Field Validation of GIS-based Models for Regional and Refuge Bird Conservation Planning: 2003 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. 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.

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.

Within each selected 800-ha landscape we attempted to locate idle grassland patches planted to smooth brome (*Bromus inermis*) to compare local abundances of grassland birds with abundances in the surrounding landscape. However, we were able to locate and gain permission from land owners for only 13 fields. All fields used were enrolled in the Conservation Reserve Program.

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 16 observers conducted surveys.

Landscape level

Roadside surveys consisting of 3 400-m, 5-minute point counts were conducted in each of the 30 selected 800 ha landscapes and 3 800 ha landscapes surrounding each of the selected landscapes (Figure 1). Roadside surveys were conducted once from 24 May to 12 June and once between 12 June and 30 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 4 trained observers.

Patch level

Two observers conducted 100-m radius point counts to estimate grassland bird abundances in idle grass patches. Observers recorded all birds of all species seen or heard with 100 m of the point during a 5-minute period. Surveys were conducted once from 28 May to 4 June and once from 13 June to 14 June. The distance from the observer to each bird also was recorded. To allow more time to accurately count other species of birds, only a simple tally of the number of red-winged blackbirds seen or heard was recorded because red-winged blackbirds were very abundant. Birds overhead were recorded if they were searching for food, defending a territory, or displaying. As many 100-m radius points were placed in each field as possible. The center of each point was at least 125 m from all field edges to reduce the number of nongrassland species recorded. The center of the point counts were at least 300 m apart. Two fields were too small for any points to fit, thus no data was collected. A total of 16 point counts were conducted in 11 fields.

NEST SEARCHING AND MONITORING

We searched for nests of bobolinks in the 8 fields in which Bobolinks were observed. We searched for nests by watching the behavior of the birds and trying to pinpoint the location of the nest. If the nest was not found after the first attempt, the area near where the nest was believed to be was marked with flagging tape and we attempted to find the nest at a later date. All found nests were marked using a surveyor flag 5 m north of the nest and a Global Positioning System. Nests were monitored every 2-3 days until the nest fledged or failed. Nests of other species were monitored if found incidentally while searching for bobolink nests.

Daily survival rates were calculated using the Mayfield method for bobolink nests. We used an 11 day incubation period and 10 day nestling period to calculate nest success for the entire nesting period (Baicich and Harrison 1997).

RED-HEADED WOODPECKER SIGHTINGS

In addition to the validation surveys, we recorded the approximate location of all red-headed woodpeckers observed by 9 researchers from May to July. The landscape characteristics of the locations of these observations will be compared to random points in the study area.

VEGETATION

Vegetation height, density, and cover were measured at 3 points for each point count placed in a field once in June . The points of vegetation measurements were located a random direction and random distance, between 0 and 100 m, from each point count location. In fields too small to contain a point count, vegetation points were a random distance and direction from the center of the field for comparison with nest sites within the field.

At each point, height-density was measured using a Robel pole and canopy cover was measured using a Daubenmire frame. Height-density was recorded as the lowest decimeter of the Robel pole visible from 4 m away at a height of 1 m from the four cardinal directions and then the values were averaged. Cover estimates were made at the same point and estimated to the nearest 5% for the following categories: grass, forb, woody, dead vegetation, litter (dead plant material lying flat on the ground), and bare ground. Litter depth was measured to the nearest mm from the soil surface to the upper surface of the litter. Vegetation height was measured to the nearest cm as the tallest piece of vegetation within 1 cm of the Robel pole.

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 17 bobolinks followed by 14 Savannah sparrows. Cerulean warblers were the species least observed with only five observations.

Landscape level

Eastern meadowlark, brown-headed cowbird, common yellowthroat, ring-necked pheasant, and Savannah sparrow were the five most often observed species during surveys (Table 4). Eastern meadowlark and savannah sparrow were most abundant in high-grass and supergrass landscapes (Figure 2). Grasshopper sparrow was seen at higher numbers in the high grass-low forest landscape (Figure 2). Killdeers were observed more often in landscapes with low amounts of forest (i.e., <10%). Brown-headed cowbird and common yellowthroat were most abundant in the low grass-high forest, high grass-high forest, and high grass-medium forest. Bobolinks (Figure 2) and ring-necked pheasants had their highest abundances in the high grass-high forest and high grass-medium forest.

