



Bird Community Monitoring at Effigy Mounds National Monument, Iowa

Status Report

Natural Resource Technical Report NPS/HTLN/NRTR—2014/851



ON THE COVER

Landscape at Effigy Mounds National Monument, Iowa
Photograph by: Lisa P. Thomas

Bird Community Monitoring at Effigy Mounds National Monument, Iowa

Status Report

Natural Resource Technical Report NPS/HTLN/NRTR—2014/851

David G. Peitz

National Park Service
The Heartland I&M Network
Wilson's Creek National Battlefield
6424 West Farm Road 182,
Republic, MO 65738

March 2014

U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science
Fort Collins, Colorado

The National Park Service, Natural Resource Stewardship and Science office in Fort Collins, Colorado, publishes a range of reports that address natural resource topics. These reports are of interest and applicability to a broad audience in the National Park Service and others in natural resource management, including scientists, conservation and environmental constituencies, and the public.

The Natural Resource Technical Report Series is used to disseminate results of scientific studies in the physical, biological, and social sciences for both the advancement of science and the achievement of the National Park Service mission. The series provides contributors with a forum for displaying comprehensive data that are often deleted from journals because of page limitations.

All manuscripts in the series receive the appropriate level of peer review to ensure that the information is scientifically credible, technically accurate, appropriately written for the intended audience, and designed and published in a professional manner. Data in this report were collected and analyzed using methods based on established, peer-reviewed protocols and were analyzed and interpreted within the guidelines of the protocols.

Views, statements, findings, conclusions, recommendations, and data in this report do not necessarily reflect views and policies of the National Park Service, U.S. Department of the Interior. Mention of trade names or commercial products does not constitute endorsement or recommendation for use by the U.S. Government.

This report is available in digital format from Heartland Inventory and Monitoring Network website (<http://www.nature.nps.gov/im/units/htln/>) and the Natural Resource Publications Management website (<http://www.nature.nps.gov/publications/nrpm/>). To receive this report in a format optimized for screen readers, please email irma@nps.gov.

Please cite this publication as:

Peitz, D. G. 2014. Bird Community Monitoring at Effigy Mounds National Monument, Iowa: Status report. Natural Resource Technical Report NPS/HTLN/NRTR—2014/851. National Park Service, Fort Collins, Colorado.

Contents

	Page
Figures.....	iv
Tables.....	iv
Executive Summary	1
Acknowledgments.....	1
Introduction.....	1
Objectives	3
Methods.....	3
Site Selection	3
Bird Surveys	5
Data Analysis.....	5
Results.....	7
Bird Surveys	7
Discussion	13
Conclusions.....	15

Figures

	Page
Figure 1. Location of Effigy Mounds National Monument (EFMO), Iowa within the Prairie Hardwood Transition Bird Conservation Region.....	2
Figure 2. Bird plot locations on Effigy Mounds National Monument, Iowa. Vegetation mapping and classification provided by Hop et al. (2005).	4

Tables

	Page
Table 1. Number of plots sampled, and sampling dates for breeding bird surveys conducted at Effigy Mounds National Monument, Iowa, by year. Also listed are observer(s) who conducted the surveys and whether or not habitat data was collected during the survey year.....	3
Table 2. Bird species recorded during breeding bird surveys at Effigy Mounds National Monument, Iowa in 2009 through 2013. The American Ornithologists' Union Code (AOU code) and residency status of each species is given.....	7
Table 3. Trends in breeding birds recorded on Effigy Mounds National Monument, Iowa, and the Prairie Hardwood Transition Bird Conservation Region for comparison.....	10

Executive Summary

In 2009, the Heartland I&M Network (HTLN) initiated breeding bird surveys on Effigy Mounds National Monument (EFMO), Iowa to address two objectives. First, we monitored changes in bird community composition and abundance. Secondly, we monitored the responses of bird communities to changes in habitat structure and other habitat variables related to management activities. This report attempts to put trends in the park's breeding bird populations into the context of trends observed within the North American Bird Conservation Initiative's (NABCI) Prairie Hardwood Transition Bird Conservation Region, the bird conservation region in which the park is located. By doing so, we can assess the influence of habitat management within the park on bird populations with an understanding of what population trends are doing regionally. In other words, we have tried to separate variability occurring within the region from that seen strictly within the park, and thus, potentially attribute the within-park variability to park conditions.

Eighty-four species of birds were recorded during May-June site visits in the five years since initiating monitoring. Eighty-two of the species are considered breeding species because they are permanent or summer residents. Six of the breeding species are *species of concern* for the Prairie Hardwood Transition Bird Conservation Region. Nine species recorded at EFMO (including two of regional concern) show negative population trends, while their 46-year regional trends have been positive. However, 15 species have positive trends on the park while their 46-year regional trends have been negative.

Although the 2013 birding season was disrupted by intense flooding, results from our bird surveys are similar to previous years and show the Red-eyed Vireo and Baltimore Oriole are the most commonly occurring and widespread species at EFMO. After the Red-eyed Vireo and Baltimore Oriole; American Redstart and Eastern Wood-pewee were the next most abundant species. The Eastern Wood-pewee is slightly more widely distributed than American Redstart.

This report provides current regional and local trends for breeding birds for future comparisons with bird data collected as part of the long-term monitoring efforts at EFMO. With this report, park staff can better account for the potential effects of management actions on breeding birds. Monitoring data also provides park staff with additional information useful for interpreting natural resources.

