Bird Assemblages at Hardwood Bottomland Restoration Sites in Western Tennessee

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Introduction

Over 800,000 ha of hardwood bottomlands have been restored under the Wetlands Reserve Program (WRP) nationwide. Restoration in the Southeastern United States has consisted mainly of replanting with trees and in some cases hydrological modifications. A goal of the WRP is providing habitat for resident and migratory birds. Currently, no monitoring protocol exists for the WRP and few studies have measured bird use at sites that differ in time since restoration. Thus, we quantified avian species composition at 17 hardwood bottomland restoration sites that differed in age and 4 reference sites in western Tennessee, U.S.A., from March – August 2008.

Objectives

1) To quantify avian community composition in hardwood bottomlands in western Tennessee that were enrolled in the WRP.

2) Relate bird community characteristics to duration since WRP enrollment (hereafter restoration age).

Study Sites

We randomly selected 17 WRP bottomland sites in western Tennessee using a multi-stage sampling approach (Fig. 1). The levels of randomization were date of restoration (1985 – 2006) and size of the replanted area (7.7 – 214.1 ha). We also systematically placed 4 reference sites within the Hatchie River bottomland. The Hatchie River is the longest unchannelized tributary of the Mississippi River located in Tennessee.

We standardized sampling plot placement such that there were 2 plots: one in the highest elevation contour of a site and one in the lowest contour. Plots were located at least 250 m apart to ensure independence among point-count samples. At sites too small for 250-m separation between plots, we placed one sampling plot at site center.
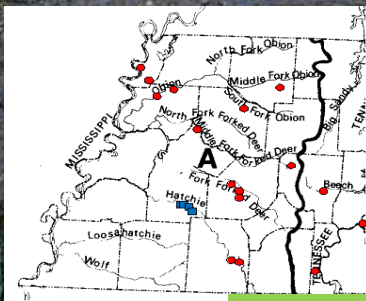
Fig. 1 Map of study sites.
● Restoration sites
■ Reference sites

Methods

Sampling

We measured bird species composition using 10-minute, 50-m radius point counts at each site twice per month from March – August 2008. We used laser range finders with 1-m accuracy to measure distance to detected birds. We conducted point counts during three seasonal periods corresponding to spring migration (March – April), breeding (May – June) and post-fledging (July – August).

Statistics

We calculated bird species richness, mean species diversity and relative abundance of families, feeding substrate guilds, and nesting habitat guilds for each seasonal period. We used linear regression to quantify the relationship ($\alpha = 0.05$) between restoration age and bird community metrics.

Results

We documented 91 avian species at restoration sites. Mean bird species diversity and richness were positively related with restoration age (Fig. 2,3). Abundance of 10 of the 24 commonly observed bird families were related to restoration age and 10 were related to site size during at least one seasonal period. Abundance of all feeding substrate guilds and 4 of the 6 nesting location guilds was related to restoration age for at least one seasonal period (Fig. 4,5).
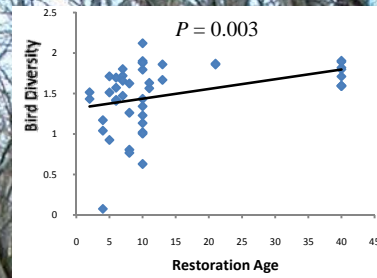
$P = 0.003$

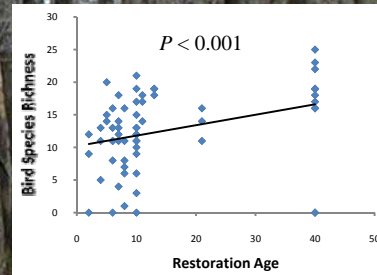Fig. 2 Relationship of mean Shannon-Wiener species diversity and restoration age.

$P < 0.001$

Fig. 3. Relationship of mean species richness and restoration age.

Feeding substrate	March – April	May – June	July – August
air			Positive
bark	Positive	Positive	Positive
canopy	Positive		
ground		Negative (p=0.0640)	Negative

Fig. 4 Relationships between feeding substrate guilds and restoration age.

Nest location	March – April	May – June	July – August
cavity/crevice		Positive	Positive
ground/herbaceous vegetation		Negative	Negative
nest parasite			
shrub/vine/bramble			
tree branch	Positive	Positive	Positive
tree twig	Positive	Positive	Positive

Fig. 5 Relationships between nesting location guilds and restoration age.

Discussion

Our results suggest that hardwood bottomland restoration sites in western Tennessee provide habitat for diverse avian assemblages, and that the bird community at older sites is beginning to resemble that of reference sites. Larger restoration sites may be important for certain bird families.

Conclusions and Future Analysis

These findings provide evidence that the WRP is meeting its goal of bird community restoration in Tennessee hardwood bottomlands.

Future analysis will focus on developing predictive habitat models using multivariate techniques to relate vegetative and abiotic characteristics of sites to bird community metrics.

References

DeGraaf, R. M. and N. L. Chadwick. 1984. Habitat Classification: a Comparison Using Avian Species and Guilds. Environmental Management 8: 511-518.

Freund, R. J., and R. C. Littell. 2000. SAS® system for regression. SAS Institute, Cary, North Carolina, USA.

King, S. L., D. J. Twedt, and R. R. Wilson. 2006. The role of the Wetland Reserve Program in conservation efforts in the Mississippi River Alluvial Valley. Wildlife Society Bulletin 34:914–920.

NRCS. 2008. Wetlands Reserve Program. <http://www.nrcs.usda.gov/programs/wrp/>. Accessed 23 Oct 2008.

Ralph, C. J., G. R. Geupel, P. Pyle, T. E. Martin, and D. F. DeSante. 1993. Handbook of field methods for monitoring landbirds. U.S. Department of Agriculture, Forest Service, Report PSW-GTR-144-Web, Albany, California, USA.

Robbins, C. S., J. R. Sauer, and B. G. Peterjohn. 1992. Population trends and management opportunities for neotropical migrants. Pages 17-23 in D. M. Finch and P. W. Stangel, editors. Status and management of neotropical migratory birds. U.S. Department of Agriculture, Forest Service, Report RM-229, Estes Park, Colorado, USA.

Sokal, R. R. and F. J. Rohlf. 1995. Biometry: the principles and practice of statistics in biological research. Third edition. W. H. Freeman, New York, New York, USA.

The Nature Conservancy (TNC). 2007. Hatchie River. <http://www.nature.org/wherewework/greatrivers/namerica/art19852.html>. Accessed 15 Feb 2008.

Acknowledgements