



Habitat Use by Spring Migrating Landbirds in Northeastern Pennsylvania



Robert Smith, Department of Biology, The University of Scranton
Margret Hatch, Penn State Worthington Scranton



Introduction

Long-term data sets reveal population declines in many landbird migrant species (Askins et al. 1990. Population declines in migratory birds in eastern North America. *Current Ornithology* Vol. 7, pp. 1-57). Declines are especially evident in shrub-nesting species – records from banding stations and bird observatories during migration demonstrate significant declines in many species of shrubland birds (Askins 1999. Restoring North America's birds: lessons from landscape ecology). Because migrating landbirds likely reference innate information about breeding habitat when making decisions about habitat use during migration, i.e., migrants occupy habitats *en route* that are similar to the breeding season (Moore and Aborn 2000. Mechanisms of *en route* habitat selection: how do migrants make habitat decisions during stopover? *Studies in Avian Biology*, 20, 34-42), the persistence of shrub-scrub habitats may be critical for these species during passage. Unfortunately, we know little about migrant-habitat relations, especially with respect to habitat use and the consequences of that use at inland, non-forested stopover sites. If persistence of migrant populations depends on locating favorable conditions throughout the annual cycle, factors associated with *en route* ecology of migrants must figure prominently in any analysis of population change and in the development of a comprehensive conservation plan for migrant species.

Objectives

The purpose of our study was to assess the importance of forested and upland shrub/scrub habitat to spring migrating landbirds by understanding 1) spatial (forested vs. shrub/scrub) variation in flying invertebrate abundance, and 2) migrant use of forested vs. shrub/scrub habitat during stopover.

Methods

-We collected data simultaneously from forested and upland shrub/scrub habitats in Lackawanna State Park and private lands immediately adjacent to the park, Lackawanna County, northeastern Pennsylvania (Figure 1).

-Forested habitats were dominated by maple (*Acer spp.*) and beech (*Fagus grandifolia*) with eastern hemlock (*Tsuga canadensis*) present in moister areas.

-Shrub/scrub habitat was ~ 25 years post agriculture, consisting principally of tartarian honeysuckle (*Lonicera tartaria*), southern arrow wood viburnum (*Viburnum dentatum*), blueberry (*Vaccinium spp.*), dogwood (*Cornus spp.*), multiflora rose (*Rosa multiflora*) and hawthorn (*Crataegus spp.*)

Invertebrate Sampling -Two Malaise traps (Figure 2) in each habitat type were cleared of invertebrates every 3 days. Invertebrates samples were dried to a constant mass at 70 C° and weighed to the nearest 0.01 gram.

Avian Census -We counted migrants daily by systematically visiting strip transects (n = 11 shrub, n = 13 forested) that ranged from 200 - 300 meters in length.

Mist-netting - We ran 2 banding sites, capturing landbirds in nets (forest n=22; shrub n=25) checked at 30 minute intervals. Forest nets included stacked 'high' nets elevated into the canopy. For each individual we recorded capture date and time, species, age and sex where possible (Pyle 1997. Identification guide to North American birds. Slate Creek Press), mass, and wing, tail and tarsus length. All birds were banded with a USGS aluminum leg band and recaptures measured without reference to previous records.



Figure 1. Study sites were in Northeastern Pennsylvania, Lackawanna County.



Figure 2. Malaise Trap for sampling flying arthropods.

