The Effects of Secondary Succession on Bird Population and Community Composition in an Old Field in Northeastern Pennsylvania

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INTRODUCTION

Migrant landbird populations face an increasing list of environmental threats, most notably pollution (Brown 1991), global climate change (Crick 2004) and habitat loss/habitat fragmentation on both their tropical wintering and temperate breeding grounds (Sherry and Holmes 1995). Indeed, long-term data sets reveal population declines in many landbird migrant species (Askins et al. 1990), including a number of species that migrate through and breed in northeastern Pennsylvania (Rosenberg and Robertson 2003). With these corresponding declines in bird populations, understanding long-term changes in avian community composition due to secondary successional[1] processes becomes increasingly vital for conservation efforts. Through constant-effort mist-netting, change in avian community composition can be monitored from year to year as habitat structure changes. Long-term monitoring provides useful knowledge into how populations of select species of songbirds respond as a habitat undergoes secondary succession.

[1]Secondary succession refers to the orderly and predictable changes a plant community undergoes after experiencing disturbance within the community, whether from agricultural activity or natural weather events.

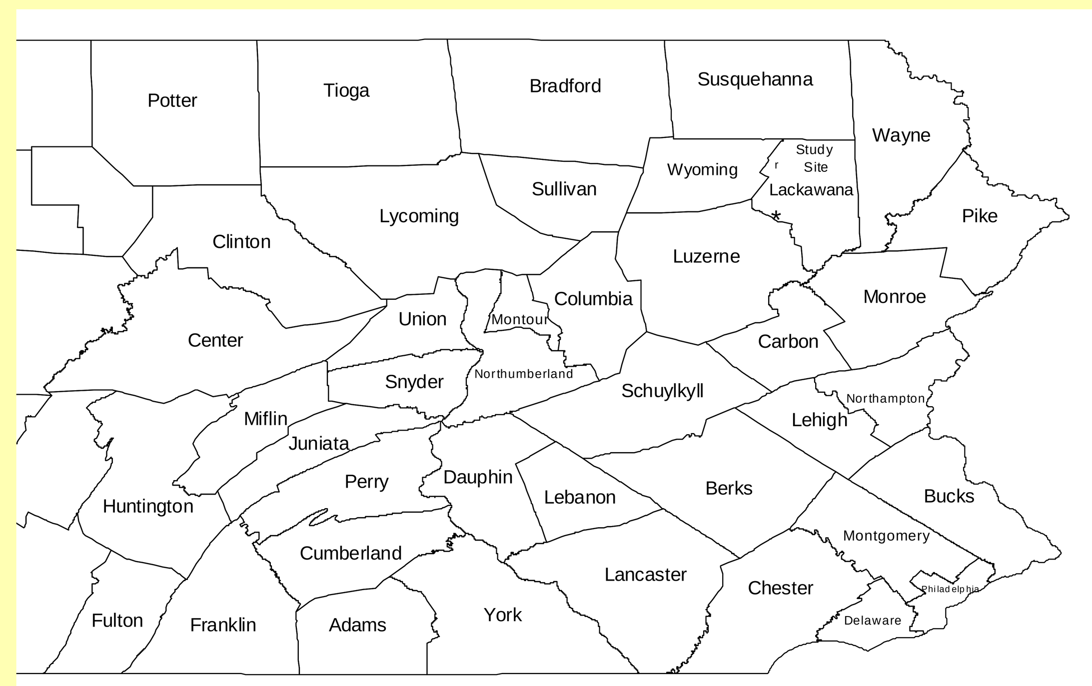

Figure 1. Our study site is located in Lackawanna County, northeastern Pennsylvania. An asterisk denotes the approximate study site location.

Figure 2. Aerial photo of our study site taken in 1992. The study area has undergone significant secondary succession since this photo was taken.

OBJECTIVES

The goals of this research include:

1. Examining bird abundance and diversity changes relative to vegetation change within northeastern Pennsylvania.
2. Providing foundational understanding of demographic trends in select bird species with the goal of identifying causal factors that contribute to these trends.
3. Contributing raw data to the Monitoring Avian Productivity and Survivorship (MAPS) program in order to aid international avian conservation efforts.