Patch level

A total of 14 species were observed during point counts in Conservation Reserve Program fields. Six of the 14 species observed are considered grassland obligates by Sample and Mossman (1997) (Table 5), and field sparrow require grassland during the breeding cycle. Red-

winged blackbird was the most abundant species observed during point counts followed by bobolink, Henslow's sparrow, and sedge wren (Table 5).

Nest Searching and Monitoring

A total of 30 nests of 3 species (bobolink [24], field sparrow [4], meadowlark [2]) were found on 5 fields. Five of the 24 bobolink nests were found with eggs. Three of the five nests with eggs hatched young. Seventeen of the 22 nests found that hatched young fledged at least one host young. All bobolink nests that failed were depredated. Two field sparrow nests were successful, one nest was abandoned, one was depredated. Both meadowlark nests were depredated.

The daily survival rates for bobolink nests were 0.9000 (SE = 0.0045, n = 4) for the incubation stage and 0.9647 (SE = 0.0002, n = 22) for the nestling stage. Overall survival was 0.313 for incubation and 0.698 for the nestling stage. These values were multiplied to get an overall success rate for bobolink nests of 22%. The small sample size of nests during incubation could bias this estimate low. Thus we combined exposure days from incubation and nestling and calculated a daily survival rate and overall success rate for the entire nesting cycle regardless of stage. The daily survival rate for the entire nesting cycle was 0.9567 (SE = 0.0003, n = 22) and the overall success rate estimate was 39%.

Red-headed Woodpecker Sightings

Fifty-four observations of red-headed woodpeckers were made 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.

Vegetation

Vegetation in CRP fields was relatively homogeneous with grasses and litter comprising most of the canopy (Table 6).

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 some of the same routes (the number yet to be determined), but also will include some new survey routes so that we have abundance information from more locations. We also will study the arrival time in the spring, territory distribution, and nest placement of bobolinks in grassland patches of different sizes to examine the relationship between patch size, patch selection, and territory placement.

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 survey route 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	0.05	0.01	2	19
Bobolink	0.81	0.12	17	264
Blue-winged warbler	0.07	0.02	3	31
Cerulean warbler	0.01	0.01	1	5
Common yellowthroat	1.86	0.11	10	551
Eastern meadowlark	0.39	0.06	7	128
Grasshopper sparrow	0.15	0.03	4	60
Golden-winged warbler	0.02	0.02	2	8
Henslow's Sparrow	0.02	0.01	2	9
Meadowlark spp.	0.02	0.01	1	8
Red-headed woodpecker	0.07	0.02	3	30
Savannah sparrow	1.28	0.12	14	409
Sedge wren	0.32	0.05	7	120
Upland sandpiper	0.02	0.01	3	8
Western meadowlark	0.07	0.02	5	23
Wood thrush	0.12	0.02	4	44

Table 4. Mean number of birds seen per roadside route 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-low forest	Low grass-high forest	High grass-high forest	High grass-medium forest	High grass-low forest	Super-grass
Baltimore oriole	0.1	0.8	1.1	0.4	0.1	0.8
Black-billed cuckoo	0.0	0.0	0.0	0.0	0.0	0.0
Brown-headed cowbird	1.5	2.5	4.4	2.5	1.1	0.9
Bobolink	0.2	1.1	1.9	2.2	0.9	1.0
Blue-winged warbler	0.0	0.0	0.0	0.1	0.0	0.0
Clay-colored sparrow	0.0	0.1	0.0	0.0	0.0	0.0
Cerulean warbler	0.0	0.0	0.0	0.0	0.0	0.0
Common yellowthroat	1.2	3.0	2.7	3.4	1.6	0.6
Dickcissel	0.3	0.0	0.0	0.1	1.0	0.7
Eastern bluebird	0.4	0.2	0.1	0.6	0.0	0.2
Eastern meadowlark	1.0	1.1	2.8	3.5	3.0	4.0
Field sparrow	0.2	1.8	0.3	1.3	0.6	0.2
Grasshopper sparrow	0.4	0.5	0.3	0.7	1.1	0.2
Golden-winged warbler	0.0	0.0	0.0	0.0	0.0	0.0
Henslow's sparrow	0.1	0.2	0.2	0.1	0.0	0.0
Horned lark	1.1	0.0	0.0	0.7	0.9	0.3
Killdeer	1.7	0.2	0.4	0.4	1.7	0.7
Meadowlark spp.	0.1	0.0	0.2	0.4	0.5	0.5
Northern harrier	0.0	0.0	0.0	0.0	0.0	0.0
Red-headed woodpecker	0.1	0.1	0.2	0.1	0.0	0.3
Ring-necked pheasant	1.0	1.4	2.5	2.7	1.2	1.1
Savannah sparrow	0.7	1.0	1.3	1.8	2.2	2.5
Sedge wren	0.2	0.2	0.4	0.1	0.3	0.0
Upland sandpiper	0.0	0.0	0.0	0.0	1.0	0.0
Vesper sparrow	0.3	0.0	0.0	0.0	0.0	0.0
Western meadowlark	0.3	0.0	0.0	0.1	0.6	1.1
Wood thrush	0.0	0.6	0.0	0.0	0.0	0.0

