

## **Is landscape change driving declines in breeding bird populations in the North Central United States?**

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### **Problem and Objective**

Breeding Bird populations are declining, and conservationists want to know why. In the North Central Region approximately 25% of bird species surveyed by the North American Breeding Bird Survey have declined significantly in abundance since 1966. International bird conservation efforts such as the North American Bird Conservation Initiative (NABCI) need information on factors causing declines in bird numbers. Previous studies indicate potential negative affects of changes in land use including habitat loss, fragmentation, and urbanization. However, there are no regional scale analyses linking temporal changes in land use and land cover to change in bird populations.

The North American Breeding Bird Survey (BBS) is one of the most extensive surveys of any wildlife species. Data from the survey allow large-scale and long-term (>30 years) analyses of population trends. Trend analyses of BBS data were one of the primary factors initially alerting biologists to declines of many bird species. We have a unique opportunity to link results from the BBS to results from the recent Hotspots of Landscape Change Assessment by the North Central Research Station.

We will determine the relationship between landscape change and changes in bird populations in the North Central States. We will relate changes in abundance of bird species along BBS survey routes to changes in the composition and pattern of land cover and human populations surrounding routes. We will use an information-theoretic approach, based on a priori hypotheses (models), which will allow strong inference about the effects of landscape change on bird populations.

### **Approach**

We hypothesize that changes in bird populations are the result of changes in landscape composition, habitat fragmentation, and population and housing density. We will use Akaike's information criteria to select the best model from a set of a priori candidate models representing the above hypotheses and draw inference about the importance of landscape factors based on the model selected. We will use multiple regression models with BBS routes as the experimental unit to relate change in species abundance to the independent variables. We will estimate change in abundance of bird species with methods established by John Sauer at the USGS Patuxent Wildlife Research Center. Regression models will be developed for each species for which trends can be estimated on a minimum number of routes (probably 50-150 species). There are approximately 550 BBS routes in the North Central States. We will then summarize

results of model selection across species and within species groups to draw inferences about the effects of changes in landscape composition, pattern, and human populations on breeding birds.

The independent variables in the analysis represent changes in land cover and population factors within an area defined by a 5-km buffer around each BBS route. Land cover and population variables represent change from 1980-2000 and were developed as part of the Hotspots of Landscape Change Assessment by the North Central Research Station. Changes in land cover will be assessed at 1-km resolution. Population and housing data are at the county level. The buffered area around each BBS route will be intersected with these GIS layers to derive an average value for each variable for each route.

Independent variables include:

1. % change in urban and built-up land area, 1980-2000
2. % change in cropland area, 1980-2000
3. % change in grassland area, 1980-2000
4. % change in forestland area, 1980-2000
5. % change in wetland area, 1980-2000
6. % change in habitat fragmentation, 1980-2000
7. % change in housing density, 1980-2000
8. % change in population density, 1980-2000

## Personnel

Frank Thompson, North Central Research Station, Columbia, MO. Contribution: conduct analyses relating changes in bird abundance to landscape change, draft manuscript.

John R. Sauer, USGS Patuxent Wildlife Research Center, Laurel, MD. Contribution: conduct population trend analysis for BBS routes, review manuscript

Robert Potts, USDA Forest Service, NCRS, Forestry Sciences Laboratory, 5985 Hwy K, Rhinelander, WI 54501. Contribution: compile landscape and population change data for area around Breeding Bird Survey Routes, review manuscript.

## Timeline

April 1, 2002	Trend analyses completed by Sauer, GIS data compiled by Potts.
August 1, 2002	Model selection completed, results compiled by Thompson
December 31, 2002	Submit manuscript for publication in <i>Ecological Applications</i> or other equivalent outlet.