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THE PASSENGER PIGEON Vol. 69 No. 2 Summer 2007

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Send all manuscripts and related correspondence to the Editors. Information for "Seasonal Field Notes" should be sent to the Bird Reports Coordinator (see inside back cover). Art work and questions about the art should be sent to the Assistant Editor for art (see left column). Manuscripts that deal with Wisconsin birds, ornithological topics of interest to WSO members, and WSO activities are considered for publication. For detailed submission guidelines, see pages 3–5 of the Spring 2000 issue (Vol. 62, No. 1) or contact the Editors. As a general guide to style, use issues after Vol. 60, No. 1, 1998.

Front Cover: This pair of Northern Cardinals at the nest with young was taken by Jack R. Bartholmai.

The Knowles-Nelson Stewardship Fund and Our Birds

Last issue I wrote in this space on the importance of wise land use and the critical need to preserve rural, undeveloped lands in Wisconsin as habitat for birds and other wildlife. Wisconsin has long had a reputation for bountiful natural resources, and for a strong conservation ethic. Wisconsinites know that we have an obligation to serve as stewards of our wild resources on behalf of birds and other creatures who cannot speak for themselves; and WSO members are, I suspect, strong supporters of such an ethic. However, the arguments for conservation are not limited to the ecological, as there is also the obvious connection between maintaining ample wild habitats and the economic health of the state, particularly the tourism industry.

Given the abundance of arguments for habitat preservation in Wisconsin, it has always been surprising to me that so much news on the land use front seems depressing these days: more and more farmland turned into sprawling subdivisions, more wetlands drained, more pristine northern lakeshores turned into vacation home front yards, more grasslands converted to corn for ethanol production, and more northern forest blocks sold off for parcelization by timber companies realizing that higher returns come from selling off their lands for development than using them for timber production. Of course, many of these trends are related to increasing human population, which is the root of the problem. But, my European example of the last issue showed that there are ways to work to help preserve habitats in the face of population pressure.

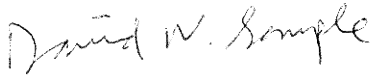
Where can we look for a way to have a positive impact on land use trends in our state? There are many places, ranging from supporting Smart Growth planning efforts in our communities, purchase of development rights programs, various permanent protection programs available through the USDA and other agencies, the growing movement of local land use trusts across the state, and other private conservation groups such as The Nature Conservancy and the Prairie Enthusiasts. Many of these groups do the heavy lifting of protecting habitats for birds and other critters.

Ultimately, the most important single tool we have for habitat preservation in Wisconsin—hands down—remains the Knowles-Nelson Stewardship Fund, which has since 1990 helped to permanently protect more habitat—477,000 acres—than any other program working in the state. It does this in a variety of ways, including outright purchase of lands, and by providing match for funds generated by other groups. A list of some of the lands and waters protected by the Stewardship Fund since its inception is impressive: both the Willow and Turtle-Flambeau Flowages, the Kettle Moraine State Forest, Chiwaukee Prairie, the Lower Wisconsin State Riverway, Bailey's Harbor Boreal Forest Natural Area, the Woodboro Lakes Wildlife Area, Spread Eagle Barrens Natural Area, Kickapoo Wildlife Area, Moose Lake State Natural Area, the St. Louis River

Estuary, Parfrey's Glen, Quincy Bluff Preserve, Jefferson Marsh, and the Goose Pond Sanctuary. As this partial list attests, the Stewardship Fund has secured significant amounts of habitat for a wide diversity of birds, and provided wild places for us and future generations to observe them in.

The current Stewardship Fund is set to expire in 2010 and is currently up for reauthorization by the state Legislature. Governor Jim Doyle has proposed to increase the funding level for the Fund from the current $60 million to $105 million annually, an important increase given the rapid increase in land prices and development pressures across the state. If you agree with me that full re-authorization of the Stewardship Fund is critically important to protecting habitats for birds and other wildlife in Wisconsin, please contact your elected officials to let them know. Grassroots support from WSO members will help ensure that the Stewardship Fund receives the full support of the state Legislature. A healthy Stewardship Fund means, plain and simple, continued protection of lands important to the birdlife of Wisconsin.

Symposium 2007—One final note: thanks to all the speakers who made Symposium 2007: Developments in Wisconsin Ornithology a success. It was inspiring to hear some of the new bird-related projects going on around the state. My sincere appreciation goes out to the other members of the planning committee: Sheldon Cooper, Andy Paulios, and most especially Christine Reel. Finally, thanks to the meeting attendees, who braved the bad weather to make the trip to Port Washington. I hope that, like me, you found it worth your while.



President

Guidelines for Authors

The Passenger Pigeon, issued quarterly by the Wisconsin Society for Ornithology (WSO), publishes articles on Wisconsin birds, on ornithological topics of interest to WSO members, and on WSO activities and business. Anyone with a serious interest in Wisconsin birdlife—whether a professional ornithologist or an amateur birder—is encouraged to submit articles and observations for this journal.

The Editors are happy to discuss ideas for articles with potential authors. There are no page charges for articles published in The Pigeon and no limit is set on the number of pages in an article.

All articles must be submitted in a digital format; as an attachment to an e-mail, or on a CD or diskette. In addition, hard copy may be sent to the Editors via U.S. mail, as it is often helpful to them, especially if there is a problem with a computer file.

Text

The text of the manuscript should be sent as either a Microsoft Word or a WordPerfect file. On the title page, provide the article title, name, address, telephone number, and e-mail address of all authors of the article. Include the acknowledgments, literature cited, and a brief biographical sketch of each author at the end of the manuscript. All of this should be included in the **one** "text" file.

Research articles should follow standard scientific format, with separate sections (as appropriate) for methods, results, and discussion, and should include a brief abstract (written for a general audience) that summarizes the nature and importance of your article.

The spelling of common and scientific bird names should follow the most recent edition of the *Check-List to North American Birds*, published by the American Ornithologists' Union, or the most recent updates to the *Check-List*. The AOU website is the best source to be sure you have the most recent listing. When appropriate, lists of species in tables or text should follow the most current AOU taxonomic sequence. Always use capital letters for the full common names of birds: example, American Robin.

All dates should be in European style (day before month): example, 1 August 1938.

Tables and Figures

Each table and figure (graphs, photographs, etc.) must be sent as a separate file—NOT embedded within the text of the manuscript. This permits the type-

setter to fit them in appropriately. Captions for all figures should be sent as a separate text file, not embedded with the figure. Tables are to be created as "typists' tables"—that is, the columns are separated with tabs; do not space over to make columns line up. No spread sheets! No tables using the "Tables" feature in word-processing programs! No spread sheets inside figure boxes! These formats cannot be adjusted by the typesetter to fit the flow of the text, and have to be retyped at considerable cost. Graphics in Power Point cannot be used by the typesetter.

Photographs should be sent at 300 dpi or higher for best resolution, and as either .tif or .jpg files. The file extensions permit Windows-based programs to recognize them, and must be present. Photos will most often appear in black and white, so keep that in mind when submitting them. Color is always possible if the author pays the cost for using color, and may be possible upon request to the Editors when submitting an article.

If it is not possible for you to submit an electronic file of a photograph, you may send a slide or print to the Editors for scanning. These will be returned to authors upon request.

General Rules

Keep computer codes to a minimum when creating your manuscript. Use only one font size for the entire document—12 point Times-Roman is best. Never use underlining or color codes—these will be removed if used. Be sure to indicate in the text where you are referring to each table or figure with (Table 1) or (Fig. 1), etc.

Do not use abbreviations in the literature cited entries—spell out the full names of journals, for example. Each entry is to be created as a "hanging paragraph," in the format you see presently in the journal.

Do not hesitate to contact the Editors with questions about manuscript preparation. Send any questions to Bettie at bettie@vbe.com or to Neil at harriman@uwosh.edu.

Reminder: Submission Guide Lines for Free-standing Photography and Art are to be found in *The Passenger Pigeon* 68(3): 211. Fall 2006.

Bettie and Neil Harriman, Editors

Erratum: The heading in the middle of the right column on page 71 in Vol. 69, No. 1 should read Marinette County, not Manitowoc County.

Wisconsin's Bird Communities: Their Composition And Dynamics

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ABSTRACT

Using 1976–2004 bird census data from different habitats in Wisconsin, we identified ten bird communities with distinct species compositions. We then compared the composition of these ten bird communities between two time periods (1950–1975 and 1976–2004). We found relatively minor changes in the number of species in each community but more substantial shifts in the relative abundances of those species. We interpret these changes in the composition of bird communities in light of regional population changes of constituent species.

Bird conservationists in Wisconsin are well aware of the dynamic changes that have occurred in some bird populations. Birds such as Red-headed Woodpeckers, Western Meadowlarks, and Grasshopper Sparrows, for example, have been declining steeply in Wisconsin, while, in contrast, birds such as Wild Turkeys, Sandhill Cranes, and House Finches have been increasing rapidly. Since 1966, when the North American Breeding Bird Survey (BBS) began providing a systematic way to track bird populations in Wisconsin, 25% of the monitored species declined significantly in abundance, 35% increased significantly, and the rest either remained relatively stable or experienced short-term deviations from some long-term average (Sauer et al. 2004). In all, since 1966, 60% of Wisconsin's breeding bird species have shown significant changes in their abundance within the state.

All these changes in individual species populations can also generate cumulative changes in the composition of bird communities (i.e., in the number of species in the community and their relative abundances), yet

there have been few attempts to analyze how Wisconsin's bird communities have changed over time as a result of complex changes in constituent species populations. For example, if BBS results reveal a significant statewide change in the abundance of a particular species, it could mean that: (1) there has been either a reduction or expansion in the total area of the species' habitat, but within suitable habitat, the species remains as abundant as in the past; (2) the available habitat has not changed, but within that habitat, the species has become significantly more or less abundant than in the past; or (3) the availability of habitat has either increased or decreased, and within its habitat the bird has also become either more or less abundant. From the community perspective, scenario 1 would produce no change in the composition of the bird community (the species is still a member of the community and present in its normal abundance); whereas scenarios 2 and 3 both imply that the species' relative abundance in the community has shifted, thereby altering the composition of the entire community.

Our central goal here is to explore how Wisconsin's bird communities have changed over the past 55 years (1950–2004). To do this, we will first categorize the bird communities of Wisconsin into ecologically appropriate units and then use current and historical data on the status of birds in those communities to reveal changes in key characteristics of ecological communities, such as the total number of species and their pattern of relative abundance.

Describing the Composition of a Bird Community

Ecologists use several standard measurements to describe the composition of a natural community (Hayek and Buzaz 1997): Species Richness, Species Diversity, and Species Evenness. Species Richness (S) is simply the total number of species present in the community, but that's not the entire picture because those species are present in very different patterns of relative abundance. Some proportion (p) of all the individual birds in the community belong to each species. A few species are relatively abundant, whereas most tend to be relatively scarce. Ecologists capture information on both species richness and relative abundance as Species Diversity ($H = -\Sigma\, p_i \ln p_i$), where p_i is the proportion of all individuals belonging to a particular species. Species Diversity increases or decreases as a result of changes in either Species Richness or the relative abundance of species. Species Diversity increases as either more species are added to the community or the relative abundance of the species becomes more similar (i.e., fewer species are either very common or very rare). Therefore, to understand why the species diversity in a community might have changed, ecologists also need information on the overall pattern of relative abundance of species in addition to information on species richness. The pattern of relative abundance is revealed as Species Evenness ($E = e^H / S$), where e is the base of natural logarithms (i.e., 2.718), and H and S are as defined above. Species Evenness increases when the relative abundances of species become more similar with

fewer species either very abundant or very rare. If these three measures (S, H and E) are known for a community, it helps to describe changes in composition and explain why they have occurred over time.

Categorizing Bird Communities in Wisconsin

Bird communities are the recurring assemblages of bird species typically found together under certain environmental conditions and at a certain time. Categorizing Wisconsin's bird communities into clearly distinguishable yet internally somewhat homogeneous units is an important first step in assessing their status. Whereas John Curtis' (1959) classification of Wisconsin's plant communities was based on detailed descriptions of the plant species composition in various environments and an analysis of how the species composition varied among environments, no such analysis or community classification exists for birds.

Ornithologists recognize that not all of Curtis' 34 plant community types have distinctive bird communities. For example, differences between the bird assemblages associated with Curtis' southern dry, dry-mesic, mesic and wet-mesic forests are relatively minor. As a result of these shortcomings, few ornithologists routinely use Curtis' plant community nomenclature to describe how bird assemblages are arranged across the landscape. Instead, they have devised many ad hoc classification schemes that better describe how bird communities seem to be organized (e.g., Zimmerman 1991, Temple et al. 2003), but none of these have been based on a rigorous analysis of the actual compositions of the bird communities. They represent each ornithologist's expert opinion.

To classify the breeding bird communities of Wisconsin in a more systematic way, we examined recent (1976–2004) bird census data from researchers at UW-Madison and from other experienced ornithologists whose fieldwork we have reason to trust (see Acknowledgments). To be included in these analyses, the counts made by these ornithologists had to record the number of species and the number of individuals of each species within a particular native plant community (although occasionally we had to deduce the Curtis plant community type from the counter's description of the location and the vegetation since, as explained above, ornithologists rarely use Curtis' terminology to describe bird habitats). Only lists that resulted from counting birds within a single, fairly uniform patch of natural vegetation during the breeding season (15 May–1 August) were used. We did not include counts from artificial vegetation, such as agricultural fields and heavily developed environments, because, in comparison with the native plant communities, the structure and composition of these environments (as well as the bird assemblages) vary so dramatically with human activities.

We imposed no restrictions on the time each observer spent counting birds at a location (which varied from minutes to hours) or the way birds were counted (e.g., from fixed points or along transects). We summed all of the counts to produce a cumulative list of all the species detected in each plant community type and cumulative tallies of all individuals of each species. We considered a list for a

community to be adequate for further analysis if it represented results from at least 10 counts. We believe each of these lists represents the cumulative results of at least 6 hours of counting birds in a native plant community type. We were able to assemble such lists for 18 of Curtis' native plant community types: (1) southern dry forest, (2) southern dry-mesic forest, (3) southern mesic forest, (4) southern wet-mesic forest, (5) southern wet forest, (6) northern dry forest, (7) northern dry-mesic forest, (8) northern mesic forest, (9) northern wet-mesic forests, (10) northern wet forest, (11) boreal forest, (12) dry prairie, (13) dry-mesic prairie, (14) mesic prairie, (15) wet-mesic prairie, (16) oak opening, (17) southern shrub-carr, and (18) emergent aquatic. Each list provided information on the number of species in the community and the relative abundance of each species. Many individuals of common species were counted whereas few individuals of rare species were tallied. We assumed that the frequency of detection was more or less directly related to abundance and that the relative abundance of each species could be expressed as the fraction of all individuals of all species that were of a particular species.

We initially analyzed these data using cluster analysis (SYSTAT 2000). Cluster analysis identifies and classifies the assemblages of species on the basis of similarities in the characteristics they possess (in this case, the number of species, the types of species, and their relative abundances). Cluster analysis identifies a number of groups that differ from one another to a specific extent. There are more substantial differences between the groups, but the samples within a single group are more similar. We used this statistical method to calculate the degrees of similarities between the bird lists for the 18 Curtis plant communities. We decided that 10 groupings of community types had bird assemblages distinct enough (and had enough historical counts) to warrant keeping them as separate units in further analyses: (1) southern upland forests (including Curtis' southern dry, dry-mesic, mesic, and wet-mesic forests); (2) southern wet forest; (3) northern upland forest (including Curtis' northern dry-mesic, mesic, and wet-mesic forests); (4) northern dry forest; (5) northern lowland forest (Curtis' northern wet forest); (6) boreal forest; (7) prairies (including Curtis' dry, dry-mesic, and mesic prairies); (8) savanna (Curtis' oak opening); (9) southern shrub-carr; and, (10) emergent aquatic. A characterization of each community and its constituent birds is given in Table 1.

Detecting Changes in Bird Communities

The next challenge is to look at these recognizable bird community types and determine how they may have changed over time. Specifically, we ask how the characteristics of the recent (1976–2004) bird communities (described above) may have differed in the past. To do this, we examined the same types of bird count data (described above) collected by many trustworthy ornithologists over a 55-year period (1950–2004). For comparisons, we subdivided the total

Table 1. Relative abundance and rank abundance for species in 10 bird communities (1976–2004)

	Relative abundance of bird species within 10 communities[1]:									
Common Name	1	2	3	4	5	6	7	8	9	10
Pied-billed Grebe										0.0299
Double-crested Cormorant										0.0025
American Bittern									0.0062	0.0075
Least Bittern										0.0149
Great Blue Heron	0.0012	0.0146								0.0149
Great Egret										0.0025
Green Heron		0.0012							0.0062	0.0050
Black-crowned Night-Heron		0.0012								0.0050
Turkey Vulture	0.0025	0.0036		0.0029			0.0121	0.0046		0.0025
Canada Goose										0.0174
Mute Swan										
Trumpeter Swan										0.0025
Wood Duck	0.0025	0.0219	0.0055						0.0031	0.0124
Gadwall										0.0274
American Wigeon										0.0025
American Black Duck										0.0025
Mallard									0.0247	0.0398
Blue-winged Teal										0.0448
Northern Shoveler										0.0100
Northern Pintail										0.0025
Green-winged Teal										0.0025
Canvasback										
Redhead										0.0323
Ring-necked Duck										0.0075
Lesser Scaup										0.0050
Hooded Merganser		0.0024								0.0025

(Continued)

Table 1. Continued.

	Relative abundance of bird species within 10 communities[1]:									
Common Name	1	2	3	4	5	6	7	8	9	10
Ruddy Duck										0.0174
Osprey			0.0014							0.0050
Bald Eagle				0.0058		0.0024				0.0050
Northern Harrier								0.0023		0.0025
Sharp-shinned Hawk			0.0055	0.0029	0.0071	0.0048				
Cooper's Hawk	0.0037									
Northern Goshawk			0.0014							
Red-shouldered Hawk	0.0012	0.0049	0.0027		0.0035					
Broad-winged Hawk	0.0012	0.0012	0.0055	0.0029	0.0071					
Red-tailed Hawk	0.0100	0.0024	0.0014	0.0029			0.0061	0.0023		
American Kestrel							0.0121	0.0070		0.0025
Merlin			0.0014		0.0035	0.0048				
Peregrine Falcon										
Gray Partridge								0.0046		
Ring-necked Pheasant								0.0139	0.0062	
Ruffed Grouse	0.0112	0.0012	0.0205	0.0262	0.0106	0.0071				
Spruce Grouse					0.0035	0.0024				
Sharp-tailed Grouse										
Greater Prairie-Chicken										
Wild Turkey	0.0137		0.0014					0.0046		
Northern Bobwhite							0.0303	0.0046		
Virginia Rail										0.0473
Sora										0.0348
Purple Gallinule										0.0025
Common Moorhen										0.0100
Sandhill Crane									0.0185	0.0050
Killdeer								0.0093		0.0025

(Continued)

Table 1. Continued.

	Relative abundance of bird species within 10 communities[1]:									
Common Name	1	2	3	4	5	6	7	8	9	10
Spotted Sandpiper										0.0025
Upland Sandpiper								0.0209		
Common Snipe										0.0124
American Woodcock	0.0012	0.0134			0.0035					
Forster's Tern										0.0050
Black Tern										0.0274
Rock Pigeon										
Mourning Dove	0.0162	0.0012	0.0014	0.0087			0.0424	0.0325	0.0031	
Black-billed Cuckoo	0.0224	0.0061	0.0014	0.0029	0.0035		0.0182			
Yellow-billed Cuckoo	0.0174	0.0158	0.0096	0.0029	0.0071					
Eastern Screech-Owl	0.0012	0.0024						0.0023		
Great Horned Owl	0.0062		0.0041	0.0029	0.0035			0.0023		
Barred Owl	0.0025	0.0061	0.0041		0.0035					
Long-eared Owl			0.0014		0.0035					
Short-eared Owl										
Northern Saw-whet Owl			0.0014		0.0071	0.0024				
Common Nighthawk							0.0182	0.0046		
Whip-poor-will	0.0137		0.0027					0.0023		
Chimney Swift		0.0024	0.0151		0.0035	0.0095				
Ruby-throated Hummingbird	0.0224	0.0207	0.0205	0.0117		0.0024		0.0070		
Belted Kingfisher		0.0024								0.0025
Red-headed Woodpecker	0.0199	0.0097	0.0151				0.0121	0.0093		
Red-bellied Woodpecker	0.0286	0.0304	0.0301					0.0070		
Yellow-bellied Sapsucker	0.0025	0.0134	0.0219	0.0175	0.0106	0.0214				
Downy Woodpecker	0.0349	0.0316	0.0342	0.0087	0.0071	0.0119		0.0116	0.0062	

(Continued)

Table 1. Continued.

	Relative abundance of bird species within 10 communities[1]:									
Common Name	1	2	3	4	5	6	7	8	9	10
Hairy Woodpecker	0.0262	0.0231	0.0247	0.0058	0.0106	0.0071		0.0046		
Black-backed Woodpecker					0.0035	0.0024				
Northern Flicker	0.0262	0.0146	0.0164	0.0029	0.0142	0.0024	0.0182	0.0186	0.0062	
Pileated Woodpecker	0.0149	0.0122	0.0055	0.0087	0.0071	0.0024				
Olive-sided Flycatcher				0.0058	0.0177					
Eastern Wood-Pewee	0.0386	0.0316	0.0384	0.0117	0.0071	0.0071		0.0023		
Yellow-bellied Flycatcher					0.0248	0.0048				
Acadian Flycatcher	0.0012	0.0024	0.0014							
Alder Flycatcher					0.0035					
Willow Flycatcher		0.0012	0.0014						0.0401	0.0050
Least Flycatcher	0.0025	0.0024	0.0315	0.0379		0.0095		0.0023		
Eastern Phoebe	0.0025	0.0024	0.0014							
Great Crested Flycatcher	0.0286	0.0268	0.0110	0.0321		0.0119			0.0062	
Eastern Kingbird		0.0024						0.0255	0.0154	0.0050
Loggerhead Shrike								0.0023		
White-eyed Vireo										
Yellow-throated Vireo	0.0050	0.0195	0.0014					0.0023		
Blue-headed Vireo			0.0055							
Warbling Vireo	0.0100	0.0170	0.0082					0.0046		
Philadelphia Vireo						0.0024				
Red-eyed Vireo	0.0399	0.0231	0.0411	0.0321		0.0475		0.0093	0.0031	
Gray Jay					0.0071	0.0048				
Blue Jay	0.0386	0.0353	0.0384	0.0554	0.1135	0.0333		0.0278	0.0062	
American Crow	0.0187	0.0231	0.0301	0.0175	0.0071	0.0095	0.0606	0.0441		
Common Raven			0.0096	0.0029	0.0426	0.0071				
Horned Lark										

(Continued)

Table 1. Continued.

	Relative abundance of bird species within 10 communities[1]:									
Common Name	1	2	3	4	5	6	7	8	9	10
Purple Martin	0.0025									0.0124
Tree Swallow	0.0025	0.0219		0.0117		0.0261	0.0424	0.0348	0.0278	0.0299
Northern Rough-winged Swallow		0.0012								0.0050
Bank Swallow							0.0182			0.0050
Cliff Swallow										0.0149
Barn Swallow							0.0303	0.0255		0.0174
Black-capped Chickadee	0.0274	0.0268	0.0342	0.0671	0.0816	0.0499		0.0232	0.0185	
Boreal Chickadee					0.0035	0.0024				
Tufted Titmouse	0.0037	0.0036								
Red-breasted Nuthatch			0.0041	0.0350	0.0390	0.0166				
White-breasted Nuthatch	0.0386	0.0268	0.0342	0.0087		0.0024			0.0031	
Brown Creeper	0.0012	0.0134	0.0014	0.0029		0.0024				
Carolina Wren	0.0012									
House Wren	0.0224	0.0268						0.0023	0.0062	
Winter Wren	0.0012		0.0014	0.0029	0.0106	0.0404				
Sedge Wren									0.0093	0.0224
Marsh Wren									0.0062	0.0423
Golden-crowned Kinglet			0.0041	0.0029		0.0071				
Ruby-crowned Kinglet			0.0014		0.0071	0.0048				
Blue-gray Gnatcatcher	0.0274	0.0219								
Eastern Bluebird				0.0029				0.0418		
Veery	0.0062	0.0061	0.0425	0.0787	0.0390	0.0451			0.0185	
Swainson's Thrush			0.0027			0.0214				
Hermit Thrush			0.0041	0.0058	0.0426	0.0238				
Wood Thrush	0.0262	0.0073	0.0123	0.0029						
American Robin	0.0324	0.0268	0.0096	0.0087		0.0119	0.0121	0.0325	0.0525	

(Continued)

Table 1. Continued.

	Relative abundance of bird species within 10 communities[1]:									
Common Name	1	2	3	4	5	6	7	8	9	10
Gray Catbird	0.0286	0.0195				0.0024	0.0061	0.0116	0.0617	
Northern Mockingbird								0.0023		
Brown Thrasher	0.0025			0.0029			0.0121	0.0371		
European Starling	0.0125	0.0134	0.0027				0.0242	0.0070		
Cedar Waxwing	0.0012	0.0146	0.0027	0.0233	0.0993	0.0404	0.0121	0.0232	0.0062	
Blue-winged Warbler	0.0050	0.0061						0.0023	0.0062	
Golden-winged Warbler										
Tennessee Warbler			0.0041			0.0024				
Nashville Warbler				0.0350	0.0284	0.0451				
Northern Parula			0.0014	0.0029	0.0213	0.0214				
Yellow Warbler	0.0050	0.0122	0.0247	0.0029		0.0024			0.0216	0.0199
Chestnut-sided Warbler	0.0025		0.0205	0.0058		0.0024				
Magnolia Warbler					0.0035					
Cape May Warbler					0.0071					
Black-throated Blue Warbler			0.0027		0.0035	0.0024				
Yellow-rumped Warbler			0.0027	0.0058	0.0390	0.0261				
Black-throated Green Warbler			0.0123	0.0350		0.0499				
Blackburnian Warbler			0.0068	0.0496		0.0404				
Yellow-throated Warbler	0.0012	0.0024								
Pine Warbler			0.0014	0.0554		0.0024				
Palm Warbler					0.0071					
Cerulean Warbler	0.0025	0.0073								
Black-and-white Warbler	0.0012	0.0012	0.0041	0.0029		0.0285				
American Redstart	0.0062	0.0243	0.0055			0.0214				

(Continued)

Table 1. Continued.

	Relative abundance of bird species within 10 communities[1]:									
Common Name	1	2	3	4	5	6	7	8	9	10
Prothonotary Warbler		0.0109								
Worm-eating Warbler	0.0012									
Ovenbird	0.0399	0.0146	0.0452	0.0845		0.0546				
Northern Waterthrush	0.0012	0.0012			0.0071	0.0071				
Louisiana Waterthrush	0.0037	0.0024								
Kentucky Warbler	0.0012	0.0012								
Connecticut Warbler				0.0029	0.0035					
Mourning Warbler	0.0012	0.0024	0.0014			0.0048			0.0031	
Common Yellowthroat	0.0025	0.0255	0.0192	0.0029	0.0035	0.0095		0.0070	0.1296	0.0299
Hooded Warbler	0.0025									
Canada Warbler			0.0014	0.0292	0.0071	0.0214				
Yellow-breasted Chat	0.0012									
Scarlet Tanager	0.0199	0.0109	0.0260	0.0087		0.0024		0.0046		
Eastern Towhee	0.0037	0.0012	0.0219				0.0121	0.0093	0.0123	
Chipping Sparrow	0.0062		0.0164	0.0087			0.0121	0.0278	0.0031	
Clay-colored Sparrow								0.0371		
Field Sparrow							0.1152	0.0487	0.0031	
Vesper Sparrow							0.0970	0.0534		
Lark Sparrow							0.0061			
Savannah Sparrow							0.0364	0.0093		
Grasshopper Sparrow							0.1030	0.0394		
Henslow's Sparrow										
Le Conte's Sparrow										0.0025
Song Sparrow	0.0037	0.0231	0.0192	0.0321		0.0190	0.0121	0.0209	0.0463	0.0299
Lincoln's Sparrow										
Swamp Sparrow						0.0024			0.1204	0.1045

(Continued)

Table 1. Continued.

	Relative abundance of bird species within 10 communities[1]:									
Common Name	1	2	3	4	5	6	7	8	9	10
White-throated Sparrow			0.0247	0.0087	0.0496	0.0451				
Dark-eyed Junco			0.0014		0.0106	0.0024				
Northern Cardinal	0.0237	0.0231							0.0062	
Rose-breasted Grosbeak	0.0349	0.0219	0.0411	0.0029		0.0048		0.0023	0.0031	
Indigo Bunting	0.0262	0.0207	0.0219	0.0146		0.0024		0.0209	0.0123	
Dickcissel							0.0182			
Bobolink							0.0061	0.0023		
Red-winged Blackbird	0.0025	0.0061					0.0788	0.0186	0.1667	0.1144
Eastern Meadowlark							0.0182	0.0278		
Western Meadowlark							0.0061	0.0046		
Yellow-headed Blackbird										0.0323
Brewer's Blackbird								0.0162		
Common Grackle	0.0199	0.0304	0.0041				0.0303	0.0046	0.0247	0.0149
Brown-headed Cowbird	0.0262	0.0255	0.0082	0.0262		0.0048	0.0303	0.0534	0.0216	0.0075
Orchard Oriole		0.0036						0.0023		
Baltimore Oriole	0.0224	0.0268	0.0233	0.0029				0.0186		
Purple Finch			0.0027	0.0087	0.1028	0.0451				
House Finch	0.0012							0.0023		
Red Crossbill				0.0029						
White-winged Crossbill					0.0071	0.0048				
Pine Siskin			0.0014		0.0284	0.0024				
American Goldfinch	0.0025	0.0158					0.0303	0.0255	0.0586	0.0050
Evening Grosbeak			0.0014			0.0048				
House Sparrow	0.0012	0.0012						0.0023		0.0299

[1] Bird community types: (1) southern upland forests, (2) southern lowland forest, (3) northern upland forests, (4) northern dry forest, (5) northern lowland forest, (6) boreal forest, (7) prairies, (8) savannas, (9) southern shrub-carr, and (10) emergent aquatic.

collection of bird counts into 2 time intervals: 1950–1975 and 1976–2004.

How Have Bird Communities Changed?

For each period of time, when an adequate number of counts could be assembled, we summarized the composition of each of the bird communities using standard community descriptors: Species Richness (S), Species Diversity (H′), and Species Evenness (E). The results of comparisons of bird communities between time periods are summarized in Table 2.

There have been some changes in species richness of bird communities over the past 55 years (Table 2). A few new species have been added to some recent communities through range and habitat expansions (e.g., Red-bellied Woodpecker, Tufted Titmouse, and House Finch), reintroductions (e.g., Wild Turkey and Trumpeter Swan) and recovery of formerly rare species (e.g., Double-crested Cormorant, Sandhill Crane, and Cooper's Hawk). Some, usually rare, species also dropped out of several past communities, but no species dropped out of a community as a result of a statewide extinction. Overall, the net changes in species richness were less than 8 species in any community. The prairie bird community suffered the greatest net loss in richness

Table 2. Comparisons of characteristics (species richness, species diversity, and species evenness) of 10 bird communities between 1950–1975 and 1976–2004.

Bird Community Type	Species Richness[1] 1950–75	Species Richness 1976–04	Species Diversity[2] 1950–75	Species Diversity 1976–04	Species Evenness[3] 1950–75	Species Evenness 1976–04
1. So. upland forests	60	62	3.094	3.407	0.374	0.487
2. So. lowland forest	73	78	2.588	3.729	0.182	0.534
3. No. dry forest	61	62	3.447	3.604	0.515	0.593
4. No. upland forests	80	83	2.898	3.671	0.326	0.473
5. No. lowland forest	52	52	2.137	3.034	0.159	0.399
6. Boreal forest	64	68	2.017	3.655	0.143	0.568
7. Prairies	41	34	2.207	3.359	0.221	0.546
8. Savannas	58	66	3.093	3.588	0.380	0.548
9. S. shrub-carr	42	40	3.195	3.162	0.581	0.591
10. Emergent aquatic	58	60	3.073	3.240	0.260	0.425

[1] Total number of species detected (S).
[2] Species diversity = $H' = -\Sigma\, p_i \ln p_i$, where p_i is the proportion of all individuals belonging to the ith species.
[3] Species evenness = $E = e^H / S$, where e is the base of natural logarithm and H and S are as defined above.