Table 5. Mean number and mean maximum number of birds seen per point count and associated standard errors (in parentheses) in Conservation Reserve Program fields in southwestern Wisconsin in May and June 2003.

Species	Mean number	Mean maximum
American Crow	0.03 (0.03)	0.06 (0.06)
Brown-headed Cowbird	0.06 (0.06)	0.13 (0.13)
Bobolink[a]	2.25 (0.68)	3.00 (0.83)
Common yellowthroat	0.13 (0.07)	0.25 (0.14)
Eastern meadowlark	0.31 (0.10)	0.44 (0.13)
Field sparrow	0.03 (0.03)	0.06 (0.06)
Grasshopper sparrow	0.03 (0.03)	0.06 (0.06)
Henslow's sparrow	1.38 (0.26)	1.94 (0.35)
Mallard	0.06 (0.06)	0.13 (0.13)
Meadowlark spp.	0.28 (0.12)	0.56 (0.24)
Red-winged blackbird	5.47 (1.18)	6.88 (1.36)
Savannah sparrow	0.03 (0.03)	0.06 (0.06)
Sedge wren	1.34 (0.23)	1.81 (0.29)
Song sparrow	0.06 (0.04)	0.13 (0.09)

[a] Obligate grassland species defined by Sample and Mossman 1997 are shown in bold.

Table 6. Mean vegetation structure and canopy cover measurements taken during June 2003 for points in Conservation Reserve Program fields planted to smooth brome in southwestern Wisconsin.

	Mean	SE
Structure		
Height-density (dm)	4.4	0.3
Height (cm)	70.5	2.9
Depth (mm)	51.4	6.4
Canopy cover (%)		
Grass	54.8	3.1
Forb	4.5	1.8
Woody	0.2	0.2
Dead	5.9	1.4
Litter	34.2	3.2
Ground	0.4	0.3