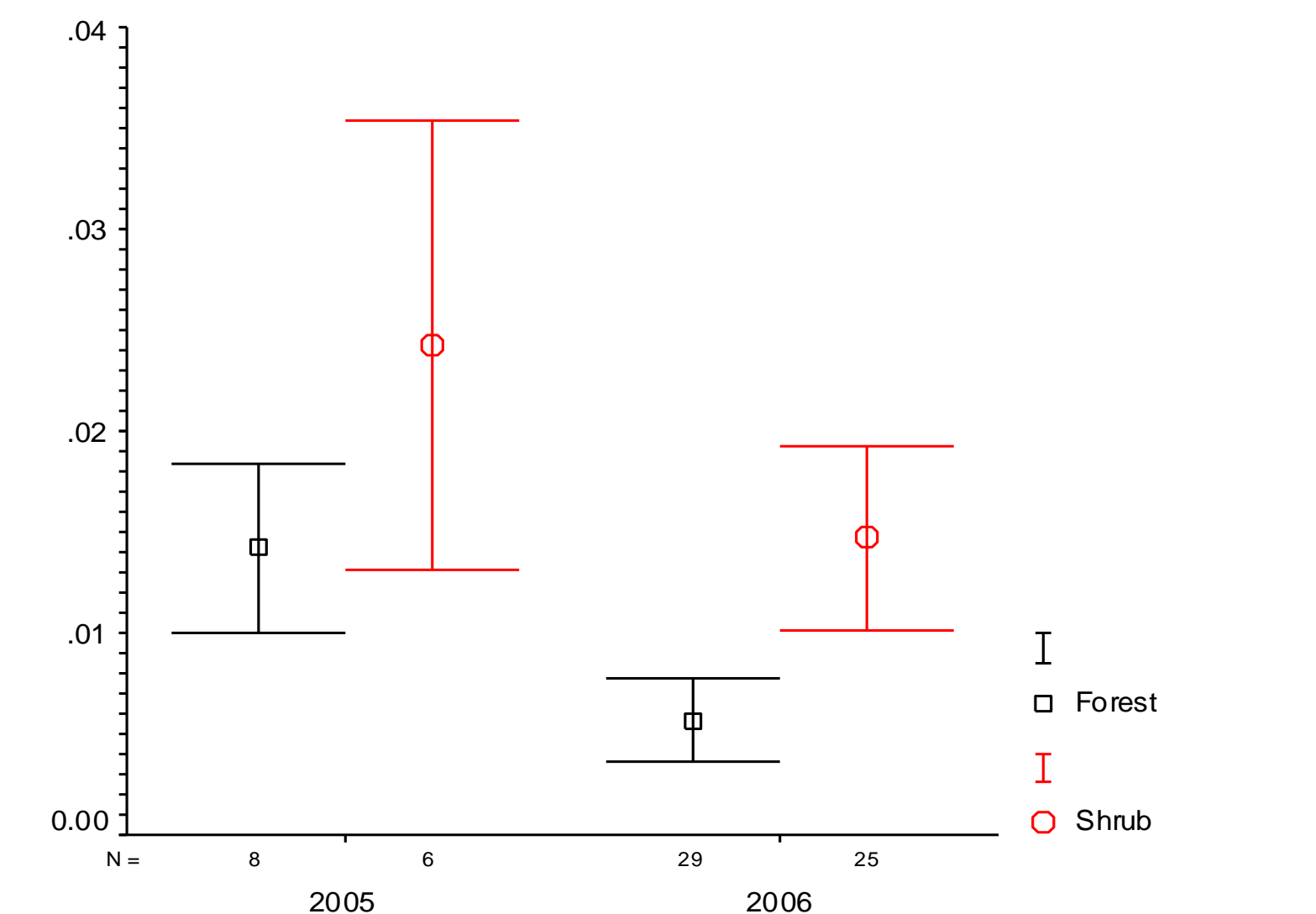


Figure 3. Comparison of invertebrate biomass between forested and shrub/scrub habitats, as estimated by Malaise Trap sampling, northeastern Pennsylvania. Whiskers represent +/- 1 standard error.

