

Field Validation of GIS-based Models for Regional and Refuge Bird Conservation Planning: 2005 Field Season Report

Les D. Murray and Christine A. Ribic, USGS BRD WCWRU, Department of Wildlife Ecology, University of Wisconsin, 204 Russell Labs, 1630 Linden Dr, Madison, WI 53706.

INTRODUCTION

The North American Bird Conservation Initiative (NABCI) is a new bird conservation effort that seeks to integrate various bird conservation plans and “deliver the full spectrum of bird conservation through regionally-based, biologically-driven, landscape-oriented partnerships”. The USGS Upper Midwest Environmental Sciences Center, La Crosse, WI (hereafter the La Crosse Lab) and USGS Patuxent Wildlife Research Center, Laurel, MD, are developing GIS data layers and GIS management tools for managing and conserving high quality habitat for multiple bird species.

The relationship between bird abundances and local vegetation characteristics has been well defined by numerous studies. Researchers also have begun to examine the relationship between landscape variables and bird abundances. Understanding relationships between abundances of bird species and landscape factors will help managers to identify areas of importance for some species of birds. The La Crosse Lab has begun using Breeding Bird Survey data to create such predictive models of bird abundances in Bird Conservation Region (BCR) 23 based on relationships to landscape variables.

This study is being conducted to gather data to be used to validate the results of the predictive models. The project also will collect data to compare abundances of grassland birds in landscapes composed of different amounts of grassland and forest in southwestern Wisconsin. The information collected by this project will be used to test the accuracy of predictive models and further understand the relationship between grassland birds and the surrounding landscape.

METHODS

STUDY AREAS

The validation portion of our study was conducted in the Iowa, Minnesota, and Wisconsin portions of BCR 23. Grids of 3 different scales (approximately 800 ha, 8,000 ha, 100,000 ha) were then overlaid on a GIS coverage of the BCR. These scales were defined by the La Crosse Lab for their landscape models. To sample the BCR geographically, the BCR was divided into 5 subregions of equal area and equal sampling occurred in each of the subregions. Fifteen 8,000 ha landscapes were randomly selected in each subregion in 2003. Within each 8,000-ha landscape, we randomly chose three 800-ha landscapes that were at least 50% contained in the 8,000-ha landscape. Thus a total of 225 800-ha landscapes were surveyed in 2003. For the 2004 field season, we randomly selected 1/3 of the 15 8,000-ha landscapes in each subregion selected in 2003 to be surveyed in 2004 and 2005. The same 800-ha landscapes surveyed in 2003 within each 8,000-ha landscape were surveyed in 2004 and 2005. An additional 10 8,000-ha landscapes were then selected for each subregion to be surveyed only in 2004. In 2005, we randomly chose 10 8,000-ha landscapes and three 800-ha landscapes in each 8,000-ha landscape to be surveyed only in 2005. Thus a total of 225 800-ha landscapes were surveyed in 2005, 1/3 of which were the same as those surveyed in 2003 and 2004.

The portion of our study that focused on the relation of grassland associated birds to landscape composition took place in southwestern Wisconsin, specifically Dane, Iowa, Green, Lafayette, and Grant counties. This area was divided into 800-ha landscapes and the landscapes were classified into 6 landscape types using the National Landcover Data (Table 1). Five landscapes of each type were then selected for our study in 2003, except an error was made in classifying one selected landscape. Thus, four low grass-low forest landscapes and six low

grass-high forest landscapes were surveyed in 2003. We selected enough landscapes of each type (2 low grassland:low forest landscapes, 1 of the other landscape types) so that a total of six landscapes of each type were surveyed in 2004 and 2005. The landscape cell that was classified incorrectly in 2003 was surveyed in 2004 and 2005, but because of its adjacency to another low grass-high forest landscape will not be considered as part of the study design.

BIRD SURVEYS

Validation surveys

Roadside surveys consisting of 3 400-m radius point counts were conducted by volunteers to estimate bird abundances in each selected 800 ha landscape. Surveys were conducted from 1 June to 4 July between ½ hour before sunrise and 4½ hours after sunrise. Most survey routes were ran twice during the time period, but some routes were only run once because of weather and lack of volunteers to cover that area. Abundance information was only collected for species being modeled and species that we may model in the future (Table 2). Volunteers only counted those birds seen or heard within 400 m of each point during a 3-minute period. Observers were careful to try to count each bird only once. A total of 33 observers conducted surveys in 2005.