Acknowledgments

We would like to thank the staff of Effigy Mounds National Monument, Iowa for allowing us access to the park during our breeding bird surveys and for assisting with bird surveys. We would also like to thank volunteer Jon W. Stravers who assisted with bird surveys on the park.

Introduction

Birds are an important component of park ecosystems, as their high body temperature, rapid metabolism, and high ecological position in most food webs make them good indicators of the effects of local and regional changes in ecosystems. It has been suggested that management activities, intended to preserve habitat for bird populations, such as for neotropical migrants, can have the added benefit of preserving entire ecosystems and their attendant ecosystem services (Karr 1991, Maurer 1993). Additionally, the National Park Service plays a role in bird conservation, as it complies with the requirements of the Migratory Bird Treaty Act of 1918 (as amended) and the Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds. Moreover, birds have a tremendous following among the public and many parks provide information on the status and trends of birds through their interpretive programs. Bird monitoring is also critical as widespread habitat loss to agriculture and urban and industrial development threaten the integrity of the region for birds.

Effigy Mounds National Monument (EFMO), Iowa is located in the south-central section of the Prairie Hardwood Transition Bird Conservation Region (Figure 1). The Prairie Hardwood Transition Bird Conservation Region is one of 67 regions identified in the North American Bird Conservation Initiative (NABCI). Started in 1999, the NABCI is a coalition of government agencies and private organizations in the United States working to ensure the long-term health of North America's native bird populations (NABCI 2013).

Prairies once dominated this region in the west and south and beech-maple forest in the north and east, separated by an oak savanna (NABCI 2013). Glaciation has resulted in numerous pothole-type wetlands and shallow lakes, and the Great Lakes' coastal estuaries. Many rivers can be found in this region with the Mississippi River being the largest. This region is second only to the Prairie Pothole region in terms of support of high densities of breeding waterfowl. Both early successional and mature woodlands provide habitat to numerous bird species as well. Approximately 150 species of breeding birds can be found in the habitat of the area (Stokes and Stokes 1996).

Data collected during the U.S. Geological Survey's annual North American Breeding Bird Surveys (BBS) between 1966 and 2011 indicate that a number of bird species with potential to occur at EFMO show evidence of population decline (Sauer et al. 2012). In fact, 38% of the species have populations reported to be in decline, with species such as the Red-headed Woodpecker (*Melanerpes erythrocephalus*), Grasshopper Sparrow (*Ammodramus savannarum*), Field Sparrow (*Spizella pusilla*), and Cerulean Warbler (*Dendroica cerulea*) declining at alarming rates.

Long-term trends in community composition and abundance of breeding bird populations provide one measure for assessing the ecological integrity and sustainability of a system. We will use trends in the composition and abundance of bird populations as long-term indicators of

ecosystem integrity at EFMO. *Ecosystem integrity* is defined as the system's capability to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of the natural habitats of the region (Karr and Dudley 1981). Research has demonstrated that birds serve as good indicators of changes in ecosystems (Cairns et al. 2004, Mallory et al. 2006, Wood et al. 2006). Therefore, changes in the numbers and composition of bird communities may reflect the result of management actions taken to restore and maintain the cultural landscape at EFMO.