METHODS

Our study site is located on private property adjacent to Lackawanna State Park, Lackawanna County, northeastern Pennsylvania (see Figure 1). Forested habitats consist primarily of red maple (*Acer rubrum*) and red oak (*Quercus rubrum*). Upland shrub/scrub habitat chosen for this work is approximately 20-25 years post agriculture, consisting principally of viburnum (*Viburnum* spp.), blueberry (*Vaccinium* spp.), dogwood (*Cornus* spp.), Tartarian honeysuckle (*Lonicera tartaria*), multifloral rose (*Rosa multiflora*) and hawthorn (*Crataegus* spp.). Since agricultural practice ceased approximately twenty-five years ago at the site, successional processes have determined the area's vegetation change. Starting as short grass habitat, the site has progressed into tall shrub and forested habitat (M. Carey, pers. comm.).

This study utilizes archived capture data from past breeding seasons (1987-2000, 2005). We chose May 1st as the beginning of the breeding season in concordance with MAPS protocol (DeSante, Burton et al. 2003). We used mistnets to capture birds at locations throughout the study site. Our netting locations remained constant over the eighteen-year span of our study. Nets were checked and data collected from captured birds at 30 - 60 minute intervals.

To correct for yearly differences in netting effort, we determined yearly capture rates for each species by dividing the total number of individuals captured by the total number of minutes all nets were open for that year. We then multiplied this metric by ten thousand, as previously employed by M. Carey (unpublished data). Yearly capture rate trends for each species were evaluated using Pearson correlation coefficients.

RESULTS

Capture rates for Veery, Red-eyed Vireo, Chestnut-sided Warbler, Gray Catbird, and Ovenbird increased with year while capture rates for Field Sparrow and Song Sparrow declined with year (see Figures 3 and 4). The relationship for Scarlet Tanager was not significant.

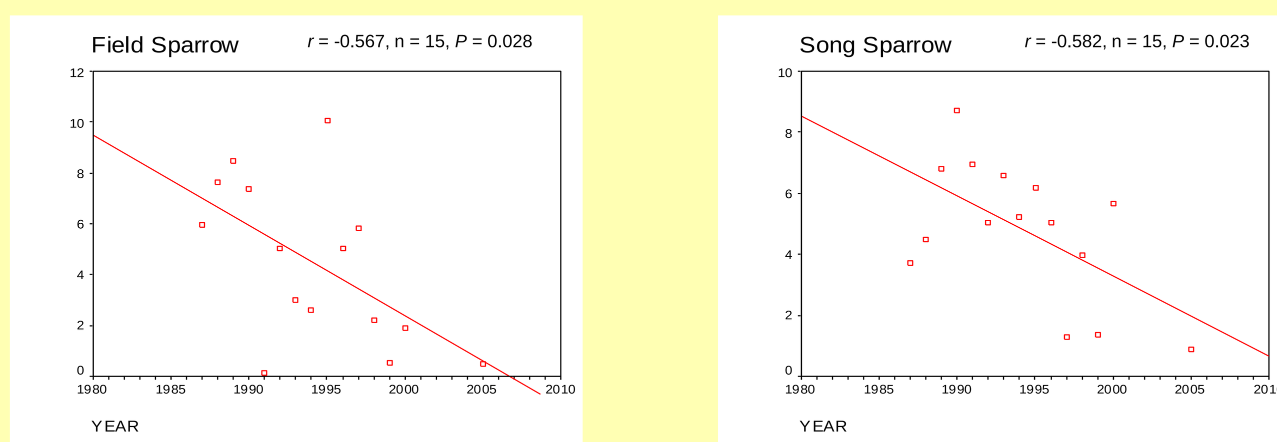

Figure 3. Yearly capture rates (Birds per minute x 10^4) from 1987 to 2005 of species demonstrating decreasing abundance over time.