Landscape level

Roadside surveys consisting of 3 400-m, 5-minute point counts were conducted in each of the 30 selected 800 ha landscapes (Figure 1) and 3 800 ha landscapes surrounding each of the selected landscapes. Roadside surveys were conducted once from 19 May to 1 June and once between 3 June and 27 June with at least one week between surveys of the same route. Surveys were conducted between ½ hour before sunrise and 4½ hours after sunrise. Observers recorded the number of birds seen or heard during each point count for selected species that often occur or

breed in grasslands (Sample and Mossman 1997) and species recorded during validation surveys (Table 4). Observers recorded whether each bird was observed during the first 3 minutes of the survey so that survey results could be compared with validation surveys. Surveys were conducted by 5 trained observers.

GROUND TRUTHING OF SELECTED LANDSCAPES IN SOUTHWEST WISCONSIN

Observers returned to all roadside survey points and recorded landuse/landcover within a 400-m radius of each point on an aerial photograph in 2003, 2004, and 2005. This information will then be digitized into a GIS to provide finer resolution habitat data for each landscape.

RED-HEADED WOODPECKER SIGHTINGS

In addition to the roadside surveys, we recorded the approximate location of all red-headed woodpeckers observed by 8 researchers from May to July. The landscape characteristics of the locations of these observations will be compared to random points in the study area using a GIS. In addition, an observer visited the locations of all sightings of red-headed woodpeckers from 2003, 2004, and 2005 and an equal number of random points and counted the number of dead trees and utility poles, estimated percent coverage of different grassland types (idle, hay, pasture), relative grass height in pastures, and percentage of forest that was grazed within 200 m and 400 m of the observation.

RESULTS

BIRD SURVEYS

Validation surveys

Savannah sparrow and common yellowthroat were the species of interest observed most often followed by bobolink, sedge wren, and eastern meadowlark (Table 3). The maximum number of birds of one species observed on a single route was 25 Savannah sparrows followed

by 22 bobolinks and 17 sedge wrens. Henslow's sparrows were the species least observed with only two observations.

Landscape level

Savannah sparrow, brown-headed cowbird, eastern meadowlark, common yellowthroat, and ring-necked pheasant were the five most often observed species during surveys (Table 4). Eastern meadowlark were most abundant in the supergrass landscapes and Savannah sparrows were most abundant in the high grass-medium forest landscapes (Figure 2). Common yellowthroat was most abundant in the low grass-high forest, high grass-high forest, and high grass-medium forest landscapes. Brown-headed cowbirds showed no pattern of abundance across landscape types. Bobolinks had their three highest abundances in the high grass-high forest, high grass-medium forest, and supergrass landscapes, but lower abundances in the high grass-low forest landscape. Ring-necked pheasants had lower abundances in the low grass-high forest and low grass-low forest landscapes, but horned larks had their highest abundance in low grass-low forest landscapes.

RED-HEADED WOODPECKER SIGHTINGS

Fifty-seven observations of red-headed woodpeckers were made in 2005, including those that occurred during landscape-level road side surveys (Figure 3). Some of these observations are probably the same bird or breeding pair seen on different days and will be considered a single territory for future analyses. Preliminary analysis suggest that within a 400-m buffer the amount of pasture, number of dead trees, percent of tree cover in pasture, and percent of deciduous forest that is grazed were greater for sites of observations than at random points (Table 5).

FUTURE WORK

Field work for this study has been completed. Future work for this project will consist of data analysis and report and manuscript writing.

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LITERATURE CITED

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Table 1. Definitions of landscapes surveyed in southwestern Wisconsin.

Landscape	%grass in landscape	%forest in landscape
low grass-low forest	30-45%	<10%
low grass-high forest	30-45%	>20%
high grass-high forest	60-80%	>20%
high grass-medium forest	60-80%	10-20%
high grass-low forest	60-80%	<10%
supergrass	>80%	<20%

Table 2. Bird species of interest for the validation surveys.