(–7 species), not surprising given the dramatic deterioration of Wisconsin's grassland habitats. The savanna community experienced the greatest net gain (+8 species), unfortunately because these previously open habitats became progressively invaded by woody shrubs that attracted more woodland birds.

On the other hand, there were many shifts in relative abundance of species within all communities. We considered a noteworthy shift in relative abundance to be one in which the rank of a species increased or decreased in magnitude by ≥ 5 positions within a community. There were 301 such noteworthy shifts in relative abundance of species within the 10 communities, with 152 increases in rank and 149 decreases in rank. In contrast, there were 537 instances in which the relative ranks of species within the communities remained unchanged (or changed < 5 positions). Overall, as shown by species evenness values in Table 2, these shifts tended to make the patterns of relative abundance within communities more even (i.e., the relative abundances of species tended to become more similar as certain formerly abundant species declined while previously scarce species became more abundant).

Species diversity, which takes into account information about species richness and relative abundance, changed for all communities, largely as a result of the changes in patterns of relative abundance (Table 2). All but one community (southern shrub-carr) became more diverse over time. The communities with the greatest changes in diversity were: southern lowland forest and boreal forest.

Why Have Bird Communities Changed?

Not all trends in the regional abundance of species across Wisconsin, as revealed by BBS data, are reflected in parallel changes in patterns of relative abundance within communities. Overall, 52% of the trends in relative abundance of species within communities were similar to regional trends in abundance for the species. Others were not similar and warrant further discussion. For example, most species, which have maintained their relative abundance (and rank) within their respective natural communities, while either increasing or declining regionally, have been influenced by changes in availability of habitat, often in artificial rather than natural habitats (Table 3). An example is the Red-tailed Hawk, which has increased in abundance regionally by expanding into developed habitat, while maintaining its relative abundance within natural communities (Stout and Temple 2006).

In contrast, many of the shifts we detected in the composition of bird communities are associated with environmental changes within habitat rather than quantitative changes in availability of habitat. Habitat fragmentation, for example, has reduced the average patch size for many ecosystems, and this environmental change influences the bird communities in predictable ways (Ambuel and Temple 1983). Some species showing regional declines appear to be suffering from their sensitivity to habitat fragmentation, especially many forest-dwelling, long-distance migrants (Table 3). Several top predators (e.g., Northern Harrier, Bald Eagle, Osprey,

Table 3. Comparisons of regional (BBS) trends in abundance and within-habitat trends in rank abundance within communities.

Common Name	Regional Trend ('66–'03)	Within-habitat Trends ('76–'04) for Community Types[1]: 1	2	3	4	5	6	7	8	9	10	Possible Explanation
Pied-billed Grebe	↔							↔				
Double-crested Cormorant											↑	DDT recovery
American Bittern	↓									↔	↓	
Least Bittern											↔	
Great Blue Heron	↔	↑	↔									
Great Egret	↔										↓	
Green Heron	↔		↓							↔	↓	
Black-crowned Night-Heron	↔		↔								↔	
Turkey Vulture	↑	↔	↔	↑				↑	↑		↑	Range expansion
Canada Goose	↑										↑	Recovery of resident subsp.
Mute Swan											↑	Lack of control
Trumpeter Swan											↑	Reintroduction
Wood Duck	↑	↑	↔		↑					↔	↔	
Gadwall											↔	
American Wigeon											↓	
American Black Duck	↔										↓	
Mallard	↑									↔	↔	
Blue-winged Teal	↓										↔	
Northern Shoveler											↓	
Northern Pintail	↔										↓	
Green-winged Teal	↓										↓	
Canvasback											↓	
Redhead											↓	
Ring-necked Duck	↔										↔	
Lesser Scaup	↔										↓	
Hooded Merganser Ruddy Duck	↑		↔								↓ ↔	
Osprey	↑				↑						↑	DDT recovery
Bald Eagle	↑		↑		↑	↑	↑				↑	DDT recovery

(Continued)

Table 3. Continued.

Common Name	Regional Trend ('66–'03)	Within-habitat Trends ('76–'04) for Community Types[1]: 1	2	3	4	5	6	7	8	9	10	Possible Explanation
Northern Harrier	↑							↑			↓	DDT recovery
Sharp-shinned Hawk	↑			↑	↔	↑	↑					DDT recovery
Cooper's Hawk	↑	↑		↑			↑					DDT recovery
Northern Goshawk					↔							
Red-shouldered Hawk	↔	↓	↔			↓						
Broad-winged Hawk	↔	↓		↔	↔	↔						
Red-tailed Hawk	↑	↔	↔	↔	↓			↑	↔	↔	↔	Habitat expansion
American Kestrel	↔			↑				↑	↔			
Merlin					↑	↑	↑					Recovery & range expansion
Peregrine Falcon											↑	DDT recovery
Gray Partridge	↓								↓			
Ring-necked Pheasant	↔							↓	↑	↑	↑	
Ruffed Grouse	↑	↔	↑	↔	↔	↔	↔					
Spruce Grouse						↑	↓					
Sharp-tailed Grouse	↔											
Greater Prairie-Chicken	↔			↑						↓		
Wild Turkey	↑	↑	↑	↑	↑				↑			Reintroduction
Northern Bobwhite	↔							↔	↔			
Virginia Rail	↔										↔	
Sora	↓										↓	
Purple Gallinule											↑	
Common Moorhen	↓										↓	
Sandhill Crane	↑									↑	↑	Recovery
Killdeer	↔							↓	↔		↑	
Spotted Sandpiper	↓										↓	
Upland Sandpiper	↓							↓	↓			
Common Snipe	↓										↔	Habitat loss

(Continued)

Table 3. Continued.

Common Name	Regional Trend ('66–'03)	Within-habitat Trends ('76–'04) for Community Types[1]: 1	2	3	4	5	6	7	8	9	10	Possible Explanation
American Woodcock	↔	↓	↑			↓			↓			Habitat loss
Forster's Tern	↔										↔	
Black Tern	↓										↓	
Rock Pigeon	↔								↓	↓	↓	
Mourning Dove	↑	↔	↔	↑	↔			↔	↔	↔		
Black-billed Cuckoo	↓	↓	↓	↔	↓	↔		↔				
Yellow-billed Cuckoo	↓	↓	↓	↔	↔	↔						
Eastern Screech-Owl	↔	↔	↑						↑			
Great Horned Owl	↔	↔	↔	↔	↔	↔			↑			
Barred Owl	↔	↔	↔		↔	↔						
Long-eared Owl					↑	↑						
Short-eared Owl								↓				
Northern Saw-whet Owl					↔	↔	↓					
Common Nighthawk	↔							↔	↔			
Whip-poor-will	↔	↓			↓				↑			
Chimney Swift	↔		↑		↓	↑	↔		↔			
Ruby-throated Hummingbird	↑		↑	↔	↔	↔	↑		↔			
Belted Kingfisher	↔		↔								↔	
Red-headed Woodpecker	↓	↓	↓		↓			↓	↓			Habitat loss
Red-bellied Woodpecker	↑	↑	↑	↑	↑				↑			Range expansion
Yellow-bellied Sapsucker	↑	↔	↔	↔	↔	↔	↔					
Downy Woodpecker	↑	↔	↔	↔	↔	↔	↔		↑	↔		
Hairy Woodpecker	↑	↑	↑	↔	↔	↔	↔		↔	↔		
Black-backed Woodpecker						↑	↑					
Northern Flicker	↓	↓	↓	↓	↓	↔	↓	↑	↔	↔		
Pileated Woodpecker	↑	↔	↔	↔	↔	↔	↔					
Olive-sided Flycatcher	↔			↔		↔						
Eastern Wood-Pewee	↔	↔	↔	↔	↔	↔	↔	↑	↑			

(Continued)

Table 3. Continued.

Common Name	Regional Trend ('66–'03)	Within-habitat Trends ('76–'04) for Community Types[1]: 1	2	3	4	5	6	7	8	9	10	Possible Explanation
Yellow-bellied Flycatcher	↔				↑	↔	↔					
Acadian Flycatcher		↑	↑		↑							Range expansion
Alder Flycatcher	↑					↓					↑	
Willow Flycatcher	↔		↓		↑					↑	↓	
Least Flycatcher	↓	↓	↓	↔	↔		↔		↔			
Eastern Phoebe	↑	↔	↔		↔							
Great Crested Flycatcher	↔	↔	↔	↔	↔		↔			↔		
Eastern Kingbird	↓		↔	↔					↓	↓	↓	
Loggerhead Shrike				↔				↓	↓			
White-eyed Vireo										↓		
Yellow-throated Vireo	↑	↑	↓		↓				↓			
Blue-headed Vireo	↑				↔							
Warbling Vireo	↔	↔	↓		↔				↔			
Philadelphia Vireo							↔					
Red-eyed Vireo	↑	↑	↑	↔	↔		↔		↔	↔		
Gray Jay	↔					↑	↔					
Blue Jay	↔	↔	↔	↔	↔	↔	↔		↔	↔	↔	
American Crow	↑	↔	↔	↔	↔	↔	↑	↔	↔	↔		Expansion in non-native habitat
Common Raven	↑			↑	↔	↔	↔					
Horned Lark	↔							↓				
Purple Martin	↓	↑	↓								↓	Winter problems
Tree Swallow	↔	↔	↑	↔			↑	↑	↑	↑	↔	
Northern Rough-winged Swallow	↔		↑								↔	
Bank Swallow	↔							↔			↔	
Cliff Swallow	↔										↑	
Barn Swallow	↔							↔	↔		↑	
Black-capped Chickadee	↑	↔	↔	↔	↔	↔	↔		↔	↔	↔	

(Continued)

Table 3. Continued.

Common Name	Regional Trend ('66–'03)	Within-habitat Trends ('76–'04) for Community Types[1]: 1	2	3	4	5	6	7	8	9	10	Possible Explanation
Boreal Chickadee	↔						↔	↔				
Tufted Titmouse	↔	↑	↑									
Red-breasted Nuthatch	↑			↔	↑	↔	↔					
White-breasted Nuthatch	↔	↔	↔	↔	↔		↔			↔		
Brown Creeper	↔	↓	↔	↔	↑		↔					
Carolina Wren			↑									
House Wren	↑	↔	↑	↑	↑				↔	↑		
Winter Wren	↑	↔		↑	↔	↑	↑					
Sedge Wren	↔									↔	↔	
Marsh Wren	↓										↓	
Golden-crowned Kinglet	↔				↓		↔					
Ruby-crowned Kinglet	↓				↓	↓	↓					
Blue-gray Gnatcatcher	↑	↑	↑									
Eastern Bluebird	↑			↑					↑			Nest boxes
Veery	↓	↓	↓	↔	↔	↔	↔			↑		
Swainson's Thrush	↔				↓		↔					
Hermit Thrush	↑			↑	↔	↔	↔					
Wood Thrush	↔	↔	↔	↔	↔							
American Robin	↑	↑	↔	↔	↔		↔	↑	↔	↔		
Gray Catbird	↔	↔	↓				↔	↔	↔	↔		
Northern Mockingbird									↑			
Brown Thrasher	↓	↓		↓				↓	↔			Habitat loss
European Starling	↓	↔	↓	↓	↓			↔	↔			
Cedar Waxwing	↔	↑	↔	↔		↔	↔	↔	↔	↔		
Blue-winged Warbler	↔	↔	↔						↓	↓		
Golden-winged Warbler	↓	↔	↔		↓				↓			Habitat loss
Tennessee Warbler	↔				↓		↔					
Nashville Warbler	↔			↔	↑	↔	↔					
Northern Parula	↔			↑	↔	↔	↔					

(Continued)

Table 3. Continued.

Common Name	Regional Trend ('66–'03)	Within-habitat Trends ('76–'04) for Community Types[1]: 1	2	3	4	5	6	7	8	9	10	Possible Explanation
Yellow Warbler	↑	↔	↑	↑	↑		↔			↔	↓	
Chestnut-sided Warbler	↔	↔		↔	↓		↓					
Magnolia Warbler	↑				↑	↔	↑					
Cape May Warbler	↔				↑	↔	↑					
Black-throated Blue Warbler	↔				↔	↓	↓					
Yellow-rumped Warbler	↑			↔	↔	↔	↑					
Black-throated Green Warbler	↔			↔	↔		↔					
Blackburnian Warbler	↔			↔	↔		↔					
Yellow-throated Warbler		↓	↔				↑					
Pine Warbler	↑			↔	↔		↔					
Palm Warbler	↔					↑						
Cerulean Warbler	↓	↓	↓		↔							
Black-and-white Warbler	↔	↓	↓	↔	↔		↔					
American Redstart	↔	↔	↔		↔		↓					
Prothonotary Warbler			↔									
Worm-eating Warbler		↔										
Ovenbird	↑	↔	↔		↑	↑	↑					
Northern Waterthrush	↔	↓	↔			↑	↑					
Louisiana Waterthrush		↔	↔									
Kentucky Warbler		↔	↔									
Connecticut Warbler	↔				↓	↓						
Mourning Warbler	↑	↑	↑		↑		↑					
Common Yellowthroat	↑	↔	↑	↓	↓	↔	↔		↔	↔	↔	
Hooded Warbler		↑										
Canada Warbler	↔			↔	↔	↔	↔					
Yellow-breasted Chat		↓										
Scarlet Tanager	↔	↔	↔	↔	↔		↓		↑			
Eastern Towhee	↔	↓	↓	↑	↔			↔	↔	↔		
Chipping Sparrow	↑	↔		↑	↔			↔	↑	↔		

(Continued)

Table 3. Continued.

Common Name	Regional Trend ('66–'03)	Within-habitat Trends ('76–'04) for Community Types[1]: 1	2	3	4	5	6	7	8	9	10	Possible Explanation
Clay-colored Sparrow	↔			↑					↑			
Field Sparrow	↓			↑				↓	↓	↓		
Vesper Sparrow	↓							↔	↔			Habitat loss
Lark Sparrow	↔							↑				
Savannah Sparrow	↓							↓	↓			
Grasshopper Sparrow	↓							↔	↓			Habitat loss
Henslow's Sparrow	↓							↓		↓		Habitat loss
Le Conte's Sparrow	↔							↓			↔	
Song Sparrow	↔	↔	↔	↔	↔		↔	↔	↔	↔	↔	
Lincoln's Sparrow	↔					↓						
Swamp Sparrow	↔						↑			↔	↔	
White-throated Sparrow	↔			↓	↔	↔	↔					
Dark-eyed Junco	↔				↓	↔	↔					
Northern Cardinal	↑	↑	↔		↑					↔		
Rose-breasted Grosbeak	↔	↔	↔	↓	↔		↔		↓	↑		
Indigo Bunting	↔	↔	↓	↔	↓		↔		↔	↔		
Dickcissel	↓							↓				Winter problems
Bobolink	↓							↓	↓			Winter problems
Red-winged Blackbird	↓	↓	↔					↔	↔	↓	↓	
Eastern Meadowlark	↓							↓	↓			Habitat loss
Western Meadowlark	↓							↓	↓			Habitat loss
Yellow-headed Blackbird	↔										↔	
Brewer's Blackbird	↓								↔			
Common Grackle	↓	↓	↔		↓			↔	↓	↔	↓	
Brown-headed Cowbird	↓	↔	↔	↔	↔		↔	↔	↔	↔	↔	Decline in non-native habitat
Orchard Oriole	↔		↔						↓			
Baltimore Oriole	↓	↓	↔	↔	↔				↔			
Purple Finch	↔			↔	↔	↔	↔					
House Finch	↑	↑							↑			Range expansion

(Continued)

Table 3. Continued.

Common Name	Regional Trend ('66–'03)	Within-habitat Trends ('76–'04) for Community Types[1]: 1	2	3	4	5	6	7	8	9	10	Possible Explanation
Red Crossbill	↔			↓								
White-winged Crossbill	↓					↓	↓					
Pine Siskin	↔				↔	↔	↔					
American Goldfinch	↑	↔	↔		↔			↔	↔	↔	↔	
Evening Grosbeak	↑				↑		↔					
House Sparrow	↓	↓	↓						↓			

[1] Bird community types: (1) southern upland forests, (2) southern lowland forest, (3) northern upland forests, (4) northern dry forest, (5) northern lowland forest, (6) boreal forest, (7) prairies, (8) savannas, (9) southern shrub-carr, and (10) emergent aquatic.

Cooper's Hawk, and Merlin) have increased in regional abundance and in relative abundance in their respective communities following banning of DDT (Table 3). Changes in food availability within a habitat often affect bird abundance. Turkey Vultures, for example, may have increased across Wisconsin and within their habitats because of increased availability of deer carcasses as white-tailed deer populations expanded.

Some regional declines of some migratory species that have been paralleled by declines in relative abundance within their communities, such as seen in Loggerhead Shrikes, Purple Martins, Dickcissels, and Brown-headed Cowbirds (Table 3), do not seem to be clearly associated with concurrent reductions in either availability or quality of breeding habitat in Wisconsin. Instead, they may be associated with events outside of Wisconsin during the non-breeding season (e.g., Basili and Temple 2001, Temple 1995, Brittingham and Temple 1982).

Regional declines of some species seem to be associated with both overall losses of habitat as well as reductions in quality of remaining habitat. Regional declines in several grassland bird species are associated with statewide loss of grassland habitat, but many of these birds have also experienced reductions in their relative abundance within the prairie bird community, even in remaining patches of suitable habitat (Table 3).

Limitations of These Analyses

When trying to reveal how the composition of a community has changed over time, the ideal approach involves repeating surveys at the exact sites where previous data were collected. This approach is possible if the procedures used to describe the community in the past can be replicated, and if the locations of prior surveys were recorded (and the sites still exist in a natural state). Unfortunately, this ideal approach is rarely feasible for most bird communities in Wisconsin,

and only a few applications of this ideal approach have been possible. For example, Ambuel and Temple (1982) documented 25 years of change in the bird communities of southern Wisconsin forests previously surveyed by Bond (1957), and Weise et al. (2004) resurveyed birds on a State Natural Area they had censused 30 years previously .

The alternative approach we have used takes advantage of extensive data collected by ornithologists who were not necessarily trying to describe the composition of bird communities, but were simply keeping a record of birds they counted in a particular location and vegetation type. Their individual counts would not alone provide a complete sample of the bird community in a particular type of vegetation, but when their counts are combined, the resulting lists provide a more representative sample of the composition of bird communities. We assumed we could generally rely on the accuracy of bird identifications and counts by experienced ornithologists, and this assumption has been tested and validated with several other similar data sets (e.g., Temple and Cary 1990). Nonetheless, there are some potential limitations to our approach.

Some involve the sites at which counts were made. Since the list of species and number of individuals for each community were accumulated from counts at many sites, there is a possibility that the characteristics of the sites influenced results. For example, consider the influences of succession and patch size. We only required that counts be attributable to a plant community type, but we did not require that the counts be from either a particular successional stage or a habitat patch of some minimum size. Hence, it is possible that for some communities, especially forests, the lists we analyzed represent data from a mixture of forest stands of different ages (from younger stands to old-growth conditions). Since the composition of the bird community typically shifts with succession, the balance of data from stands of different ages could influence results.

The size of a habitat patch also influences the composition of the bird community, and smaller patches typically do not support populations of area-sensitive species. Because, in most cases, we do not know the size of the patches of vegetation in which counts were made, it is possible that some counts were made in patches too small to support a full complement of species. This problem, for example, almost certainly exists in the data from prairies; there are few remaining patches of native prairie in Wisconsin large enough to harbor such area-sensitive species as Greater Prairie-Chickens. As a result, area-sensitive grassland species may be under-represented on (or absent from) our species lists.

Another issue involves the pooling of data over 25-year periods. We had to do this in order to accumulate an adequate number of counts, but in doing so we possibly masked rapid changes in bird populations that occurred within a period. For example, within our 1976–2003 time interval, BBS results suggest Western Meadowlarks experienced a dramatic 93% decline (Sauer et al. 2004); a mixture of counts from early and late in the 27-year period fails to describe accurately the true status of the species

within the community at any particular time.

Nonetheless, we believe the insights into the changes in the composition of Wisconsin's bird communities couldn't have been derived in any other way. We offer our insights as a starting point for discussing future work on bird communities that conform more closely to the ideal approach. The collection of such data is actually underway within the Wisconsin Department of Natural Resources as part of regular censusing of the state's system of State Natural Areas. With slight improvement in methodology, this and other efforts could eventually yield data comparable to those based on resurveys of John Curtis' plots (Curtis 1959).

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Brown Thrasher by Dennis Kuecherer.

Cedar Waxwing by Jeff Hapeman.

Correlating Christmas Bird Count Data from Madison, Wisconsin, with Land Cover Types

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ABSTRACT

This study uses Christmas Bird Count (CBC) data between 1990–1999 and 2001–2002 to examine the correlation between the distribution and abundance of winter birds and land cover in Madison, Wisconsin. CBC relative abundance data for each species in each of 23 count areas were pooled for the study years and then correlated with land cover percentages in those count areas using the Spearman's rank correlation test. Results of this test indicated that relative abundance of 63.6% of the studied species positively correlated significantly with the relative availability of their typical winter habitat. The group of birds with the strongest correlation was the waterfowl. Excluding waterfowl associated with open water, 52.7% of species positively correlated significantly. The group with the lowest correlation was the forest birds. This study concludes that CBC data can be used to detect broad patterns of avian response to land cover types.

INTRODUCTION

Christmas Bird Count (CBC) data have been generally underutilized in ecological studies despite the fact that no other wildlife survey in North America encompasses such a vast geographic and temporal scale. This neglect is largely owing to concerns over the reliability of the data. Critics worry about the CBC's lack of standardization, lax rules on how to count, and the variable number of participants of differing skill levels within each group, who spend varying numbers of hours in the field, covering different distances and using different modes of travel (Root 1988a, Butcher *et al.* 1990, Dunn *et al.* 2005). The increase in the popularity of feeder-watching without separating the birds seen at feeders from birds seen in the field in the count data might lead to a bias in the count towards feeder birds, especially in northern regions (Dunn 1995). Furthermore, coverage of

count areas within count circles is not mandated, with the result that coverage varies from year to year, and habitat coverage is not uniform within count areas. Finally, the competitive aspects of birding might make teams try hard to achieve the longest lists, including staking out rare birds for the day of the count, spending the most time in the best spots rather than doing uniform coverage of the count area, and using methods to attract birds such as putting out seed, counting at feeders, and making noises, such as "pishing" (Bock and Root 1981, Butcher *et al.* 1990, Dunn *et al.* 2005). All these factors have diminished the value of the CBC in the eyes of the scientific community to the extent that Bock and Root (1981) suggest that scientists should avoid CBC data entirely, except for questions of large-scale population distribution and abundance.

Despite this, scientists have recognized the value of such an extensive, long-term database. Drennan (1981) has argued that the vastness of the database itself reduces sampling error and is an unparalleled resource that ought to be better utilized. The effort of observers to tally large species totals ensures that information on avian distribution is well-represented by the data (Dunn *et al.* 2005). Furthermore, scientists have recently begun to evaluate the data to determine trends in avian abundance. Despite the fact that the survey was not intended to monitor populations, Butcher *et al.* (1990) found that population trends in sample species derived from CBC data mirrored the trends of species reflected in Breeding Bird Survey data, a much more standardized bird-monitoring survey. The authors concluded that CBC data can be used for assessing winter populations, as all comparisons between CBC data and other counts show general agreement. Dunn *et al.* (2005) and LePage and Francis (2002) also point to the strong agreement between CBC data and Project Feederwatch, another large-scale winter bird count.

Most studies using CBC data (Bock and Lepthien 1974, Root 1988a, Root 1988) have focused on continent-wide patterns of distribution and abundance. For example, Root (1988) examined environmental factors influencing the distributional boundaries of birds. In addition to climatic factors, including minimum January temperatures and duration of frost-free period, Root analyzed vegetation in association with distribution. As a large-scale analysis of CBC data, Root provided a solidly supported argument for the factors influencing continental distribution patterns.

Other scientists have studied how habitat affects species richness and abundance in more localized areas. Crosby and Blair (2001) analyzed CBC data from 1960–1998 for the western side of Cincinnati, Ohio, in association with a study of how land cover affects bird abundance. They hypothesized that increasing urbanization should be reflected in an increase in urban birds and a decrease in native "urban avoiders." While CBC data did show an increase in urban exotic birds, urban avoiders likewise increased. Crosby and Blair suggested such results could be due to a bias in CBC data, owing to observers recording data from bird feeders or covering certain habitats with a disproportionate effort that is not reflected in percentages of land cover.

The purpose of my study is to examine how well CBC data on the distribution and abundance of birds correlate with land cover types within the count circle centered on Madison, Wisconsin. The importance of this preliminary analysis lies in beginning to understand how birds are using habitat in a complex heterogeneous landscape during the winter and identifying questions that can be examined by more detailed studies. This study also provides a general test of the application of CBC data to understanding bird distributions at a local scale.

Materials and Methods

Christmas Bird Counts occur on a single day between 14 December and 5 January each year. Volunteers count all birds detected within a circle 15 miles in diameter (Root 1988a). The count circle is divided into smaller individual count areas. Volunteers record data for the individual count areas, which are then combined over the entire count circle. Along with records of number of birds seen, weather conditions, distance traveled, and total party hours spent counting are also recorded. Party hours are defined as total time a group of observers was in the field in a count area counting birds. Party hours provide a way to standardize counts for effort (Bock and Root 1981, Root 1988a).

This study used CBC data from 1990–1999 and 2001–2002 from 23 individual count areas within the Madison, Wisconsin, CBC circle (Figure 1). Data from 2000 were not available. Data in this study were pooled across all 12 years. Count information was tabulated for each count area for the number of individuals of each species detected per total party hours. The relative abundances of species for each count area were then ranked in descending order.

I described the land cover within individual count areas using the WISCLAND land cover map (Wisconsin Initiative for Statewide Cooperation on Landscape Analysis and Data *et al.* 1999). Data from the WISCLAND geographic information system, created using satellite imagery from 1992, were analyzed using ArcMap (Environmental Systems Research Institute 2005) to measure the percentages of land cover types within count areas (Table 1). I used the "Summarize" feature in ArcMap to find the total area of each habitat type for each count area. These totals were then divided by the total area in each count area to determine land cover percentages which were then ranked in descending order. Habitat was defined using the broad land cover categories established for the WISCLAND geographic information system. Although WISCLAND data include sub-categories based on more narrowly defined cover types, this study utilized primarily the broader land cover categories: agriculture, barren, forest, forested wetlands, grassland, open water, shrubland, and wetlands. The "urban" land cover type subdivisions (high-intensity and low-intensity urban development and golf courses) were retained. The distinction between degrees of urban development could be significant in this study, with certain species of birds likely to use residential habitats (defined in WISCLAND as low-intensity) but not high-intensity urban development. Concerning open water, Madi-

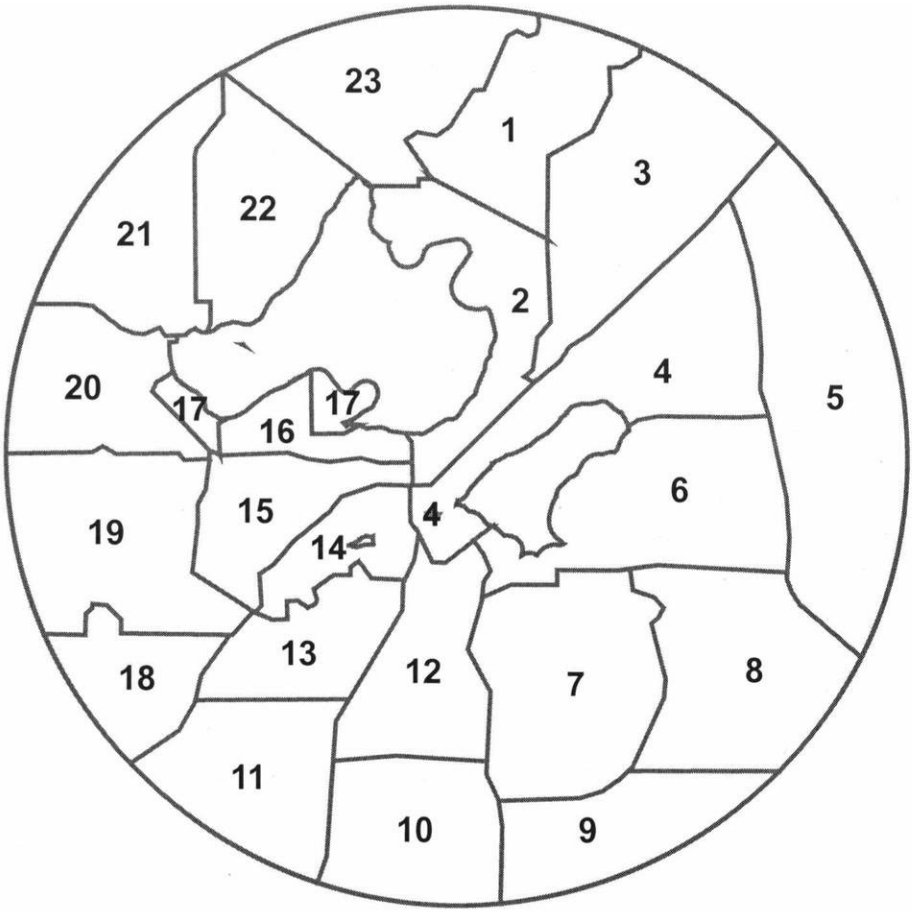

Figure 1: Map of the Madison, Wisconsin, Christmas Bird Count circle, showing the 23 count areas.

son contains several large lakes within the count circle. To index open water habitat, a buffer of 300 meters offshore was created in ArcMap and used to calculate the area of open water. This was considered to be a reasonable distance from shore that observers with binoculars could locate and identify birds.

Typical winter habitat was established for each species from a review of published literature. Each bird species was assigned one or more of the eleven WISCLAND land cover categories that closely matched its typical winter habitat (Table 2).

The ranked relative abundance of each species within each count area (individuals/party hour) was correlated with the ranked percentage of land cover that represented typical winter habitat for the species in each of the 23 count areas. I predicted that count areas with a higher proportion of typical winter habitat would have higher relative abundances of species preferring that habitat. A Spearman's rank-correlation coefficient was calcu-

Table 1. Percentage of available land cover types within Madison, Wisconsin, Christmas Bird Count areas.