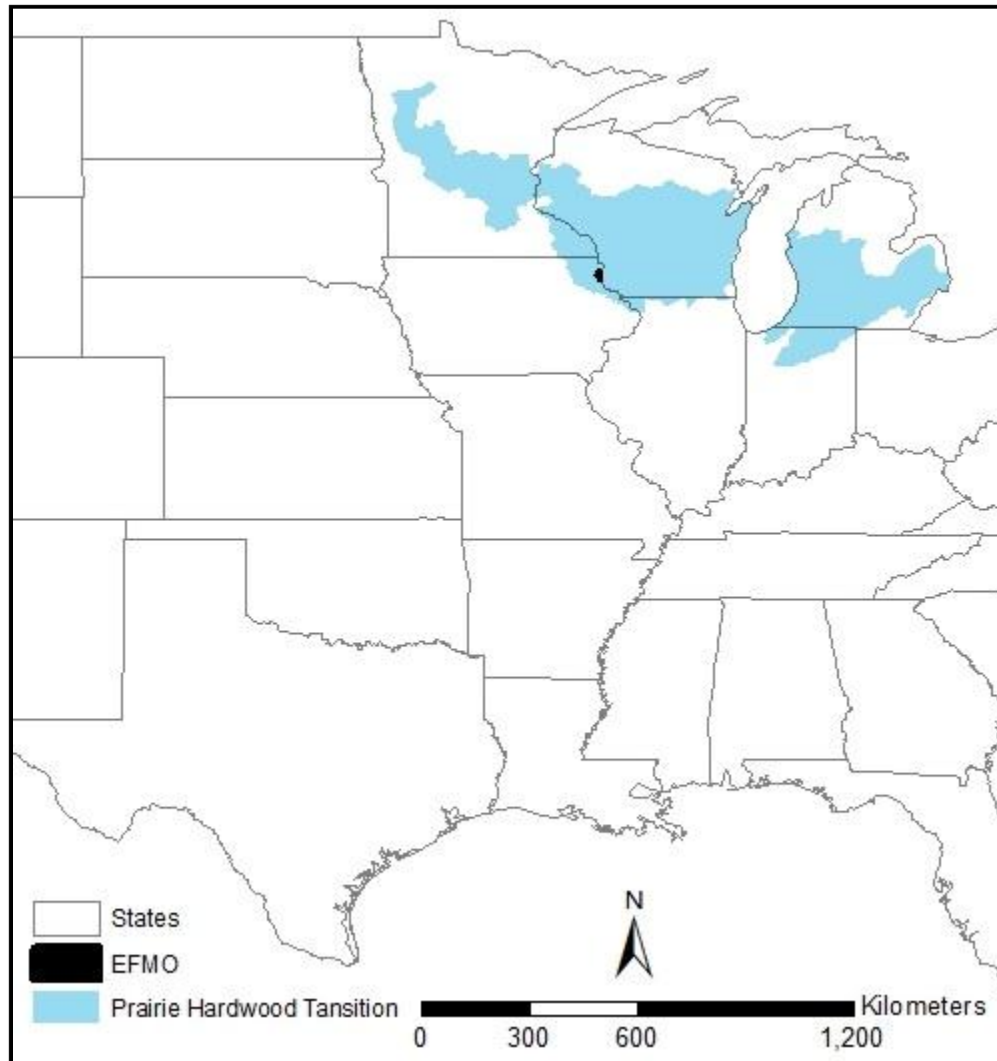


Figure 1. Location of Effigy Mounds National Monument (EFMO), Iowa within the Prairie Hardwood Transition Bird Conservation Region.

Objectives

There are two primary objectives for monitoring breeding birds at Effigy Mounds National Monument:

- Identify significant temporal changes in the species composition and abundance of bird communities that occur at EFMO during the breeding season.
- Improve our understanding of breeding bird – habitat relationships and the effects of management actions such as stand thinning or prescribed fire on bird populations, by correlating changes in bird community composition and abundance with changes in specific habitat variables (e.g., vegetation structure, ground cover).

As a first step in meeting monitoring objectives, this report summarizes population trends for birds recorded during the first five years of monitoring. A more comprehensive report on habitats found within the park is forthcoming and should be consulted when making habitat management decisions (James and Peitz, in draft).

Methods

Site Selection

Permanent monitoring locations or 'plots' were selected by overlaying a systematic grid of 400 x 400 meter cells (originating from a random start point). The orientation of the grid was rotated 45 degrees to prevent monitoring sites from being influenced by man-made features (roads, fences, etc.) located along cardinal directions. We established 52 permanent plots in the various habitats across the park (Figure 2). Monitoring occurred on the majority of the 52 sites across most years (Table 1).

Table 1. Number of plots sampled, and sampling dates for breeding bird surveys conducted at Effigy Mounds National Monument, Iowa, by year. Also listed are observer(s) who conducted the surveys and whether or not habitat data was collected during the survey year.

Year	Sampling Dates	Number of Plots Sampled	Observer(s)	Habitat Data Collected
2009	May 29 – June 1	34	D.G. Peitz*	Yes
2010	May 20 – June 10	45	E.K. Groom, D.D. Koenig and J.W. Stravers	No
2011	May 24 – June 19	39	J.A. Salesman and J.W. Stravers	No
2012	May 20 – June 20	35	J.W. Stravers	No
2013	May 29 – June2	21	D.G. Peitz*	Yes

*Heartland I&M Network staff.

During bird surveys in 2009 and 2013, monitoring plots were located using navigation waypoints (Peitz et al. 2008) in a GPS unit and temporarily marked with 36-inch pin flags to aid in relocating the plots for habitat assessment, eliminating the need for permanent plot markers. We

collected pin flags from each plot once the habitat work was completed. During bird surveys in 2010 – 2012, years when habitat assessments were not conducted, monitoring plots were located using a GPS unit. However, plot locations were not marked with pin flags.

