Field Validation of GIS-based Models for Regional and Refuge Bird Conservation Planning: 2004 Field Season Report

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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 Lacrosse 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 USGS Upper Midwest Environmental Sciences Center 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 overlayed on a GIS coverage of the BCR. These scales were defined by the LaCrosse 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. An additional 10 8,000-ha landscapes were then selected for each subregion to be surveyed only in 2004 and we randomly chose three 800-ha landscapes in each 8,000-ha landscape to be surveyed. Thus a total of 225 800-ha landscapes were surveyed in 2004, 1/3 of which were the same as those surveyed in 2003.

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. The landscape cell that was classified incorrectly in 2003 was surveyed in 2004, 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 26 observers conducted surveys in 2004.

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 28 May to 15 June and once between 15 June and 9 July 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 4 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 and 2004. 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 7 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 and 2004, 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

Common yellowthroat and Savannah sparrow were the species of interest observed most often followed by bobolink, eastern meadowlark, and sedge wren (Table 3). The maximum number of birds of one species observed on a single route was 16 Savannah sparrows followed by 14 Common yellowthroats. Upland Sandpipers were the species least observed with only two observations.

Landscape level

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

RED-HEADED WOODPECKER SIGHTINGS

Seventy-eight observations of red-headed woodpeckers were made in 2004, 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

Future work will include continuation of roadside surveys for the landscape and validation portions of the study. We will use the same roadside routes for the landscape level surveys so that a higher resolution GIS database can be constructed for the areas being surveyed. For the validation surveys, we will use the same 25 8,000-ha landscapes surveyed in 2003 and 2004, but also will survey 50 different 8,000-ha landscapes in 2005 so that we have abundance information from more locations.

ACKNOWLEDGEMENTS

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LITERATURE CITED

Baichich, P. J., and C. J. O. Harrison. 1997. A guide to nests, eggs, and nestlings of North American birds. Second edition. Academic Press, San Diego.

Sample, D. W., and M. J. Mossman. 1997. Managing habitat for grassland birds: a guide for Wisconsin. Wisconsin Department of Natural Resources, Madison. 154 pp.

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.

Species	Mean	SE	Max	Total
Black-billed cuckoo	0.02	0.01	1	9
Bobolink	0.67	0.09	12	299
Blue-winged warbler	0.04	0.01	2	16
Cerulean warbler	0.01	0.01	2	6
Common yellowthroat	2.02	0.12	14	848
Eastern meadowlark	0.40	0.06	8	162
Grasshopper sparrow	0.19	0.04	5	73
Golden-winged warbler	0.01	0.00	1	5
Henslow's Sparrow	0.02	0.01	2	9
Meadowlark spp.	0.02	0.01	1	7
Red-headed woodpecker	0.08	0.02	4	31
Savannah sparrow	1.50	0.14	16	637
Sedge wren	0.29	0.06	11	122
Upland sandpiper	0.00	0.00	1	2
Western meadowlark	0.04	0.02	4	20
Wood thrush	0.12	0.02	3	51

Table 4. Mean number of birds seen per survey on roadside routes from 24 May to 30 June 2003 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	0.67	0.08	1.17	0.33	0.42	0.00
Black-billed cuckoo	0.00	0.00	0.00	0.00	0.00	0.00
Brown-headed cowbird	2.67	2.00	2.83	1.83	2.83	2.33
Bobolink	0.33	0.33	1.25	2.00	0.17	2.58
Blue-winged warbler	0.08	0.00	0.00	0.00	0.00	0.00
Clay-colored sparrow	0.00	0.00	0.00	0.00	0.00	0.00
Cerulean warbler	0.00	0.00	0.00	0.00	0.00	0.00
Common yellowthroat	2.08	1.58	1.75	2.92	1.50	1.17
Dickcissel	0.17	0.00	0.00	0.33	0.67	0.75
Eastern bluebird	0.58	0.00	0.67	0.67	0.83	0.00
Eastern meadowlark	0.83	2.17	2.00	3.00	4.08	5.00
Field sparrow	1.00	0.00	0.83	1.17	0.50	0.25
Grasshopper sparrow	0.00	0.08	0.17	0.67	0.67	0.50
Golden-winged warbler	0.00	0.00	0.00	0.00	0.00	0.00
Henslow's sparrow	0.17	0.08	0.00	0.00	0.00	0.17
Horned lark	0.00	3.33	0.17	0.08	1.92	0.25
Killdeer	0.75	2.00	0.08	0.58	0.50	0.67
Meadowlark spp.	0.00	0.00	0.58	0.25	0.25	0.42
Northern harrier	0.00	0.00	0.00	0.00	0.00	0.08
Red-headed woodpecker	0.17	0.08	0.33	0.17	0.33	0.00
Ring-necked pheasant	1.42	0.67	3.08	2.17	1.25	1.92
Savannah sparrow	1.75	1.92	0.42	2.17	1.42	3.50
Sedge wren	0.17	0.00	0.00	0.08	0.00	0.00
Upland sandpiper	0.00	0.00	0.00	0.00	0.67	0.08
Vesper sparrow	0.00	0.08	0.00	0.00	0.17	0.00
Western meadowlark	0.00	0.17	0.00	0.33	0.75	0.67
Wood thrush	0.83	0.00	0.08	0.17	0.00	0.00