Count Area	Agriculture	Barren	Forest	Forested Wetland	Grassland	Open Water	Shrubland	Urban/ Developed: Golf Course	Urban/ Developed: High Intensity	Urban/ Developed: Low Intensity	Wetland
1	11.5%	0.4%	7.0%	2.6%	9.5%	7.2%	0.0%	3.9%	7.8%	15.1%	34.9%
2	0.6%	0.1%	6.1%	0.9%	10.5%	26.4%	0.0%	2.2%	24.4%	28.7%	0.3%
3	25.0%	3.2%	3.2%	1.5%	22.9%	0.1%	0.1%	0.0%	28.2%	9.2%	6.7%
4	5.7%	1.7%	2.9%	0.8%	13.3%	11.1%	0.0%	0.0%	32.3%	30.9%	1.4%
5	53.3%	5.7%	7.0%	0.7%	19.4%	0.1%	0.0%	4.4%	2.0%	1.1%	6.2%
6	3.8%	1.7%	8.3%	2.1%	12.0%	13.0%	0.1%	1.4%	19.2%	33.6%	4.7%
7	30.9%	0.6%	11.6%	3.1%	13.2%	10.3%	0.1%	0.0%	7.2%	4.6%	18.4%
8 & 9	31.8%	1.8%	8.0%	3.1%	17.1%	10.8%	0.0%	0.0%	6.3%	7.6%	13.4%
10	52.2%	3.0%	14.3%	0.6%	25.7%	0.0%	0.2%	0.0%	0.0%	0.0%	4.1%
11	52.5%	4.5%	7.3%	0.1%	18.4%	0.4%	0.2%	0.0%	8.9%	7.4%	0.4%
12	22.7%	2.9%	9.0%	2.3%	15.2%	0.3%	0.1%	0.0%	22.2%	9.6%	15.7%
13	7.3%	0.9%	24.1%	1.5%	18.9%	1.3%	0.0%	0.1%	25.2%	18.4%	2.4%
14	0.6%	0.0%	12.9%	13.7%	3.6%	16.3%	0.0%	4.6%	7.4%	34.2%	6.8%
15	0.2%	0.0%	10.6%	0.2%	8.0%	0.7%	0.0%	4.5%	19.5%	56.4%	0.1%
16	1.1%	0.1%	16.1%	7.1%	0.0%	25.9%	0.0%	5.0%	25.8%	18.9%	0.0%
17	0.2%	0.0%	18.2%	1.4%	7.5%	51.1%	0.0%	0.0%	3.8%	17.5%	0.4%
18	20.6%	2.3%	6.1%	0.1%	22.8%	0.1%	0.2%	0.0%	25.7%	22.1%	0.1%
19	8.9%	0.9%	9.2%	0.0%	21.3%	0.3%	0.1%	0.1%	30.7%	28.6%	0.0%
20	7.9%	1.7%	9.6%	0.6%	16.9%	3.5%	0.0%	0.0%	32.4%	27.3%	0.3%
21	61.0%	3.9%	6.1%	1.4%	8.3%	2.2%	0.0%	0.0%	4.2%	5.0%	7.9%
22	51.3%	3.6%	10.1%	0.7%	9.9%	10.8%	0.1%	0.0%	0.7%	3.6%	9.3%
23	51.3%	3.5%	8.3%	1.2%	15.4%	5.5%	0.0%	0.0%	1.8%	1.5%	11.5%

Table 2. Species included in the analysis and their typical winter habitat (expressed in terms of WiscLand cover types).

Species	WiscLand Land Cover Category
Common Loon	open water
Pied-billed Grebe	open water
Great Blue Heron	wetlands
Mute Swan	open water
Tundra Swan	open water
Wood Duck	open water
Gadwall*	open water
American Wigeon	open water
American Black Duck*[1]	open water
Mallard*	open water
Northern Shoveler	open water
Northern Pintail	open water
Green-winged Teal	wetlands
Canvasback	open water
Redhead	open water
Ring-necked Duck	open water
Lesser Scaup	open water
Bufflehead	open water
Common Goldeneye*	open water
Hooded Merganser	open water
Common Merganser*	open water
Red-breasted Merganser	open water
Ruddy Duck	open water
Northern Harrier	grassland, agriculture, & wetlands
Sharp-shinned Hawk	forests
Cooper's Hawk	forests
Northern Goshawk	forests
Red-tailed Hawk	grassland
Rough-legged Hawk	grassland & wetlands
American Kestrel	grassland & agriculture
Ring-necked Pheasant	grassland
Wild Turkey	forests & agriculture
Virginia Rail	wetlands
American Coot	open water
Wilson's Snipe	wetlands
Rock Pigeon	urban high, urban low, & agriculture
Mourning Dove	agriculture
Red-headed Woodpecker	forests
Red-bellied Woodpecker	forests
Yellow-bellied Sapsucker	forests
Downy Woodpecker	forests
Hairy Woodpecker	forests
Northern Flicker	forests
Northern Shrike	agriculture
Blue Jay	forests
American Crow*	urban low, agriculture, & golf
Horned Lark	agriculture, barren, & golf
Black-capped Chickadee*	forests
Tufted Titmouse	forests
Red-breasted Nuthatch*	forests
White-breasted Nuthatch*	forests
Brown Creeper*	forests
Carolina Wren	shrubland
Winter Wren	forests
Golden-crowned Kinglet	forests

(Continued)

Table 2. Continued

Species	WiscLand Land Cover Category
Eastern Bluebird	grassland & agriculture
Hermit Thrush	forests
American Robin	forests
European Starling	urban high, urban low, & agriculture
Cedar Waxwing	forest & urban low
American Tree Sparrow	urban low & shrubland
Song Sparrow	shrubland & wetlands
Swamp Sparrow	wetlands
White-throated Sparrow	urban low & shrubland
Dark-eyed Junco	forests & grassland
Lapland Longspur	grassland & agriculture
Snow Bunting	grassland & agriculture
Northern Cardinal	urban low & shrubland
Red-winged Blackbird	wetlands
Common Grackle	urban low & agriculture
Brown-headed Cowbird	agriculture
Purple Finch	forest, urban low, & shrubland
House Finch	urban high & urban low
Common Redpoll	urban low, shrubland, & wetlands
Pine Siskin	forests
American Goldfinch	urban low & grassland
House Sparrow	urban high & urban low

* Species with missing data in 1990–1993

lated for the ranked abundance of each species in each count area and for the ranked availability of its typical winter habitat in each count area (expressed as land cover types). Spearman's rank correlation provided a nonparametric test of the strength of the relationship between the relative abundance of each species and the relative availability of the land cover types that represent its typical winter habitat. The correlation coefficient indicated the strength of the correlation, with 1 being a perfect positive correlation and –1 being a perfect negative correlation. A value of zero indicated no correlation.

To be included in this study, species had to be counted in at least six of the twelve years of the study. These species appeared with enough regularity in the Madison area that their habitat affinities might be revealed in the data. Owl species were excluded due to inconsistencies in the count methods during the years of the study. Two other categories of birds were also excluded from this study. First, species whose home ranges exceed the size of the individual count areas were not included, as these species utilize habitat over an area that cannot be adequately described in individual count areas. Species in this category include the Canada Goose *(Branta canadensis)*, Bald Eagle *(Haliaeetus leucocephalus)*, Ring-billed Gull *(Larus delawarensis)*, and Herring Gull *(Larus argentatus)*. The second excluded group includes species whose winter distribution is strongly influenced by the presence of bird feeders. These species cannot be correlated easily with habitat, as they are almost always seen in winter in Madison at bird feeders. Birds in this category include the

Eastern Towhee *(Pipilo erythrophthalmus)*, Fox Sparrow *(Passerella iliaca)*, and White-crowned Sparrow *(Zonotrichia leucophrys)*.

Data for certain species were missing from 1990–1993. These species are nonetheless included in the study, as eight years of data are available. Total party hours used to standardize the data compensated for species with missing data. Species with some missing data are indicated in Table 2. In addition, a few count areas occasionally were not counted in a given year. This was not a frequent occurrence and did not affect the pooled data. Data for areas 18 and 19 were excluded from the study in 2002, as only in this year were these areas combined in the count. Finally, totals for count areas 8 and 9 were combined as, from 1995–2002, they were counted as a single area.

Results

Table 3 shows the Spearman's rank correlation coefficients calculated for the relative abundance of each species and the relative availability of the land cover type that represents its typical winter habitat. Values in bold print are those for which there was a significant correlation ($p<0.05$) between the species' relative abundance and the relative availability of the land cover that was typical habitat. This analysis revealed that 63.6% of the species analyzed showed a significant positive correlation between relative abundance and relative availability of typical habitat in the Madison count circle. The strongest correlation was with the species associated with open water, i.e., the waterfowl. Among the waterfowl, 20 out of 23 species showed a significant positive correlation with the relative availability of open water. Green-winged Teal *(Anas crecca)* correlated significantly with wetlands, while Wood Duck *(Aix sponsa)* and Northern Pintail *(Anas acuta)* did not correlate significantly with any habitat tested.

If species associated with open water are excluded from the totals, the relative abundances of 52.7% of the remaining species positively correlated with relative availability of their typical winter habitat. The strongest correlation among non-open water species was with wetland species. Among those species associated with wetland habitats, 83% of the species showed significant correlations. Only Virginia Rails *(Rallus limicola)* did not show a significant correlation. Values were likely affected for this species by the fact that wintering Virginia Rails seem to exist largely in a pocket in just one count area, which does not have the largest proportion of wetland in the count circle.

Among species preferring grasslands, 62.5% showed a correlation with their preferred habitats. The fact that the Lapland Longspur *(Calcarius lapponicus)* did not have a significant correlation is surprising, considering that the Snow Bunting *(Plectrophenax nivalis)*, with very similar habitat preferences for grasslands and agriculture, showed a strong correlation. Also surprising was the Northern Harrier's *(Circus cyaneus)* weak correlation. It is possible that the harrier's low frequency of occurrence in low numbers in only 5 count areas affected the results, although the abundance of the Rough-legged Hawk *(Buteo lagopus)*, occurring in similarly low numbers in

Table 3. Spearman's rank correlation coefficients for species abundance and the typical winter habitat of each species. Species in **bold type** showed significant correlations ($p<0.05$) with their typical winter habitat. In all cases, $n=23$.

Species	WiscLand Land Cover Category	Correlation Coefficient	Comments
Common Loon	**open water**	**0.6404**	
Pied-billed Grebe	**open water**	**0.429**	
Great Blue Heron	**wetlands**	**0.583**	
Mute Swan	**open water**	**0.6974**	
Tundra Swan	**open water**	**0.4048**	
Wood Duck	open water	–0.0266	not correlated with either wetlands or forested wetlands
Gadwall	**open water**	**0.4485**	
American Wigeon	**open water**	**0.688**	
American Black Duck	**open water**	**0.4833**	
Mallard	**open water**	**0.5842**	
Northern Shoveler	**open water**	**0.566**	
Northern Pintail	open water	0.0392	not correlated with wetlands or open water/agriculture
Green-winged Teal	**wetlands**	**0.3744**	not correlated with open water
Canvasback	**open water**	**0.652**	
Redhead	**open water**	**0.5697**	
Ring-necked Duck	**open water**	**0.5355**	
Lesser Scaup	**open water**	**0.6499**	
Bufflehead	**open water**	**0.7408**	
Common Goldeneye	**open water**	**0.8909**	
Hooded Merganser	**open water**	**0.7305**	also correlated with wetlands
Common Merganser	**open water**	**0.7266**	
Red-breasted Merganser	**open water**	**0.6477**	
Ruddy Duck	**open water**	**0.5971**	
Northern Harrier	grassland & agriculture & wetlands	0.1945	
Sharp-shinned Hawk	forests	0.013	
Cooper's Hawk	forests	–0.1785	
Northern Goshawk	forests	–0.2144	
Red-tailed Hawk	**grassland**	**0.5351**	

(*Continued*)

Table 3. Continued.

Species	WiscLand Land Cover Category	Correlation Coefficient	Comments
Rough-legged Hawk	**grassland & wetlands**	**0.5194**	
American Kestrel	**grassland & agriculture**	**0.738**	
Ring-necked Pheasant	**grassland**	**0.4871**	
Wild Turkey	**forests & agriculture**	**0.474**	
Virginia Rail	wetlands	0.2931	only occurred in areas 12 & 14
American Coot	**open water**	**0.7876**	
Wilson's Snipe	**wetlands**	**0.519**	
Rock Pigeon	**urban high & low & agriculture**	**0.3778**	not correlated with urban high/low
Mourning Dove	**agriculture**	**0.5998**	not correlated when combined with urban low or high/low
Red-headed Woodpecker	forests	–0.1653	
Red-bellied Woodpecker	**forests**	**0.4548**	
Yellow-bellied Sapsucker	forests	0.2643	
Downy Woodpecker	forests	0.1927	
Hairy Woodpecker	**forests**	**0.5646**	
Northern Flicker	forests	–0.0227	
Northern Shrike	**agriculture**	**0.5179**	
Blue Jay	forests	–0.0311	
American Crow	urban low & agriculture & golf	0.0875	
Horned Lark	**agriculture & barren & golf**	**0.5082**	
Black-capped Chickadee	**forests**	**0.6262**	not correlated with forest & urban low (0.2208)
Tufted Titmouse	forests	0.32	not correlated with forest & urban low (0.0807)
Red-breasted Nuthatch	**forests**	**0.4227**	
White-breasted Nuthatch	**forests**	**0.5008**	
Brown Creeper	forests	0.1559	
Carolina Wren	**shrubland**	**–0.4943**	
Winter Wren	forests	–0.0158	
Golden-crowned Kinglet	forests	0.2632	
Eastern Bluebird	grassland & agriculture	–0.2408	
Hermit Thrush	**forests**	**0.6359**	
American Robin	**forests**	**0.5191**	
European Starling	**urban high & low & agriculture**	**0.4869**	
Cedar Waxwing	**forests & urban low**	**0.4886**	
American Tree Sparrow	**urban low & shrubland**	**–0.703**	

Table 3. Continued.

Species	WiscLand Land Cover Category	Correlation Coefficient	Comments
Song Sparrow	shrubland & wetlands	0.3378	
Swamp Sparrow	**wetlands**	**0.3891**	
White-throated Sparrow	**urban low & shrubland**	**0.5056**	
Dark-eyed Junco	**forests & grasslands**	**0.4636**	
Lapland Longspur	grassland & agriculture	0.3545	
Snow Bunting	**grassland & agriculture**	**0.7068**	
Northern Cardinal	**urban low & shrubland**	**0.4411**	
Red-winged Blackbird	**wetlands**	**0.5744**	not correlated with wetlands/agriculture
Common Grackle	urban low & agriculture	–0.2761	
Brown-headed Cowbird	agriculture	0.1889	
Purple Finch	forests & urban low & shrubland	0.3095	
House Finch	**urban high & low**	**0.4534**	
Common Redpoll	**urban low & shrubland & wetlands**	**–0.4301**	
Pine Siskin	**forests**	**0.449**	
American Goldfinch	urban low & grassland	0.2751	
House Sparrow	urban high & low	0.1767	not correlated with urban high or urban high/low/agriculture

only 8 count areas, correlated strongly with grasslands and wetlands.

Of the species whose typical habitat includes agricultural fields, Northern Shrikes *(Lanius excubitor)* and Horned Larks *(Eremophila alpestris)* correlated significantly, while Brown-headed Cowbirds *(Molothrus ater)* did not. Although DeGraaf and Rudis (1986) indicated Mourning Doves *(Zenaida macroura)* inhabit agricultural, suburban, and urban habitats in winter, Mirarchi and Baskett (1994) pointed out that further information is needed on Mourning Dove wintering habitat. This analysis showed that the relative abundance of Mourning Doves is correlated with availability of agricultural habitats but not urban or suburban habitats.

Among the birds that, according to the literature, use forested habitats or forests in conjunction with another habitat type, only 45.8% showed a significant correlation with their typical habitat. None of the woodland hawks (Sharp-shinned *[Accipiter striatus]*, Cooper's *[Accipiter cooperii]*, or Northern Goshawk *[Accipiter gentilis]*) correlated with forest habitat. Squires and Reynolds (1997) suggest that the goshawk's wintering habitat is not well known, and its distribution may correlate with prey abundance rather than forest distribution. There was also a surprising lack of correlation among woodpeckers, with only the relative abundance of Red-bellied *(Melanerpes carolinus)* and Hairy Woodpeckers *(Picoides villosus)* correlating with forest cover. Downy Woodpeckers *(Picoides pubescens)* may have been influenced by the presence of feeders, although the relative abundance of Black-capped Chickadees *(Poecile atricapillus)* correlated significantly with availability of forested habitat, despite being a common feeder bird and the fact that the literature indicated a significant suburban element in their winter distribution in addition to woodlands (Smith 1993, DeGraaf and Rudis 1986). Purple Finches *(Carpodacus purpureus)* did not correlate with forest, low-density urban, and shrubland habitats, which was to be expected as Wootton (1996) indicated that their distribution is likely driven by food availability rather than habitat.

The final major grouping includes urban birds and birds that inhabit low-intensity urban and shrubland habitats. Rock Pigeons *(Columba livia)* and European Starlings *(Sturnus vulgaris)* correlated significantly with human-disturbed habitats of low- and high-intensity urban development and agriculture. Unexpectedly, the House Sparrow *(Passer domesticus)* did not show significant correlation with either urban habitats or urban and agricultural habitats. The House Finch *(Carpodacus mexicanus)* correlated with urban habitats. Among native species, White-throated Sparrows *(Zonotrichia albicollis)* and Northern Cardinals *(Cardinalis cardinalis)* correlated with shrubland and low-intensity urban habitats. American Tree Sparrows *(Spizella arborea)* and Common Redpolls *(Carduelis flammea)* negatively correlated with the habitat indicated in the literature.

Discussion

These results show the challenges of correlating bird abundance with land cover across large landscapes. Results for the open water birds correlated very strongly, which was to be ex-

pected. Most of these birds would not exist in a given area if not for the presence of open water, and Madison is able to support a large number and variety of waterfowl with its large lakes. However, beyond the open water species, correlating bird abundances with land cover in Madison becomes less clearcut. Excluding open water species, the relative abundances of only slightly over half (52.7%) of the species correlated well with relative availability of their typical winter habitat. Many species are likely more influenced by food availability than habitat (raptors), some may be influenced by the presence of bird feeders that may draw them from their typical habitats (Downy Woodpecker, American Goldfinch *[Carduelis tristis]*), while others may be habitat generalists that defy correlation with any particular habitat (American Crow *[Corvus brachyrhynchos]*).

For others, the lack of correlation is puzzling. The low level of correlation among forest birds in particular stands out and suggests two directions for future study. First, it suggests that further study is needed of their winter habitat. The value of CBC data could be greatly improved in this regard if the suggestion of Dunn *et al.* (2005) to use geographic positioning systems to establish the position of birds in relation to habitats within CBC count areas.

A second direction for future study would be to determine how birds respond to the size of habitat patches (as opposed to the cumulative area of habitat across a landscape). Within a fragmented landscape, birds may not find large enough patches of their habitat. Percentage of forest cover within the Madison count areas ranges from a low of 2.92% to a high of 24.10%, but in all count areas the forest cover is highly fragmented. How birds are distributed within these fragmented landscapes could reveal how these species are affected by habitat fragmentation.

Madison's extensive urban and suburban habitats are used by some species which show correlations with these land cover types. While only two native birds (White-throated Sparrows and Northern Cardinals) correlated with the suburban and shrubland habitats, non-native birds (such as Rock Pigeons, European Starlings, and House Finches) correlated strongly with heavily disturbed environments of high-intensity urban, suburban, and agricultural lands. Madison CBC data could be used to examine the extent to which urban and exotic birds outnumber native birds in developed areas. Beissinger and Osborne (1982) found that House Sparrows and starlings comprised 45.5% of individuals in an urban setting and that the six most abundant species comprised 78% of the individuals in town. Furthermore, Blair (1996) determined that, across an urban landscape, while moderate human disturbance increases species richness and density, these disturbed areas increase the abundance of more widespread common species at the expense of rarer habitat specialists.

The most critical limitation of this study is the fact that specific information on the habitat in which birds were detected is lacking from CBC data. My data suggest general trends and correlations, but determination of what habitats birds are actually using awaits further study. Secondly, the very broad categories assigned to

birds as typical habitat can be misleading. The habitats of some birds may not fit within the WISCLAND categories. Thirdly, this study does not take into account changes in land use over time. Land cover percentages represent WISCLAND information from 1992. However, while land use may have changed over the years of the study, these changes were probably not significant enough to affect the analysis. Finally, the question remains as to the significance of the lack of correlation for many species. Best and Stauffer (1986) emphasize that relationships between wildlife and habitats may not be evident if habitat variables are defined too broadly and measured at too large a scale. As mentioned above, my study necessarily involved broad habitat categories and a lack of specific habitat information, and the scale at which I described habitat composition is relatively large.

In conclusion, this study has demonstrated that CBC data can be used to reveal the broad patterns that birds respond to in a winter landscape. Utilizing the more detailed information that is available from the individual count areas rather than pooled data from the entire count circle, land cover analysis can, for many birds, reveal habitat correlations. This study appears to be unique in using CBC data in this way.

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Upland Sandpiper posing for Dennis Malueg.

Yellow-bellied Sapsucker by Scott Franke.

Early Response to a Prairie Planting Project by Grassland Birds: 2000 to 2006

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ABSTRACT

This paper describes the vegetative changes which occurred through 2006 in a series of prairie plantings done from 2000 to 2003 on former agricultural land in southwest Waushara County, Wisconsin. How these vegetative changes relate to use by grassland birds for nesting was evaluated. Breeding bird surveys were conducted in the prairie plantings from 2000 to 2006 to determine the use of the plantings by selected species of grassland birds. The surveys demonstrated an increase in the grassland bird species, an increase in the number of species fledging young, and an increase in the total number of breeding birds over time. Implications for grassland bird conservation on public and private lands are discussed.

INTRODUCTION

The amount of native grassland in Wisconsin has declined to less than 1% of what existed prior to the 19th century (Samson and Knopf 1996). Over this period of time, there has been loss, fragmentation and degradation of grassland habitat. Loss of grassland habitat has resulted in a decline in grassland birds, especially since many pastured dairy farms have been converted to farms raising predominantly row crops. Concern about the decline in grassland birds has led to efforts to protect and restore grassland habitat on public and private lands (Sample and Mossman 1997).

A variety of state and federal programs is available to private landowners to enhance the value of their property for wildlife. In this case the United States Fish and Wildlife Service's Partners for Fish and Wildlife and the Natural Resources Conservation Service's Wildlife Habitat Incentives Program (WHIP) funding was used to aid in a prairie restoration project on 90 acres which was planted sequentially with native forbs and grasses from 2000–2002. The project's primary purpose is to create and enhance habitat for the federally endangered Karner Blue butterfly; however, benefits to grassland birds were noted and are summed up in this paper. The following is a description of the prairie restoration project, an inventory of grassland bird species that uti-

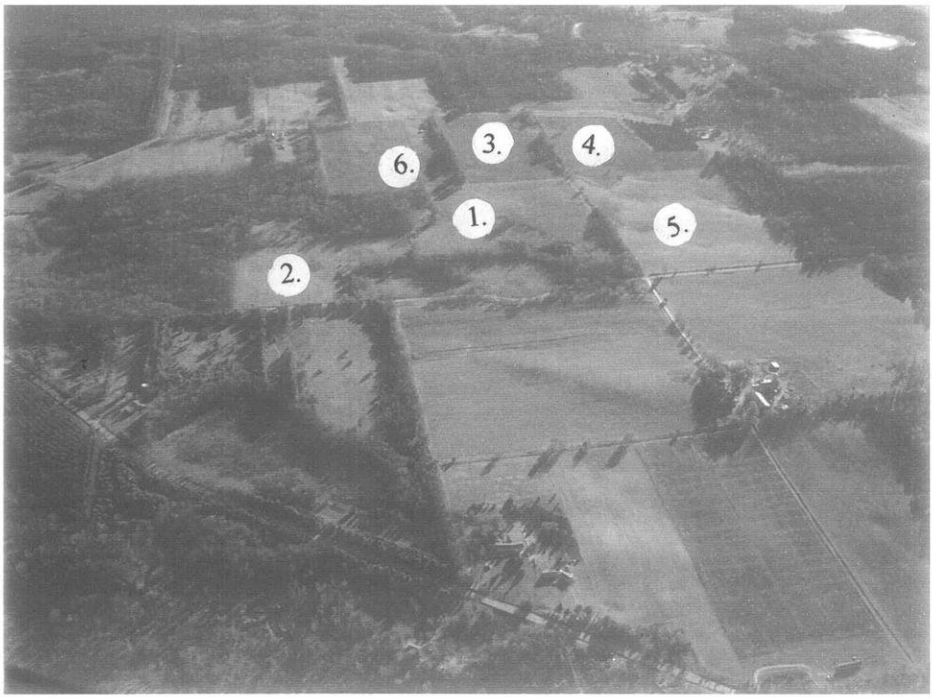

Figure 1. 2003 photograph of the project area and the adjoining lands.

lized the restored area for nesting from 2000–2006, and a summary of issues regarding grassland bird conservation.

This restoration project is located in southwest Waushara County, Wisconsin and is part of the Mecan River priority watershed. It is in the Coloma Barrens and Savannah Area, a portion of the Central Plains Division of grasslands designated in Sample and Mossman's 1997 publication. Two internet reference sites were used extensively in preparing what follows: http://www.npwrc.usgs.gov/resource/birds/wiscbird/index.htm (Sample and Mossman); and http://www.npwrc.usgs.gov/resource/literatr/grasbird/index.htm.

Methods

The restoration was conducted on 90 acres of land which had been used for agricultural production of corn and alfalfa for over 40 years. Adjacent to, and interspersed in, the project area are seven permanent and ephemeral wetlands. Fields are separated to some extent by hedge rows of shrubs and trees (Fig. 1). The land is gently rolling and soil types range from Adrian muck to Plainfield sand. The vast majority of soil is either Plainfield sand, Richford sandy loam, or Hortonville fine sandy loam. There are about 270 acres of farmed fields adjacent to the restoration project sites, consisting of 15% pasture, 20% corn, and 65% alfalfa. The alfalfa is

usually mowed for the first time in late May each year.

The project fields were fallow for 1 year prior to planting. After treating the area to be planted with glyphosate, prairie seeds were planted with either a Brillion seeder or a no-till drill. A mix of grasses and forbs which are native to this area of southwest Waushara County (Cochrane and Iltis 2000) were planted. Cool season grasses in the planting were Junegrass (*Koeleria macrantha*) and porcupine (needle) grass (*Stipa spartea*); warm season grasses included were big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), indiangrass (*Sorghastrum nutans*), sideoats grama (*Bouteloua curtipendula*), Canada wild rye (*Elymus canadensis*), sand dropseed (*Sporobolus cryptandrus*) and switchgrass (*Panicum virgatum*). Thirty-six species of forbs chosen for the predominantly dry soils on the site were planted. Field 1 (15 acres) was planted in the spring of 2000, field 2 (12 acres) in the spring of 2001, field 3 (19 acres) in the fall of 2002, and fields 4 (20 acres), 5 (19 acres), and 6 (5 acres) in the fall of 2003 (Fig. 1). Because of the many variables in prairie planting success, there is no consistent difference between spring and fall planting (Beilfuss and Barzen 2004). In this project there was better forb germination in the fall plantings. A general assessment of the plantings through 2006 was conducted (see Results).

Informal surveys conducted by car, bicycle, and on foot for 15 years prior to the project revealed only occasional grassland birds within a radius of about 2 miles. Field (*Spizella pusilla*) and Vesper (*Pooecetes gramineus*) Sparrows were recorded nesting in a small adjacent remnant prairie fragment prior to the project planting. Clay-colored (*Spizella pallida*), Grasshopper (*Ammodramus savannarum*), and Vesper Sparrows occupied a 60 acre cut over Christmas tree plantation 1999 to present, although Grasshopper Sparrows have abandoned the site as trees re-sprouted. Bobolinks (*Dolichonyx oryzivorus*) were present in a hayfield usually not harvested until August for several years until it was plowed. Savannah Sparrows (*Passerculus sandwichensis*) were observed occasionally throughout the period.

Breeding bird surveys began on the project site in the spring of 2000. With few exceptions counts were conducted and observations made at least weekly from early April through early October of each year. Species surveyed were selected from the list of the 40 species that require grasslands during their breeding cycle (Sample and Mossman 1997). The 11 species chosen (Table 1) are all of management concern in Wisconsin (Sample and Mossman 1997). Counts were conducted following the methodology used in conducting the Breeding Bird Surveys (BBS) of the U.S. Department of the Interior.

Because of a farm lane running between the plantings and the ability to conduct surveys from adjacent roads, it was not necessary to enter the prairie restorations to do an adequate survey. Birds were listened for and observed at various times of the day, but an early morning survey was almost always conducted. Grassland birds can be effectively surveyed throughout the day (Swengel and Swengel 2000). The project surveys at times found more Bobolinks mid to late morning and Vesper Sparrows late in the day. To es-

Table 1. Maximum number of singing males 15 May–15 July. (f) = fledged young of species.

Species	2000	2001	2002	2003	2004	2005	2006
Sedge Wren				4(f)			
Dickcissel	2		2	3(f)	2	4(f)	12(f)
Clay-colored Sparrow							1
Field Sparrow	1	2(f)	2	2	2	2	2(f)
Vesper Sparrow	2(f)	1	2	3(f)	5	7(f)	6(f)
Lark Sparrow				1	1	4(f)	1(f)
Savannah Sparrow				1	1	3(f)	2(f)
Grasshopper Sparrow					2	3(f)	5(f)
Bobolink	3(f)	4	4	3(f)	5(f)	6(f)	8(f)
Eastern Meadowlark					1	1	1
Western Meadowlark				1			

timate nesting pairs, the number of singing and/or observed males per survey was recorded (Winter and Faaborg 1999). The maximum number of males detected on any survey during the breeding season, chosen to be from 15 May–15 July, is entered in Table 1. The (f) in Table 1 designates that at least one fledgling of that species was seen in any year. In addition to the survey species listed in the table, observations were noted of any other of the 40 grassland bird species identified by Sample and Mossman (1997) that utilized the prairie restoration during the survey period.

Results

There are noticeable differences among the species composition and structure resulting from the restoration efforts between plantings and within areas of the same planting. These differences are providing a variety of habitats for nesting grassland birds (they are all grassland habitats, but differences are more in terms of structural variation). A general description of the predominant grassland environment in the planted fields is as follows (Fig. 2—2005 aerial photo).

Field 1 has produced an abundance of tall grasses with few forbs. It partially surrounds a 2 acre wetland. At first there was persistent alfalfa in its south half which is now being displaced by native grasses. This is where Bobolinks first began nesting.

Field 2 had poor germination of forbs and grasses and is still dominated by quack grass and smooth brome. It is a dry, short grass environment with little bluestem as the dominant native grass.

Field 3 had excellent germination of forbs and grasses. The east section is dry and dominated by short grasses, the west by taller grasses. Two wetlands provide localized mesic to wet-mesic environments.

Field 4 and **Field 6** had good germination of forbs and grasses. Both fields have shortgrass structure and are dry. Both contain abundant Junegrass.

Field 5 had only moderate germination of all prairie species (even though planted on the same day as field 4). It is a medium to tall grass environment with residual quack grass

Figure 2. 2005 aerial photograph of the 6 fields with locations of singing males indicated.

and smooth brome. Several swales provide localized mesic habitat. A significant amount of mullein is present, providing good perching structure.

The difference in plant species composition correlates to differences in nesting locations of different bird species. One can get an idea of the variation of vegetation from the aerial photo (Fig. 2). The lighter shaded areas correspond to areas of sparser vegetation. The light linear space in the photo around the perimeter of field 5 shows mowing in progress to control sweet clover when the photo was taken in July 2005.

Table 1 shows a general increase in both numbers and species of birds utilizing the prairie plantings during the years of observation. Sedge Wrens (*Cistothorus platensis*) nested for only one year in field 1 in a mesic to wet-mesic tall grass section. This is not inconsistent with their nomadic nesting behavior. Dickcissels (*Spiza americana*) have increased, first nesting in field 1 and then expanding to fields 3–6. There was a large influx of Dickcissels into Wisconsin in 2006, which may partly account for the 12 males counted in that year. Field Sparrows have not increased, confining their nesting activity thus far to field 2. This is not surprising since their preferred nesting habitat is in more sparse grassland typically containing shrubs and small trees. Vesper Sparrows, which occupied field 2 as a fallow field prior to planting, have also occupied fields 3 and 4. Lark Sparrows (*Chondestes grammacus*) have nested in the driest areas with sparse litter and were most visible following a spring burn of field 2 in 2004. Savannah Sparrows have

moved from field 1 to field 5. Grasshopper Sparrows were first seen in 2004 occupying field 3, and have expanded to drier sections of fields 4 and 6. Bobolinks may be using the plantings most successfully. They nested in field 1 the year it was planted and subsequently have expanded to the more mesic areas of fields 3 and 5. There has been an influx of Bobolinks into the project area in late May or early June in 2004–06 which could represent attempts to relocate after eviction from first nesting attempts in alfalfa. It is unlikely that meadowlarks have nested with the exception of a possible Eastern Meadowlark (*Sturnella magna*) nesting in 2006.

Figure 2 indicates the general locations of singing males during the years of observation. Birds appear to be selecting habitat according to their nesting requirements. It was noted that few birds have utilized the northeast end of field 1 and the south end of field 2. This may be due to the narrow corridor of prairie in this location. An exception is the Lark Sparrow. It favored a xeric ridge between fields 1 and 2 which has an adjacent array of shrubs. Also one might expect Grasshopper Sparrows to utilize field 2 because of appropriate nesting structure. They haven't, perhaps because of the more isolated location and small size of this field.

