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Evaluation of Stop-level vs. Route-level Breeding Bird Survey Counts for Modeling the Influence of Land Use and Climate on Breeding Blackbird Abundance in North Dakota

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Introduction

The Red-winged Blackbird (*Agelaius phoeniceus*), Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*), and Common Grackle (*Quiscalus quiscula*) are the three most abundant blackbird species (Icteridae) found in North Dakota and comprise almost 10% of its avian population (Stewart and Kantrud 1972). Blackbird abundance combined with their food habitats make them significant agricultural pests on sunflower. Cost estimates for blackbird damage to sunflower in the North Dakota are likely over \$10 million dollars annually (Kleingartner, pers. comm). Because of this economic impact blackbirds have on agriculture, it is important to understand land use and climatic factors influencing blackbird abundance. This study will compare route-level and finer-scale summaries of stop-level resolution to determine which scale is most effective for creating blackbird abundance models from land use and climate data. This additional resolution of analysis will potentially improve the fit of blackbird abundance models by providing additional information that may be missed in larger scale analyses.

Study Area

Our study area is the Prairie Pothole Region (PPR) of the North Dakota (Fig. 1) which covers roughly 125,000 km² (48,000mi²). The PPR was shaped approximately 12,000 years ago during the Pleistocene Epoch, when the glaciers retreated and left behind millions of small wetlands or potholes scattered throughout the landscape (Leitch 1989). Due to blackbirds' attraction to wetland habitats, the PPR of North Dakota provides an ideal study area to examine land use and climatic effects on blackbird populations.

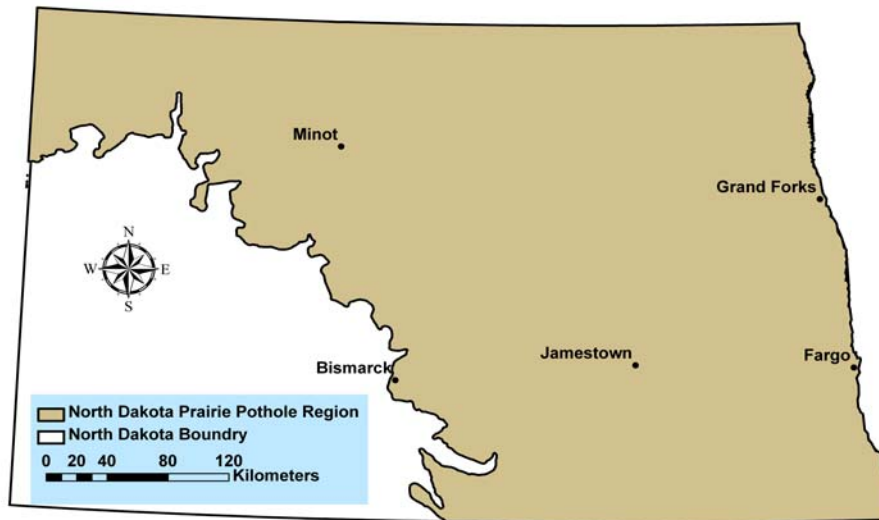


Figure 1. Prairie Pothole Region within the context of North Dakota.

Methods

We will analyze landscape-level influences on blackbird populations using data from several large-scale, long-term datasets. Blackbird data were obtained from the North American Breeding Bird Survey (BBS) which monitors bird population trends across North America (Robbins et al. 1986) (Fig. 2). Climatic data were acquired from the National Climatic Data Center. Land use data were gathered from the USGS National Land Cover Data Set 1992 (NLCD).

We will analyze bird abundance data from 1980 through 2000 using a summarized stop-level analysis. BBS routes have been divided into 10-stop increments using ArcInfo 9.0 (Figure 3). Climatic and land use data will be related to bird abundance information using ArcInfo v9.2 and SAS v9.1, and a hierarchical modeling approach. We will summarize weather variables for each breeding season (1980 through 2000) by averaging temperature data and summing precipitation data. Additionally, weather effects over the entire year as well as from the previous season will be examined because past weather might affect vegetation the following year thereby influencing blackbird abundance.

Landscape-level habitat variables will be quantified in an 800-m buffer area surrounding all 10-stop segments of each North Dakota BBS route using land cover spatial data. Each grid cell within the 800-m buffer will be classified into one of nine general land cover types likely to be found in the PPR (Fig. 4). Landscape-level factors such as habitat diversity and edge effects will be examined. Spatial organization of features will be incorporated into landscape analyses by measuring contagion of land use types (degree which land types are found within continuous patches), and diversity/evenness measures of landscape pattern.

Models incorporating landscape-level habitat variables to estimate blackbird abundance within the PPR will be developed *a priori* before analyses begin. Model-selection with

maximum likelihood estimation and Deviance Information Criterion (DIC) will be used to select the best model from the candidate set for each blackbird species (Forcey et al. 2007).

Results from these analyses will be compared to similar route-level analyses performed by Forcey (2006). We will make qualitative and quantitative comparisons of route-level and summarized stop-level BBS counts by comparing model fits from this study to the results of Forcey (2006).