Table 5. Average characteristics of landscape within 400 m of observations of red-headed woodpeckers in 2003 and 2004 and random points in southwestern Wisconsin.

	Observations		Random
	2003	2004	Points
Percent of grassland idle	24.0	18.8	25.2
Percent of grassland in hay	21.2	26.2	23.8
Percent of grassland in pasture	47.4	48.6	39.8
Pasture height[a]	2.2	2.1	2.2
Percent tree cover in pasture	8.1	9.4	6.4
Number of dead trees	5.1	4.9	2.3
Number of utility poles	6.8	6.3	5.1
Percent deciduous grazed	10.0	13.8	4.3

[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.

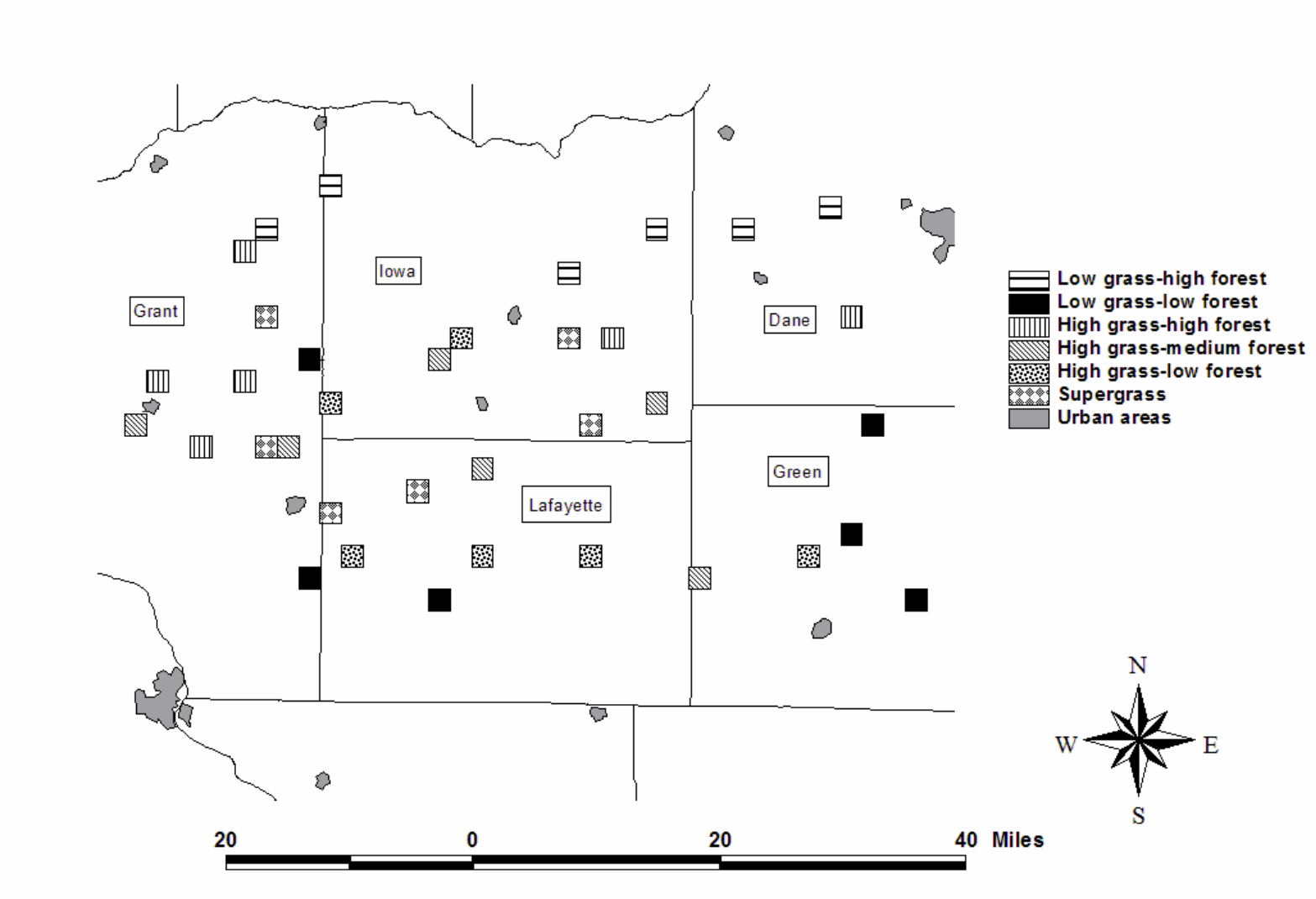

Figure 1. 800-ha landscapes of six different types selected for landscape-level study of grassland associated birds in southwestern Wisconsin.

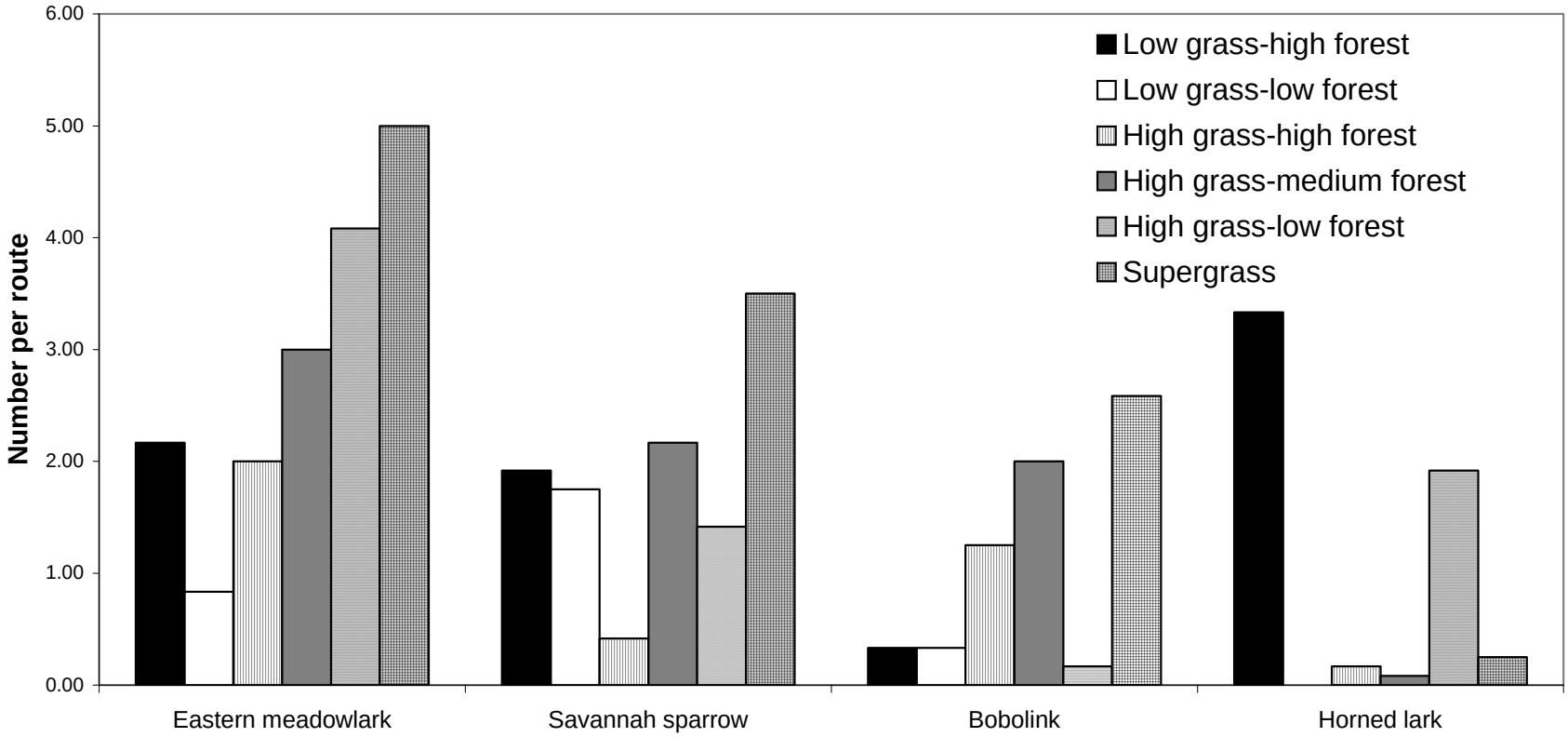

Figure 2. Number of birds seen per survey on roadside routes in 6 different landscape types (n=6) in southwestern Wisconsin during 2004 breeding season for the four most abundant grassland obligate species.