Therefore, from 2000–2006 the number of species utilizing the prairie for nesting has increased in relation to their presence prior to the establishment of this grassland project, as well as the number of species fledging young. Also the total number of singing males of all species has steadily increased.

In addition to the 11 species in Table 1, other of the 40 grassland requiring species (Sample and Mossman 1997) utilized the project area from 15 May–15 July. Eastern Bluebirds (*Sialia sialis*) and presumably Brown-headed Cowbirds (*Molothrus ater*) nested. Northern Harriers (*Circus cyaneus*), Red-tailed Hawks (*Buteo jamaicensis*), and American Kestrels (*Falco sparverius*) hunted the grasslands. Ring-necked Pheasants (*Phasianus colchicus*), Northern Bobwhite (*Colinus virginianus*), and Blue-winged Teal (*Anas discors*) were present and may have nested. Thus at least 19 of the 40 species in Wisconsin which require grasslands during their breeding cycle have used the project area at some time from 2000–2006. With the exception of Lark Sparrows, the grassland species found in the survey could be expected in this location based on Wisconsin Breeding Bird Atlas data (Cutright *et al.* 2006).

Although no systematic attempt was made to calculate nesting success, some notable indications of successful nesting were observed. Three Lark Sparrow nests fledged young in 2005. In July of 2005 about twenty Bobolinks were seen in a flock on one occasion in a wetland between Fields 1 and 5. On August 4, 2006 a flock of about thirty Bobolinks was in Field 3 and twenty in Field 1. On the same day about twenty-five Dickcissels were seen in three groups in Fields 5 and 3. It is unknown if some birds came from outside the prairie complex, but this seems unlikely given the absence of Bobolinks and Dickcissels on land within several miles of the project. Also on August 4 five fledgling Grasshopper Sparrows were seen, two in Field 3 and three in Field 4. Careful

long term monitoring for reproductive success will need to be done in the future.

Discussion

Biodiversity is a measure of the health of any ecosystem. Although some grassland bird species use non-native grasslands such as pastures and hayfields effectively, the diversity provided by a native prairie environment should offer advantages to a host of grassland bird species. The prairie environment, including remnant native prairies sites and established prairie projects, provides structural diversity as well as diversity of food sources. Diversity and abundance of invertebrates in a prairie offer an advantage in nutrition to nesting birds and their offspring (Lloyd and Martin 2005). Diversity and abundance of seeds is important in the pre- and post-nesting period (Volkert 1992). Structural diversity offers more opportunity for successful nest location and construction, singing and observation perches, and probably avoidance of predators. Also it would seem that the climate buffering capacity, including stabilizing soil temperature, of a diverse prairie environment (Weaver 1968) is important to the well-being of grassland birds. Because of these factors it is likely that a natural or restored prairie is much more beneficial to grassland birds than non-native grassland.

Volkert found that there was a positive response of grassland birds to a prairie planting in southeast Wisconsin over the first 8 years of its existence (Volkert 1992). Informal surveys conducted at this site in the ensuing years up to the present indicate a healthy population of the bird species which originally occupied the planting. The structural diversity provided by the mix of grasses and forbs in the planting has been maintained (Volkert, pers. comm.).

In this Waushara County study the prairie seeding is just beginning to mature and mimic the structure of a native prairie. It may take decades before the planting resembles a native prairie in its structure or composition, if this is even achievable. Though small in size, the study area has a rich diversity of grassland environments from wet to xeric. Because of this diversity, the project may support a greater number of grassland plant and bird species than a planting of similar size in a more homogeneous environment. As the planting matures, plant species composition and structure will change. In addition to plant succession, fire, drought, grazing, insect outbreaks, burrowing mammals, and many other factors will alter the prairie landscape and its attractiveness to nesting grassland birds.

Obstacles to the ongoing success of the project for grassland birds are significant. The main concern is the limited size of the project area and small size and poor quality of adjacent surrogate grasslands. Though large enough to attract nesting grassland birds, it is unknown if it is large enough to ensure true nesting success to stabilize or increase local bird populations and function as a population source site. (The Wisconsin Department of Natural Resources has planted 130 acres of prairie in the immediate area since 2000 which add to the effective size of this project.) Also the significant edge effect present in

the project (Fig. 1) may be detrimental to nesting success as a result of functioning as a predator corridor allowing increased nest predation (Winter, et al. 2000). This can be improved by removal of shrubs and trees from the hedgerows between the fields in the restoration. In the longer term the prairie will need to be maintained through fire and/or mowing. Periodic burns of established burn units have been made. Field 1 was burned in 2002, 2004, and 2006. Field 2 was burned in 2003 and 2005. On all prairie restorations, private and public, the long term maintenance cost is an obstacle to retaining ideal grassland conditions.

The study has indicated that grassland birds will colonize a prairie planting in its earliest stages and this will result in some degree of nesting success. After the planting was doubled in size in the fall of 2003 (from 45 to 90 acres), some species of birds began to utilize the newly established sites according to their habitat preferences. This is especially evident for Grasshopper Sparrows which first occupied field 3 in 2004 and expanded to fields 4 and 6 in 2005 (Table 1 and Fig. 2). It is anticipated that changes will occur in grassland bird use of the prairie as it evolves. Native prairies in central Wisconsin tend to be dry, and native grasses, even those forming sod in a more fertile environment, grow as bunch grasses. This allows for spaces between the grasses for forbs and more open areas as nesting habitat, especially for species such as Grasshopper and Vesper Sparrows. As the prairie evolves, some bird species may experience greater nesting success, while others may decline.

Although the project was designed to benefit Karner Blue butterflies, projects designed to aid one particular endangered species often benefit many other species. The level of use of this prairie planting by grassland birds has been an unexpected result. The initial colonization and nesting success in the planting in the short term will hopefully continue. The birds are occupying areas of habitat most congenial to their nesting activities (Sample and Mossman 1997). The immediate expansion of some species into the fields planted in 2003 is encouraging. Site fidelity is shown by Bobolinks, Dickcissels, Eastern and Western Meadowlarks, and Grasshopper, Vesper, Field, Savannah, and Clay-colored Sparrows. (Johnson, et al. 2004). Area sensitive species, such as Grasshopper and Savannah Sparrows, Eastern and Western Meadowlarks and Bobolinks, require up to at least 100 acres to support a breeding population (Herkert 1994) and appropriate habitat exists for them in the project. The other species in the project, that are more dependent on vegetative structure than area, should also benefit from the varied grassland habitat established on the project site. Dickcissels show nesting patterns not related to vegetative structure or area and are expected to fluctuate yearly because of unknown factors (Herkert 1994).

As a follow up to establishing this project, it is important to gain as much information as possible about how to preserve, restore, and maintain habitat for grassland birds. "Without understanding the interactions among grassland bird populations and patch size, vegetation characteristics, predator communities, and landscape configuration—and the variation of

these interactions among years—it will be difficult to manage the remaining grassland habitat in a way that ensures the long term survival of grassland birds" (Winter and Faaborg 1999). In Wisconsin the majority of grassland and potential grassland habitat is privately held. Grassland bird populations should benefit from restoration projects to protect and restore grasslands and especially prairies on private lands, particularly if these lands are close to large size prairies (Sample and Mossman 1997). CRP, GRP, Partners for Fish and Wildlife, Landowner Incentive Program, and other state and federal programs can offer financial assistance as well as biologic expertise. Land trusts are an underutilized instrument for preserving our grasslands and the birds that use them. Both conservation and agricultural easements can bring long-term stability to areas identified as important to grassland birds.

Conclusion

This grassland restoration project, though relatively small, provides significant grassland habitat for a variety of dependent bird species. While this project was focused on the conservation of Karner Blue butterflies, the resultant bird population that was attracted to this site was a significant response. An initial, though short-term, nesting survey has documented use of this environment by many grassland birds for successful nesting. Future monitoring of nesting activity and success will be important to determine the long-term benefits to these birds. Additional projects to restore grassland (prairie) habitat in the project area should further increase the benefit for grassland birds.

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Dennis Malueg found a White-breasted Nuthatch among the berries.

The Double-crested Cormorant, Values and Impacts

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Double-crested Cormorant numbers are at or near historic peaks in many areas throughout their range in North America (Post 1988, Hatch 1995, Wires et al. 2001). Like Ring-billed Gulls, cormorant populations have responded to improved environmental conditions by increasing reproduction and survival rates (Ludwig 1974). These favorable environmental changes have largely resulted from human impacts (Duffy 1995, Lysack 2006). Once DDT was banned in the United States and Canada in 1972 (U.S. EPA 1972), Double-crested Cormorant populations increased from 12–20% per year until at least the late 1980s (Weseloh et al. 1995). This increase continues in recently colonized areas (Scharf and Shugart 1998, Wires and Cuthbert 2006).

Most avian biologists acknowledge the banning of DDT as a major factor in the recovery of many bird species, especially raptors (Bald Eagle, Osprey, and Merlin), and fish-eating birds such as the Double-crested Cormorant, American White Pelican, and Herring Gull (Postupalsky 1978, Weseloh et al. 1995). Cormorant populations can increase quickly because they produce large numbers of offspring (2–5) per year and can live for 20 years (Klimkiewicz and Futcher 1989, Hatch and Weseloh 1999, USGS 2006). They are also the food finders and nest pioneers, well adapted to seasonal reproductive failures. Why have cormorant populations increased so dramatically in spite of colony disturbance, reductions in fish populations and control programs on the lower Mississippi wintering grounds, and near breeding colonies on the Great Lakes and in Manitoba, Ontario, and Quebec, Canada (McCleod 1953, Bedard et al. 1995, Parks 2005)? Cormorants have adapted to benefit from many man-enhanced environmental changes including the following:

1. The establishment of power dams near breeding colonies.

   Dams provide open water, teeming with fish attempting to go upstream to spawn early in the spring, before

local lakes and rivers open up. Early nesters have advantages in nest location within colonies and fledge young earlier. Food supplies just before and during nest initiation are critical for female breeding condition to produce large egg clutches and healthy offspring. Conditioning contributes to pair bonding, the drive to reproduce, and nest fidelity. Cormorant males and females share incubation (Brechtel 1983, Hatch and Weseloh 1999). They do not carry food in their bills and typically use thermals allowing them to feed nearly 100 miles from their breeding colonies. Fish below power dams help assure that inexperienced juveniles are in good physical condition prior to their first migration.

2. The creation of permanent lakes and reservoirs inland from the Gulf of Mexico's coast (Glahn et al. 1995).

Numerous reservoirs have been established on seasonal streams throughout the Gulf Coast area. These reservoirs function as flood control structures, local water supplies for irrigation and human recreation as well as to supply opportunities for cottage development, boating, and fishing. Cormorants are using these well-stocked water bodies, reducing their need to go to the Gulf for food.

3. The increase in catfish and crayfish ponds along the lower Mississippi and in other Gulf Coast areas (Trapp et al. 1995, Tobin 1998, Wires and Cuthbert 2006).

Cormorants are food finders; they explore water bodies along their migration route. Set the table and they will come! This is true for the commercial catfish and crayfish ponds but also for the smaller scale ponds containing stocked trout or other fish species. This food source is especially important for first year birds providing migration route feeding opportunities and reducing their need to feed in salt water.

4. Commercial fishing near the breeding grounds has removed large, deep-water, game fish from many inland water bodies (Lysack 2006).

These game fish have been replaced by smaller species living higher up in the water column. The replacement fishes are more vulnerable to sight-feeding Cormorants. Sturgeon and lake trout, for example, have been replaced by suckers and perch; perch are being replaced by crappies, blue-gills, and bass. More available food on the breeding grounds means higher productivity.

Double-crested Cormorants nest in colonies, usually on isolated islands, generally in association with other colonial waterbird species such as gulls, terns, and herons (Koonz 1985). Double-crested Cormorants will sometimes initiate nesting colonies on the ground but more often pioneer in trees. When they nest in trees their guano kills the trees within a few years and a portion of the colony soon nests on the ground. As the colony ages the trees die and fall down, leaving only the ground for nest sites.

What makes Double-crested cormorants ecologically significant is that they are food finders, colony pioneers, and colony makers (Brechtel 1983,

Hanbridge 1984, Glanville, 1992). They are largely responsible for the success of the colonies that may be occupied by a number of other species including: Ring-billed Gull, Herring Gull, California Gull, Common Tern, Black-crowned Night-Heron, Caspian Tern, Great Blue Heron, and American White Pelican (Koonz 1985).

As primary food finders, cormorants leave the nesting colony in food-finding flocks. Pelicans, terns, and gulls, which cannot obtain food from more than a meter's depth, follow the cormorants and take advantage of the food sources, brought to the surface by the diving cormorants (Hobson et al. 1989). American White Pelicans not only take advantage of the fish schools brought to the surface but they will cleptoparasitize cormorants by grabbing them with their huge bills and shaking until the cormorants disgorge their fish (Brechtel 1983). Terns and gulls pick up any fish (dead or alive) that the cormorants bring near to or on the surface.

Cormorants pioneer new colonies when their populations become too high on traditional colonies, when food is abundant in an area distant from a traditional colony, or when a traditional colony is disturbed (Koonz 1989). New colonies (in areas never before occupied) will sometimes be initiated by several species at once. Cormorants, pelicans, and Black-crowned Night-Herons initiated a new colony on the shores of Manitoba's Lake Winnipegosis in May of 1988. This new colony was initiated after their traditional colony was disturbed by vandals. There were hundreds of pairs of cormorants and pelicans and dozens of pairs of herons nesting that first year. All the nests were initiated within a day or two of each other. That mainland colony was soon abandoned—likely attacked by raccoons and/or foxes. More traditionally in central Canada, cormorants will initiate a new colony on a treed island. These new colonies are either invaded immediately, or within a year or two, by Great Blue Herons and sometimes Black-crowned Night-Herons. Herring Gulls nest on the ground near the edges of the colony within a year or two. In a few more years the trees begin to die and the ground under the trees begins to become less vegetated. Pelicans and then Ring-billed Gulls initiate as the vegetation thins out under the trees and tree stumps. If the island is occupied for long enough, Caspian and Common Terns may join in. Nine colonial waterbird species have been recorded nesting on the same Lake Winnipegosis' island (McMahon and Koonz 1991). In areas where the islands are treed, species like Common Terns and Caspian Terns have little chance for nesting without cormorants creating nesting habitat.

There are two strategies used by colonial waterbirds to carry food. Terns carry it in their bills, while pelicans, herons, egrets, and cormorants carry food in their crops/stomachs. Those that carry food in their crops/stomachs can regurgitate it at the colony. Terns are known as short-distance feeders while cormorants, herons, egrets, and pelicans are considered long-distance feeders. Cormorants eat large quantities of food each day. They can fly long distances for food and bring it back to the colony (Hobson et al. 1989). By bringing nutrients back to the colony from

long distances, cormorants cause an "atoll" or "halo" effect in the waters surrounding the breeding colony by increasing the nutrient load around the colony. Waters near the colony produce a larger biomass than do waters in other parts of the lake. This increased biomass is thought to provide more food for short distance feeders nesting in association with cormorants.

An important feature of waterbird ecology, at least on the prairies of Central North America, is the interaction between species within individual nesting colonies (McMahon and Koonz 1991). Herring Gulls are the earliest species to nest, before the snow melts. They feed on the eggs and young of all other species, scavenging fish or carrion until the associated species begin nesting. Next to nest are cormorants, pelicans, and herons (both Great Blue and Black-crowned Night). Ring-billed Gulls follow a week or so later, followed closely by Caspian Terns. Common Terns are typically the latest to nest. This nesting chronology relates to feeding strategies. Gulls, herons, pelicans, and cormorants feed on larger fish, Caspian Terns feed on second year fry and Common Terns rely largely on hatchlings.

Typically, treed islands are occupied by: Great Blue Herons (sometimes with Great Egrets) nesting in the tops of trees, Black-crowned Night-Herons nesting in the middle of trees, and cormorants nesting low in the trees and on the ground (Thompson 1981, McMahon and Koonz 1991). American White Pelicans nest on the ground under the trees. Herring Gulls nest away from cover. Herring Gulls may nest in colonies with few or no other species present but they typically nest singly or in small numbers (Koonz and Rakowski 1985). If the island is largely devoid of trees, cormorants will occupy the rough ground, pelicans will have the flatter, smoother areas, and Ring-billed Gulls will occupy lower areas and places not taken by the pelicans or cormorants. The Caspian Terns will have uplands adjacent to, or mixed with, the Ringbills while Common Terns will be nearest the water's edge, vulnerable to storm surges (McMahon and Koonz 1991).

Some established colonies are known to have been used for well over 100 years. Colonies on Lake Winnipegosis visited by Charles Wendell Townsend just after 1900 were still being used in 2000 (Townsend in Bent 1922, McMahon and Koonz 1991, Koonz 2001). Some of these colonies had originally been on boulder piles left by retreating glaciers. Over time, guano accumulated, forming larger and larger platforms on which many pairs of several species could nest. These guano (organic) colonies feel spongy underfoot, but are largely un-vegetated. Species thought to require sand to nest (Caspian Terns, Common Terns, pelicans) breed in very large numbers on these islands (McMahon and Koonz 1991, Koonz and Rakowski 1985).

Spacing of species within colonies appears to be extremely important. On undisturbed colonies, cells of nesting Ring-billed Gulls, Caspian Terns, and Common Terns are typically separated from each other by pelican and cormorant nesting cells, established prior to the gull and tern nest initiation (McMahon and Koonz 1991). If the cormorants and pelicans are not

present, the gulls and terns nest in mixed colonies. Stress levels are generally rather low when traditional colonies are visited (those with pelicans, cormorants, gulls, and terns). Counting nests during the day in those colonies does not appear to be a major threat to productivity provided that the colony is not in full sun and the nests have not just hatched. When gull and tern nests are not separated by cormorant or pelican cells, stress levels are extreme. When visited, nesting residents rapidly destroy eggs throughout those colonies. Those colonies are not visited for egg counting.

A strange phenomenon about disturbed traditional guano colonies (islands on which the cormorants and pelicans have been disturbed enough to abandon them) is that they appear to be declining in size. The numbers of birds from the remaining species (Ring-billed Gulls, Caspian Terns, Common Terns) nesting on them is in decline and the islands themselves are eroding around the edges (Koonz 2001). Is it the stress, disturbance, diminishing food supplies related to less nutrient input from the larger birds, or some other factor?

Are cormorants negatively impacting the fishery? Should we reduce cormorant populations? Over 12,000 food samples were collected from cormorant nest sites and from feeding flocks to determine what fish species they were eating (Hobson et al. 1989). Cormorant feeding flocks were rushed with boats to get the birds to regurgitate their fish. Regurgitated fish were netted and identified. Cormorants eat what they can catch. They do not eat large numbers of bottom feeding fish that are light sensitive (Lysack 1988). They do eat suckers, yellow perch, and tullibees.

Cormorants nest in association with other species, eat only live fish, have good eyesight, are quick to learn and become gun-shy. They cannot be easily poisoned, shot, or rounded up in nets. From the mid 1940s to mid 1950s, Manitoba embarked on a cormorant reduction program on Lakes' Winnipegosis and Winnipeg (McLeod 1943, McLoed and Bondar 1953). When the program was initiated, cormorant numbers on Lake Winnipegosis were approximately 10,000 pairs, nesting on 12 colonies. The most effective control method was to dip the eggs in boiling water or hot wax. This method resulted in the adults sitting on dead embryos until too late in the season for re-nesting (they would renest if the eggs were destroyed early in the incubation period). How much non-target destruction took place during this action was not recorded but anyone who has visited a colony with several nesting species present knows that the losses were considerable. By the mid-1950s, when the control program was terminated, cormorant numbers on Lake Winnipegosis were estimated to be 2000 pairs. Those 2000 pairs nested on 18 islands rather than the original 12. The cormorant decline continued until after 1969 when only 1400 adults were thought to reside on the lake (Vermeer 1969). After 1971, cormorant populations exploded and by 1985, 28 colonies were recognized on the lake (Hobson et al. 1989). Three years of surveys (1987–1989) revealed 50 active colonies; over 50,000 cormorant nests were counted in 1987 (McMahon and Koonz 1991). Not only did cormorant numbers increase, colony numbers in-

creased as well. A lake survey in 2000 revealed approximately 50,000 nests on 56 colonies, similar numbers to those found in 1987 (Koonz 2001).

Manitoba's cormorant control program produced two interesting outcomes. First, cormorants initiated new colonies even as populations declined. Second, cormorant numbers continued to decline for another 20 years after the control program ended, until after the DDT ban in the early 1970s (Vermeer 1969).

Double-crested Cormorants are a natural part of nature's changing environment. They are opportunistic and interact with other colonial waterbird species in ways that we do not fully understand. Reducing their numbers will negatively impact other species with which they nest and interact. Number reductions will be difficult because cormorants have an extremely high rate of reproduction, and adults live for many years. To effectively reduce cormorant numbers, we must understand why those numbers have increased so dramatically and change the environment that has allowed the increase to happen. Without changing the ecosystem to reduce the carrying capacity for cormorants, their populations will quickly recover to utilize the resources available. Cormorant control will become an annual affair that will be more costly each year as the birds adapt to being persecuted by pioneering new colonies away from those being disturbed. Killing one waterbird species will also set a precedent that will put other colonial waterbird species at risk. A Lake Winnipegosis Caspian Tern colony visited in the summer of 1981 had several dozen terns with their heads wrung off (Koonz 1982); I visited a number of waterbird colonies (on several Manitoba lakes) in the 1980s and 1990s where young cormorants had been herded together and clubbed to death along with American White Pelican offspring.

It has taken decades for many of the public to stop shooting raptors; do we wish to foster the decimation of all colonial waterbirds because **we** have enhanced the environment for Double-crested Cormorant populations? Can society afford to wait for natural controls such as Newcastle disease, avian cholera, botulism, bird flu, parasites, or food shortages to reduce Double-crested Cormorant populations? We have caused the problem, should cormorants and their associated ecosystem pay for it?

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"Sense of Place" by Janet Flynn.

Guidelines for Successful Monitoring of Eastern Bluebird Nest Boxes

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Why Monitor Eastern Bluebird Nest Boxes?

In Wisconsin, Eastern Bluebirds have traditionally never been abundant because good habitat is lacking in the state. But in the late 1960s, 1970s, and early 1980s, Breeding Bird Surveys reported by the USGS, Patuxent Wildlife Research Center, www.pwrc.usgs.gov, on the same stretches of roadway on a yearly basis, started revealing alarming drops in what bluebird populations we had (partly due to severe weather in 1976–77 on their overwintering grounds (Davis and Roca 1995; Table 1). The other three main cavity nesters (chickadees, swallows, and wrens) did not show a similar drop in population.

Armed with this information, the WDNR approached citizen groups around the state to attempt to stimulate an interest in an artificial nest box program to "bring back" this imperiled species. The Bureau of Endangered Resources of the WDNR called a meeting at Schmeeckle Reserve in Stevens Point in February of 1986 (Don Bragg, WDNR retired, personal communication). As a result of this meeting, the Bluebird Restoration Association of Wisconsin (BRAW) was formed on 15 March 1986. BRAW has worked to increase the population of this species ever since.

Table 1. Population trends for the Eastern Bluebird and other cavity nesting species in Wisconsin and North America based on Breeding Bird Surveys reported by the USGS, Patuxent Wildlife Research Center, www.pwrc.usgs.gov.

Species	1966–1979: WI	1980–2005: WI	1980–2005: NA
EABL	–10.5%	+4.5%	+2.5%
TRES	+3.2%	+0.4%	–0.2%
BCCH	+1.1%	+1.2%	+0.4%
HOWR	+ 0.6%	+1.0%	+0.0%

EABL = Eastern Bluebird; TRES = Tree Swallow; BCCH = Black-capped Chickadee; HOWR = House Wren. Populations levels for all North American bird species can be found at: www.mbr-pwrc-usgs.gov/bbs

Table 2. Comparison of Eastern Bluebird (EBF) and Tree Swallow (TSF) fledgling production in 2005 and 2006.

Year	EBF	EBF/Box	TSF	TSF/Box	Total Boxes	EBF:TSF
2006	21,102	3.50	6,574	1.1	6,021	3.2: 1
2005	17,670	2.94	8,440	1.4	6,016	2.1: 1

History of Bluebird Production in Wisconsin by BRAW Monitors

How well have we done? Table 1 shows that bluebirds made a solid comeback from 1980–2005 (+ 4.5%/year), even better than in North America as a whole (+2.5%/year). Some, perhaps most, of the credit for the resurgence in the bluebird population can be attributed to the extensive artificial nest box program implemented by BRAW.

Table 2 compares BRAW data for the 2005 and 2006 seasons. Bluebird fledglings increased by a robust 19.4% and by 0.6 birds/nest box in 2006 compared to 2005. Tree Swallows, on the other hand, dropped by 22%. The ratio of bluebirds to swallows increased by 1.1 bluebirds/swallow. Box numbers were almost identical between the years. When bluebird numbers increase and swallow numbers decrease, it is a sign that the trails are starting to mature throughout the state. By that I mean, as we place and relocate boxes to better bluebird habitat by using the criterion of bluebird occupancy, they naturally attract a higher and higher percentage of bluebirds and fewer swallows and this change is demonstrated by data such as those in Table 2.

Figure 1 shows data collected by BRAW members since 1994. For the past 5 years bluebird production has shown a dramatic improvement. This change has been made possible by improved production techniques discovered by the research of Joe O'Halloran and others in the BRAW monitoring community and subsequently implemented. It is now likely that the bluebird is experiencing stable or increasing populations throughout most of its range in Wisconsin. In a very real sense, then, it joins the Bald Eagle, Osprey, and Peregrine Falcon, among others, in the fraternity of birds that has been brought back from the brink of extinction in Wisconsin, by citizens concerned for their survival.

Table 3 shows bluebird production for the Aldo Leopold Audubon Trail that I coordinate (21 other monitors helped in 2006). We started in 2002, averaging well below the state average with only 1.33 fledglings/box.

Four years later, we have increased our fledgling rate by 435% to 5.79/box (3.5 statewide) and rank first, second, or third for all production categories in Wisconsin (trails of over 50 nest boxes). This feat occurred in spite of expanding our trail by 355 boxes during that time (note: new nesting sites take time to occupy).

This dramatic change has been done through hard work and by gaining insights into the behavior of bluebirds and other cavity nesting songbirds. One must "learn how to think like a bluebird." I believe that the information we have gained can

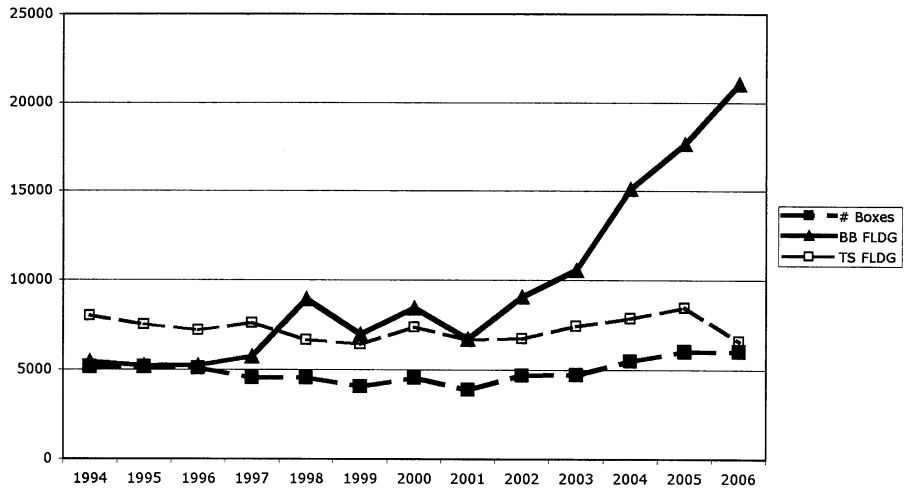

Figure 1. Number of fledgling Eastern Bluebirds and Tree Swallows, and number of nest-boxes, from 1994–2006. It should be noted that most BRAW monitors dropped paired boxes in 1997, and crowded single boxes in 2002. Figure was prepared by Dr. Peter Dunn, Department of Biology, UW-Milwaukee.

improve any bluebird trail anywhere in the eastern United States (including the Audubon trail which is being expanded to 782 nest boxes in the 2007 season). See Table 4 for details.

By following these guidelines, any monitor in any area of the country that has the right habitat should be able to increase bluebird production, in some cases dramatically so.

Common Myths Associated With Bluebird Monitoring

There are several myths that monitors must dispel in order to reach a high production potential for their boxes:

1. Moderate disturbances will cause bluebirds (and other cavity nesting songbirds) to abandon their nests—

This is so untrue. This myth, very common in the general public, has been used forever by parents and others to keep children from vandalizing nests. It may serve a good function from that standpoint, but beyond that goal, the idea is worthless.

It should first be noted that perching birds (= passerines) can smell but, "residual human scent on eggs and

Table 3. Eastern Bluebird productivity on the Audubon Bluebird Trail, 2002–2006.

Years	Nest Boxes on Trail	Total Fledglings & Fledglings/Box	% of Boxes with Double Broods	% of Boxes with Triple Broods
2002	89	188—1.33/Box	3.4%	0
2003	164	351—2.14/Box	12.8%	0
2004	184	719—3.91/Box	29.9%	0
2005	381	1732—4.55/Box	40.4%	2.4%
2006	444	2568—5.79/Box	55.2%	5.2%

Table 4. Management practices that are thought to have improved Eastern Bluebird production on the Audubon Bluebird Trail.

Location

1. Bluebirds need a territorial forage area of 3-21 acres of predominantly open habitat (braw.org/Ask the Pros/Drs. Linda Whittingham & Peter Dunn/Dept. of Biology, UW-Milwaukee);
2. Ideal sites: short, sparse grass with interspersed trees: cemeteries, golf courses, parks, roadsides, RR tracks;
3. Boxes should be totally exposed to sunlight from sunrise until noon; thereafter, shading is permissable;
4. Perch sites:
   a) One or more trees (10'+ high is ideal) right in front of, or to one side of nest box, as perch for adults delivering food and first perch for fledglings (20-30' from box)
   b) Fences (barbed wire, electric, wooden)
   c) Electrical wires, clothes lines
5. Noisy sites okay (heavy traffic highways, railroads, temporary air shows, church picnics).

Relocation

1. Change the nest box position if there has been no bluebird nesting attempt in a season OR;
2. Change by the end of the following April (90% of bluebirds have nested by then).

Box Style/Dimensions

1. In "the wild," bluebirds prefer to occupy old woodpecker holes that are not usually very large or very deep;
2. Shallow, narrow boxes work best:
   a) 4–5″ below the bottom of the hole as maximum depth
   b) 4 × 4″ or 4 × 5″ nesting platform;
3. No vents, or keep vents closed until June 1 (end of July in black fly habitat);
4. Oval hole small enough to keep out starlings and cowbirds;
5. Don't use predator guards on box fronts (too thick for bluebirds) or perches on boxes (used by predator birds like sparrows and kestrels).

Spacing

1. Space no closer than 100+ yards (Zeleny 1976). Note: Tree Swallow occupation is encouraged if boxes are placed closer than this (braw.org/Ask the Pros);
2. Pairing reduces bluebird and increases swallow production/box.

Nest, Egg, and Chick Removal (Procedures approved by USFWS in December 2006)

1. Partial or complete nests w/o eggs: 1st week; 2nd, 3rd, 4th weeks, no change, then remove; restart week count if more building occurs; if wet, remove, replace with dry, coarse grass or pine needles (white pine preferred);
2. Eggs, full clutch in week 1; if they do not hatch in 2nd, 3rd or 4th week, place back of fingers on eggs; if cold to touch, remove nest and eggs.

Chicks starving/lethargic

1. Foster into nests with chicks of similar age, + or – 2 days (place with slightly younger, if possible)—37 of 42 reared by adoptive parents in Audubon study.

Predator Guard on Mounting Pole/Post

1. Steel fence posts are superior to rebar; pvc or aluminum tubing is superior to conduit (Terry Glanzman from Mondovi has experienced massive losses on his trail from raccoons; he uses conduit/rebar);
2. House Sparrow predation: No nest box has proven to be sparrow proof—4″ PVC, K-Boxes, and slot boxes are thought to work for some people (David and Roca, 1995).