Forest	Grassland	Generalist
Black-billed cuckoo ^a	Bobolink ^a	Common yellowthroat ^b
Blue-winged Warblers ^b	Eastern meadowlark ^b	
Cerulean warbler ^a	Grasshopper sparrow ^a	
Golden-winged warbler ^a	Henslow's sparrow ^a	
Red-headed woodpecker ^a	Savannah sparrow ^b	
Wood Thrush ^a	Sedge wren ^a	
	Upland Sandpiper ^a	
	Western Meadowlark ^b	

^a Priority species in BCR23 that have been modeled.

^b Species that we may model in the future.

Table 3. Mean number of birds seen per route per survey and associated standard error, maximum number of birds seen on a route, and total number of observations for roadside survey routes conducted by volunteers for use to validate predictive models of bird abundance in BCR 23 in 2005.

Species	Mean	SE	Max	Total
Black-billed cuckoo	0.05	0.02	4	20
Bobolink	0.70	0.09	22	277
Blue-winged warbler	0.08	0.02	2	31
Cerulean warbler	0.01	0.01	2	3
Common yellowthroat	1.71	0.08	8	677
Eastern meadowlark	0.35	0.04	4	139
Grasshopper sparrow	0.09	0.02	6	35
Golden-winged warbler	0.01	0.01	1	4
Henslow's Sparrow	0.01	0.00	1	2
Meadowlark spp.	0.03	0.01	2	10
Red-headed woodpecker	0.06	0.01	2	23
Savannah sparrow	1.87	0.15	25	739
Sedge wren	0.48	0.07	17	190
Upland sandpiper	0.01	0.01	2	3
Western meadowlark	0.05	0.01	3	20
Wood thrush	0.08	0.02	3	33

Table 4. Mean number of birds seen per survey on roadside routes from 19 May to 27 June 2005 in 800-ha landscapes in southwestern Wisconsin classified into six landscape types (see Table 1 for definitions).

Species of interest	Low grass-high forest	Low grass-low forest	High grass-high forest	High grass-medium forest	High grass-low forest	Super-grass
Baltimore oriole	0.79	0.33	1.17	0.17	0.42	0.17
Black-billed cuckoo	0.00	0.00	0.00	0.00	0.00	0.00
Brown-headed cowbird	2.79	2.25	2.17	2.33	3.00	3.08
Bobolink	0.57	0.00	1.00	1.92	0.42	1.50
Blue-winged warbler	0.36	0.00	0.08	0.00	0.00	0.00
Clay-colored sparrow	0.07	0.00	0.17	0.00	0.00	0.00
Cerulean warbler	0.00	0.00	0.00	0.00	0.00	0.00
Common yellowthroat	2.36	1.08	2.08	2.50	1.83	0.58
Dickcissel	0.00	0.33	0.17	0.50	0.83	1.25
Eastern bluebird	0.07	0.17	0.17	0.42	0.08	0.33
Eastern meadowlark	0.50	1.67	2.33	3.00	3.75	3.92
Field sparrow	1.43	0.33	0.83	0.92	0.58	0.42
Grasshopper sparrow	0.00	0.00	0.08	0.75	0.58	0.33
Golden-winged warbler	0.00	0.00	0.00	0.00	0.00	0.00
Henslow's sparrow	0.00	0.00	0.17	0.08	0.00	0.00
Horned lark	0.00	3.08	0.50	0.58	1.67	1.00
Killdeer	1.00	1.58	0.50	1.33	1.75	1.00
Meadowlark spp.	0.00	0.17	0.08	0.50	0.17	0.42
Northern harrier	0.00	0.00	0.00	0.00	0.00	0.00
Red-headed woodpecker	0.00	0.08	0.08	0.17	0.25	0.25
Ring-necked pheasant	0.93	0.50	2.25	1.75	2.33	1.75
Savannah sparrow	1.71	1.75	1.25	4.17	1.83	2.92
Sedge wren	0.07	0.17	0.50	0.42	0.58	0.42
Upland sandpiper	0.07	0.00	0.17	0.00	0.08	0.25
Vesper sparrow	0.07	0.17	0.17	0.00	0.00	0.08
Western meadowlark	0.00	0.17	0.00	0.00	0.17	0.67
Wood thrush	1.36	0.25	0.08	0.00	0.00	0.00

Table 5. Average characteristics of landscape within 400 m of observations of red-headed woodpeckers and random points in southwestern Wisconsin in 2005.