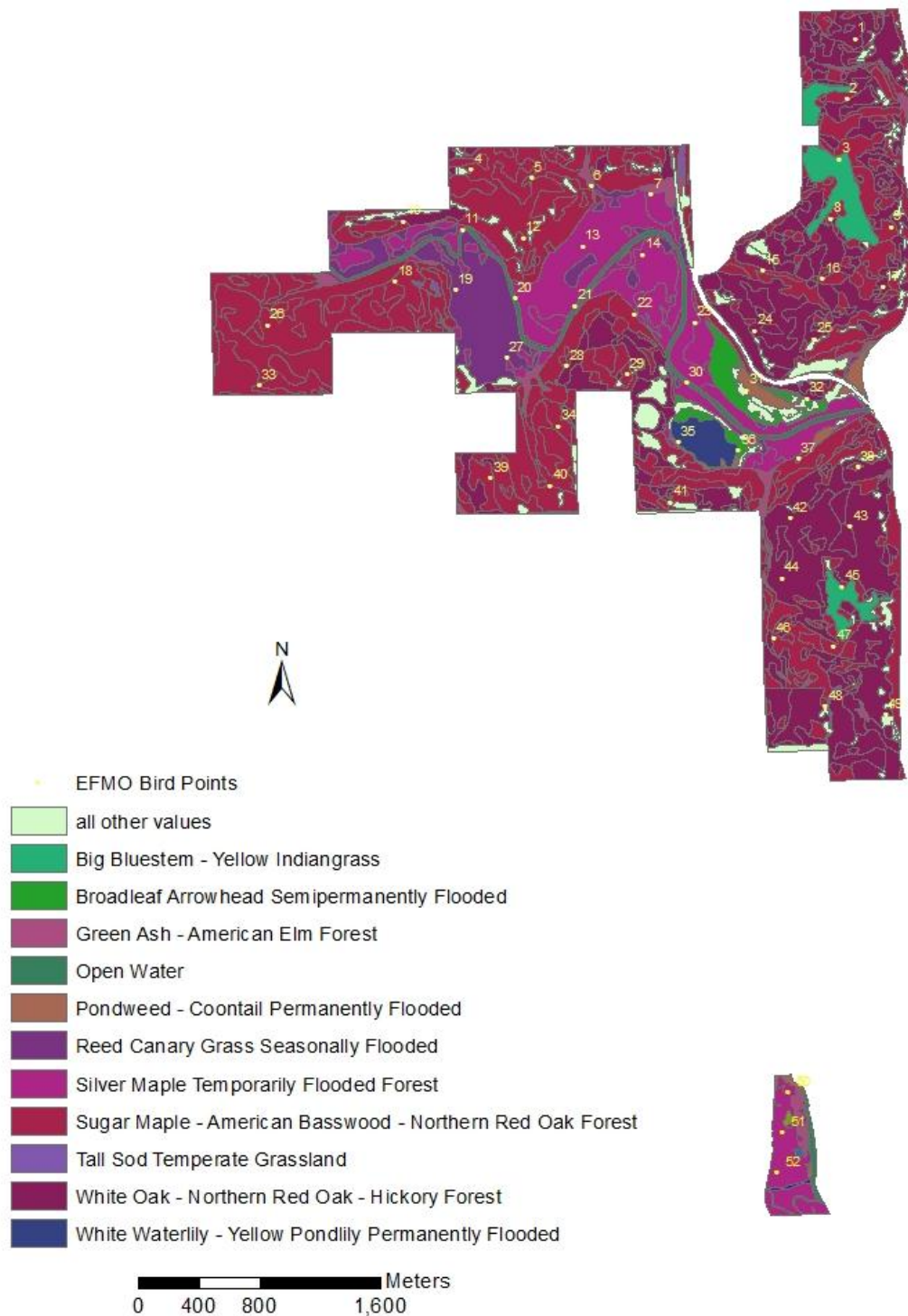


Figure 2. Bird plot locations on Effigy Mounds National Monument, Iowa. Vegetation mapping and classification provided by Hop et al. (2005).

Bird Surveys

Bird surveys followed methods outlined in the bird monitoring protocol by Peitz et al. (2008) and summarized in this text. Variable circular plot counts, a point count methodology that incorporates a measure of detectability into population estimates, were used to survey birds present (Fancy 1997). All birds seen or heard at plots during 5-min sampling periods were recorded along with their corresponding distance from observer. Bird observations were separated into two time segments: those detected during the first three minutes of the count (to allow for comparisons with the national Breeding Bird Survey data), and any new birds detected during the final two minutes of the count. For most species, we recorded each individual bird as a separate observation. For species that usually occur in clusters or flocks, the units recorded were cluster or flock size, and not the individual bird. During analysis, each individual in a cluster or flock was treated as a separate observation. After completing a count at a plot and filling out the data sheet, the observer navigated to the next plot using a GPS unit. While traveling between plots, the observer was vigilant for the presence of species not recorded during timed surveys. These species help formulate a more complete species list for the park by identifying species missed during timed surveys. We sampled birds during a period when it was light enough to observe birds to four hours after sunrise.

Variable circular plot counts were conducted in an attempt to get an “instantaneous count” of all birds present. The observer recorded birds flushed from a plot when approached and the counts were started as soon as the observer reached plot center. We recorded all birds seen or heard, including flyovers, along with distance from the observer when possible. For this report, all birds seen or heard during the full 5-min are included. Individual birds recorded from a previous plot were noted and excluded from analysis.

Data Analysis

Prior to summary analysis, the residency status (permanent resident, summer resident, migrants) of each bird species recorded was determined. Identifying the residency of each species helps to exclude migrants from analysis of breeding birds within EFMO. Population trend estimates, expressed as a percent change per year, is the simplest measures of population changes over a time period. For this report we obtained regional breeding bird trends for the Prairie Hardwood Transition Bird Conservation Region during two periods, 1966-2011 and 1999-2011 (Sauer et al. 2012). We then compare trends seen in the bird populations at EFMO with these trends. In this report, the word increasing is used to represent positive trends, and decreasing negative trends in individual bird populations within EFMO. Stable populations or those with too few observations to calculate trends are denoted with dash lines. The proportion of plots occupied by each species annually was determined (total number of plots occupied by a species/plots surveyed) and used in calculating trends based on average percent annual change. Population trends at EFMO are reported as increasing, decreasing, or stable based on the direction of percent annual change. The frequency and abundance of bird species recorded in 2013 were reported as well (Appendix 1),

using the proportion of plots occupied by each species, and for each species, the number of individuals encountered per plot visit (individuals/plot visit).