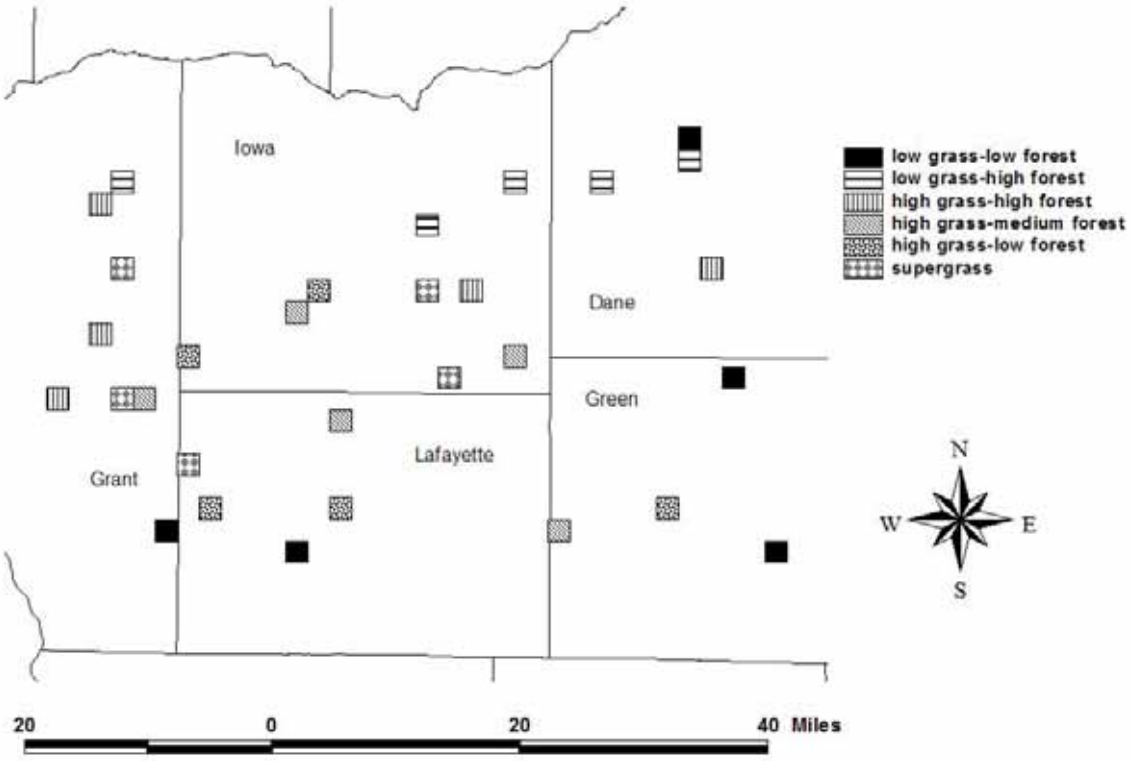

Figure 1. 800-ha landscapes of six different types selected for landscape-level study of grassland associated birds in southwestern Wisconsin.