Landscape characteristics	Observations	Random Points
Percent of grassland idle	24.1	33.3
Percent of grassland in hay	31.8	32.9
Percent of grassland in pasture	42.4	23.4
Pasture height ^a	2.0	1.9
Percent tree cover in pasture	8.1	7.3
Number of dead trees	6.3	3.0
Number of utility poles	6.8	6.1
Percent deciduous grazed	9.2	3.4

^a Pasture height was visually estimated and recorded in one of four categories (1 = <2" tall, 2 = 2-6" tall, 3 = 6.1-12" tall, 4 = >12") and then averaged.

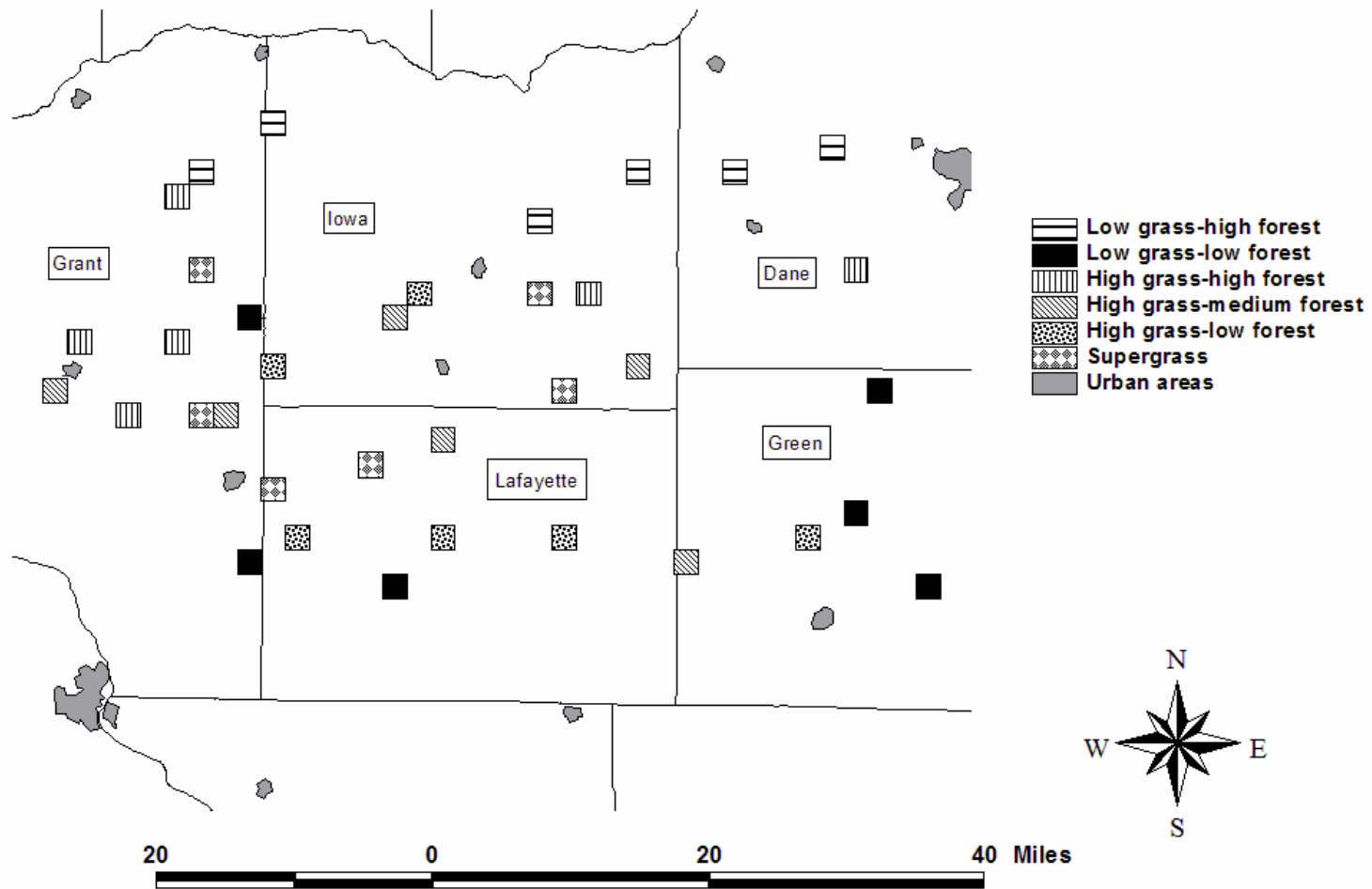


Figure 1. 800-ha landscapes of six different types selected for landscape-level study of grassland associated birds in southwestern Wisconsin.