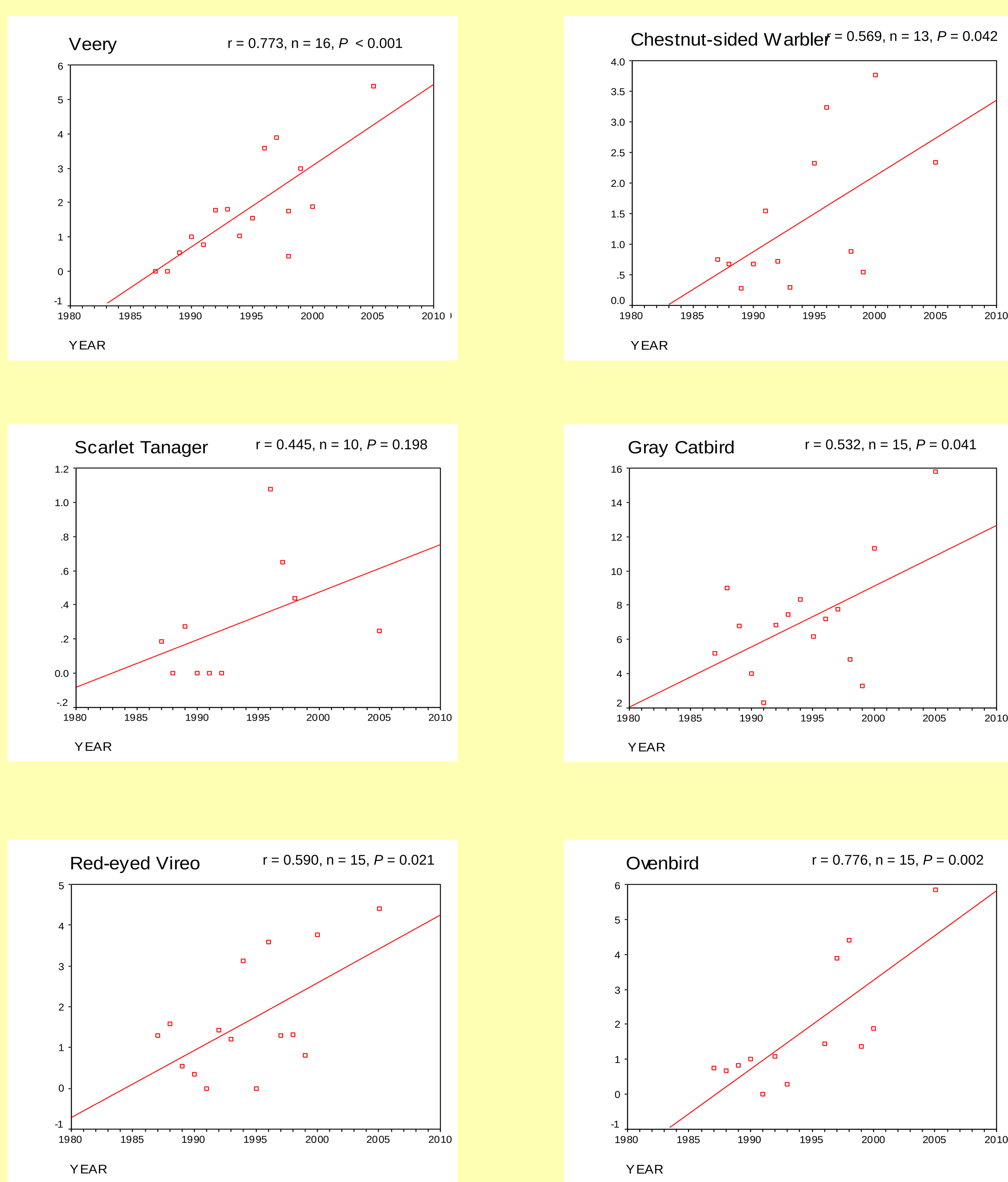

Figure 4. Yearly capture rates (Birds per minute x 10^4) from 1987 to 2005 of species demonstrating increasing abundance over time.

SUMMARY

The year/capture rate correlations illustrated in Figures 3 and 4 indicate that bird populations and bird community composition changed as our study site underwent secondary succession. Veerys, Ovenbirds, Red-eyed Vireos, and Scarlet Tanagers are typically associated with mature forest habitat (characteristically considered the 'endpoint' of old field, secondary succession) , and were captured at higher rates in later years whereas Field Sparrows and Song Sparrows prefer early successional habitats with a strong grass/open component, and were captured at lower rates later in the study. Chestnut-sided Warblers and Gray Catbirds prefer mid-successional habitats with abundant shrubby vegetation. Much of our study area is in mid-succession, with a strong shrub component to the overall vegetation composition.

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