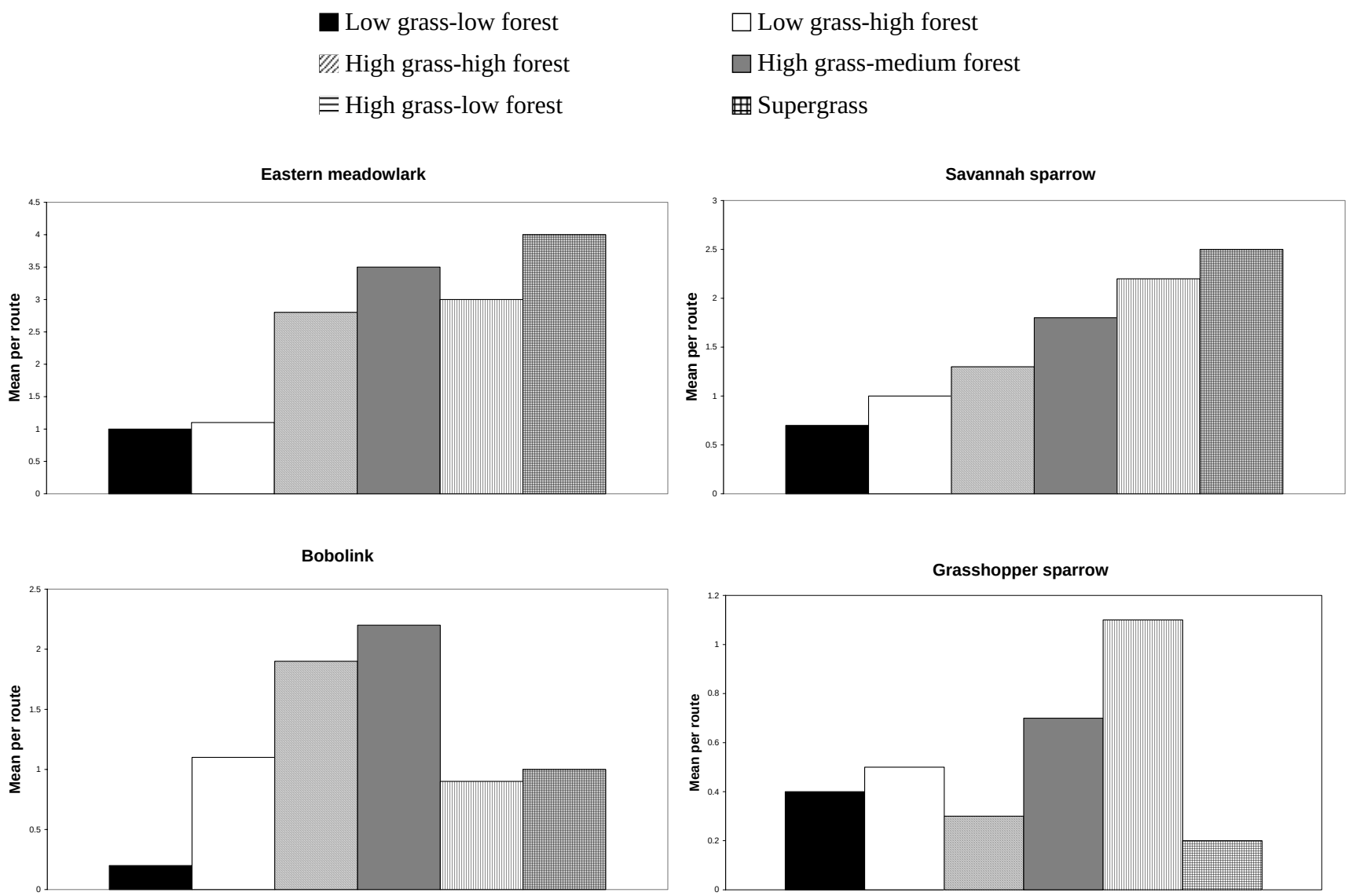

Figure 2. Abundances of 4 obligate grassland birds (Sample and Mossman 1997) in landscapes with various amounts of forest and grassland in southwestern Wisconsin during May and June 2003.

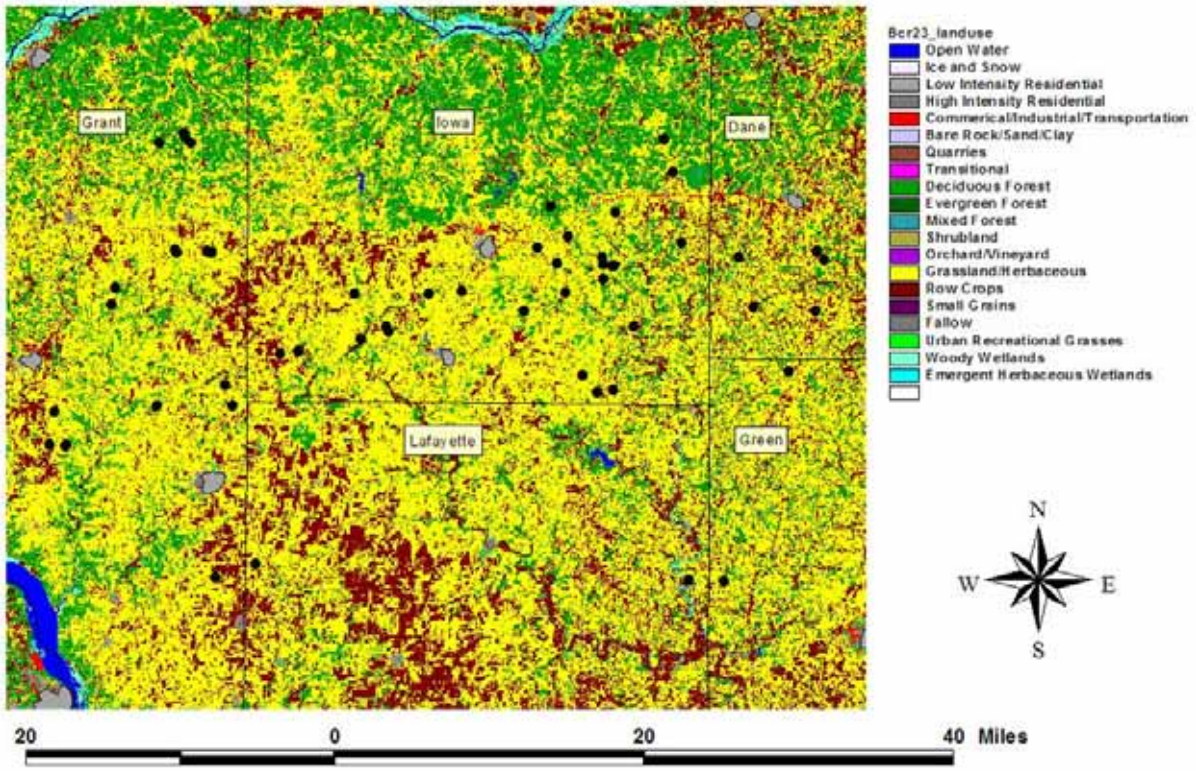

Figure 3. Red-headed woodpecker sightings in southwestern Wisconsin in 2003.