Results

Bird Surveys

Between years 2009 and 2013, 21 to 45 plots at EFMO were surveyed yearly for breeding birds (Table 1). During this five year period, 174 plots were surveyed, and 84 different bird species were recorded, 82 of which have the potential to breed within the park (Table 2; Jackson et al. 1996). Four breeding species, Chimney Swift (*Chaetura pelagica*), Hooded Merganser (*Lophodytes cucullatus*), Kentucky Warbler (*Oporornis formosus*), and Northern Rough-winged Swallow (*Stelgidopteryx serripennis*), were only observed outside 5-min survey periods. Olive-sided Flycatcher (*Contopus cooperi*), a migrant was also recorded outside 5-min survey periods. Six of the breeding species recorded are considered species of regional concern for the Prairie Hardwood Transition Bird Conservation Region (U.S. Fish and Wildlife Service 2008).

Table 2. Bird species recorded during breeding bird surveys at Effigy Mounds National Monument, Iowa in 2009 through 2013. The American Ornithologists' Union Code (AOU code) and residency status of each species is given.

Common name	Species name	AOU code	Residency ¹
Acadian Flycatcher	<i>Empidonax virescens</i>	ACFL	SR
American Crow	<i>Corvus brachyrhynchos</i>	AMCR	R
American Goldfinch	<i>Carduelis tristis</i>	AMGO	R
American Redstart	<i>Setophaga ruticilla</i>	AMRE	SR
American Robin	<i>Turdus migratorius</i>	AMRO	SR
Bald Eagle	<i>Haliaeetus leucocephalus</i>	BAEA	R
Baltimore Oriole	<i>Icterus galbula</i>	BAOR	SR
Barn Swallow	<i>Hirundo rustica</i>	BARS	SR
Belted Kingfisher	<i>Megaceryle alcyon</i>	BEKI	R
Black-and-white Warbler	<i>Mniotilta varia</i>	BAWW	SR
Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>	BBCU	SR
Black-capped Chickadee	<i>Poecile atricapillus</i>	BCCH	R
Blue Jay	<i>Cyanocitta cristata</i>	BLJA	R
Blue-gray Gnatcatcher	<i>Poliophtila caerulea</i>	BGGN	SR
Blue-winged Warbler	<i>Vermivora pinus</i>	BWWA	SR
Brown Creeper	<i>Certhia americana</i>	BRCR	R
Brown Thrasher	<i>Toxostoma rufum</i>	BRTH	SR
Brown-headed Cowbird	<i>Molothrus ater</i>	BHCO	SR
Canada Goose	<i>Branta canadensis</i>	CAGO	R
Carolina Wren	<i>Thryothorus ludovicianus</i>	CARW	R
Cedar Waxwing	<i>Bombycilla cedrorum</i>	CEDW	SR
Cerulean Warbler	<i>Dendroica cerulean</i>	CERW	SR
Chimney Swift*	<i>Chaetura pelagica</i>	CHSW	SR
Chipping Sparrow	<i>Spizella passerina</i>	CHSP	SR
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>	CLSW	SR

Table 2 (continued). Bird species recorded during breeding bird surveys at Effigy Mounds National Monument, Iowa in 2009 through 2013. The American Ornithologists' Union Code (AOU code) and residency status of each species is given.

Common name	Species name	AOU code	Residency ¹
Common Grackle	<i>Quiscalus quiscula</i>	COGR	SR
Common Yellowthroat	<i>Geothlypis trichas</i>	COYE	SR
Downy Woodpecker	<i>Picoides pubescens</i>	DOWO	R
Eastern Bluebird	<i>Sialia sialis</i>	EABL	SR
Eastern Kingbird	<i>Tyrannus tyrannus</i>	EAKI	SR
Eastern Meadowlark	<i>Sturnella magna</i>	EAME	SR
Eastern Phoebe	<i>Sayornis phoebe</i>	EAPH	SR
Eastern Towhee	<i>Pipilo erythrophthalmus</i>	EATO	SR
Eastern Wood-pewee	<i>Contopus virens</i>	EAWP	SR
European Starling	<i>Sturnus vulgaris</i>	EUST	R
Field Sparrow	<i>Spizella pusilla</i>	FISP	SR
Great Blue Heron	<i>Ardea herodias</i>	GBHE	SR
Great Crested Flycatcher	<i>Myiarchus crinitus</i>	GCFL	SR
Grasshopper Sparrow	<i>Ammodramus savannarum</i>	GRSP	SR
Gray Catbird	<i>Dumetella carolinensis</i>	GRCA	SR
Hairy Woodpecker	<i>Picoides villosus</i>	HAWO	R
Hooded Merganser*	<i>Lophodytes cucullatus</i>	HOME	SR
House Finch	<i>Carpodacus mexicanus</i>	HOFI	R
House Wren	<i>Troglodytes aedon</i>	HOWR	SR
Indigo Bunting	<i>Passerina cyanea</i>	INBU	SR
Kentucky Warbler*	<i>Oporornis formosus</i>	KEWA	SR
Least Flycatcher	<i>Empidonax minimus</i>	LEFL	SR
Mallard*	<i>Anas platyrhynchos</i>	MALL	SR
Mourning Dove	<i>Zenaida macroura</i>	MODO	SR
Northern Cardinal	<i>Cardinalis cardinalis</i>	NOCA	R
Northern Flicker	<i>Colaptes auratus</i>	YSFL	R
Northern Parula	<i>Parula americana</i>	NOPA	SR
Northern Rough-winged Swallow*	<i>Stelgidopteryx serripennis</i>	NRWS	SR
Olive-sided Flycatcher*	<i>Contopus cooperi</i>	OSFL	M
Ovenbird	<i>Seiurus aurocapilla</i>	OVEN	SR
Pileated Woodpecker	<i>Dryocopus pileatus</i>	PIWO	R
Prothonotary Warbler	<i>Protonotaria citrea</i>	PROW	SR
Red-bellied Woodpecker	<i>Melanerpes carolinus</i>	RBWO	R
Red-eyed Vireo	<i>Vireo olivaceus</i>	REVI	SR
Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>	RHWO	R
Red-shouldered Hawk	<i>Buteo lineatus</i>	RSHA	R
Red-tailed Hawk	<i>Buteo jamaicensis</i>	RTHA	R
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	RWBL	R
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>	RBGR	SR
Ruby-throated Hummingbird	<i>Archilochus colubris</i>	RTHU	SR

