopover during fall migration.

This study confirms that fall Neotropical landbird migrants can be found in Florida's commercial citrus groves and may be utilizing these areas as stopover habitat. Therefore, citrus groves may represent important potential feeding and resting sites for Neotropical landbird migrants as urban and residential development continues at a rapid pace in Florida. Considering that Robbins et al. (1989) found mature citrus groves in Belize, Jamaica, and Costa Rica provided attractive habitat to wintering Neotropical migrants, additional long-term studies are recommended to further elucidate how these migrants are utilizing citrus groves during migratory periods and assess their quality as stopover habitat. The potential exists to manage Florida's citrus grove habitats to provide suitable stopover habitat for Neotropical migrants. Additionally, both migratory and resident species in need of conservation attention could benefit from grove habitat structure and management created to enhance migratory bird use of citrus agroecosystems.

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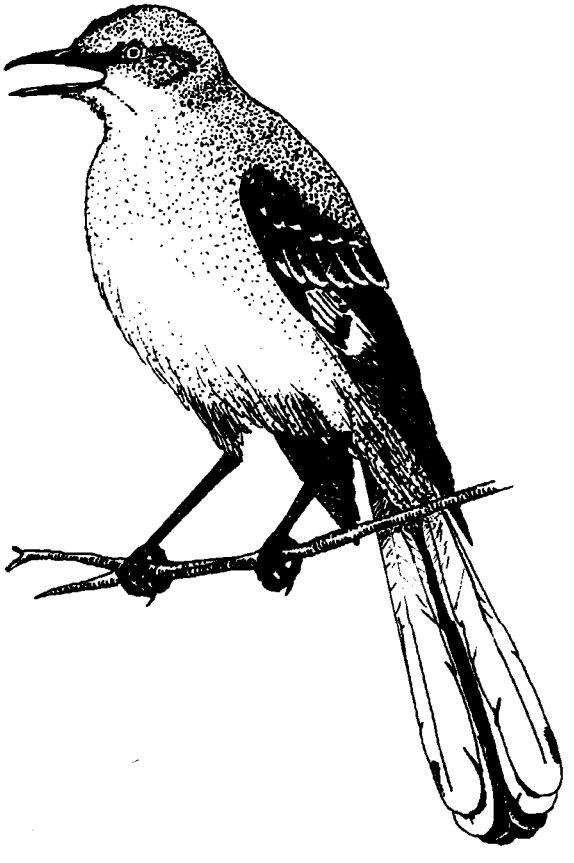

Northern Mockingbird by George west