Direction of Opening

1. Keep away from prevailing westerly winds (cools boxes, lets in driving rain);
2. Use the same direction for all boxes;
3. Cornell University has determined that directing the opening of a nest box to the east improves the fledging rate of Eastern Bluebirds in northern latitudes. Apparently, boxes pointed in that direction heat up more quickly in the mornings in cold weather but do not collect as much heat from a southern exposure in summer.

nest does not deter the parental instincts of passerines (Gill 2007)." Their sensory existence is mainly limited to sight and hearing. When one opens a nest box, therefore, and handles the eggs or young, or the adults themselves, the birds are not influenced by smell.

In fact, bird banders have captured both adults and young in the nest for decades, taken them out to band them, held them firmly to affix the band and then released (adults) or replaced them in the nests—all with only rare mishaps. And bluebird monitors don't come close to traumatizing juveniles and adults in this way.

Moreover, Audubon monitors have found 42 starving chicks in nests in 2005 and 2006 and have moved them to other nests with young. In 37 of 42 cases, the adults adopted and raised these foreign chicks successfully. Had smell or disturbance been a problem, they would have rejected these fostered chicks. By the way, the five birds that died were all exceptionally weak when put into the adoptive nests, and didn't have much of a chance for survival anyway.

Still not convinced? I will give you two more examples:

a. In two instances (wrens nearby and gas pipeline being put in), nest boxes with eggs had to be moved up to 200 ft from the original site. Instead of abandoning the eggs, both hens followed the boxes, incubated, and hatched all eggs successfully and also successfully fledged all young.

b. One day I moved a box with five 10-day-old chicks (unknown to me), tossed it in the back of my trailer and transported it 15 miles to a site where I wanted to put up the box. To my horror, I discovered there were chicks in the box and rushed back to the original site and put in a post, guard, and box under the watchful eyes of both bluebird parents. The box was away from the original nest site for 3 hours. In spite of this maximum disturbance, the parents continued feeding and raising the young and fledged all five chicks.

Therefore, we sell nesting birds short. We fail to remember that in the case of cavity nesting birds, they carefully inspect the box and surrounding habitat for its reproductive potential. When the hen eventually picks the box, she has already decided (bonded to) that this is an ideal site for her to lay eggs and raise young. When she lays eggs, she has even more reproductive potential for her future (additional bonding) and when the chicks hatch, hell has to freeze over to get her and the rooster to abandon those young (maximum bonding). So give the bluebird hen and rooster credit. Touch and modest disturbance of eggs, nest, and young will not cause them to abandon the nest, eggs, or young. Quite the opposite: they need your tender love and care to maximize their reproductive potential. By all means, do monitor your cavity nesting songbirds but with moderation.

2. When you place a nest box, you are placing it in a permanent position, never to move it again.

Nothing could be further from the truth. No nest box on any bluebird trail should be considered permanent unless it is attracting bluebirds! To do otherwise is to focus on your ego that is saying "this place will be absolutely ideal for bluebirds." Well, I am sorry, but if bluebirds don't build in your house, they are saying, "sorry, moni-

tor, I don't like where you placed the box—I can't raise young in these conditions." Don't you owe it to them to put it in a place where they can nest?

I support the contention that every nest box put up for bluebirds should afford a maximum opportunity to attract them. If you agree, then I recommend these principles of placement/moving boxes: Any time you place a box in a new location, let it go a season and then until the end of April in the following season. Our experience with Audubon nest boxes is that 90% of all boxes that will be built in during the season will be built in by the end of April.

By moving any boxes that have had no bluebird nests in them by the end of April the 2nd season the boxes are in place, you have essentially given them two seasons to attract bluebirds, but can then place them in a new position that still has a chance to attract a pair for the remainder of the 2nd season.

3. Noise will prevent successful nesting in bluebirds.

To me, it was surprising to find that bluebirds tolerate high levels of noise. The first insight I got about this fact was placement of a nest box in a park along a heavily traveled street on the west edge of Plover, Wisconsin. This box has been in place for four years and has successfully produced broods all four years and successful double broods in the past three years.

Armed with this experience, I selected a "very noisy site" along Highway 54 between Plover and Wisconsin Rapids. This site has thousands of automobiles passing along it (100–200′ from the boxes) each day and up to 11 100-boxcar freight trains, passing within 50–100′ of the boxes each day. In an experiment in 2005, I placed four boxes along the tracks and three of the boxes produced bluebirds. In 2006 I expanded the trail to 36 boxes and 30 of them produced bluebirds. Noise was not a significant factor in limiting the production of bluebirds in this situation.

What was most important was the habitat I selected. It consisted of a highway with a swath of vegetation of about 50′ kept cut low (which made it ideal for ease of insect observation), 20–30′ high electrical wires overhead for perch hunting, short trees in front of the boxes for adults to perch on prior to entering the box with food and for young to fly to when they fledge, and railroad tracks with short grass hunting sites on both sides of the track. In spite of the noise levels, it was an excellent and productive habitat for bluebirds.

4. One should not put boxes next to roadways for fear of bluebird adults/young being killed by passing cars.

The majority of boxes on the Audubon Trail are along roadways. I know of no adult or fledgling that has ever been killed by an automobile (we have produced 5,558 young in 5 years of study). On the contrary, moderately traveled roads provide a great opportunity to raise successful broods and are safe to stop along. Heavily traveled roads (see #3) can be outstanding for raising bluebirds but hazardous to stop along.

5. One has to monitor nest boxes only once every two weeks or a month.

This myth is being perpetuated by those who either don't have a commitment to monitoring songbirds or is

over-committed, and lacks the time to do so. When one "takes on" the responsibility of nest box monitoring, it should mean a several hour commitment at least once/week. Anything less and the necessary commitment is lacking and monitoring should not be undertaken by a person under those circumstances.

When one assumes the responsibility for monitoring a nest box, you assume the responsibility to do what you can, to see that the natural cycle of the songbird is completed without interference from humans or other predators. Monitoring once per week assures: 1) accurate collection of data; 2) nests and/or eggs will be removed from inactive boxes; 3) removal of wet nests or wet nests with eggs or chicks can be replaced with dry nests; 4) dying chicks can be removed and fostered into nests with healthy young; 5) finding and controlling acute problems such as black fly infestations; and 6) fixing nest boxes, posts, or guards that might have been damaged and that are threatening the safety of the songbirds in question.

Natural History Information for Cavity Nesting Songbirds

Natural history data have been collected each year (2002–06) of the Audubon Study. Table 5 is representative of the data collected during that time. Actual dates vary somewhat, but the over-all principles are the same.

Swallows, wrens, and sparrows (usually in that order, but it depends on the habitat) are the main competitors for nest boxes occupied by bluebirds throughout Wisconsin (individual trails may vary from these statewide trends). Chickadees are a distant 4th as a competitor but do compete for boxes on some occasions.

In late March and early April, only chickadees and sparrows compete with bluebirds for nest boxes, as all start nesting about the same time (sparrows before bluebirds before chickadees). If one places nest boxes 100+ feet in the open, away from wooded edges, occupancy by chickadees is normally not a problem. Likewise, if you place your nest boxes some distance away from cattle and other livestock (200+ yards) or do not place your boxes in suburban neighborhoods where millet and corn are fed in the spring and summer, occupancy by sparrows is minimal.

Bluebirds have a "wing up" on swallows in that they will start building nests 3–4 weeks before swallows. As our winters have shortened due to global warming, the swallow is narrowing that gap because they are migrat-

Table 5. Reproductive landmarks of native songbirds and House Sparrows in the Central Wisconsin area (2005 data—in some cases, actual dates may be off by a few days).

Species	Arrival Date	1st Nest Built	1st Egg Laid	First Hatch	First Fledge	Last Fledge	Length of Reproduction
EABL	24 Mar	1 Apr	10 Apr	30 Apr	20 May	10 Sept	163 d
BCCH	Resident	7 Apr	18 Apr	5 May	25 May	25 July	110 d
TRES	29 Mar	1 May	12 May	8 June	28 June	21 July	82 d
HOWR	20 Apr	15 May	23 May	20 June	20 July	2 Sept	107 d
HOSP	Resident	1 Apr	10 Apr	NA	NA	NA	163 d#

Estimated only

Table 6. Eastern Bluebird and Tree Swallow productivity in different box types during 2006. Boxes are listed in decreasing order of bluebirds fledged per box. Only box types with at least 10 represented state-wide are named; the remainder are included under "Other."

Box Style	Number of Boxes Presented	Bluebirds Fledged Per Box	*Range of Bluebirds Fledged/Box	% of Box Occupancy by Bluebirds	Swallows Fledged Per Box
K-box	527	5.4	0.8–6.0	61	0.5
NABS-Style	1,233	4.4	0.4–10.0	51	0.7
Peterson	1,881	3.6	0.3–9.4	67	1.2
Other	945	3.1	0.0–15.0	55	0.9
Tree Branch	70	2.7	1.0–3.6	68	1.1
Simple	433	2.4	0.0–10.0	60	1.3
Hill Lake	331	2.2	0.0–8.0	51	1.4
Gilbertson	116	2.2	0.5–8.4	61	1.5
Her. Olsen	389	1.9	0.0–12.0	56	1.9
Troyer Slot	96	1.5	0.4–6.5	48	3.3

* Values are the minimum and maximum statewide for individual nest-box trails.
Table produced by Dr. Peter Dunn, Department of Biology, UW-Milwaukee.

ing back from the Gulf Coast earlier. But for now, the bluebird faces less competition from the swallow for the first nesting than the 2nd nesting.

Even less is the competition from House Wrens. First of all, if one places a nest box 100+ feet away from short, dense, brushy vegetation, wrens usually do not build in those boxes and if they do so, build dummy nests. Secondly, wrens migrate back to Wisconsin even later than swallows. Since they do not even start nesting until mid-May, nearly 100% of nest-seeking bluebirds have selected boxes by then. Therefore, wrens are almost never a competitor in the first nesting cycle, but can become a major competitor in the 2nd and/or 3rd nesting cycles for bluebirds.

What Kind of Nest Box Should I Use for a Bluebird Trail?

In their natural environment, bluebirds occupy abandoned woodpecker holes. Therefore, boxes that simulate these holes work best. Shallow nest boxes with floors that are only 4–5″ below the bottom of the oval hole and with an interior platform of 4″ × 4″ or 4″ × 5″, fledge the most bluebirds. For the BRAW data reported in 2006, the only boxes that fledged more than the statewide average of 3.5 bluebirds/box were, in order of productivity, K-boxes, NABS/NABS-Style, and Petersons (Table 6). Moreover, these three boxes had among the lowest swallow occupancy of all boxes. You can't go wrong by placing these three boxes on your routes if you want to increase production.

Those using nest boxes which attract fewer birds than the state average should first be sure boxes are placed according to the principles in this guide and then consider replacing them with a higher producing nest box, if still producing fewer bluebirds than the state average.

It should further be noted that each of these box types has an "oversized" opening, or oval in both the NABS-Style and Peterson boxes. Oval holes have been shown to produce more

bluebirds than smaller, round holes (www.braw.org /Braw Articles/Close). Although it is difficult to prove, some investigators think that an oval hole allows adults to "tip-feed" their young without having to completely enter the hole as is the case with a circular opening. This behavior theoretically saves time for the adult.

It should be pointed out that 60.5% of all nest boxes being reported to BRAW are of the three leading types listed. As others see the importance of providing a better style of box for increasing bluebird production, we should see the average number of bluebirds fledged/box increase steadily.

Meanwhile, it is possible to modify your boxes and still increase production, even though you don't replace them with the more productive boxes discussed. When we first built our Peterson boxes for the Audubon Trail, we used a poor model type and the nesting platform was 8" below the bottom of the oval entrance hole. This construction flaw forced bluebirds to build a nest that was nearly double the normal volume.

The second year, we inserted a platform into the box that was only 5" below the level of the oval opening. As Table 3 shows, we increased the bluebird fledgling rate by 60% from 2002 to 2003 with only this major modification of our trail (few boxes were moved). So, for those with deeper boxes, such as Hill Lake and Herman Olsen models, you can improve their productivity by simply inserting a new nest platform to make them shallower. Better still, shift to the "Big 3," more productive boxes.

Monitoring Instructions

Terminolology—

Clutch: Total eggs in nest

Brood: Group of birds in the nest

Broody: Word to explain why a female does not want to leave the clutch when the box is opened

Double Brood Box: Boxes that have fledged two broods in a single season

Triple Brood Box: Boxes that have fledged three broods in a single season

Fledged: The process of young leaving the nest

Fledglings: Young that have flown from the nest never to return

Fledgeout: Date that last young of the season leave the nest

Juveniles: Young that are living outside the nest; first stage of adulthood

Juvenile Assisted Feeding: Juveniles from the first brood who are assisting in feeding the 2nd or 3rd broods or the juveniles from the 2nd brood who are assisting feeding in the 3rd brood.

Nest Box Year: A nest box that has been monitored for one season

Nestling (= chick or young): Individual birds in the nest

Forms to use—

I prefer to use individual sheets for each nest box (Form 20). I think that this form allows you to record data in much more detail than if you use the "Monitor's Short Form" (20S). Whichever you chose to use, however, you should summarize the data on a Form 21 or E-Form 21 and send it to me by 1 September. When you use a Form 20, you are expected to determine the age of the young in the nest

box to assure that you take caution as they age, in order to keep them from jumping out of the nest box (see below). If you monitor the nest boxes once every 6–8 days (1 week average), it is usually pretty easy to determine the age of the young.

The Form 21 has been dramatically altered for the 2007 season. We have eliminated spacing and nest box type in order to make the form more "user friendly." Also, we are asking monitors to record data for both wrens and chickadees as they are important songbirds as well. All forms are available at www.braw.org

Approaching and opening the nest box—

Monitor boxes once/week. Experience has shown that production of bluebirds improves if you visit one or more times/week. For example, if there is an extreme weather event and a nest gets wet, the eggs/birds can survive for only a few days. If you monitor the boxes only once every two weeks, you assure that the eggs/young will die under these circumstances. By visiting every week, you could build a dry nest and save the eggs/young (see below). Also, weekly monitoring helps you determine if the nest is active or not (see box below). Destroying inactive nests increases productivity.

It is essential, whenever possible, to get the hen to leave the nest prior to opening the nest box. Several times on the Audubon trail, hens have been injured as they attempted to leave the box when it was opened but could not use the exit hole. On at least one occasion, a monitor was so startled that he/she slammed the door shut, thinking that the young were escaping and crushed and killed the hen in the door of the box. Such accidents are rare but can be eliminated by using the approach given below.

As you approach the nest box, make a loud pishing or clapping noise from 10–20′ away. Pishing is commonly used by birdwatchers and involves making a shhhhhh sound with an explosive "p" sound preceding it (one continuous sound). If the hen does not flush from the nest, go to the back of the box and make loud tapping noises on it.

If the hen still doesn't flush, step to the side of the box, away from the opening and open the box. The hen should flush from the nest. If she still does not flush, return to the back of the box and make both a pishing and tapping sound. If she is still so "broody" that she stays on the eggs (less than 5% of the time if the above protocol is followed), simply reach in and firmly pick her up from the nest and toss her in the air. She will chatter at you, but injury is not a problem with this technique (remember that smell is not a problem and this capture technique is used by bird banders on a regular basis). I have used this technique dozens of times without harm to the hen. This technique can also be used with other songbirds, but a hen swallow will grasp nesting material, so care should be taken when removing her, so you don't remove her eggs.

By using these techniques, you should be able to get an accurate count of eggs and young, important data for BRAW.

Counting eggs & nestlings—

After you have flushed the hen from the nest, you are then ready to count the eggs and/or nestlings.

Counting eggs:

A complete clutch (= total) is 4–5 light blue eggs. In unusual cases, probably associated with exceptionally good habitat and feeding conditions, 6 eggs are laid. Of the nests of eggs laid in the past 5 years on the Audubon trail, only one had 7 eggs in it. All hatched and fledged, so such clutches are possible but ultrarare.

More commonly, representing 1–3% of all eggs laid on the Audubon Trail, are white eggs. None of our "white egg nests" ever have blue eggs in them, so this condition seems to be a fixed genetic trait that does not vary over the lifetime of the individual, apparently a type of "egg albinism" (Gowaty and Plissner 1998).

When you look into the "hen-less" nest, pull back the cup edge and you will be able to see the eggs. If it is a Tree Swallow nest, you must part the feathers to find the eggs. The eggs of chickadees are covered when the hen leaves the nest, so carefully pull back the hair covering them to get a count. In some cases, it is best to "touch-count" the eggs. This technique allows you to count the eggs with minimal disturbance. Rarely, you will find a larger, brown-mottled egg in the nest that is likely to be that of a Brown-headed Cowbird. This bird is protected and the egg should be left in the nest to complete its natural cycle. To help prevent this parasitism, reduce the size of your box opening.

Incubation takes 13–14 days in bluebirds (Erhlich et al. 1988). However, data collected on the Audubon trail indicate that in cold weather, eggs may sit in the nest for up to 13 days before incubation begins, a very good reason to give the nest four weeks with a full clutch before destroying the nest.

Counting nestlings:

Healthy nestlings that are hungry will naturally "gape" when you open the nest box. If they are sleepy or recently fed, they usually can be enticed to gape by making a light pishing or kissing sound. If neither of those conditions allow you to get an accurate count of the nestlings, simply pick up one or two of them and spread out the others. I have used this technique hundreds of times without any harm to the young. And, remember, smell is not a problem for cavity nesting songbirds. Rearing chicks takes 15–21 days, depending on the time of year (spring is longer, summer shorter; Berger et al. 2001).

What should I do if nests remain incomplete, empty, or with unhatched eggs?

All songbirds are protected by the Migratory Bird Treaty Act of 1918. The Act states: "unless and except as permitted by regulations . . . it shall be unlawful at any time, by any means or in any manner to pursue, hunt, take, capture, kill . . . possess, offer for sale, sell, purchase, ship, export, import . . . , transport or cause to be transported . . . any migratory bird, any part, nest, or eggs of any such bird . . . included in the terms of conventions between the United States and (Canada) . . . the United Mexican States . . . and the . . . Government of Japan."

BRAW absolutely supports this law. It is therefore illegal to destroy any nest, eggs, or young of any songbird except in the following situations approved by Ms. Andrea Kirk, Permits Chief, Migratory Birds, USFWS Re-

gion 3, Ft. Snelling, MN 55111 on 27 December 2006. Ms. Kirk has determined that nests and/or eggs of any songbird are inactive in the following situations and can therefore be destroyed:

1. Partial Nests of any songbird that is monitored regularly: Week 1—If there is no more additional nest building in weeks 2, 3, or 4, the nest can be removed in the 4th week. Timing restarts when there is any additional nest building.
2. Complete Nests of any songbird that is monitored regularly: Week 1—If no eggs are laid in the nest in weeks 2, 3, and 4, nest can be removed in the 4th week.
3. Complete clutch of eggs of any songbird that is monitored regularly: Week 1—If none hatch in weeks 2, 3, or 4, touch eggs with back of fingers. If cold to touch, nests and eggs can be removed in the 4th week.

Five years of data collection from Audubon led to this ruling by Ms. Kirk of the USFWS. It is our experience that when empty, partial, or complete nests or nests with unhatched eggs are left in the box, it "blocks" nesting attempts from individual hens that started the nest or from new hens. Although we do not know which "type of bluebird" is being blocked, our data indicate that removal of the nests using the procedure listed above, leads to a new nest being built and/or clutch of eggs laid, within one or two weeks in most boxes when this procedure is followed in the months of April through June.

On 2 December 2006, the BRAW Board voted 12 to 0 to establish the following policy: "No bluebird monitor's data will be accepted for seasonal reporting if they are known to destroy active songbird nests." Monitors are expected to follow the criteria for inactive nests approved by the USFWS on 27 December 2006. If they do not and indicate that on their BRAW Form 21s or in personal conversation with BRAW Board members, their data will not be accepted for consideration in BRAW reports and their names will be submitted by me as violators of federal law to the USFWS.

After the young have fledged, what do I do with the old nest?

I ask monitors on the Audubon trail to remove the nests from the boxes after the young have fledged. They are further asked to scrape off all feces on the sides of the boxes, but do not have to wash out the inside of the box. For those that are compelled to clean out the box more thoroughly, however, use only water and a towel (no soap; windex spray bottles work well).

I recommend removing the old nest from the area by placing it in a plastic sack and disposing of it in the trash at home. While insects such as blow flies are rarely a problem for songbirds in our experience, there is only one reason to leave the nest in place, that of leaving the jewel wasp, a parasite on blowflies, in place to parasitize blowflies in the next nest (Berger et al. 2001). Since it has been our experience that blowflies are not injurious to bluebird nestlings and that old nests block nesting attempts by other bluebirds, we still recommend removing the old nests except in the situation that follows: The longer one has a trail in place, the more common are second (and third) nestings. This means that new nests will sometimes be

started prior to removing the old nest. In that case, the new nest can be built so high that it makes the bluebirds more vulnerable to predation because they are so close to the opening. If the nest is sturdy enough, it is possible to lift it off of the old nest and remove the old nest from under it. In other instances, it is so flimsy that it is best to leave the old nest underneath the new one. It is not worth the risk of disturbing nest building and the abandonment of the box by the hen.

Problems encountered while monitoring boxes—

a) Nest boxes occupied by other bird species.

Swallows, wrens, and chickadees are "good guys," i.e., songbirds. They should be treated with respect as described above. The best technique to keep song birds other than bluebirds out of your boxes is to put them in habitat preferred by bluebirds, not other species.

Swallows prefer habitat with water over the drier, upland habitat preferred by bluebirds. Keeping boxes away from water (including marshland) will increase the chances of attracting bluebirds to them.

Wrens love short, dense, brushy vegetation with shading. Keep boxes 100′ away from such vegetation and usually you get only a dummy nest. Four weeks after nest building begins, you can legally destroy it (if it does not have eggs) and usually a bluebird or swallow will move in. It is best, however, to move the box another 50–100' away from the dense vegetation, reducing the desirability of the site to male wrens.

Chickadees are the least likely to occupy a bluebird house. They prefer edges of woods and shaded nesting habitat. Keeping boxes 100+ feet away from such habitats will usually eliminate their nesting in your box. Sometimes they will occupy a box in the open, far away from woods. But it is rare that these nests are successful. There really is nothing you can to do to prevent these occupations. But three weeks after you experience a completed clutch without hatching, touch it to see if the eggs are being incubated (chickadees cover their eggs when they leave the nest, so carefully remove the hair covering them to "feel" the eggs). If they are cold to the touch, you can legally remove the eggs and nest.

House Sparrows are not native song birds and can legally be destroyed in any life stage: nest, eggs, young, adults. For five years, 27 different Audubon monitors have struggled with the drop in reproductive potential of bluebirds that sparrows cause. We continue to experiment, but so far, we have concluded that no nest box reduces sparrow occupancy. Davis and Roca (1995) and Jerry Schoen, BRAW Board member from Whitewater, claim that slot boxes help them control sparrows. It should be noted that the Troyer Slot box is the worst bluebird producer of all the major boxes, however (Table 6). What works best is to keep the boxes at least 200 yards away from livestock farms and out of suburban subdivisions where residents are feeding cracked corn and millet, as they are ideal foods for sparrows. That being said, we still have 10% of our boxes infested with sparrows.

The best way to discourage sparrows permanently is to let them lay their eggs and hatch their young. Then the young should be destroyed. Since nei-

ther landowners nor monitors can normally "stomach" this approach, a secondary method is to let the sparrows lay their eggs (complete clutch is 5–7 eggs) and then destroy the nest. This approach usually discourages sparrows from further nesting. Still another technique is based on the fact that when the sparrow hen starts laying eggs the male will sometimes stay overnight with the hen in the box. It is possible then to capture and destroy both the hen and rooster. Sparrow "scarecrows or spooks" have proven ineffective in scaring off sparrows as the birds quickly adjust to them and return to the boxes. Finally, some people use a variety of sparrow traps to capture and destroy the adults. That is a permanent solution only if the male is captured as he will simply attract a new hen. Sparrow capture is so labor intensive that it is rarely used in trails of more than 25 boxes. I do not advise wasting your time trying to trap sparrows—simply move the boxes.

b) Wet nests.

Rarely do nests get wet in boxes. If they do, the most common reason is a "leaky box." The first consideration, therefore, is to repair the box by replacing boards, tightening them, or caulking leaks. Sometimes, under extraordinary conditions, winds will blow so strongly, that an otherwise "water-tight" box will "take on water" and produce a wet nest.

Songbird hens, including the bluebird, incubate their eggs at about 97°F. A wet nest quickly drops the egg temperature below this level, causing them to arrest their development. Wet nests also cause abandonment of nests prior to egg laying. If there are young in the nest, especially less than a week old, they will quickly die of hypothermia from a wet nest, especially in cold weather.

The bottom line is, replace all wet nests with dry material. It is best to begin the season with a small sack of dried vegetation, good enough for making up to 6 nests. All too often, when you experience finding a wet nest, all other vegetation around the box is wet. "Plan ahead" is a good policy when it comes to wet nests. Once the hen completes a nest, she will tolerate any kind of cup-shaped vegetation that might be available to make a "humanly-constructed" nest. Preferred materials, however, include white-pine needles and any dead, short-leaved grasses. Soft grasses are better than hard, brittle ones.

All the monitor has to do is form a cup-shaped nest approximating the dimensions of the nest in the box. Remove the eggs or chicks from the wet nest and place them in the dry nest. Put the dry nest with eggs or chicks, back into the box and pat it down a bit to approximate the size and shape of the previous nest. Do not worry about this part of the process, however, as the hen will quickly arrange the new nest to her liking (and thank you as a bonus). Audubon monitors have done this procedure dozens of times and it is 100% successful if the nest can be replaced soon after it gets wet.

c) Starving chicks in the box.

In 2005 and 2006, 42 nestlings were found starving in the boxes on the Audubon Trail. Thirty-seven of them were saved by following the procedures given below.

The first step is to identify starving chicks. If there is a dead chick in the

nest already, that is usually a good sign that other chicks in the nest are stressed as well. It is more likely, however, that you will discover starving chicks by finding them largely unresponsive to your typical pishing/kissing noises. In addition, if no adults are seen around the nest box, it is likely that one or both parents are dead or have abandoned the chicks.

If it is cold weather, wrap the young in tissue or toweling that will keep them warm. If it is hot weather, heat will be their enemy, so keep them as cool as possible.

You should locate a nest with chicks in it that are somewhat younger than the age of the chicks that are starving. This strategy is important because the starving young are retarded in their physical development and after being adopted by the new parents will grow at about the same rate as the younger chicks.

Often, however, trails are so small that not many choices are available to use for adoptive nests. I have successfully fostered chicks into nests in which the occupant chicks were 6 days older than the adopted chick(s). This places a hardship on the parents, however, as they have to cope with juveniles outside the box and a chick(s) inside the box. But the technique will still work.

Another rule of thumb is to put no more chicks into the adoptive nest than will total 5 or 6 (6 only if absolutely necessary). Two healthy adult birds can raise 5 chicks in most cases, but coping with 6 is stressful and can lead to the loss of the adoptive chick.

d) Critters invading the box.

i. **Blackflies**—Blackflies are the most dangerous insect for cavity nesting songbirds. They seem to be most common in the southern and western part of the state, particularly around slow moving rivers. Gary Gaard, BRAW member from Dane County, has discovered that they are less likely to enter boxes with closed vents (www.braw.org /BRAW articles/Gaard). So if you are losing entire broods, healthy one week and a dead, amorphous mass the next, it could well be blackflies. Check around the wings and abdomens for small bite marks, the sure signs of blackfly infestation. The best thing to do in the case of chick loss to black flies is to close the vents until the end of the season.

ii. **Blowflies**—In the 5 years of the Audubon study, 1262 nest boxes have been monitored, representing 1262 nest box years. During this time, no known deaths have occurred to nestlings because of blowflies. We think they are a non-issue, at least in central Wisconsin. During the months of June–August, we find them in up to 50% of our nests, often with dozens of maggots. Blowfly larvae are gray-brown and about 1/2″ long and are usually not very active when you find them in the nests. It is true that blowflies are ectoparasites on nestlings, attaching to the abdomens for nourishment. Typically, these "feedings" occur at night and the larvae return to the safety of the nest during the day. My advice is to ignore the blowfly larvae because they are harmless to the songbird young. But you if you think they are a problem, you can get rid of them by removing the infested nest and replacing it with an artificial nest that you construct as per the instructions above.

iii. **Ants**—Ants are rarely a problem in nest boxes in central Wisconsin, although they have "been known to attack, kill, and devour newly hatched nestlings on occasion. They may even attack and kill the young birds by entering the eggs as soon as the shells are cracked in the hatching process" (Zeleny 1976). Pyrethrin sprays are safest for spraying ants in nests but they are short acting. On the Audubon trail we use "Bonide bug beater yard & garden insect control granules" (Bonide Products, Inc., Oriskany, NY). By putting these granules on the nesting platform underneath the nest, they do not come into contact with nestling or adult songbirds. They are very effective and last much longer than pyrethrin sprays. We have noticed no harmful effects from these granules.

iv. **Mites**—In our 1,262 nest box years, we have recorded no known fatalities from mites. In fact, it is rare that they occur in numbers large enough to be detectable by humans. But sometimes, they overrun a nest and must be dealt with when removing the old nest. It is best to use gloves as they are "creepy crawlers" of the worst kind. They do not harm humans (and apparently the birds in the box), but they are uncomfortable if they get on your skin. Just rub them off and try to "dust out" the box as best you can so the next brood will not start with a bad infestation.

v. **Wasps**—Rarely, wasps attach inside the nest box but more commonly they attach underneath the nest box. It is always possible to get stung by them, so caution should be used when removing the nest. To prevent their further attachment to the same site, spread vasoline or bar soap over the place the nest stalk attached to the box.

e) Climatic Effects.

In northern latitudes, cold has proven to be the most limiting factor during the reproductive season, much more so than heat (as reported by bluebird monitors across the state). In 2006, for example, an intense low pressure system dominated the weather throughout Wisconsin during the week of 11–12 May. For 48 hours on those two days, cold, wind-driven rain fell and caused hens to abandon eggs and/or chicks in order to survive themselves.

In that one week of May, 286 eggs and chicks were lost on the Audubon trail. That 2-day number represented 26% of the total loss of 1098 eggs and chicks for the entire season and exceeded the total loss of eggs and chicks in the two hot months of July and August. This is an extreme example of the underlying principle that the majority of egg and chick loss occurs in the colder months of April and May.

The principle of "cold is bad for reproductive success," is a major reason that BRAW recommends closing vents until 1 June (leave closed until 1 July in areas vulnerable to black fly infestation).

So Why Monitor Bluebird Boxes?

At the start of this "monitor's guide," I indicated that a major reason for developing bluebird trails is to preserve bluebirds and other cavity nesters. But bluebird trails are more than just for conservation of the crea-

tures of creation. It is for us. It is vital for us to be associated with a conservation project.

Few persons in the world have the chance to experience the wonder and mystery of following the development of a wild creature. But nest box monitors do. This is a sacred experience that should be shared with as many people as possible.

It is likely that in this modern age of technological marvels, fewer and fewer children have the chance to "experience nature." Take adults and especially children with you on your monitoring trips. Explain to them the wonders that you see each time you go out on your trail.

Good luck finding, raising, and fledging "the blues."

ACKNOWLEDGMENTS

January 2007: This monitoring guide is dedicated to the 27 nest box monitors for the Aldo Leopold Audubon Society Bluebird Trail from 2003–2006. It is because of their careful collection of data and responsible reporting that it has been made possible.

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Kent Hall is an Emeritus Professor of Biology from UW-Stevens Point. During his 30 years at UW-SP, he specialized in Environmental Physiology with an emphasis in cold temperature biology. After his retirement in 1998, he turned his attention to birdwatching in the ABA area (701 Life Species) and the World (2,533 Life Species). In the last few years his interests have turned to a variety of conservation projects, including bluebirds. He is Vice-President, Board Member, and Coordinator of Data Collection and Analysis for the Bluebird Restoration Association of Wisconsin. In addition, he serves on the Boards of the Aldo Leopold Audubon Society and the Friends of Mead-McMillan Association, Inc. (V-P & Fund raiser). He is currently directing fundraising for $1,000,000 for a Wildlife Educator at the Mead State Wildlife Area, his 3rd million raised for conservation projects in Central Wisconson.