Table 2 (continued). Bird species recorded during breeding bird surveys at Effigy Mounds National Monument, Iowa in 2009 through 2013. The American Ornithologists' Union Code (AOU code) and residency status of each species is given.

Common name	Species name	AOU code	Residency ¹
Scarlet Tanager	<i>Piranga olivacea</i>	SCTA	SR
Song Sparrow	<i>Melospiza melodia</i>	SOSP	R
Tennessee Warbler	<i>Vermivora peregrina</i>	TEWA	M
Tree Swallow	<i>Tachycineta bicolor</i>	TRES	SR
Tufted Titmouse	<i>Baeolophus bicolor</i>	ETTI	R
Turkey Vulture	<i>Cathartes aura</i>	TUVU	SR
Veery	<i>Catharus fuscescens</i>	VEER	SR
Warbling Vireo	<i>Vireo gilvus</i>	WAVI	SR
White-breasted Nuthatch	<i>Sitta carolinensis</i>	WBNU	R
White-eyed Vireo	<i>Vireo griseus</i>	WEVI	SR
Willow Flycatcher	<i>Empidonax traillii</i>	WIFL	SR
Wild Turkey	<i>Meleagris gallopavo</i>	WITU	R
Wood Duck	<i>Aix sponsa</i>	WODU	SR
Wood Thrush	<i>Hylocichla mustelina</i>	WOTH	SR
Worm-eating Warbler	<i>Helmitheros vermivorum</i>	WEWA	SR
Yellow Warbler	<i>Dendroica petechia</i>	YWAR	SR
Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	YBSA	SR
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	YBCU	SR
Yellow-throated Vireo	<i>Vireo flavifrons</i>	YTVI	SR

* Species recorded between point transects or other times outside of 5-min survey periods.

¹ Residency: R = year around resident; SR = summer resident; M = late migrant through Iowa; According to Jackson et al. (1996).

Species names are valid and verified names taken from the Integrated Taxonomic Information System web site (ITIS 2013).

Bolded species names are those species considered of conservation concern for the Prairie Hardwood Transition Bird Conservation Region (U.S. Fish and Wildlife Service 2008).

Thirty-one breeding species at EFMO, or 38% have shown negative population trends within the larger Prairie Hardwood Transition Bird Conservation Region between 1966 and 2011 (46 years; Table 3). And between 2001 and 2011 (11 years) this number increased to 38 species or 46% of all the breeding species recorded. During our monitoring, 18 of the breeding species or 22% recorded at EFMO have shown negative population trends within the park. Our results suggest that between 42% (1966-2011 estimates) and 53% (2001-2011 estimates) fewer species at EFMO are declining as compared to the region. However, we were unable to calculate trends on the six breeding species recorded outside the 5-min survey periods, and 16 additional species showed neither a positive or negative population trend. Differences in population trends in the park, as opposed to those in the region, may be an artifact of our short sampling period (5-years)

within the park. These differences, however, may also be attributable to the quality of habitat within the park as well.

Nine species recorded at EFMO – Bald Eagle (*Haliaeetus leucocephalus*), Blue-winged Warbler (*Vermivora pinus*), Eastern Wood-pewee (*Contopus virens*), Hairy Woodpecker (*Picoides villosus*), Northern Parula (*Parula americana*), Ovenbird (*Seiurus aurocapilla*), Ruby-throated Hummingbird (*Archilochus colubris*), Scarlet Tanager (*Piranga olivacea*), and Wild Turkey (*Meleagris gallopavo*) - show negative population trends, while their 46-year regional trends have been positive (Table 3). Two of these species – Bald Eagle and Blue-winged Warbler are species of regional concern for the Prairie Hardwood Transition Bird Conservation Region. However, 15 species showing negative population trends in the region – Baltimore Oriole (*Icterus galbula*), Blue Jay (*Cyanocitta cristata*), Brown-headed Cowbird (*Molothrus ater*), Common Grackle (*Quiscalus quiscula*), Eastern Towhee (*Pipilo erythrophthalmus*), Field Sparrow (*Spizella pusilla*), Great Blue Heron (*Ardea herodias*), Great Crested Flycatcher (*Myiarchus crinitus*), Indigo Bunting (*Passerina cyanea*), Least Flycatcher (*Empidonax minimus*), Northern Flicker (*Colaptes auratus*), Red-winged Blackbird (*Agelaius phoeniceus*), Song Sparrow (*Melospiza melodia*), Warbling Vireo (*Vireo gilvus*), and Yellow-billed Cuckoo (*Coccyzus americanus*) - have positive trends on the park.