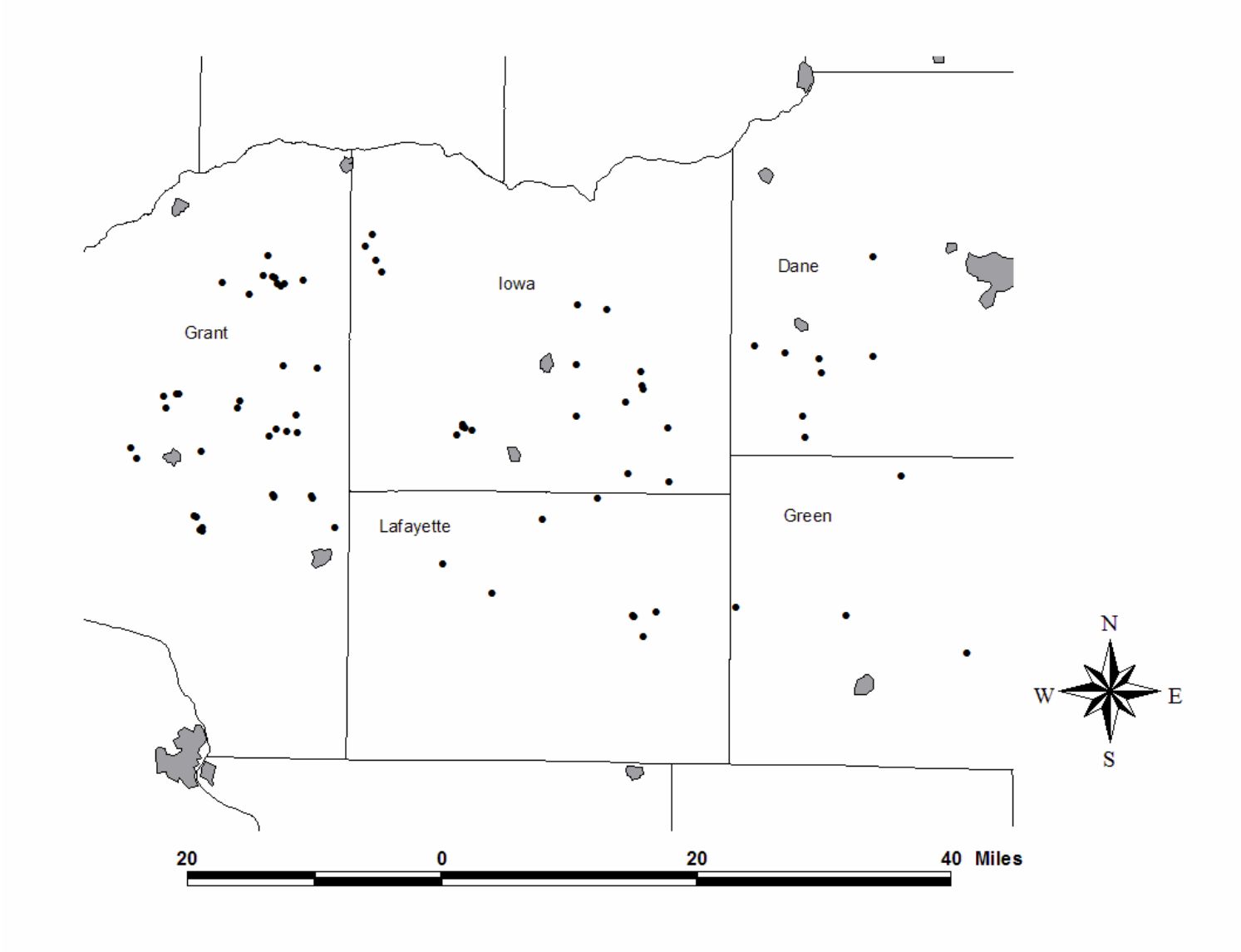

Figure 3. Locations of observations of red-headed woodpeckers in southwestern Wisconsin in the 2004 breeding season.