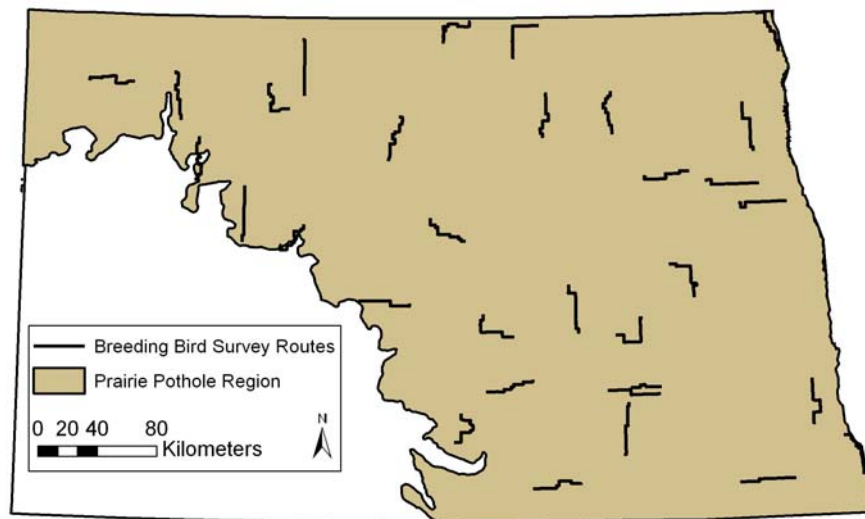


Figure 2. Distribution of North American Breeding Bird Survey routes in North Dakota's Prairie Pothole Region.

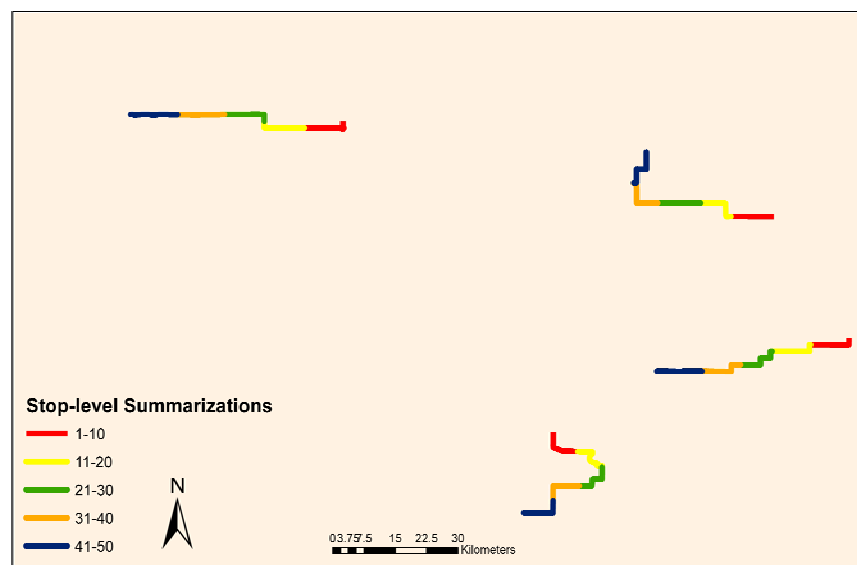


Figure 3. North Dakota's North American Breeding Bird Survey routes divided into 10-stop increment segments.

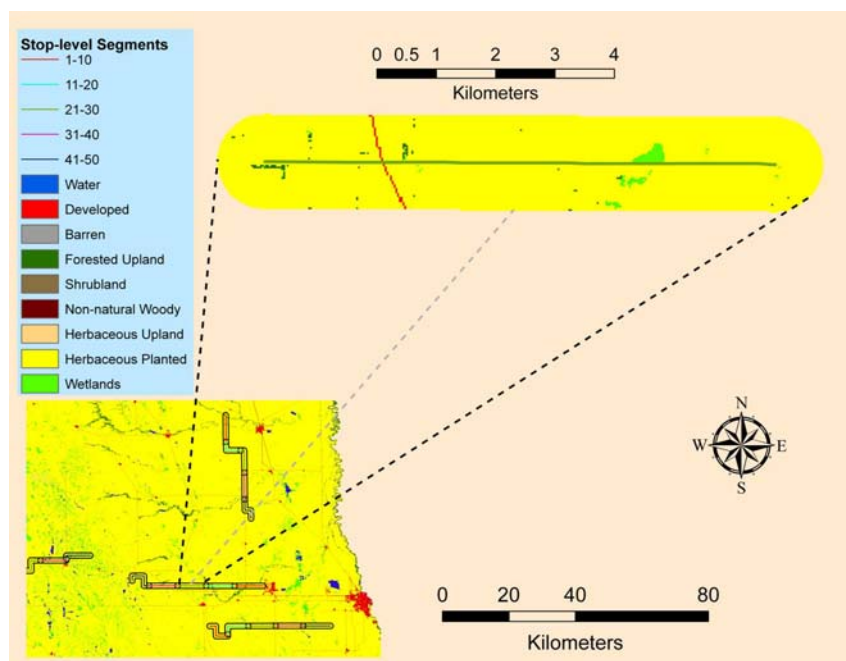


Figure 4. Land use surrounding 800-m of a 10-stop segment of North Dakota Breeding Bird Survey route.

Management Implications

Depredation of North Dakota sunflower fields by blackbird populations results in the annual loss of millions of dollars. An understanding of how habitat and environmental variables influence blackbird populations will facilitate blackbird-sunflower damage reduction decisions. Additionally, research is also needed comparing BBS route-level analysis to stop-level analysis to determine if a smaller-scale resolution will provide further information that may be missed at larger scale analyses. This study may provide researchers with a suggestive spatial scale for analyzing BBS data to best understand how blackbirds are influenced by environmental factors. Results will allow managers to make informed decisions regarding the reduction of blackbird damage to sunflower.

Acknowledgements

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