Portrait of a male Rose-breasted Grosbeak by Scott Franke.

The Autumn of 2006 at Cedar Grove

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The autumn of 2006 was the 57th year of continuous operation of the Cedar Grove Ornithological Station. We arrived on 14 August and departed after 21 November. We watched for migrants from dawn to dusk on each of the 100 days, and counted or estimated their numbers. We attempted to trap all hawks. We also operated a 136m long line of 61mm (stretched mesh) mist nets with 72m of them extending to a height of 8m. These large mesh nets captured small birds only rarely. Probably more than 100 warblers escaped through the nets for every one captured. Beginning on 5 October, we left the mist nets up at night to capture owls.

After very poor years in 2004 and 2005 (Mueller et al. 2006), the total number of hawks seen this year was average. However, this was primarily due to the significant increase in Broad-winged Hawks (Table 1). Almost all broad-wings migrate between 15 and 25 September (Mueller et al. 1997) and the weather during that time determines the number of broad-wings seen for the entire fall. Turkey Vultures, Cooper's Hawks, and Bald Eagles were also seen in above-average numbers, but the numbers of Sharp-shinned Hawks, Red-shouldered

Table 1. Numbers of diurnal raptors observed and the percent trapped

	Observed			% Trapped		
	2006	2005	Average 1996–2005	2006	2005	Average 1996–2005
Turkey Vulture	256	115	155.9	0.0	0.0	0.0
Black Vulture	0	0	0.1	—	—	0.0
Mississippi Kite	1	0	0.2	0.0	0.0	0.0
Northern Harrier	209	103	167.7	2.4	1.0	0.0
Sharp-shinned Hawk	1845	1101	2148.8	18.5	16.9	0.2
Cooper's Hawk	238	152	167.8	29.0	36.2	0.4
Northern Goshawk	4	1	13.4	50.0	100.0	0.5
Red-shouldered Hawk	19	13	26.7	5.3	0.0	0.0
Broad-winged Hawk	1420	30	867.5	0.1	0.0	0.0
Swainson's Hawk	1	1	0.1	0.0	0.0	0.0
Red-tailed Hawk	863	611	790.7	15.2	20.1	0.2
Rough-legged Hawk	9	14	32.5	0.0	0.0	0.0
Golden Eagle	1	0	0.8	0.0	0.0	0.1
Bald Eagle	26	14	13.3	0.0	0.0	0.0
Osprey	40	55	62.9	0.0	0.0	0.0
Merlin	399	213	416.0	20.6	18.9	0.2
American Kestrel	52	31	78.0	7.7	6.5	0.1
Peregrine Falcon	54	62	72.4	20.4	17.7	0.2
Short-eared Owl	0	0	0.7	—	—	0.0
Unidentified	61	25	51.2	0.0	0.0	0.0
Total	**5498**	**2542**	**5479.8**	**11.8**	**16.5**	**13.8**
Total*	3782	2342	4393.4	17.1	17.9	17.5

*Less vultures, Broad-winged Hawks, and Osprey

Hawks, Rough-legged Hawks, Ospreys, American Kestrels, and Peregrine Falcons were all below average (Table 1). Sharp-shins are normally the most common hawk observed at Cedar Grove and most are seen between about 13 September and 23 October (Mueller et al. 1997). Weather was poor for concentrating migrating hawks at Cedar Grove for an extended period between 25 September and 12 October during which time quite a few sharp-shins migrated. Hawk migrations at Cedar Grove are greatly influenced by weather. Westerly winds after a cold front drift hawks to the lakeshore, producing concentrations of hawks, northerly or easterly winds drift hawks away from the lakeshore (Mueller and Berger 1961, 1967).

The Mississippi Kite seen on 30 September was the third in as many years

Table 2. Numbers of owls netted.

Species	2006	2005	Average 1996–2005
Long-eared Owl	32	1	13.2
Great Horned Owl	0	0	0.7
Barred Owl	0	0	0.1
Northern Saw-whet Owl	106	44	127.0
Eastern Screech-Owl	2	4	1.8
Total	**140**	**49**	**142.8**

Table 3. Numbers of non-raptorial birds netted.

Species	2006	2005	Average 2002–05
Yellow-bellied Sapsucker	5	10	9.8
Northern Flicker	15	22	25.3
Eastern Wood-Pewee	4	3	4.5
Eastern Phoebe	20	9	12.0
Red-eyed Vireo	12	9	18.5
Blue Jay	7	21	22.0
Brown Creeper	43	30	21.8
Golden-crowned Kinglet	33	10	14.0
Ruby-crowned Kinglet	17	10	14.3
Swainson's Thrush	117	372	283.5
Gray-cheeked Thrush	13	43	40.5
Hermit Thrush	87	85	111.5
Palm Warbler	19	7	7.3
Yellow-rumped Warbler	69	40	39.0
American Redstart	9	4	7.8
White-throated Sparrow	27	23	42.5
Fox Sparrow	35	53	41.5
Dark-eyed Junco	63	232	132.5
Pine Siskin	1	0	8.8
American Goldfinch	12	22	25.0
Totals all species	**880**	**1208**	**1120.5**

and the fourth since 1969. The species appears to be becoming an annual event at Cedar Grove.

We trapped and banded 648 hawks, better than the 419 trapped last year but still below the average of 698 for the last 10 years. The percentage of hawks seen that were trapped was well below last year and also below the average for the last 10 years, but the percent of the total with the vultures, Ospreys, and broad-wings removed is nearly constant (Table 1). The number of owls netted was much greater than last year but about at the average for the last 10 years (Table 2). The number of Northern Saw-whet Owls was below average, but it was a record year for Long-eared Owls, just over the 31 netted in 1996.

The number of non-raptorial birds netted was only 73% of that netted in 2005, and also was below the average for the past four years. Major contributors to the decline were Swainson's (and Gray-cheeked) Thrushes and Dark-eyed Juncos (Table 3). In contrast, there was no real decline in Hermit Thrushes or White-throated Sparrows. The declines in Swainson's and juncos may not reflect a real population decline: The number of Swainson's Thrushes netted in 1963 was only 38% greater than that of 2006, and the number of juncos was 19% less. The great year-to-year variations in the number of birds netted can probably be attributed to variations in weather conditions producing concentrations of the birds. In 2002, we began noting the number of non-raptorial birds netted, and we do not yet have enough years of data to determine population trends.

The most interesting birds netted were: two Whip-poor-wills on 25 September; on 29 August an Olive-sided Flycatcher with prominent bright yel-

Table 4. Numbers of non-raptorial migrants observed.

Species	2006	2007	Average 2001–05
Double-crested Cormorant	1145	1713	2542.8
Great Blue Heron	46	13	19.8
Tundra Swan	56	149	347.0
Canada Goose	6334	7075	6963.6
Sandhill Crane	47	255	178.8
Common Nighthawk	189	312	649.8
Chimney Swift	394	365	690.2
Red-headed Woodpecker	7	4	8.4
Northern Flicker	864	475	756.4
Blue Jay	1583	1239	1632.2
Purple Martin	15	9	23.4
Swallow sp.	2308	609	2963.8
American Robin	8445	1704	2550.0
Cedar Waxwing	5524	8247	13130.4
Blackbirds sp.	5094	1492	2723.4
Small Finches	238	125	1232.6
All non-raptorial migrants	**34,969**	**29,401**	**35,893.4**

low "lips" on the gape, indicating very recent fledging and probably breeding in the near vicinity; and our first ever Cliff Swallow on 19 September.

In contrast to the number of non-raptors netted, the numbers seen migrating over the station was greater than in 2005 and the five-year average (Table 4). Major contributions to the increase were robins, blackbirds, and swallows (it is not always possible to determine the species in the latter two, so we have lumped all species). In contrast, waxwings, cormorants, Canada Geese, Sandhill Cranes, and nighthawks all showed a decrease. Again, it is impossible to know whether or not any of these changes reflect what is happening in the population because of year-to-year differences caused by weather affecting the concentration of migrants.

The Muellers, Dan Berger, and John Bowers were present at the station essentially every day and the Kaspars and Tom Meyer were there on 20 days. Julie Gibson, Bill Cowart, and Diane Ten Pas also helped with the operation.

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The Cedar Grove Ornithological Station is a non-profit organization incorporated under Chapter 131 of the Wisconsin Statutes, and it relies heavily on public donations for continued operation. All personnel are unpaid volunteers. We thank all the WSO members who have contributed to the station.

Wisconsin Big Day Counts: 2006

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One of the great joys of writing the annual summary *Passenger Pigeon* article for Wisconsin's "Big Day" counts entails the simple pleasure of reminiscing about birding adventures in our fine birding state. Whether recalling the long hours, the grueling routes, the prize species, the delightful camaraderie—or even the friendly competition—of one's own effort, or vicariously experiencing a comparable thrill by reading the accounts of other birders and their exploits, the opportunity for reflection on past successes, as well as the corresponding anticipation of yet another warbler fall-out on a golden birding day in May, certainly diminish the dreariness of the short daylight, frigid temperature, and driving snow of a winter day like today (the day I'm plunking out this article on my laptop).

Big Days, of course, can be held during any of our 12 calendar months and four seasons. But as evidenced by this past year's counts, most birders have a special fondness for conducting their Big Days during the peak of spring migration in May. And Big Days need not involve extensive mileage and equally high expenditures for gasoline. Jim Frank's continuing practice of conducting an annual Big Day count within the confines of Ozaukee County establishes a fine example. Nevertheless, there's something magical about spreading one's birding wings far and wide, at least one day a year, and I've heard of many birders growing their year lists by 50, 60, 70, or even more species on the day they set aside each year for this splendid event.

Since Big Day counts are generally designed to maximize the number of species seen in the course of a singular 24-hour day, the following 11 counts are arranged from the most to the least birds tabulated.

The Counts

Brothers **Andy Paulios** and **Jason Paulios** found 160 species on 21 May, sticking to the "fabled Hoffman route"—with the lone exception to their swing through central Wisconsin being the non-inclusion of Horicon Marsh. According to Andy, "This was the hardest 160 species I've found in a day. Other than one small flock of warblers, there was no migration at all." Nevertheless, the Paulios/Paulios tandem found more species on this

day than any other team during 2006, giving credence once again to the theory that this particular route is one of the state's best, one that will undoubtedly continue to be traversed by other Big Day participants. By my records, this specific run has headed the list for the past five years, despite the fact that no one has really come close to approaching the 230 species day of Randy Hoffman and Al Shea on 19 May 2002.

Highlights of this species-topping day for the past year included Eastern Screech-Owl at 12:07 a.m.; Whip-poor-will and Henslow's Sparrow at Grand River Marsh; King Rail, Long-eared Owl, and Yellow-breasted Chat at Comstock Bog; Greater Prairie-Chicken, Short-eared Owl, and surprisingly good numbers of Western Meadowlarks at Buena Vista Grassland (BVG); LeConte's Sparrow in Wood County; Lark Sparrow at Necedah; Olive-sided Flycatcher at Devil's Lake State Park; Hooded Warbler at Baxter's Hollow; Prothonotary Warbler at the Arena Boat Landing; and Ruddy Turnstone at Madison's Nine Springs.

Bill Brooks, **Daryl Christensen**, and **Sean Christensen** tallied 154 species on their 15 May cruise through Marquette, Portage, Green Lake, Fond du Lac, Dodge, Columbia, and Sauk Counties. The day's best find was the Glossy Ibis at Horicon Marsh. Also discovered were Long-eared and Northern Saw-whet Owls at Comstock Bog; Greater Prairie-Chicken, Upland Sandpiper, Short-eared Owl, and Lark Sparrow at BVG; Orchard Oriole at Grand River Marsh; and Eurasian Collared-Dove at Arlington.

Daryl Tessen submitted four Big Day Count forms this year, all in May, with his best effort on 10 May when he turned up 151 species. Daryl's route took in the Bay Beach Sanctuary, Two Rivers, Manitowoc, Van Patten Road, and Horicon Marsh. The prize find of the day was a Little Gull, and other highlights included Brown Creeper, 27 species of warblers (including Pine, Prairie, and Hooded), Henslow's Sparrow, and Brewer's Blackbird.

John Fitzgerald and **Sean Fitzgerald** stuck to southeastern Wisconsin on 9 May, when they reached the 150 species threshold. Counties covered were Walworth, Waukesha, Milwaukee, and Ozaukee. Highlights of this father/son team included Eastern Screech-Owl at 4:30 a.m.; Black-bellied Plover, Upland Sandpiper, and Brewer's Blackbird at Delavan's Turtle Valley Wildlife Area; Orchard Oriole in the Southern Kettle Moraine; and Orange-crowned and Hooded Warblers, as well as Louisiana Waterthrush, in the Kettle Moraine vicinity.

Eric Howe, **Mike Ramsden**, **Wayne Rohde**, and **Quentin Yoerger** located 147 species on 15 May, when they took in Green, Dane, Columbia, and Dodge Counties. Their day began with Pileated Woodpecker and Orchard Oriole in the 40 acre woods on Wayne's parents' Green County farm, where their team saw and heard both the songs and the call notes of Wood, Swainson's, and Gray-cheeked Thrushes, and Veery—all at close range. Rohde noted that he could have gone home at that point, and considered the day a success! Bell's Vireo and Henslow's, Grasshopper, Clay-colored, and White-crowned Sparrows were added at the tiny but increasingly well-known Marbleseed Prairie in northwest Green County, as

was the Glossy Ibis at their final stop of the day, Horicon Marsh.

Daryl Tessen, who managed four solo, "unplanned" Big Days in 2006, traveled to Crex Meadows, Fish Lake, the Brule River, and Wisconsin Point on 25 May, when he found 143 species. Best birds of the day were Red-necked Grebe, 60 (!) Trumpeter Swans, Northern Goshawk, Merlin, Sharp-tailed Grouse, Yellow Rail, Whip-poor-will, Gray Jay, 23 species of warblers (including Connecticut), 13 species of sparrows (including LeConte's and Nelson's Sharp-tailed), and Purple Finch.

Jim Frank once again stuck to a single county (Ozaukee) on 18 May when he came across 134 species. Jim's effort netted him Common Loon, 15 species of waterfowl (including Long-tailed Duck and Black Scoter), Whimbrel, Hudsonian Godwit, six species of gulls (including Thayer's, Lesser Black-backed, and Glaucous), 19 species of warblers, 11 species of sparrows, and nine species of blackbirds (including Brewer's Blackbird and Orchard Oriole).

Daryl Tessen saw and/or heard 124 species on 24 May when he visited Wyalusing State Park, Goose Island, Perrot State Park, Trempealeau National Wildlife Refuge, and Crex Meadows. His best species of the day were Red-necked Grebe, Black-bellied and Piping Plovers, Red-necked Phalarope, 40 Black Terns, Bell's Vireo, LeConte's and Nelson's Sharp-tailed Sparrows, and nine species of blackbirds.

Mark Peterson located 120 species on 26 May, while taking in Wyalusing and Yellowstone Lake State Parks, Baxter's Hollow, and Spring Green Prairie. Highlights included Red-shouldered Hawk, White-rumped Sandpiper, Black Tern, Yellow-billed Cuckoo, four Empids and eight other flycatchers, 19 species of warblers (including Prothonotary, Kentucky, Connecticut, Mourning, and Louisiana Waterthrush), Lark and Henslow's Sparrows, Brewer's Blackbird, and Orchard Oriole.

Kay Kavanagh found 114 species on 30 May in Florence County, when she discovered five raptors, nine shorebirds, both cuckoos, five woodpeckers, eight flycatchers, five thrushes, 17 warblers (all nesting), eight sparrows, eight blackbirds, and four finches. Good finds for the day included Upland and Baird's Sandpipers.

Daryl Tessen deemed his 23 May Big Day "the first of four days cruising Wisconsin while heading to the WSO convention in Rhinelander." Taking in Schoenberg Marsh, Goose Pond, Baxter's Hollow, Spring Green Prairie, Governor Dodge State Park, and Wyalusing State Park, Daryl accumulated 114 species, with the following standing out: Red-shouldered Hawk, White-rumped Sandpiper, Eurasian Collared-Dove, Chuck-will's-widow, Whip-poor-will, White-eyed and Bell's Vireos, 15 species of warblers (including Prothonotary, Hooded, and Worm-eating), Lark and Henslow's Sparrows, and Orchard Oriole.

In addition to the 2006 Big Day counts, one count from 2004 was inadvertently excluded from the 2004 summary article, that of **Ross Mueller** on 18 May 2004, when he found 139 species at Comstock Bog, Germania, White River, Horicon Marsh, and Sheboygan Marsh. Best finds for Mueller, who noted this was his "first Big Day," included Red-shouldered and Rough-legged Hawks, Whip-poor-will, Olive-

sided Flycatcher, American Pipit, and 19 species of warblers (including Orange-crowned). Welcome to the Big Day counts, Ross! What a fine effort!

Conclusion

With the completion of this article, my role of penning the results of Wisconsin Big Days is nearing the end, and WSO Board of Directors is currently looking for another volunteer to assume this responsibility. I've thoroughly enjoyed the four years I've served in this capacity, and wish to thank all who have sent your reports and anecdotes my way.

And speaking of anecdotes, I've always particularly enjoyed the stories birders have shared—even when the scribbled notes on a field card are difficult to decipher! It's clear that the vast majority of Big Day participants are enthused not just about numbers, but also about the special and unexpected birding moments that occur in the course of their outings. It's in this spirit that I wish to conclude my remarks.

I'm convinced that as long as I recall my own Big Day venture in 2006, I'll treasure with much fondness what's been my sole opportunity to date to hear all four species of woodland thrushes vocalizing both their songs and their calls in the span of a single day. That was a thrill—as was coming across a Pileated Woodpecker on my Mom and Dad's farm in Green County. I've birded that woods for 40 straight years, and never, until 2006, encountered a Pileated there. Wisconsin's ***Atlas of the Breeding Birds of Wisconsin***, also published in 2006, indicates an encouraging increase in numbers for this species. And I'd like to think that the little pocket in southeast Wisconsin, which is generally unoccupied by this cousin of the Ivory-billed Woodpecker, may one day again be filled. Who knows? It's winter now, but May is coming, and I can dream . . .

The Rules

For all who wish to participate in future Big Day counts, please remember these rules and guidelines:

- The count must be taken within a 24-hour calendar day (midnight to midnight).
- The count must be taken within the state boundaries, but it may cover as many parts of Wisconsin as birders can reach in the time limit.
- All participants must be within direct conversational contact at all times during the birding and traveling periods. This excludes meal and rest stops if birding is not conducted during those times. This limits the number of parties involved to one, and participants to the number safely and comfortably seated in one vehicle.
- Areas can be revisited during the day.
- The same areas may be covered on different Big Day counts.
- No fees are involved in conducting the counts.
- Be sure to drive safely. Sleep deprivation is characteristic of those engaging in Big Days, and drivers and passengers alike are urged to use great caution while driving.
- Counting individual birds is optional.

- Please note that there is no special Big Day form. Standard checklists, such as WSO's ***Wisconsin Birds—Field Checklist***, may be used.
- It is critical that all unusual species—whether they are early or late sightings, or rare species—be completely documented. Reports of rarities are subject to review by the WSO Records Committee.
- Completed Big Day results should be sent directly to Randy Hoffman, WSO Bird Reports Coordinator [see inside front cover of this issue for address], and clearly marked as a Big Day report. All 2007 Big Day reports must reach Randy Hoffman no later than 15 January 2008 to be included in *The Passenger Pigeon* report on Big Days 2007.

Gray Krogman captured a Peregrine Falcon in mid-scratch.

Scott Franke caught this male Northern Harrier in flight.

Lark Sparrow found by Gary Krogman.

"From Field and Feeder"

Observations of unusual behavior or fascinating occurrences concerning Gyrfalcon and Common Grackle.

A Story of Gyrfalcon Interactions

11 December 2005, on Chequamegon Bay near Ashland, Ashland County, Wisconsin—Something exciting happens nearly every day in the field, but few events will rival what I was fortunate to witness on Sunday afternoon, 11 December 2005. At the end of my daily check of the Ashland lakefront, I scanned the Chequamegon Bay breakwall on the east side of town and spotted a distant Snowy Owl far out on the ice. As I studied it, a feathered shape blazed through my scope view. I got on it with my binoculars and quickly realized it was the local Gyrfalcon on a beeline for something, but I wasn't sure what. The Gyrfalcon stooped . . . then stooped again. A second Snowy Owl was under attack.

After a few passes the Gyrfalcon let up and perched on some bay ice about 100 yards from the nearer snowy and a few hundred yards from the farther owl.

Moments later the nearer snowy took flight and the Gyrfalcon would have none of that. The Gyrfalcon again took direct flight at the owl and knocked it to the ground. With each stoop from the falcon, the owl ducked to avoid contact or jumped up talons first to protect itself.

Satisfied snowy #1 wasn't going anywhere, the Gyrfalcon peeled off and made another beeline for the more distant Snowy Owl. In my scope, I had both Snowy Owl #2 facing me and the Gyrfalcon low in flight headed for it. As the Gyrfalcon approached, the Snowy Owl exhibited a typical defensive posture—body bent forward as it stood tall with feathers puffed out and wings spread open.

The Gyrfalcon approached but no contact was made. On the second stoop, the owl leaped with feet outstretched and the Gyrfalcon retreated.

You'd think that would be enough fun for one day but not so for this Gyrfalcon. He wanted more. When he peeled off Snowy Owl #2, he again took low direct flight toward something but again I didn't know what. So I panned my scope to the left and found the next target—a coyote that had been lounging out on the ice. "Is this Gyrfalcon really going to take a shot at this coyote," I thought. Yep, he did. And boy was he lucky. As he stooped on the coyote, the coyote jumped up and took a swipe at him. Even this wasn't enough to deter the feisty Gyrfalcon. Another pass . . . and

another pass. Then the Gyrfalcon actually perched on the ground not 20 yards from the coyote. The coyote ran over and the Gyrfalcon flushed but didn't move far. The coyote then made another pursuit and the Gyrfalcon flushed one last time.

The Gyrfalcon took flight en route for the breakwall and, after a few final passes at Snowy Owl #2, which was now perched on the end of the breakwall, things settled down. He too alighted on the rock wall and proceeded to preen and rest for a while. After an hour or so, the Gyrfalcon flew out to a random spot on the ice and began feeding on what appeared to be a prey item cached in the snow. That's where he stood when I finally left him, a full two hours after the saga began.

I feel very fortunate to have been afforded such a raw glimpse into the awesome world of these amazing birds.—*Ryan Brady, Ashland, WI.*

Unusual Common Grackle Nesting

August 2005, Lake Oahe, South Dakota— Every birder who has spent thousands of hours in the field each year has seen certain abnormal behavior in birds from time to time; or at least behavior that might be normal for the bird but not normally observed by the birder.

That was the case in August of 2005 when I was actually fishing instead of birding on Lake Oahe in South Dakota. Lake Oahe is a 350,000 acre impoundment on the Missouri River and supports the largest underwater forest in the western United States. When the dam was completed in 1961, millions of cottonwood trees that lined the Missouri River from Garrison, North Dakota to Pierre, South Dakota became submerged by 100 or more feet of water.

Since that time, severe droughts have lowered the water levels by more than 30 feet, exposing tree tops and snags at just about every bend in the old river channel. These trees are prime areas for walleyes and other fish that hang out by the trunks. The exposed tops, in turn, are used by woodpeckers, starlings, kingbirds and Tree Swallows, all of which are eager to show their displeasure at any fisherman who gets too close to their nests.

While contentedly catching walleyes by such a grove of trees on 5 August, I kept seeing a Common Grackle fly from the shore out to a single snag, then back to shore again. Since the surface of the lake was covered with swimming grasshoppers, I assumed the bird was out there catching food, then flying back to shore to a nest.

As I got nearer to the tree, however, I noticed a cavity that was about five-inches across and the head of a bird peering out at me. It had big yellow "lips" which identified it as a hatchling. Peering into the cavity, I was surprised to see three Common Grackle chicks, their mouths wide open, gaping for food.

I had never seen nor heard of Common Grackles nesting in tree cavities, but more surprising to me was the fact that this particular tree stood alone a good 250 meters from shore! I quickly steered the boat away from the tree and began fishing a distance away, but watched with binoculars as both adults continued to catch grasshoppers along the shoreline, then fly out to the tree to feed the three youngsters.

Often, on their flights back to shore, they would drop a fecal sac into the water.

I wondered if this type of nesting behavior was unique to the western prairie where trees and brush were scarce and grackles as well as other birds had to make do with whatever habitat was available. So when I arrived back in Wisconsin, I decided to find out if anyone had ever observed such behavior in the Badger State where there was abundant nesting habitat for Common Grackles. Certain that I had just witnessed something that no one on earth has ever seen, I decided to post the sighting on the internet to see what kind of response I would receive. I quickly learned that I wasn't the only person who has seen unusual nesting behavior in Common Grackles as well as other birds.

Tom Erdman, from Green Bay, Wisconsin had this to say about his experience with Common Grackles: "Grackles are amazing and very adaptive. I've seen cavity nests, mud nests in trees and shrubs (mostly conifers), and also with well-woven plant-material nests in cat-tail marshes. They've been in kestrel boxes (or flicker) too. The most strange was a small colony of 6–8 pairs which were nesting in the bottom of an active Bald Eagle nest on Lobstick Bay in the Lake of the Woods."

Laura Erickson from Duluth also has seen Common Grackles nesting in the bottom of large raptor nests; she wrote that "I've three or four times seen grackles nesting in the bottom sticks of osprey nests."

Erdman and Erickson's sightings confirm what is in John Terres' *The Audubon Society Encyclopedia of North American Birds* concerning the nesting habits of Common Grackles: "Singly or in colonies up to dozens of pairs in tall ornamental evergreen trees of country lanes or city parks, also in elms, maples, etc., cedars of hillside pastures, in cattail marshes, *in holes of trees or stumps* (emphasis mine), in willow swamps, in old buildings and in *lower parts of ospreys' nests* (again, emphasis mine) . . ."

I was surprised to see that Terres included "holes of trees or stumps" in his remarks about nesting grackles, but did not include artificial nest boxes as reported by Erdman or Dennis Haessly from Waushara County, Wisconsin, who wrote that "This is the first year (2005) that we had a grackle nesting in one of our kestrel boxes."

Another report of grackles nesting in a nest box came from Rick Pertile of Minneapolis: "I remember about six year ago (1999?) that a grackle nested in the martin houses my parents' neighbor had up in the Upper Peninsula of Michigan. I watched as the parents came and went with food for the young. The female would go completely into the box, but the male would only go in half way then back out."

These comments reminded me that I once saw a Common Grackle fly out of a Wood Duck box, but at the time I assumed it was foraging in the box and not nesting. I posed this question to a friend who monitors several dozen Wood Duck boxes a year and he said that he has seen cowbirds coming out of Wood Duck boxes. Could his "cowbirds" possibly be grackles or were they indeed cowbirds visiting Tree Swallow nests?

As a side note to these comments, Pertile added that "A few years back, a fellow employee at work told me she

had a Cedar Waxwing nesting in one of her birdhouses. I questioned this immediately and was very doubtful. She brought in a picture and it was in fact a Cedar Waxwing."

Another unusual story came from Joe Schaufenbuel of Stevens Point: "I found a cavity nesting Red-winged Blackbird once years ago (1980 in Iowa) and none since. Your find of a hole-nesting Common Grackle must be equally unusual. Through the intervening years, I have watched for similar nesting activity in red-wings and your observation is the closest I've come."

Cavity nesting in Common Grackles although occasionally observed, seems to be as unusual as it is rare. During the Wisconsin Breeding Bird Atlas conducted by more than 1,600 volunteers between 1995–2000, only one atlaser, R. Noske, confirmed a Common Grackle nesting in an artificial box in Forest County (*Atlas of the Breeding Birds of Wisconsin*, Cutright et al. 2006). None were recorded nesting in natural cavities.

As Tom Erdman points out, "Grackles are amazing and very adaptive." Common Grackles were one of my favorite birds as a youngster, and remain so today. I consider it a special gift to have been able to observe them in this unusual nesting behavior and look forward to the next surprise our avian world has in store for me.—*Daryl Christensen, Montello, WI.*

Eastern Meadowlark
by Seth Cutright.

50 Years Ago in *The Passenger Pigeon*

Until completion of the breeding bird atlas project, detail on the distribution of many Wisconsin breeding bird species was lacking. For a few species, questionnaires were used to solicit information on bird distribution from birders and other naturalists. The lead article in this issue summarized the results on a county by county basis of such a questionnaire and was supplemented with unpublished and published reports for Great Blue Heron colonies. Fifty-one active colonies, distributed statewide, were described for 1956.

The WSO always has had an interest in bird conservation, a tradition that continues today under the strong leadership by Bill Mueller. At the 7 May 1957, annual business meeting at Green Lake, three bird conservation issues were discussed. Owen Gromme suggested that the WSO go on record as recommending the purchase of Wallace Grange's Sandhill Game Farm. As we know today, this became a reality, with 9,150 acres in state ownership as a wildlife area. Those wishing to learn more about the Sandhill Game Area and the Grange era, please visit http://www.dnr.state.wi.us/org/land/wildlife/reclands/sandhill/Grangehistory.htm. This resolution was seconded by Charles Kemper, and it was passed.

Sam Robbins offered a resolution expressing WSO's opposition to any proposal to create an open hunting season on the Mourning Dove in Wisconsin. This resolution was seconded by Walter Scott and passed.

Dixie Larkin noted that DDT used to destroy the beetles carrying Dutch Elm Disease was killing many birds. Walter Scott felt that the right way to treat the elm disease without killing birds would be found. Legal Counsel Allan Simpson moved this matter be referred to the incoming officers and board of directors, and his motion was passed.

Excerpt from Vol. 19 (2), 1957 by WSO Historian Noel J. Cutright, 3352 Knollwood Road, West Bend, WI 53095. h. 262 .675. 2443, w. 262. 268. 3617, noel.cutright@we-energies.com.

Carolina Wren checking out a cavity was recorded by Gary Krogman.

Lessons From the Seasons: Summer 2006

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The first wild-hatched Whooping Crane chick in over 100 years is easily the top story from Wisconsin's bird haunts. In June, two chicks emerged from their confining shells to become instant celebrities among the conservation of endangered species crowd. This species has been the icon of endangered species protection since the population dipped to 15 birds in the late 1940s.

Whooping Cranes fall into a difficult category of rarity from which a conservation strategy can be developed. Four primary categories of rarity have been constructed. 1) species with small home ranges and small populations, such as island species like Laysan rails, Hawaiian honeycreepers, and Galapagos finches. This group by far forms the bulk of the World Conservation Union's (also know by ICUN) Critically Endangered category. 2) species with relatively high populations but limited to a few locations during critical times of the year. This group includes species like terns, alcids (especially the Great Auk) and egrets that may be jeopardized if a few nesting locations are lost. 3) species with large ranges and large populations that are vulnerable to habitat change. This group includes the Passenger Pigeon, which through a combination of habitat loss and excessive market hunting became extinct. 4) species with large ranges and very small populations. Whooping cranes fit this category with preEuropean settlement populations estimated between a few and several thousand.

The exhaustive history of Whooping Crane conservation is several books worth of information, but in essence revolves around the concept that extinction for this species is an unacceptable outcome. Little guidance on how to prevent the potential loss of this icon was in place in the 1940s. Scientists needed to try things. A blank slate was not the starting point because we knew habitat and individual bird protection were critical.

In one paragraph the conservation strategy is summed. First we need to find the nesting areas and understand the breeding biology. Discovering that two eggs were laid, but usually only one chick survived, led to second egg collection and eventually a captive breeding program. A few excess eggs permitted experimenting with a surrogate parent breeding program using

Sandhill Cranes, which failed. Discovery that imprinting young Canada Geese on ultralight aircraft can successfully be surrogate migration path instructors led to the second flock in Wisconsin.

The future looks good for successfully creating a second migratory flock. The next few years will determine if the optimism is justified or not. Regardless of the result of the second flock, birders should be very aware of the incredible perseverance of the conservationists and extraordinary financial commitment needed to prevent human-induced extinction.

Another phenomenon for the summer of 2006 was the statewide explosion of Dickcissels. As far as I could tell, Dickcissel reports came from 70 of the state's 72 counties. Every old field seemed to have a pair or more. I recorded a singing male from a 20 by 20 meter patch of weeds surrounded by parking lot. Remarkably unattractive habitat, but during super invasion years this was an example of how many birds were in the state.