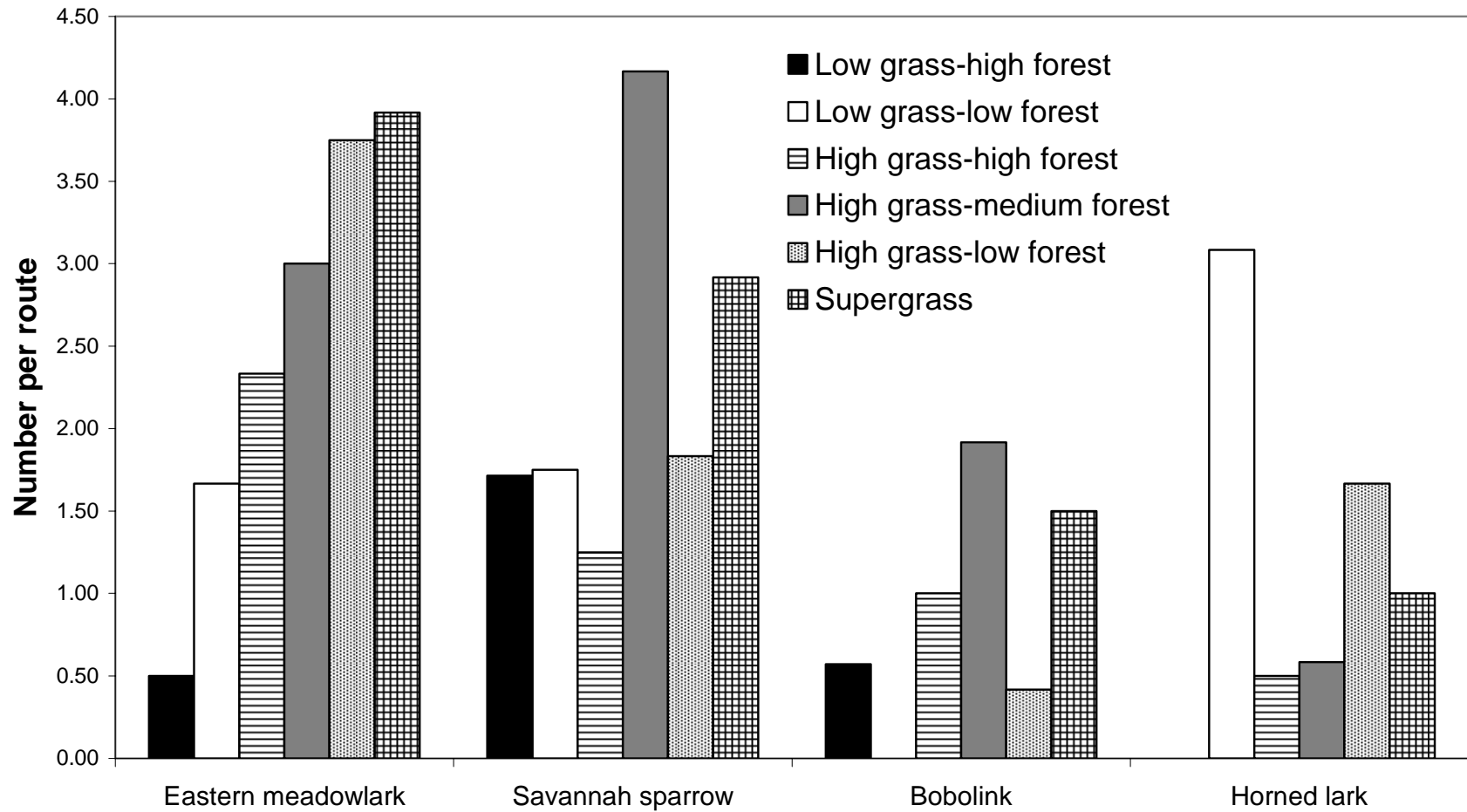


Figure 2. Number of birds seen per survey on roadside routes in 6 different landscape types (n=6) in southwestern Wisconsin during 2005 breeding season for the four most abundant grassland obligate species.