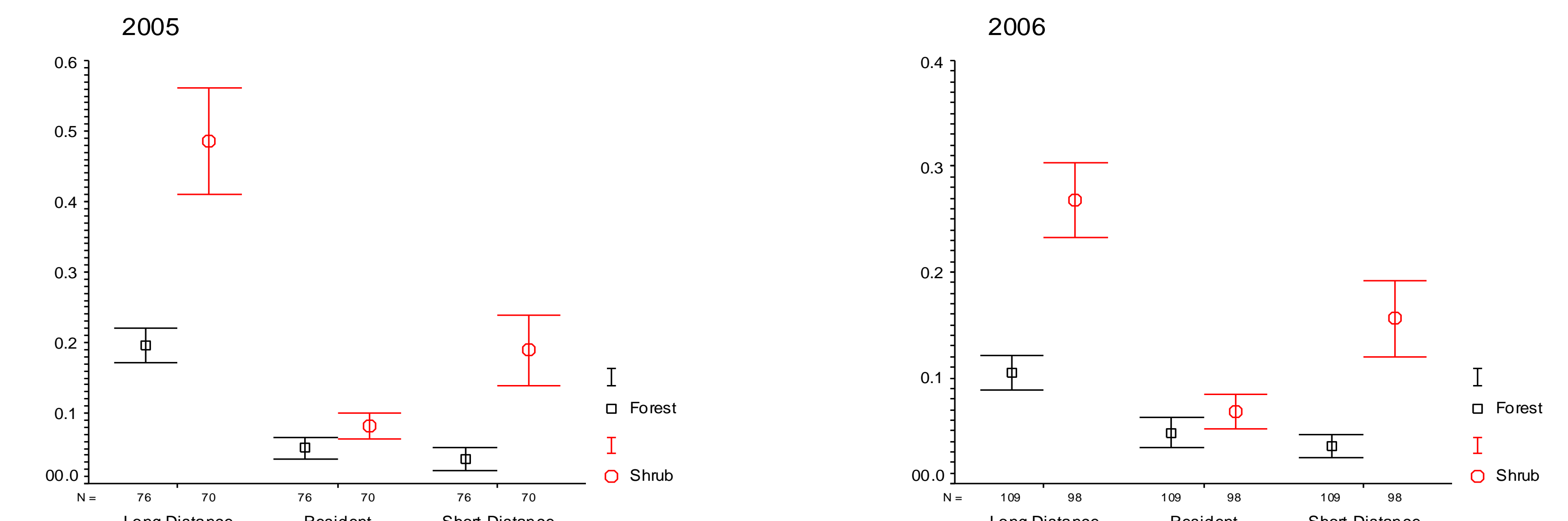


Figure 4. Habitat use by migrant and resident landbird species as determined by transect census during spring migration. Whiskers represent +/- 1 standard error.

Results

Invertebrates – We found no difference between study sites in biomass estimates derived from Malaise trap samples (Mann-Whitney $Z = -0.068$, Bushko $n = 36$; Lackawanna $n = 28$, $P = 0.946$) so we pooled invertebrate data across study sites. After controlling for year ($F_{1, 60} = 16.156$, $P < 0.001$) a GLM on ranks indicated that there was more invertebrate biomass ($F_{1, 60} = 6.998$, $P = 0.01$) trapped per 100 minutes in shrub/scrub habitat than forested habitat (Figure 3).

Avian Census – We detected more Long Distance ($F_{1, 349} = 61.489$, $P < 0.001$) Short Distance ($F_{1, 349} = 165.402$, $P < 0.001$) and Resident ($F_{1, 349} = 14.098$, $P < 0.001$) landbirds in shrub/scrub than forested habitat (Figure 4). Year had a significant effect in the analysis of Long Distance ($F_{1, 349} = 35.010$, $P < 0.001$) but not short distance ($F_{1, 349} = 1.236$, $P = 0.267$) nor resident ($F_{1, 349} = 2.512$, $P = 0.114$) counts.

Mist-nets - We recorded 3483 captures of 78 species. Netting results suggest many more birds were present in shrub/scrub habitat than forested during spring migration (Table 1).

We only captured 3 species in forested habitat not captured in shrub/scrub (Red-shouldered Hawk, Brown Creeper and White-breasted Nuthatch) while we captured 33 species in shrub/scrub habitat that were not captured in forested habitat (Table 1). Many forest-breeding birds used shrub/scrub habitat extensively during stopover, including Hermit Thrush, Veery, Swainson's Thrush, Wood Thrush, Red-eyed Vireo and Ovenbird (Table 1).

Conclusion

Shrub habitat in northeastern Pennsylvania appears important to spring migrating landbirds. Results suggest that birds use shrub habitat more than forest habitat. This may be a consequence of more resources available to migrants in shrub habitats.

Acknowledgements

Funding was provided by The Pennsylvania Department of Conservation and Natural Resources Wild Resource Conservation Program. We thank Ms. Anna Bushko and the folks at Lackawanna State Park for permission to census and capture birds and bugs on their properties. We also thank Mike Carey for allowing us to utilize part of his Field Sparrow study area and for providing insight into the ecology of this system. Finally, numerous undergraduates from the University of Scranton contributed to this work.