Dickcissels provide another example of rare bird conservation. I know with a population estimated at 20 or more million birds, how can this remotely be considered a rare bird. Category 2 from above provides a clue. In the United States, Dickcissels are a wide spread breeder with Wisconsin lying at the northeastern limit of its range. Last summer's invasion most likely was due to the severe drought in the southern and central Great Plains. The species arrived about ten days late around the last few days of May, but they arrived en masse. Indications from other states did not reveal a population explosion.

Vulnerable concentrations do not occur during the nesting season, but on their wintering grounds. During migration and especially wintering birds in the llanos of Venezuela, Dickcissels form incredible huge and dense flocks. In the nesting season they eat primarily insects, but on their wintering grounds they are almost exclusively grain eaters. The size and extent are very reminiscent of blackbird flocks in southern United States. They forage in loosely aggregated flocks in the day, then go to the aggregated dense predictable roosts at night.

It is at the roost that Dickcissels are particularly vulnerable. A few Venezuelan rice farmers have aerially sprayed these roosts with pesticides. A single farmer has the potential to wipe out a substantial proportion of the world's population. A few dozen farmers acting in unison could eliminate most of the world's population.

Rare bird conservation is needed before the bird becomes rare. Conservation actions must account for the needs of the farmers. If they are not making a profit, they will most assuredly take it out on the birds. A fragile agreement is in place where the farmer's limit spraying, but that could change in a heartbeat. Diligence is paramount.

Different species require different conservation actions. The conservation of Dickcissels may not be as complicated or expensive as Whooping Crane conservation, but it is equally as important.

The Summer Season: 2006

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Fewer observers included comments about the summer's weather in their reports, fewer than I have received in any previous year. Most of this year's comments came from southern counties: Paul and Glenna Schwalbe, Columbia; Karen Etter Hale, Jefferson; and Daryl Tessen, several counties. What the Schwalbes described is consistent with observations made by the others. They reported that June was warm, with 14 days of 80 or above and 2 days reaching 88, with only 3 nights below 50 and 3 of 70 or above. Total June rainfall was 2.67 in., most of that during the last week; only 0.47 in. fell during the first 16 days. July was also very hot, with 26 days of 80 or above and 4 days above 90. The lowest night temperature was 56, and 8 nights were in the seventies. July rainfall was 3.2 in. total, but with less than 0.5 in. during the first 10 days of the month. Janine Polk, from the Dunn/Eau Claire County area, observed that it was "dry in this part of the state; many ponds and marshes are low or completely dried up."

Illustrating the impact of seasonal passages of weather fronts on migration, John Idzikowski referred in a 2 July WisBirdNet e-mail to the appearance of a variety of shorebirds at the Milwaukee Coast Guard impoundment "coming in on last night's front," stating: "This is at least a week earlier than previous years for this kind of July diversity and numbers."

Observers recorded 258 species during the season. The account that follows gives details on 168 of them. An additional 68 species that are not mentioned were common and widespread enough to be reported from more than 25 counties. The remaining 22 species, generally noted in 10–25 counties, are listed here, along with the number of counties in which each was recorded: Green-winged Teal (12), Hooded Merganser (17), Ring-necked Pheasant (20), Pied-billed Grebe (20), American Bittern (12), Cooper's Hawk (23), Broad-winged Hawk (22), Virginia Rail (13), Sora (15), Ring-billed Gull (21), Herring Gull (12), Black-billed Cuckoo (23), Great Horned Owl (12), Barred Owl (13), Whip-poor-will (15), Horned Lark (22), Purple Martin (23), Blue-gray Gnatcatcher (25), Hermit Thrush (20), Golden-winged Warbler (13), Yellow-headed Blackbird (13), and Brewer's Blackbird (19).

Rarities

Observers located a large number of rarities during the season. Among these, three species are worthy of special note. One was the White-winged Dove; in only 5 previous seasons, including summer 2000, have observers documented this rare visitor to Wisconsin. This year's bird was relatively easy to find in a residential neighborhood of Green Bay. Another rarely encountered species was the Kirtland's Warbler. A few birders who searched this year the Jackson County area where Janine Polk found 3–4 last summer were able to find birds, in some cases having excellent opportunities both to hear and see them. Another very rare species (having been recorded in only 6 summers since 1984) was a Chuck-will's-widow heard very well in Jackson County in July.

Although less rare, a number of additional species, some out of season, helped to make this an interesting summer season: Red-necked Grebe, Snowy Egret, Yellow and King Rails, Piping Plover (seen by many observers, in several locations), American Avocet, Willet, Whimbrel, Hudsonian Godwit, Red-necked Phalarope, Laughing, Little, Thayer's, and Lesser Black-backed Gulls, Snowy Owl (2–3 individuals), Great Gray Owl, Scissor-tailed Flycatcher, White-eyed Vireo, Boreal Chickadee, Northern Mockingbird, Yellow-throated, Prairie, and Worm-eating Warblers, Summer Tanager, and Nelson's Sharp-tailed Sparrow.

Other Features of the Season

Perhaps the season's most striking phenomenon was the major invasion of Dickcissels, the largest we have experienced in a number of years. Five far northern counties were among the 41 where birders encountered this species, and observers who took the time to count them could find as many as a hundred or more in a short morning.

Another phenomenon, not unique to this season, was the presence of "northern" warblers in southern counties well into June. Responding to someone in Milwaukee County reporting both Parula and Pine Warblers on 28 June, Idzikowski offered a helpful possible explanation: "Add Mourning, Black-throated Green, Blackburnian, Northern Waterthrush, Nashville, and Canada to Parula and Pine [Warblers] and you have the list of occasional/attempted breeders and June lingerers ranging all the way south to the moist shaded ravines with sandy soil and especially with a few pines along the lakeshore to Racine County or inland in bog forests and swamps of sufficient size. These occurrences match the southern extent of "northern" vegetation along the lakeshore delineated by Curtis's plant 'tension zone'."

County Coverage

The "Contributors and Cited Observers" section of this report looks very different from what it did even a few short years ago. This summer's list contains 102 names, but only 31 of those people submitted anything like "traditional" reporting forms. Each of about 20 of those people submitted such a form for a single county, and each of about 10 more submitted such forms for multiple counties (at least 2, but up to 5, 8, or, in the case of the in-

defatigable Kay Kavanagh, 18 counties!). Data of these kinds submitted electronically, via e-mails to Bird Reports Coordinator Randy Hoffman, added results from 2 more individuals and 4 counties.

Examining this year's single- and multiple-county reporting forms confirms what we already suspect: there is a huge difference in "coverage" our counties receive. We can illustrate with some county totals for summer 2006. Observers in 13 counties reported 100–140 species each. Other county totals break down this way: 7 counties produced 90–99 species each, 5 produced 80–89 species, 7 produced 70–79 species, 5 produced 60–69 species, and 7 produced 50–59 species. Without even trying to establish what would constitute "reasonable" coverage, we soon realize that more than 40% of our counties yielded fewer than 50 species this year. Knowledge of the nature of the reports actually received, electronically and otherwise, shows that for each of the many relatively unrepresented

counties, the number of species reported ranges downward from a half-dozen or less all the way to zero.

I concur with the sentiment sometimes offered in these pages that we should be careful not to produce a very short list of non-reporting counties, lest that assertion mislead readers to think that we in fact have "legitimate" claim that we do a great job of providing pretty comprehensive coverage of most of our counties.

As I consider the reports we received from the "Cited Observers" who did not submit formal county lists (about 57 individuals) and reflect on their contributions, several questions come to mind: (1) Why didn't they submit more formal reports?, (2) Would/did they have problems submitting county reports using the forms available on the WSO website? (3) Do some individuals really prefer not to use electronic means to submit reports? (4) Do they simply have too little time and/or inclination to submit a comprehensive county report?

A high proportion of the reports included in the Seasonal Summary simply came via e-mails voluntarily sent to WisBirdNet, some of them in e-bird format. Such e-mails often constituted one of very few reports of a species and/or from a county. Other important e-mails made use of protocols inviting observers to submit reports, including documentation if required, via WSO Rare Bird Long or Short Forms.

Records obtained via electronic means, therefore, constituted an important part of Wisconsin's 2006 seasonal record, and it is clear that increasing use of them will continue to enrich the knowledge of our avifauna. I have only one caveat, based on my observation that at least for the summer season, over the course of the last 4–5 years, many observers who formerly faithfully submitted single- and/or multi-county reports no longer do so. I can identify no less than 15 individuals who formerly were and now no longer are on our Contributors list. Not only are their counties now much more poorly represented, but the particular genius they displayed, in what they chose to explore and the significance of what they found, is sorely missed. I do not know why they are not currently contributing, but in case the reason might have something to do with our ever-increasing emphasis on handling records electronically (which I applaud), I would make a plea that we be sure not to discourage people from submitting records in "traditional" ways.

Reports
(1 June–31 July 2006)

Trumpeter Swan—Reported from Burnett and Douglas (Semo), Dodge (Tessen), Forest (Kavanagh), Grant (Romano), Jackson (Meyer), St. Croix (Persico), Washburn (Haseleu), and Wood (Meyer and Tessen) Counties.

Tundra Swan—One was present in Ashland/Bayfield County 11 June–10 July (Brady).

Gadwall—Up to 3 were in Ashland/Bayfield County 15 June–8 July (Brady). Also noted in Burnett (Haseleu), Dane (Thiessen), Dodge (Frank), Fond du Lac (Kavanagh), Manitowoc (Sontag), and Winnebago (Ziebell) Counties.

American Wigeon—Observed only in these counties: Ashland/Bayfield (Brady), Dodge and Fond du Lac (Kavanagh), Manitowoc (Sontag), and Oconto (Smiths).

American Black Duck—Observers reported this species from only 6 counties: Dodge, Manitowoc, Milwaukee, Racine, Sheboygan, and Winnebago.

Northern Shoveler—Noted in Ashland/Bayfield, Dane, Dodge, Manitowoc, Ozaukee, Walworth, and Winnebago Counties.

Northern Pintail—Reported only from Ashland/Bayfield (Brady), Burnett (Haseleu), and Dodge (Frank) Counties.

Canvasback—These 2 counties provided the season's only observations: Ozaukee (Frank) and Winnebago (Knispel and Ziebell).

Redhead—Observed in Ashland/Bayfield, Dodge, Fond du Lac, Manitowoc, Marinette, Vilas, and Winnebago Counties.

Ring-necked Duck—Noted only in these counties: Ashland/Bayfield, Burnett, Douglas, Forest, and Jackson.

Greater Scaup—Observers found these in Ashland/Bayfield, Manitowoc, and Oconto Counties.

Lesser Scaup—Noted in Ashland/Bayfield, Dodge, Marathon, Monroe, and Winnebago Counties.

Bufflehead—No reports this season.

Common Goldeneye—Found in Ashland/Bayfield (Brady), Door (the Lukes; a brood), Manitowoc (Sontag), Racine (Gustafson), Sawyer (Polk; a brood), and Sheboygan (Evanson) Counties.

Common Merganser—Reported only from Door (the Lukes, Semo), Douglas (La Valleys), and Winnebago (Ziebell) Counties.

Red-breasted Merganser—Observed in these counties: Door (the Lukes; hen and 19 ducklings on 7 July), Marinette (Campbell; 19 on 1 July), Ozaukee (Frank), and Racine (Gustafson).

Ruddy Duck—Reported from fewer counties than in recent years: Dodge, Fond du Lac, Manitowoc, Trempealeau, Walworth, and Winnebago.

Gray Partridge—No reports this season!

Ruffed Grouse—As recently as 1999 and 2000, this species was reported from more than 25 counties. The year's 11 counties is closer to the norm of the last 3–4 years.

Spruce Grouse—No reports this year.

Sharp-tailed Grouse—Reported only from Douglas County (La Valleys, Johnson).

Greater Prairie-Chicken—Observed in Portage County in early June (Prestby, Tessen).

Northern Bobwhite—Nearly all of this year's 11 reporting counties are ones where one might expect to find this species.

Common Loon—Bush observed 2 juveniles on Lake Mendota, Dane County, on 4 June. Hale reported that again this year, a bird summered in Jefferson County. None of the remaining 16 reporting counties were unusual.

Horned Grebe—For 15 years observers have provided no more than 1–2 records of this species. This year, a bird in breeding plumage was very close to shore in Ozaukee County on 7 July and 29 July (Frank). Other birds were reported from Door (the Lukes), Douglas (La Valleys), and Manitowoc (Sontag) Counties.

Red-necked Grebe—Ziebell counted 21 on 15 June in Winnebago County. Other reports came from these counties: Burnett (Haseleu, Semo), Door (Tockstein), Fond du Lac (Schwartz), and Manitowoc (Baumanns).

American White Pelican—As the number of reporting counties rises (13 this season), so does the number of individuals recorded. Ziebell counted no less than 660 in Winnebago County on 15 June, and other observers reported from one to several hundred in several other locations; these higher counts tended to be from counties bordering Lake Michigan. And as last year, enough birds summered at Horicon Marsh to afford birders ample chances to see them there.

Double-crested Cormorant—Ziebell estimated no less than 3400 to be present in Winnebago County on 13 June. This species was reported from 17 additional counties.

Least Bittern—Noted in only 8 counties this season: Ashland/Bayfield (Brady; present again this year but breeding not confirmed), and Dodge, La Crosse, Manitowoc, Oconto, Ozaukee, Sheboygan, and Waukesha.

Great Egret—Reported from somewhat fewer counties (17) than in some recent years. Ziebell estimated no fewer than 450 to be present in Winnebago County on 13 June. Some observers were fortunate to see large numbers in the Horicon Marsh area, and Thometz estimated over 100 at the Trempealeau Wildlife

Refuge on 27 July. Several observers reported over 20 in the Manitowoc area. Brady noted one in Iron County on 26 July.

Snowy Egret—Baumanns first reported 2 birds in Brown County 9 June, and other observers continued to see them there well into July. Additional reports came from Dodge and/or Fond du Lac (Motquin) and Winnebago (Sykes) Counties.

Cattle Egret—The only report came from Ziebell, who noted that this species was seen through 7 July in Winnebago County.

Black-crowned Night-Heron—Ziebell tallied 840 in Winnebago County on 13 June. Up to 40 birds were noted in Manitowoc County on 22 July (J. Holschbach). Observed in 10 counties in all.

Osprey—Observed in 23 counties, with nesting reported from no less than 4 of them, including Milwaukee and Waukesha.

Sharp-shinned Hawk—Reported only from 6 counties (Door, Douglas, Florence, Green, Marinette, and Winnebago), considerably fewer than usual.

Northern Goshawk—Noted only in Door (the Lukes) and Florence (Kavanagh) Counties.

Red-shouldered Hawk—The only reports came from just 7 counties: Grant, Green, Iowa, Outagamie, Sauk, St. Croix, and Waukesha.

Merlin—Observed in these 8 counties: Door, Douglas, Florence, Langlade, Lincoln, Marinette, Monroe, and Vilas.

Peregrine Falcon—Reported from Dodge, Jackson, La Crosse, Manitowoc, Marathon, Ozaukee, and Winnebago Counties.

Yellow Rail—Had Bob Howe not happened to visit the Thunder Lake State Wildlife Area near Three Lakes in mid-June after finishing field work in the Nicolet Forest, he would not have heard and recorded the 3 rails who happened to call there close to the road. This constitutes the summer's only report, because others who often search for this species either didn't try this season or had no success.

King Rail—Adults of this also elusive species, sometimes accompanied by young, were reported from several counties: Columbia (Prestby), Dodge (S. Cutright, Thometz), and Door (Schwartz).

Common Moorhen—Noted in these counties: Dodge, Fond du Lac, La Crosse, Walworth, and Waukesha.

American Coot—Reported from fewer counties than usual: Dodge, Fond du Lac, Jefferson, La Crosse, Manitowoc, Sheboygan, Walworth, Waukesha, and Winnebago.

Black-bellied Plover—Of the several counties reporting early June departures, the latest was Ashland/Bayfield (11 June, Brady).

Semipalmated Plover—Lingering birds were noted in these counties: Marathon 7 June (Belter), Ashland/Bayfield 15 June (Brady), and Manitowoc 20 June (Sontag). Some returning birds began to appear in several areas as early as 7 July (Milwaukee County, Prestby), with other arrivals stretching over the next 1–2 weeks. As often is the case, there are birds difficult to classify as coming or going, including birds in Milwaukee 25 June (Frank) and in Racine 27 June (Dixon).

Piping Plover—An incredible year for these! No less than 14 observers submitted reports. See "By the Wayside" for selected accounts. Matteson reported finding 4 nests in the Apostle Islands, with 4 of 5 hatched young having been banded, and Brady found 6 adults and 5 chicks on Long Island.

American Avocet—More reports than usual, from these counties: Milwaukee 22 June (Gustafson) and 9 July (Wood) and Dodge 14 July (Baumanns).

Solitary Sandpiper—Was a 2 June bird in Douglas County (Johnson) northbound— And how should we characterize a 15 June bird in Winnebago County (Ziebell)? Obviously returning birds appeared in several scattered locations 5–9 July.

Greater Yellowlegs—Returning birds appeared first in Manitowoc County 5 July (Sontag) and in 6 more counties within the next 4 days.

Willet—Observed in Milwaukee County 19–22 June (Frank, Gustafson, Jackson).

Lesser Yellowlegs—Lingered in Marinette County through 3 June (Kavanagh). Southbound birds showed up earliest in these counties: Manitowoc 21 June (Sontag), Ashland/Bayfield 24 June (Brady), Dane 29 June (Thiessen), and Jefferson 30 June (Hale).

Upland Sandpiper—Brady found 10 in Ashland/Bayfield Counties. Noted by others in these additional counties: Burnett, Door, Douglas, Grant, Iowa, Marinette, Monroe, Ozaukee, Portage, Walworth, and Waukesha.

Whimbrel—Noted in these 3 counties: Milwaukee 3 June (Lubahn), Manitowoc 24 June (Sontag), and Oconto 16 July (Smiths).

Hudsonian Godwit—One was in Manitowoc County 16 June (Sontag).

Ruddy Turnstone—Very few reports: Manitowoc County through 5 June (Sontag), on 24 June (Baumanns), and after 30 July (Sontag), Racine County through 2 June (Gustafson), and Winnebago County through 4 June (Ziebell).

Red Knot—There were reports of this increasingly scarce species from 2 counties: Milwaukee 19 June (Frank), 20 June (Jackson), and 24 June (Baumanns), and Racine 28 July (Weber, 6 birds).

Sanderling—Stragglers were noted in these counties: Manitowoc through 1 June (Sontag), Racine through 2 June (Prestby), and Sheboygan through 4 June (Frank). Returning birds appeared 10 July in Ashland/Bayfield County (Brady), with others 19 July in Oneida County (Brady). Further migrants showed up beginning about a week later.

Semipalmated Sandpiper—The latest spring departures were noted in Dodge County 14 June (Kavanagh), Manitowoc County 18 June (J. Holschbach), and 21 June in Ashland/Bayfield County (Brady). Southbound birds began to appear by 9 July in Racine County (Gustafson) and by 10 July in Ashland/Bayfield County (Brady), with no other locations reporting arrivals until over a week later.

Least Sandpiper—Birds lingered in several counties through the first week of June, latest ones being Waukesha (Gustafson, 6 June), Manitowoc (Sontag and Tessen, 7 June), and Dodge (Tessen, 8 June). Were 6 birds in Winnebago County 15 June (Ziebell) going or coming? The earliest southbound birds appeared 25 June in Milwaukee County (Frank) and 29 June in Dane County (Thiessen) and Manitowoc County (Sontag).

White-rumped Sandpiper—Reported from these counties: Ashland/Bayfield (Brady, through 17 June), Manitowoc (J. Holschbach, 17&18 June; Sontag, through 22 June), Milwaukee (Lubahn, 29 July), and Racine (Prestby, 1& 2 June).

Baird's Sandpiper—Last reported from 2 counties in mid-June, Dodge (Kavanagh) and Milwaukee (Idzikowski). Had returned to 5 northern counties by 19–22 July.

Pectoral Sandpiper—Two in Ashland/Bayfield County until 17 June might have been headed north or south (Brady). Appeared in several counties during the first week of July.

Dunlin—Departed from 3 southern counties during the first week of June. One was still in Ashland/Bayfield County 17 June (Brady).

Stilt Sandpiper—Reported from Ashland/Bayfield County 7 July (Brady and Oksiuta). Had appeared in 3 additional counties by mid-July, with birds being observed in several further locations by19–22 July.

Short-billed Dowitcher—The first birds of the season appeared in several southern counties during the first week of July. Birds were observed in 8 counties overall. The highest number of individuals reported from one location was 50, in Dodge County on 22 July (Tessen).

Long-billed Dowitcher—Noted only in Dodge County, on 14 July (Baumanns) and 22 July (Schwalbes, Tessen).

Wilson's Snipe—Observed in these 9 counties: Burnett, Dodge, Douglas, Marathon, Oconto, Price, Sawyer, Waukesha, and Winnebago.

American Woodcock—Reported from Door, Douglas, Florence, Manitowoc, Marinette, Ozaukee, Price, and Sawyer Counties.

Wilson's Phalarope—One was seen in Burnett County 23 June (Paulios). July reports came from Dane (McDowell) and Dodge (Frank, Tessen) Counties.

Red-necked Phalarope—Polk found the season's only reported bird of this species in a Dunn County pond on 28 July.

Laughing Gull—Sontag and Tessen saw a bird in Manitowoc County 6–7 June.

Franklin's Gull—Last summer produced but a single report. In contrast, this season 8 ob-

servers found birds in 4 counties, all bordering Lake Michigan.

Little Gull—After several summers of no reports, this season enabled 9 observers to find birds in Ashland/Bayfield, Manitowoc, and Sheboygan Counties. Shillinglaw noted 3 present in Sheboygan County on 2 July.

Bonaparte's Gull—Present throughout the season in several counties and for a significant part of the summer in several others. Reported from 5 counties in all.

Thayer's Gull—Present through 23 June in Manitowoc County (Sontag).

Lesser Black-backed Gull—Documented by several observers. See "By the Wayside." Present through the season in Manitowoc County (Sontag) and observed in Oconto County 25 June (Smiths) and in Sheboygan County 18 June (Wood).

Great Black-backed Gull—Multiple observers observed this species in both Manitowoc and Sheboygan Counties. Present throughout the season in Door County (the Lukes).

Caspian Tern—Present through most or all of the entire season in Ashland/Bayfield (Brady), Door (the Lukes), Manitowoc (Sontag), Milwaukee (Prestby), and Winnebago (Ziebell) Counties. Also reported from several additional counties, most bordering or not far from Lake Michigan.

Black Tern—Several observers reported good numbers of this species. Observed in 17 counties overall.

Common Tern—Reported from 7 counties, all but one bordering Lake Michigan or Lake Superior. Brady observed 135 in Ashland/Bayfield County on 9 June.

Forster's Tern—Present through the season in Manitowoc (J. Holschbach) and Winnebago (Ziebell) Counties. Matteson reported survey results showing over 250 nests present on Lake Poygan at the end of May. Other reports came from these counties: Dane, Dodge, Grant, Sheboygan, and Walworth.

Eurasian Collared-Dove—Observed in Grant County 2 June, in the Patch Grove area where this species has been found previously (Evanson).

White-winged Dove—Houston, Tessen, and Wood could see easily (and Belter could photograph) a Brown County bird which spent time (at least 4–6 July) in a Green Bay neighborhood. See "By the Wayside."

Yellow-billed Cuckoo—Of the 24 reporting counties, the most northern ones are Burnett, Florence, Marathon, Marinette, and Washburn.

Eastern Screech-Owl—The season's most unusual observation of the species was of one bathing in the Lukes' Door County birdbath on 21 June. Also reported from Milwaukee County 8 June (Vargo), Ozaukee County 4 June (Frank), and Winnebago County 1 June (Knispel) and 3 July (Bruce).

Snowy Owl—One was photographed 26–28 July in Park Falls, just south of the Ashland/Price County line (Tom Nicholls, fide Brady). Joan Grant reported a dark-plumaged bird in downtown Green Bay on 16 July (fide Nancy Bohm). Scott Baughman found one 4 July in Fond du Lac County, and another (?) bird was reported via a photo in the Sheboygan Press. It's not known whether these last mentioned birds could be the same individual. One bird or 2, both were very white, in contrast to the Green Bay bird.

Great Gray Owl—Although Brady could not duplicate the extensive searching to see how many birds might remain following last year's big winter invasion, he did learn of reports this summer (via J. Van Stappen) of at least 3 birds in Ashland/Bayfield County.

Long-eared Owl—Brady reported that a pair nested in Bayfield County and fledged 3+ young. Other reports came from Marquette County 13 June (2 birds, Prestby) and from Burnett County 24 June (Paulios).

Short-eared Owl—At 5:15 AM on 4 July in a Waukesha County spot known as a wintering area of this species, Bielefeldt was pleasantly surprised to see one of these. Also noted in Portage (Tiede and Van Den Brandt) and Winnebago (Bruce) Counties.

Northern Saw-whet Owl—June observations came from Burnett (Paulios) and Douglas (Johnson and Semo) Counties.

Common Nighthawk—This year's 10 reporting counties compares to an annual 18–20+ since 2000. The sample size is small, but a number of observers commented on the fewer birds

they heard this year than they recall in at least some recent years.

Chuck-will's-widow—Jackson described well one that he heard in Jackson County on 3 July. See "By the Wayside."

Red-headed Woodpecker—Year to year comparisons may not provide dependable information about trends, but this year's 22 reporting counties is less than last year's 30.

Red-bellied Woodpecker—Among the 32 reporting counties, the most northern were Douglas (Semo), Florence and Marinette (Kavanagh), and Oconto (Smiths).

Yellow-bellied Sapsucker—Of the 19 reporting counties, the only ones that were not northern were Grant (Kavanagh), Iowa and Sauk (A. Holschbach), and Trempealeau (Thometz).

Black-backed Woodpecker—Brady found 3 birds in different parts of Iron County in June. Birds were observed in Forest County 13 June (carrying food; Prestby) and 26 June (Kavanagh).

Olive-sided Flycatcher—Reported from 3 counties: Douglas (La Valleys), Iron (Brady), and Vilas (Prestby).

Yellow-bellied Flycatcher—Gustafson found late migrants in Waukesha (1 June) and Racine (2 June) Counties. In his extensive survey of Iron County, Brady found large numbers, totaling close to a dozen or more on each of 4 different mornings. Reported from a total of 13 northern counties.

Acadian Flycatcher—Reported in these 13 counties: Dane, Grant, Green, Iowa, Jefferson, Manitowoc, Monroe, Ozaukee, Richland, Rock, Sauk, Walworth, and Waukesha.

Alder Flycatcher—As is usual, most of the 35 reporting counties were northern. Migrants often linger well into June in more southern counties, but typically a few birds remain in such locations through the season, e.g. this year in Green (Evanson), Ozaukee (Frank and Mueller), and Waukesha (Gustafson) Counties into July and beyond.

Willow Flycatcher—Reported from 27 counties, including these northern ones: Douglas (Johnson), Marathon (Belter), and Oconto (Smiths).

Scissor-tailed Flycatcher—An accommodating bird provided a treat 13–15 June for several Door County birders (Leeder, Peters). See "By the Wayside."

Loggerhead Shrike—The only report, of 3 birds including one young, came from Oconto County 25 July (Smiths).

White-eyed Vireo—This season's 3 reports were all on 2–3 June, in Racine (Gustafson), Green (Wood), and Walworth (Nowak) Counties.

Bell's Vireo—Seen and/or heard by at least 11 observers in these counties: Dane, Eau Claire, Green, Iowa, Jefferson, Marquette, Trempealeau, and Winnebago.

Yellow-throated Vireo—Among the 31 reporting counties, the most northern ones were Burnett and Washburn (Haseleu), Douglas (Johnson), and Florence, Forest, and Marinette (Kavanagh).

Blue-headed Vireo—Two birds in Walworth County 13 July were unusual (Gustafson). The 11 other reporting counties were all northern ones.

Gray Jay—Brady confirmed breeding in Iron County. There were no other reports.

Common Raven—Paulios explored the Goose Lake State Wildlife area in extreme eastern Dane County on 2 June. One hour's time yielded 28 species, including 3 Acadian Flycatchers, a Western Meadowlark and—most surprising—a Common Raven being harassed by blackbirds. Ravens were reported from 19 additional mostly northern counties.

Boreal Chickadee—Breeding was confirmed in Forest (Prestby) and Iron (Brady) Counties.

Tufted Titmouse—Reported only from these 9 counties: Clark, Columbia, Dane, Green, Iowa, Jefferson, Sauk, Walworth, and Waukesha.

Red-breasted Nuthatch—The 30 counties in which this species was found included these southern ones: Columbia, Dane, Iowa, Jefferson, Milwaukee, Sauk, and Waukesha.

Brown Creeper—Noted only in these 5 counties: Door (the Lukes), Douglas (Johnson

and Semo), Florence (Kavanagh), Ozaukee (Frank and Mueller), and Washington (Frank).

Carolina Wren—Reported from no less than 6 counties: Crawford (Semo), Dane (Martin), Jefferson (Hale), Milwaukee (multiple birds; Bontly, Huf, and Vargo), Rock (Rohde), and Waukesha (Moretti).

Winter Wren—Among the 13 reporting counties were these more southern ones: Ozaukee (Mueller) and Sauk (A. Holschbach).

Marsh Wren—Ziebell found 350 in Winnebago County 15 June. Reported from 22 counties in all.

Golden-crowned Kinglet—Prestby reported over 20 in Forest and Vilas Counties 13 June. Noted in 6 additional counties within normal range.

Ruby-crowned Kinglet—Dixon had the chance to watch one loosely associating with a group of chickadees in his Kenosha yard on 11 June. He had 20 minutes to hear its scolding chatter and watch it as it raised its ruby crown. All the other reports came from more expected counties: Forest and Vilas (Prestby), Iron (Brady), and Oconto (Smiths).

Eastern Bluebird—We tend not to get from observers information that lets us track with any confidence how well this species is doing. The number of reporting counties varies for multiple reasons. This year's number is 37, not far from the average of recent years.

Swainson's Thrush—Idzikowski heard a late migrant singing in Milwaukee on 16 June. Reports from normal breeding range came from Douglas (La Valleys), Iron (Brady), and Price (Kavanagh) Counties.

Wood Thrush—Reported from 34 counties, including a fair number of northern ones.

Northern Mockingbird—Reported only from the far north, in Ashland County 7 June (Oksiuta) and Bayfield County 9 June (Jim Lind fide Brady).

Blue-winged Warbler—Of the 18 reporting counties, Marathon (Belter) and Oconto (Smiths) were the most northern.

Tennessee Warbler—Lingered until 1 June in Waukesha County (Gustafson). Was one in Marinette County 1 July just way out of place (Campbell)? Early migrants were in Burnett (Brady) and Portage (Schaufenbuel) Counties 24 July.

Nashville Warbler—One was in Milwaukee County 16 June (Bontly). Three were in the Cedarburg Bog, Ozaukee County, on 2 July (Mueller). The remaining 21 reporting counties were in the central and northern part of the state.

Northern Parula—Present in Milwaukee County 2 June–21 July (Bontly). Also reported from 13 central and northern counties.

Chestnut-sided Warbler—Reported from 29 counties. While the majority of the reports came from northern counties, there was a good representation from more southern locations.

Magnolia Warbler—This season's records came from these counties: Door, Douglas, Forest, Florence, Lincoln, Marathon, Marinette, Rusk, and Vilas.

Cape May Warbler—The only observations were in Douglas (La Valleys) and Vilas (Prestby; at least 8 on 13 June) Counties.

Black-throated Blue Warbler—Birds were singing 4 June in Kenosha County (Dixon) and 3 June in Walworth County (Jacyna). Reported later from these counties: Door (the Lukes), Douglas (Johnson and Semo), Forest, Florence, and Marinette (Kavanagh), Iron (Brady), and Vilas (Prestby).

Yellow-rumped Warbler—Reported from 13 central and northern counties.