During our most recent bird surveys (2013), the Red-eyed Vireo (*Vireo olivaceus*) and Baltimore Oriole were the most commonly occurring species at EFMO based on their mean numbers of individuals per plot (Appendix 1). The American Redstart (*Setophaga ruticilla*) and Eastern Wood-pewee were the second most commonly occurring species. After the Red-eyed Vireo and Baltimore Oriole, the Eastern Wood-pewee and American Redstart were the next most widely distributed species across plots surveyed.

Table 3. Trends in breeding birds recorded on Effigy Mounds National Monument, Iowa, and the Prairie Hardwood Transition Bird Conservation Region for comparison.

Common name	Region				EFMO
	1966 - 2011		2001 – 2011		2009 - 2013
	Trend	95% CI	Trend	95% CI	Trend
Acadian Flycatcher	0.0	-1.8, 1.9	0.7	-2.7, 4.9	Increasing
American Crow	0.5	0.2, 0.8	-0.7	-1.6, 0.1	Increasing
American Goldfinch	0.9	0.4, 1.4	-1.1	-2.4, 0.2	Increasing
American Redstart	2.7	1.7, 3.5	3.0	1.0, 5.1	Increasing
American Robin	0.9	0.7, 1.1	1.5	1.0, 2.1	Increasing
Bald Eagle	13.5	10.5, 16.8	15.4	8.2, 22.9	Decreasing
Baltimore Oriole	-0.7	-1.1, -0.3	-0.5	-1.5, 0.5	Increasing
Barn Swallow	0.0	-0.4, 0.4	-0.1	-1.2, 0.9	Stable
Belted Kingfisher	-1.5	-2.3, -0.7	-1.0	-2.9, 1.2	Stable
Black-and-white Warbler	-0.4	-1.6, 0.8	-0.3	-3.2, 2.2	Decreasing
Black-billed Cuckoo	-2.0	-2.9, -0.9	-0.7	-3.4, 3.1	Decreasing
Black-capped Chickadee	2.6	2.0, 3.1	0.9	-0.7, 2.4	Increasing

Table 3 (continued). Trends in breeding birds recorded on Effigy Mounds National Monument, Iowa, and the Prairie Hardwood Transition Bird Conservation Region for comparison.

Common name	Region				EFMO
	1966 - 2011		2001 – 2011		2009 - 2013
	Trend	95% CI	Trend	95% CI	Trend
Blue Jay	-0.6	-1.0, -0.3	-1.3	-2.4, -0.3	Increasing
Blue-gray Gnatcatcher	4.3	2.9, 5.7	1.7	-1.4, 4.7	Increasing
Blue-winged Warbler	1.2	0.0, 2.6	2.7	0.5, 5.7	Decreasing
Brown Creeper	-0.2	-4.9, 4.6	0.0	-11.4, 8.8	Decreasing
Brown Thrasher	-2.3	-2.7, -1.8	-0.5	-1.9, 1.4	Stable
Brown-headed Cowbird	-1.1	-1.5, -0.6	0.2	-1.1, 1.5	Increasing
Canada Goose	16.9	14.1, 20.1	18.1	12.7, 23.6	Stable
Carolina Wren	3.9	-0.6, 7.8	6.2	-3.6, 17.0	Increasing
Cedar Waxwing	1.7	0.9, 2.5	-0.1	-2.3, 2.0	Increasing
Cerulean Warbler	-2.6	-5.1, 0.1	-0.9	-5.9, 6.5	Decreasing
Chimney Swift*	-0.7	-1.2, -0.1	-1.0	-2.5, 0.5	--
Chipping Sparrow	1.4	1.1, 1.7	1.0	0.2, 1.7	Increasing
Cliff Swallow	4.0	2.7, 5.4	1.4	-4.0, 6.2	Decreasing
Common Grackle	-2.6	-3.0, -2.0	-1.4	-2.6, -0.2	Increasing
Common Yellowthroat	0.0	-0.3, 0.3	-0.3	-1.0, 0.4	Increasing
Downy Woodpecker	0.6	0.0, 1.2	-0.2	-2.0, 1.5	Increasing
Eastern Bluebird	3.1	2.2, 4.0	1.0	-1.0, 3.1	Stable
Eastern Kingbird	-2.2	-2.6, -1.7	-3.3	-4.7, -1.9	Decreasing
Eastern Meadowlark	-3.7	-4.2, -3.2	-2.9	-4.1, -1.6	Stable
Eastern Phoebe	1.4	0.6, 2.1	-1.3	-3.1, 0.4	Stable
Eastern Towhee	-1.0	-1.6, -0.4	0.5	-1.0, 2.2	Increasing
Eastern Wood-pewee	0.4	0.0, 0.8	-0.5	-1.6, 0.5	Decreasing
European Starling	-1.4	-1.9, -1.0	-1.4	-2.4, -0.4	Stable
Field Sparrow	-3.2	-3.6, -2.7	-1.9	-3.0, -0.7	Increasing
Great Blue Heron	-0.3	-1.2, 0.6	-0.1	-2.2, 2.0	Increasing
Great Crested Flycatcher	-0.2	-0.6, 0.3	-0.2	-1.5, 1.2	Increasing
Grasshopper Sparrow	-7.0	-8.2, -5.9	-5.9	-9.1, -2.6	Stable
Gray Catbird	0.2	-0.1, 0.6	-0.2	-1.1, 0.6	Increasing
Hairy Woodpecker	0.2	-0.5, 1.1	-0.4	-2.8, 1.7	Decreasing
Hooded Merganser*	6.8	3.7, 10.2	9.0	1.6, 17.7	--
House Finch	19.5	13.7, 24.9	-6.0	-8.8, -3.1	Stable
House Wren	0.6	0.3, 1.0	1.2	0.3, 2.2	Increasing
Indigo Bunting	-0.5	-0.9, -0.2	-1.8	-2.8, -0.9	Increasing
Kentucky Warbler*	--	--, --	--	--, --	--
Least Flycatcher	-1.7	-2.4, -1.0	-3.4	-5.4, -1.4	Increasing
Mallard*	1.1	0.0, 2.1	0.3	-2.1, 2.4	--
Mourning Dove	-0.2	-0.5, 0.2	0.2	-0.7, 1.1	Stable
Northern Cardinal	1.8	1.5, 2.2	0.4	-0.5, 1.3	Increasing