SPECIES	Forest Captures per 100 net hours	Shrub Captures per 100 net hours	Total Captures per 100 net hours
* Sharp-shinned Hawk	0.000	0.039	0.024
* Red-shouldered Hawk	0.015	0.000	0.006
* American Woodcock	0.000	0.019	0.018
Yellow-billed Cuckoo	0.000	0.029	0.018
* Black-billed Cuckoo	0.000	0.174	0.106
Northern Flicker	0.060	0.106	0.088
Hairy Woodpecker	0.136	0.010	0.059
Downy Woodpecker	0.045	0.029	0.035
Eastern Phoebe	0.075	0.019	0.041
* Yellow-bellied Flycatcher	0.000	0.029	0.018
* Acadian Flycatcher	0.000	0.019	0.012
* Willow Flycatcher	0.000	0.029	0.018
* Alder Flycatcher	0.000	0.048	0.029
Trail's Flycatcher ¹	0.000	0.434	0.265
Least Flycatcher	0.030	0.309	0.200
Blue Jay	0.106	0.125	0.118
Black-capped Chickadee	0.649	2.180	1.600
Eastern Tufted Titmouse	0.075	0.289	0.206
White-breasted Nuthatch	0.045	0.000	0.018
Brown Creeper	0.015	0.000	0.006
House Wren	0.000	0.106	0.065
Carolina Wren	0.000	0.010	0.006
Gray Catbird	0.392	4.186	2.759
* Brown Thrasher	0.015	0.183	0.124
American Robin	0.377	0.212	0.277
* Wood Thrush	0.664	1.177	0.888
Hermit Thrush	0.558	0.856	0.618
* Swainson's Thrush	0.090	0.174	0.141
Gray-cheeked Thrush	0.030	0.029	0.029
Veery	0.588	1.022	0.877
Blue-gray Gnatcatcher	0.000	0.010	0.006
Ruby-crowned Kinglet	0.015	1.022	0.641
Cedar Waxwing	0.045	0.077	0.065
* Blue-headed Vireo	0.015	0.077	0.053
Red-eyed Vireo	0.287	0.608	0.488
Philadelphia Vireo	0.000	0.019	0.012
Black-and-white Warbler	0.075	0.260	0.200
* Golden-winged Warbler	0.000	0.019	0.012
* Blue-winged Warbler	0.075	0.801	0.518
Brewster's Warbler	0.015	0.453	0.282
Tennessee Warbler	0.000	0.010	0.006
Nashville Warbler	0.075	0.723	0.471
Northern Parula	0.000	0.029	0.018
Yellow Warbler	0.000	0.395	0.241
Magnolia Warbler	0.030	0.897	0.559
* Black-throated Blue Warbler	0.015	0.241	0.153
Yellow-rumped Warbler	0.030	0.048	0.041
* Black-throated Green Warbler	0.030	0.193	0.141
* Blackburnian Warbler	0.000	0.029	0.018
Chestnut-sided Warbler	0.030	0.849	0.529
* Blackpoll Warbler	0.000	0.039	0.024
* Prairie Warbler	0.000	0.289	0.182
Yellow Palm Warbler	0.000	0.019	0.012
Ovenbird	1.267	1.157	1.247
Northern Waterthrush	0.015	0.096	0.065
Mourning Warbler	0.000	0.058	0.035
Common Yellowthroat	0.241	3.250	2.159
* Yellow-breasted Chat	0.000	0.019	0.012
Wilson's Warbler	0.000	0.183	0.112
* Canada Warbler	0.000	0.222	0.141
American Redstart	0.000	0.338	0.206
Baltimore Oriole	0.015	0.106	0.071
Brown-headed Cowbird	0.060	0.048	0.053
* Scarlet Tanager	0.030	0.068	0.053
Northern Cardinal	0.136	0.299	0.235
Rose-breasted Grosbeak	0.060	0.183	0.135
Indigo Bunting	0.045	0.058	0.053
Purple Finch	0.030	0.386	0.253
American Goldfinch	0.000	0.241	0.147
Eastern Towhee	0.045	0.444	0.286
State-colored Junco	0.015	0.154	0.100
Chipping Sparrow	0.000	0.096	0.059
Clay-colored Sparrow	0.000	0.010	0.006
Field Sparrow	0.000	0.511	0.312
Eastern White-crowned Sparrow	0.000	0.010	0.006
White-throated Sparrow	0.075	1.534	0.965
Lincoln Sparrow	0.000	0.203	0.124
Swamp Sparrow	0.000	0.087	0.053
Song Sparrow	0.015	0.203	0.129
Grand Total	6.742	28.713	20.491

Table 1. Summary of birds captured from 15 April through 15 June, 2005, 2006 at Lackawanna State Park and private lands immediately adjacent to the park. An asterisk denotes Pennsylvania Game Commission Birds of Conservation Concern.



¹Trail's Flycatchers are birds that were either Alder or Willow Flycatchers. This grouping represents individuals which were impossible to identify to species.