Black-throated Green Warbler—Present in Manitowoc County through 25 July (J. Holschbach), in Sauk County through the season (A. Holschbach), in Sheboygan County through 4 July (Frank), and in Waukesha County through 16 July (Gustafson). There were single day observations in Milwaukee County 7 June (Bontly) and Ozaukee County 11 June (Mueller). The remaining 13 reporting counties were within normal range.

Blackburnian Warbler—Present through 20 July in Sauk County (A. Holschbach). Mertins found 4 fall plumage birds in Vernon Marsh, Waukesha County, on 29 July. All other reports came from 10 northern counties.

Yellow-throated Warbler—Reported in June from Grant (Kavanagh and Semo) and Waukesha (Gustafson and Prestby) Counties.

Pine Warbler—Present through the season in Sheboygan County (Prestby). Also reported from Milwaukee County 27 June (Bontly), from Walworth County 11 June (Jacyna), and from Waukesha County through 3 July (Gustafson). Noted in 18 additional counties representing normal range.

Kirtland's Warbler—Following last summer's extensive search by Polk of suitable Jackson County habitat, she and several other birders (Belter, Hoffman, Prestby, and Tessen) explored that and adjacent habitat, finding no less than 3 singing males, sometimes favored by excellent conditions for seeing as well as hearing them. See "By the Wayside." Meanwhile, in far-away Marinette County, Kavanagh found and also could hear and see very well a singing male on 9 June.

Prairie Warbler—Kohler-Andrae State Park, Sheboygan County, was again the favorite place to search for this species. Among several observers who reported it this year, some provided good descriptions (Brassers, Frank, Wood). Although several people thought they may have heard more than one bird, no one ever found a second.

Palm Warbler—Reported from these counties: Douglas, Iron, Lincoln, and Vilas.

Bay-breasted Warbler—Gustafson found a straggler in Waukesha County 1 June.

Cerulean Warbler—Belter found one in Marathon County 7 June. Other reports came from Columbia, Grant, Jefferson, Rock, Walworth, Waukesha, and Waushara Counties.

Black-and-white Warbler—Reported from 28 counties overall, most of them more northern. A 9 June report from Grant County reminds us that even a very southern county can harbor this species in summer, and it's not unusual some years (like this one) for June birds to be found in counties like Milwaukee, Sheboygan, and Waukesha.

Prothonotary Warbler—Observed in these counties: Grant (Kavanagh and Semo), Iowa (A. Holschbach), Jefferson (Hale), Outagamie (Petznick), Rock (Yoerger), and Sauk (A. Holschbach).

Worm-eating Warbler—The only report submitted was of a "small mostly non-descript light brown bird with striking yellow-buff and black striped crown" seen on the Scuppernong Springs nature trail in Waukesha County 30 June (Mertins).

Northern Waterthrush—Noted in Door, Douglas, Florence, Lincoln, Marathon, Marinette, Oconto, Ozaukee, Rusk, and Waupaca Counties.

Louisiana Waterthrush—All reports came from Eau Claire (Polk), Grant (Kavanagh and Semo), and Sauk (A. Holschbach) Counties.

Kentucky Warbler—There were reports from 3 counties: Dane 2 July (Evanson), Douglas 26 June (Johnson), and Grant (Kavanagh and Semo).

Connecticut Warbler—Recorded in more counties than in recent years: Douglas (Johnson, La Valleys, Semo), Langlade (Soulen, Richmond), Monroe (Lichter), and Marinette (Kavanagh).

Mourning Warbler—Present throughout the season in Milwaukee County (Bontly). Noted also in Columbia, Dane, Ozaukee, Jefferson, Manitowoc, Racine, Sheboygan, and Waukesha Counties, as well as in 15 central and northern counties.

Hooded Warbler—Reported from these counties: Dane, Jefferson, Ozaukee, Rock, Sauk, Walworth, Waukesha, and Wood.

Wilson's Warbler—Observed in early June in Door (the Lukes), Douglas (Johnson), and Iron (Brady) Counties.

Canada Warbler—Noted in Manitowoc County 10 June (J. Holschbach) and in Milwaukee County 11 June (Huf). Two were present in the Cedarburg Bog, Ozaukee County, on 29 June (Mueller). Still present in Sauk County on 2 July (A. Holschbach). Observed also in 8 counties much further north.

Yellow-breasted Chat—Reported from 5 counties, often by multiple observers: Dane, Green, Marquette, Milwaukee, and Kenosha.

Summer Tanager—An adult male was seen well and heard by Bontly17–19 June in Milwaukee County. She suggests this might be the same bird that had been seen in mottled plumage several times this spring at the Schlitz Audubon Center.

Field Sparrow—Among the 31 counties from which these were reported, the most

northern were Douglas, Florence, Marathon, Marinette, and Menominee.

Lark Sparrow—A. Holschbach found 9 on 30 June in Sauk County, where this species was present through the season. The only other reports were from Eau Claire County 22 June and Marinette County 28 June (Kavanagh) and from Jackson County 5 June (Christensen).

Grasshopper Sparrow—Among the 13 reporting counties, the most northern were Marathon in the east (Belter) and St. Croix in the west (Persico).

Henslow's Sparrow—Noted in 16 mostly southern counties. The highest number of individuals reported was 8 in Wood County on 6 June (Prestby).

Le Conte's Sparrow—Reported from 5 mostly northern counties: Burnett (Haseleu), Douglas (Johnson, La Valley, and Semo), Florence (Kavanagh), Jackson (Christensen), and Wood (Meyer, Brandle, and Prestby).

Nelson's Sharp-tailed Sparrow—Haseleu reported these from Burnett County on 8 June. Paulios reported 7 from there on 28 June.

Lincoln's Sparrow—Brady confirmed breeding in Iron County; he found 8 there on 26 June. Prestby found 20–25 in Forest and Vilas Counties on 13 June. Other reports came from Douglas, Lincoln, and Marinette Counties.

White-throated Sparrow—Present in Dane County 1 June (Martin). Four were in the Cedarburg Bog, Ozaukee County, on 26 June (Mueller). Present through much of the season in Manitowoc County (Sontag). All the remaining 12 reporting counties were northern and central ones.

Dark-eyed Junco—Noted only in these counties: Florence and Marinette (Kavanagh), Iron (Brady), and Forest and Vilas (Prestby).

Northern Cardinal—Among the 40 counties from which this species was reported, the most northern ones were Burnett, Door, Douglas, Florence, Forest, Marinette, and Washburn.

Dickcissel—A banner year, with reports coming from no less than 41 counties, among them such far northern ones as Burnett, Douglas, Forest, Florence, and Marinette. In addition to the widespread nature of this invasion, many observers remarked on the large number of individuals they found. A few who sampled numbers in their neighborhoods reported totals ranging from several dozen to over a hundred.

Eastern Meadowlark—Again this year, the number of counties in which birders found this species (35) was three times the number from which Western Meadowlarks were reported.

Western Meadowlark—Observers found this species in only 11 counties this year: Ashland/Bayfield, Douglas, Forest, Florence, Grant, Green, Iowa, Ozaukee, Portage, St. Croix, and Walworth. (Note the number of northern counties on this short list.) Last year, Evanson's survey of the 2 meadowlark species in Green County located 33 Easterns, compared to 22 Westerns. A survey he conducted this season gave an Eastern/Western ratio of 28 to 4.

Orchard Oriole—Noted in 14 counties this season. Quite a few observers remarked on multiple birds present, and a fair number reported evidence of nesting.

Purple Finch—Observed in 16 mostly northern counties.

White-winged Crossbill—Prestby found this species in Vilas County on 13 June.

Pine Siskin—Very few reports this season. Oldham saw one in her Milwaukee birdbath on 22 June. The other reports, also in June, came from Marathon (Belter) and Marinette (Kavanagh) Counties.

Evening Grosbeak—Present through the season in Douglas (La Valleys) and Florence and Marinette (Kavanagh) Counties.

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Bobolink by Scott Franke.

Tom Prestby recorded a Summer Tanager.

"By the Wayside"—Summer 2006

These documentations for rare species include Piping Plover, Lesser Black-backed Gull, White-winged Dove, Chuck-will's-willow, Scissor-tailed Flycatcher, and Kirtland's Warbler.

PIPING PLOVER
(*Charadrius melodus*)

18 June 2006, North mud flat area of the Manitowoc Impoundment, Manitowoc County—Saw two small light tan colored plovers . . . smaller than a Killdeer, and about the same size as Semipalmated Plover. They had a small round ball shaped head, with a football shaped body. The top of the head and the back and wings were all of light gray color. The primaries would be a darker black color. Their forehead between base of bill and front of eye was white along with the lower half of their face and front and sides of the body. They had a short and small white line above their eyes. From the front of their eye up on to the top of their head was a thin black stripe that made the white forehead stand out more. The back half of their face/head from behind their eye and back of head were also this light gray color. They had orange legs and one had two bands on. The one with bands on had one on each leg, one orange and the other dark or black. The base of their necks had a black band going around to the sides of their bodies. They also had a black chest band. One bird had solid black here and the other was almost faded in the middle. The bill was very short and pointed, and it was orange with a black tip.—*Seth Cutright, West Bend, WI.*

4 July 2006, Kohler-Andrae State Park, Sheboygan County—I walked north of the nature center and soon saw 3 shorebirds on the waterline about 30 yards in front of me. One was a Spotted Sandpiper and 2 were the sought-after Piping Plovers. I immediately noticed the very light gray back on both birds and the orange bill with a black tip. Both birds had a black line between both eyes and one bird had a full black breastband while the other's was present but very faded in the middle. The bird with the faded breastband had a red/orange band on its right leg and a black and a gray band on its left leg (Fig. 1). I contacted a graduate student who informed me that this bird was most likely born last year in the UP of Michigan. The other plover was unbanded. I watched and photographed them for the next hour as they fed and occasionally rested in the sand. They followed each other as if they were a pair.—*Tom Prestby, Wauwatosa, WI.*

Lesser Black-backed Gull (*Larus fuscus*)

June and July 2006, Manitowoc Harbor, Manitowoc County—The Lesser Black-backed Gull seems to have made Manitowoc more than just a place to "vacation" as both adult and subadult individuals have been found for over a year. The adult is easy to identify as it usually is found standing on the concrete breakwater just south of Waldo Blvd. The birds sport a dark gray black mantle and wings with jet black primaries. Because the feet tarsal bones are very long, the Lesser Black-backs stand as tall as the Herring Gull even though they are noticeably about 4–5″ smaller in size. The adults often have streaking in the head, nape, and sides. The feet are yellow in the adult, and the orange spot on the lower mandible is very large. If the individual is a first or second year bird, one must be careful to eliminate a California Gull as their plumages seem similar and certainly their size.—*Charles Sontag, Manitowoc, WI.*

25 June 2006, On south breakwater from North Oconto Causeway, Breakwater Park, Oconto, Oconto County—A darker-backed gull than Ring-billed and Herring Gulls. Bird was larger than a Ring-billed, but smaller than a Herring Gull (slightly), with yellow legs. The bird was an adult in late winter plumage, with a yellow bill with a single red gonyl spot on the lower mandible. The black back was not a dark, true black, but a black, dark gray tone and darker onto the primaries.—*Jerry Smith, Oconto, WI.*

18 June 2006, North Point, Sheboygan, Sheboygan County—This was a first-summer bird with dull, dark gray upperparts but with some brownish and pale gray edges on a few of the scapulars. The underparts were white, as was the head, but there were black irregular streaks on both. The wingtips were solid black and the tail was white with a thick black terminal band. There was a black smudge around the eye. The bill was black but had a hint of pale coloration at the base of the lower mandible. The legs were pale yellow. This bird was intermediate in size between nearby Ring-billed and Herring Gulls, but much smaller than a nearby Great Black-backed Gull. The bill of the Lesser Black-backed Gull was much thinner, less massive, and angular than that of the Great Black-backed Gull.—*Thomas C. Wood, Menomonee Falls, WI.*

White-winged Dove (*Zenaida asiatica*)

23–24 June 2006, One block southeast of the intersection of Highway 172 and Webster Avenue, Green Bay, Brown County—Is Mourning Dove size but has a shorter, non-pointed tail. It has a white, very long wing bar on the lower edges of its wings. When the bird flies, there is a very visible white wing patch and smaller white patches on the lower corners of its tail. Vocalization is very similar to the "who cooks for you" call of a Barred Owl.—*Ed Houston, Green Bay, WI.*

4 July 2006, in the vicinity of the Houston residence in Green Bay, Brown County—It was singing from a house roof. It remained there for one-half hour, at least. The dove was about the size of a Mourning Dove. It had obvious white on the wings while perched and a square tail. When it

flew once, easily visible was the white in midwing, with the outer wing tip area black. The tail had white and black when it flew. The almost constant "Barred Owl" call was also significant.—*Daryl Tessen, Appleton, WI.*

4 July 2006, Sugarbush Court, Green Bay, Brown County—I . . . observed this bird from my vehicle as it perched on a residential roof. It was about fifty yards away and I used 10x42 binoculars. It was easy to find because I heard the call I have heard many times in the desert southwest and immediately located the bird on the roof. It was overall pale brownish in color, not unlike a Mourning Dove, but lacked the black spots on the upperwing. Most noticeable was the white line at the bottom of the folded wing. This feature is not present on any other North American dove. Also quite striking was the thick turquoise orbital ring. A black patch on the face below the eye was more noticeable than on a Mourning Dove. There were no markings on the nape and no "collar," thus further eliminating Turtle Dove or Spotted Dove. The undertail was white but had a black terminal bar approximately where the undertail coverts terminate. The tail was rounded and short, unlike the long pointed tail of a Mourning Dove.—*Thomas C. Wood, Menomonee Falls, WI.*

[See Fig. 2.]

CHUCK-WILL'S-WIDOW (*Caprimulgus carolinensis*)

2 July 2006, Near the junction of Staffon and Kirck Roads, Jackson County, about 10 miles ENE of Black River Falls—I arrived at Staffon Rd. shortly before 8:30 PM and began slowly driving between Cemetery Road and Kirck Road. I would stop my car to get out and listen every quarter mile or so. At 9:20 I was about 3/4 mile east of Kirck Road when I heard the first Whip-poor-will call. I headed back toward Kirck Road and stopped about one-half mile away from the intersection. From this location I could hear a Whip-poor-will calling, but faintly heard another bird farther west. At this point I noticed that the call of the other bird was similar to the Whip-poor-will, but did not reach as high of a pitch on the ascending notes. I returned to my car and drove west. As I neared Kirck Road I could clearly hear the bird while I was driving. About 200 yards past Kirck Road the bird sounded like it was calling from about 50 yards directly south of my location on Staffon Road.

From this location I could clearly hear the loud whistle call of the bird. My notes written while at this location described the call as a low "tuc" followed by a very brief pause, then a very emphatic two syllable "Wee-Weeo," with a slight tailing off at the end of the second syllable. I was able to hear Whip-poor-will at the same time to compare the two calls. The Whip-poor-will's call sounded more like "Whip" or "Will," with emphasis on the first and third syllables. The Whip-poor-will call was more strung together without pause.

I listened to the bird for about 5 minutes. It was calling very consistently for the entire time. I coughed and apparently flushed the bird. It stopped calling for a couple minutes, and when it resumed calling it had moved to the north side of the road. I remained in the area for a few more minutes, and it was still calling when I

Figure 1. This Piping Plover was photographed on 4 July 2006 at Kohler Andrae State Park in Sheboygan County by Tom Prestby.

Figure 2. The Brown County White-winged Dove was photographed on 25 June 2006 by Dan Belter.

Figure 3. One of the male Kirtland's Warblers in Jackson County was photographed by Dan Belter on 7 June 2006.

left at 9:45 PM.—*Quentin Yoerger, Evansville, WI.*

SCISSOR-TAILED FLYCATCHER (*Tyrannus forficatus*)

13–15 June 2006, Corner of Plateau Road and Woodcrest Road, on the outskirts of Sister Bay, Door County—A **long tail**. At first I thought it was a bird with something in its feet, or was carrying a turkey feather. The tail was very incongruous to the size/shape of the body. I noted the whitish-light grey head, light grey feathers continued down over its "shoulders." Almost like it was combed/styled that way. On the chest there was an orangish hue. Bird was a little smaller than a robin. Wing feathers were grey, striped.—*Susan Leeder, Sister Bay, WI.*

15 June 2006, Corner of Plateau Road and Woodcrest Road, on the outskirts of Sister Bay, Door County—This bird flew in front of me (on my bicycle), and I noted its extremely long scissor-tail. It perched on a dead bush/shrub, and I noted its white chest, rusty/pink underwings (breast) which shown very brightly during flight. Light gray on back and head, black bill, black eye, and **very** long black and white scissor tail. It soared beautifully over the field. Its tail was very obvious, and when it was perching, its tail was obviously long, hanging way down below the branch it was on.—*Glenna Peters, Sister Bay, WI.*

KIRTLAND'S WARBLER (*Dendroica kirtlandii*)

7 June 2006, On Cemetery Road, northeast of Black River Falls, Jackson

County—There were 2 birds at this location (singing), but I only went to look for the closest one to the road. When I reached the area where the closest bird was singing its loud song, it took me only a few seconds to locate the bird. It was an adult male (Fig. 3). He moved around a lot, so I had many good views at all sides of him. On the front he had yellow from the chin and throat all the way down to the lower belly. The sides and the chest had black streaks that went down to the flanks. The underside of the rump was white. On the upper side of this bird, I saw a gray head with fine streaks on the crown. There were white crescents above and below the eye and the lores were black. The bill was also black in color. The rest of the upper parts were gray with black streaking. I also noticed two whitish wing bars. The legs were dark also.—*Dan Belter, Weston, WI.*

6 June 2006, Near Cemetery Road, Jackson County—Upon arriving at the Jackson County spot where Kirtland's Warblers were reported last year and this year, I immediately heard a loud "chur-cha-chif-chif-chidip" song which became both louder and faster at the end. I knew it was a Kirtland's Warbler and after a few minutes I was able to find it in my binocs and locate it in my scope. It sat on the top of a Jack Pine for several minutes, giving me a great opportunity to study it. It was a large warbler, similar in shape to Palm Warbler but larger. The back, head, and tail were a dull medium blue which contrasted with the yellow throat and belly. A white wingbar and white lines above and below the eye were noticed as well as black streaking on the blue back and down the sides of the bird. The bill was large and black, and the undertail coverts were white. The bird did not act like a warbler, singing his loud song from the branch for several minutes before moving to a new perch. As I studied this bird, I heard another which was too far away to see. The two birds I heard both sang similar accelerating songs.—*Tom Prestby, Wauwatosa, WI.*

4 June 2006, Jack pine area on Cemetery Road north of Highway 54, east of Black River Falls, Jackson County—Returning about 4:00 to one of the possible sites, I exited my vehicle and almost immediately heard one, then a second Kirtland's Warbler singing. One was quite a ways back off the road, but the other was fairly close, moving around "marking" its territory. In about 15 minutes it started singing in some small deciduous trees near the road, with a few jack pines interspersed. Suddenly it appeared and sang for the next half hour in plain view—exciting! It was a dark-backed, yellow-breasted warbler. Besides the dark back, the head, wings, and tail also were dark. There were faint wingbars. Only occasionally did it bob its tail. The yellow breast had dark marks on the sides. In addition the blue-gray back had black streaks and there was an eye ring. What an exciting hour!—*Daryl Tessen, Appleton, WI.*

29 July 2006, Off Cemetery Road in Jackson County, the same location the June reports came from—I was walking in the area where 3 Kirtland's were seen in June. My purpose was to document an abuse to the vegetation. I did see a compacted Volunteer trail. At the site a thunderstorm was brewing overhead. I sat in a depression with full raingear until the storm moved southeast. The skies lightened

and bird song commenced. I heard a song of rich notes, loud and emphatic with the last notes rising in pitch and the most intense. I'm not good at pneumonics, but the "chidup" note at the end was obvious. After 4–5 songs the bird stopped singing. I pished continuously for 30–60 seconds, when I saw a large warbler foraging in the midst of low jack pines. It was large for a warbler with a grayish head, broken eyering, yellowish throat. The back was grayish background with black stripes, long tail. Wingbars were white and obvious but not prominent. The flanks and belly were yellow with stripes on flanks. Undertail was white. The tail was pumped quite a bit.—*Randy Hoffman, Waunakee, WI.*

9 June 2006, Marinette County—I was driving slowly along a sand road in a jack pine plantation when I heard a loud call. It resembled the timbre of a Connecticut Warbler, but was ascending Chip, Chip, Chup, Sweet, Sweet, Weet, Weet. I listened for a couple minutes locating the tree where it was singing, then spotted it on the upper branches of a 15 foot jack pine. The bird was singing from a tree close to a small clearing next to the dirt road. I had the sun to my back, so I had very good looks at the bird. I noted the bright yellow throat, breast, and belly with black streaks along the sides below the throat. I noted the light broken eye-ring on a gray head. The back was gray with dark streaking, with two white wing bars. The bill and legs were black, and lores were dark. The bird remained perched singing loudly during the entire time of viewing. On two subsequent visits on 15 and 26 June I heard this same song in the same plantation. However, both times it was at least 200–400 yards from the original location.—*Kay Kavanagh, Niagara, WI.*

Scott Franke found this Great Blue Heron grabbing a snack.

Confirmed Breeding of Wilson's Phalarope

Wilson's Phalarope chick in the grass near nest.

Wilson's Phalarope going to a nest in the rough (fescue grass) at Fox Lake Golf Club, Dodge County, Wisconsin, on 12 June 2006.

Egg shell fragment from Wilson's Phalarope nest that had three eggs, 13 June 2006.

Young Wilson's Phalarope in the grass at the Fox Lake Golf Club in Dodge County, Wisconsin in June 2006. These photos documenting confirmed breeding were taken by Jack R. Bartholmai.

WSO Records Committee Report Summer 2006

Jim Frank

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The WSO Records Committee reviewed 16 records of 6 species for the summer 2006 season, accepting 13 of them. Included in these records is Wisconsin's sixth record of a White-winged Dove.

The Records Committee and WSO would like to thank Dan Belter for his 5 years of service on the Records Committee. Only one who has done a similar stint can fully appreciate the time and thought that goes into that kind of commitment. Thanks, Dan!

With the onset of the the fall season, Karl David has been passed the baton from Dan and will join Bob Domagalski, Mark Korducki, Bill Cowart, and Jim Frank for 2007 Records Committee work.

Accepted Records

White-winged Dove—

#2006-038 Brown Co., 23, 24 June 2006, Houston; 25 June 2006, Belter; 4 July 2006, Tessen.

Similar in size to a Mourning Dove, the striking thing about this bird was the large white wing patch that extended along the lower edge of the folded wing. The overall color was a bit grayer than a Mourning Dove. In flight, the white wing patches contrasted with the black primaries. The tail was squared off rather than pointed, but still had black and white stripes at the distal end of the lateral tail feathers. The iris was red instead of dark. The first report also mentioned being initially fooled by the Barred Owl-like call of the White-winged Dove.

This is Wisconsin's sixth record.

Snowy Owl—

(#2006-039) Sheboygan Co., 3 July 2006, Brasser, Brasser (photo);

(#2006-039) Fond du Lac Co., 4 July 2006, S. Baughman.

This large, almost entirely white owl lacked ear tufts and had yellow eyes.

These two sightings were lumped together as they were less than 25 miles apart and in similar plumage.

The July 4th observation was made while conducting a BBS route.

Chuck-will's-widow—

(#2006-046) Jackson Co., 2 July 2006, Yoerger.

Heard in comparison to a Whip-poor-will, this bird had a four syllable call in contrast to the three note Whip-poor-will. The three note Whip-poor-will call is emphatic on the first and third notes. The Chuck-will's-widow call had a low "tuc" first note with a pause before the loud second and third notes, the third note trailing/slurring off into the fourth note.

Scissor-tailed Flycatcher—

(#2006-040) Door Co., 13–15 June 2006, Leeder; 15 June 2006, Peters.

This flycatcher was a bit smaller than a robin and had a light gray back and head, white breast, and pink-orange axillars. Most striking was a long black "scissortail." The bill and eye were also black.

Kirtland's Warbler—

(#2006-041) Jackson Co., 4 June 2006, Tessen (2 birds), 6 June 2006, Prestby (2 birds), 7 June 2006, Belter (2 birds), 29 July 2006, Hoffman.

A large warbler was described as having a dark gray back and wings with black streaks on the back. The light yellow throat, breast, and belly were accented by black streaks on the side of the breast. The lores were black creating a bit of a masked appearance. A broken white eye ring and intermittent tail-wagging were also noted. White wingbars were reported as present, but not striking in appearance. The undertail coverts were white.

Records Not Accepted

Mississippi Kite—

(#2006-037) Rock Co., 4 June 2006 (2 reports).

Mississippi Kites are notoriously tough to document given the brevity of the average sighting and the subtleness of the field marks. This Cooper's Hawk-sized raptor had more pointed, falcon-like wings. The primaries and tail were black, the rest of the bird a uniform, dark gray. One observer noted white on the dorsal aspect of the bird in one of its banking movements, but couldn't specify the location and gave brief consideration to a harrier, but didn't feel the rump was white.

Without being able to add some distinctive field marks such as the whitish head, whitish dorsal secondaries, and dark mask, the evidence for this identification remains incomplete. On a sunny day, the under surface of a hawk can lose color and pattern definition and wing shape can change during flight. In all likelihood, this was correctly identified, but the visual evidence was not quite complete.

Chuck-wills'-widow—

(#2006-034) Vernon Co., 14 June 2006.

(#2006-046) Jackson Co., 29 July 2006.

The observers undoubtedly heard accurately, but these reports relied on stating that the call was different than a Whip-poor-will heard at the same time, without describing the emphasis on or the pause between notes that distinguish the calls.

About the Artists

Jack R. Bartholmai is an amateur wildlife photographer and wood sculptor living near Beaver Dam. His work appears frequently in local newspapers, travel brochures, calendars, and bird publications. He gives numerous talks on birds and his work and is an active member of the Horicon Bird Club. He was the 2005 recipient of the WSO Bronze Passenger Pigeon Award.

Seth Cutright, a younger WSO member, enjoys bird photography and sketching birds. He is a graduate of Concordia University with an art major. He participates in many bird surveys and counts including the Riveredge MAPS banding program, the hawk watch at Concordia, and numerous Christmas Bird Counts.

Janet Flynn interprets nature in watercolor as a full time endeavor. She finds the beautiful Baraboo Hills to be both a classroom and a source of inspiration for her vibrant, unique watercolors. Her work has been juried into numerous national and international exhibitions including "Birds in Art" and is marketed at the International Crane Foundation gift shop.

Scott Franke has been a birding enthusiast for 29 years and an amateur photographer for the past two. He and his wife, Dawn, are parents of two active youngsters, Seth (12) and Michelle (10), and live in Wauwatosa. During the day, Scott works as an information technology manager at Northwestern Mutual. At night, he dreams of capturing all the elements of a perfect bird image—breeding plumage, warm light, a classic behavioral pose. That same dream always seems to include better camera equipment than whatever he currently owns. Many weekend mornings, you will find Scott enjoying one of southeastern Wisconsin's great birding venues. More of his images are available at http://www.pbase.com/srfdrf.

Jeff Hapeman has been interested in the natural world since childhood, and in photography since his teens years. After obtaining a MS in Botany and starting and selling a successful information technology consulting business, Jeff returned to photography in 2002. He began serious bird photography in 2004 and some of his more recent works can be viewed at: http://www.pbase.com/jhapeman.

Gary Krogman has been digiscoping birds in western Wisconsin (mostly within 100 miles of Eau Claire) for several years. Butterflies also are a favorite subject for his camera.

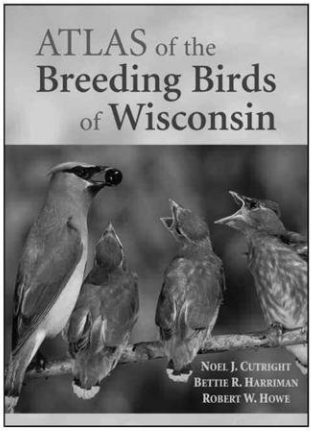
Major Dennis R. Kuecherer is retired from the US Army and from doing field work for the WDNR, the Department of Interior, and the Wisconsin Breeding Bird Atlas (WSO). He has

been an active birder most of his life, and enjoys drawing and photographing birds as well as counting them. He recently moved from Idaho back to Wisconsin.

Dennis Malueg is a serious amateur bird and wildlife photographer who travels Wisconsin in search of his photos. He also works from his own backyard, prairie, and 80-acre forest in Waushara County to capture wildlife images.

Tom Prestby is an undergraduate at UW-Madison, studying Wildlife Ecology. He plans on attending graduate school and pursuing a career in wildlife or environmental conservation. He has been birding for over 10 years and has taken up the hobby of digiscoping.

This Black-crowned Night-Heron with its reflection was captured by Scott Franke.



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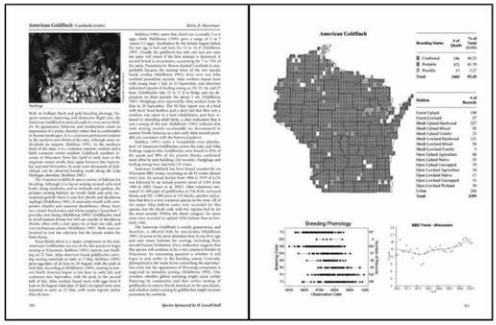

The two-page species accounts – 214 of them in all – provide a host of information on the state's breeding species, including their range, habitat preference, breeding biology, conservation concerns, and population trends. An additional 23 less-common species also are covered. Also included are chapters on Atlas methodology, results, history, habitats, and conservation.

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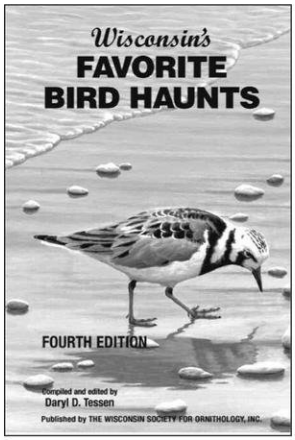


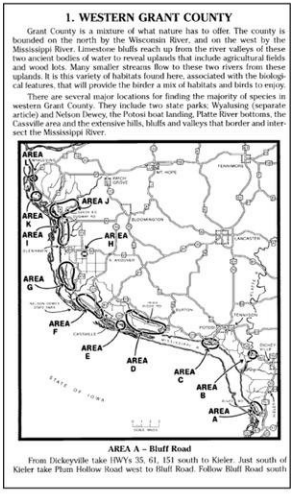
Wisconsin's Favorite Bird Haunts,

Fourth Edition (2000)

Compiled and edited by Daryl Tessen with contributions from birders throughout the state. Features artwork by Thomas Schultz, David Kuecherer, Rockne Knuth, Judith Huf, and Jeannie Perry.

- Covers all 72 counties
- Contains 135 favorite haunts, detailing more than 1,000 areas
- Includes detailed directions as well as a map for each location
- Features some 45 bird illustrations, 15 of them in color
- Includes a list of 400 valid Wisconsin state species and 15 hypothetical species (current as of January 2000)

This book, designed for durability and functionality, is printed on heavy coated paper and has a spiral binding so it lies flat when open. 6″ by 9″. 544 pages.



1. WESTERN GRANT COUNTY

Grant County is a mixture of what nature has to offer. The county is bounded on the north by the Wisconsin River, and on the west by the Mississippi River. Limestone bluffs reach up from the river valleys of these two ancient bodies of water to reveal uplands that include agricultural fields and wood lots. Many smaller streams flow to these two rivers from these uplands. It is this variety of habitats found here, associated with the biological features, that will provide the birder a mix of habitats and birds to enjoy.

There are several major locations for finding the majority of species in western Grant County. They include two state parks, Wyalusing (separate article) and Nelson Dewey, the Potosi boat landing, Platte River bottoms, the Cassville area and the extensive hills, bluffs and valleys that border and intersect the Mississippi River.

AREA A – Bluff Road

From Dickeyville take HWYs 35, 61, 151 south to Kieler. Just south of Kieler take Plum Hollow Road west to Bluff Road. Follow Bluff Road south

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THE WISCONSIN SOCIETY FOR ORNITHOLOGY

The Wisconsin Society for Ornithology is an educational and scientific non-profit organization founded in 1939 "to encourage the study of Wisconsin birds." The Society achieves this goal through programs in research, education, conservation, and publication.

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