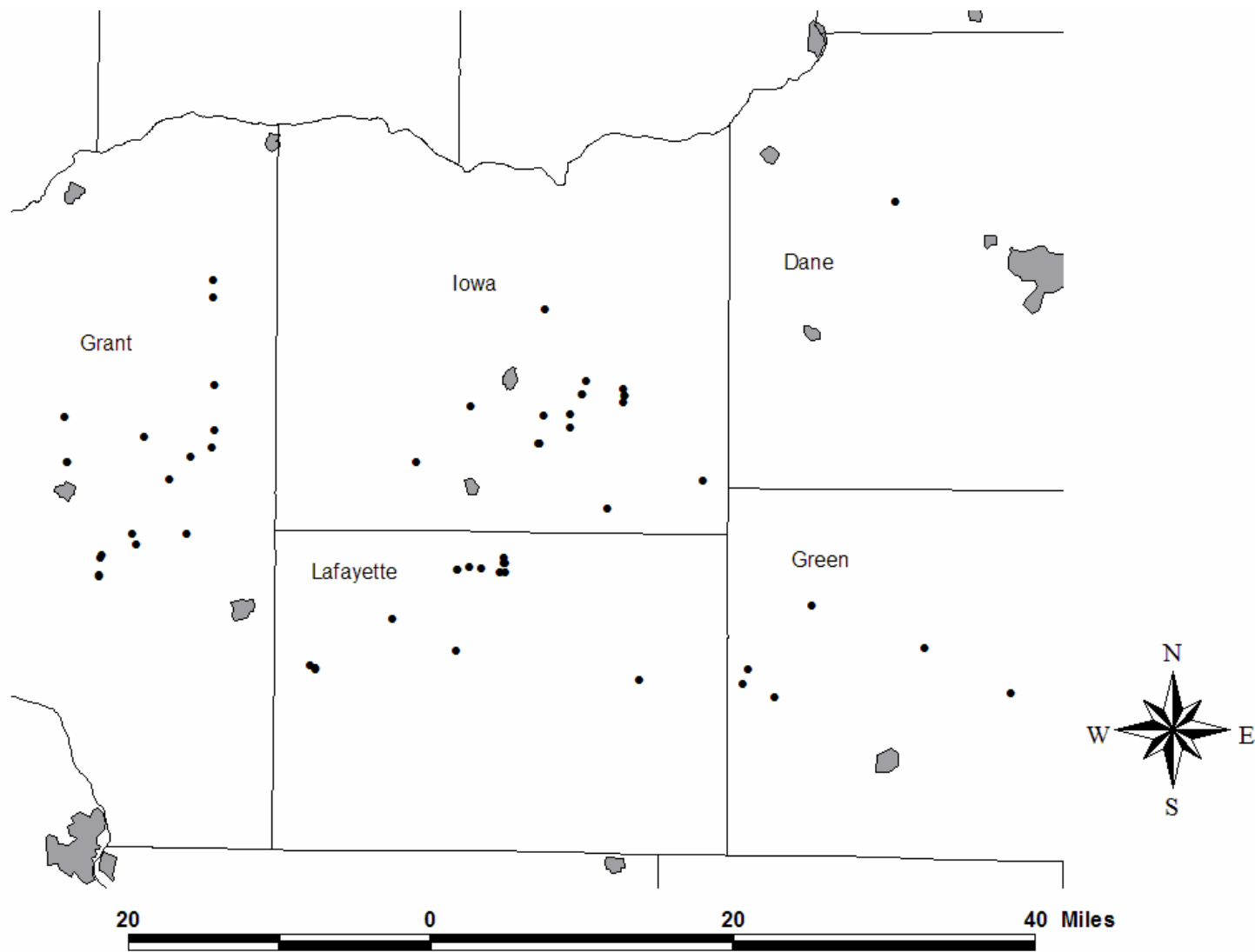


Figure 3. Locations of observations of red-headed woodpeckers in southwestern Wisconsin in the 2005 breeding season.