Table 3 (continued). Trends in breeding birds recorded on Effigy Mounds National Monument, Iowa, and the Prairie Hardwood Transition Bird Conservation Region for comparison.

Common name	Region				EFMO
	1966 - 2011		2001 – 2011		2009 - 2013
	Trend	95% CI	Trend	95% CI	Trend
Northern Flicker	-3.2	-3.7, -2.7	-2.6	-4.0, -1.0	Increasing
Northern Parula	2.5	-3.6, 8.2	4.7	-7.6, 19.6	Decreasing
Northern Rough-winged Swallow*	-1.1	-2.4, 0.0	0.0	-2.0, 2.4	--
Olive-sided Flycatcher*	0.3	-4.7, 5.0	-1.0	-20.5, 7.6	--
Ovenbird	1.5	1.0, 1.9	0.4	-1.2, 1.7	Decreasing
Pileated Woodpecker	3.1	2.2, 4.1	2.7	0.2, 4.7	Increasing
Prothonotary Warbler	1.6	-2.6, 6.1	1.8	-3.8, 9.7	Increasing
Red-bellied Woodpecker	5.3	4.7, 5.8	5.3	4.1, 6.5	Increasing
Red-eyed Vireo	2.1	1.7, 2.5	1.4	0.3, 2.4	Increasing
Red-headed Woodpecker	-5.5	-6.3, -4.8	-4.5	-6.8, -2.1	Decreasing
Red-shouldered Hawk	1.1	-1.4, 3.7	2.8	-5.8, 11.0	Increasing
Red-tailed Hawk	2.2	1.5, 2.8	1.8	0.1, 3.4	Stable
Red-winged Blackbird	-1.4	-1.7, -1.0	-1.3	-2.0, -0.6	Increasing
Rose-breasted Grosbeak	0.1	-0.3, 0.6	0.2	-1.0, 1.4	Increasing
Ruby-throated Hummingbird	4.6	3.6, 5.5	3.9	1.2, 6.1	Decreasing
Scarlet Tanager	0.8	0.1, 1.4	-1.0	-3.1, 1.1	Decreasing
Song Sparrow	-0.6	-0.9, -0.3	-1.2	-1.9, -0.4	Increasing
Tennessee Warbler	--	--, --	--	--, --	Stable
Tree Swallow	2.7	2.0, 3.5	1.0	-1.1, 3.1	Increasing
Tufted Titmouse	1.4	0.3, 2.5	-0.4	-2.8, 2.0	Increasing
Turkey Vulture	6.1	4.5, 7.7	8.0	4.9, 12.0	Increasing
Veery	-0.3	-1.0, 0.4	0.0	-1.8, 2.0	Decreasing
Warbling Vireo	-0.9	-1.4, -0.4	0.0	-1.2, 1.3	Increasing
White-breasted Nuthatch	1.4	0.8, 2.1	1.1	-0.7, 2.9	Increasing
White-eyed Vireo	5.4	-1.7, 13.9	6.0	-3.5, 21.2	Stable
Willow Flycatcher	-0.4	-1.1, 0.3	-0.3	-1.9, 1.2	Decreasing
Wild Turkey	19.5	16.8, 22.4	14.1	8.8, 19.2	Decreasing
Wood Duck	1.4	-0.1, 2.8	2.1	-0.4, 4.7	Stable
Wood Thrush	0.2	-0.5, 0.8	-1.4	-3.5, 0.3	Increasing
Worm-eating Warbler	--	--, --	--	--, --	Stable
Yellow Warbler	1.6	1.1, 2.1	1.3	0.2, 2.4	Increasing
Yellow-bellied Sapsucker	3.5	2.0, 4.8	2.9	-0.5, 5.6	Increasing
Yellow-billed Cuckoo	-0.8	-2.2, 0.4	1.4	-2.4, 5.5	Increasing
Yellow-throated Vireo	2.6	1.9, 3.3	3.0	1.4, 4.7	Increasing

* Species recorded between point transects or other times outside of 5-min survey periods.

Bolded species names are those species considered of concern for the Prairie Hardwood Transition Bird Conservation Region (U.S. Fish and Wildlife Service 2008).

Regional trend data from BBS surveys (Sauer et al. 2012).

Discussion

Breeding bird surveys were initiated at EFMO in 2009 to assist the park in assessing the integrity of various habitats through time. During the five years of monitoring since 2009, 84 bird species have been recorded. Eighty-two are permanent or summer residents to the area (Jackson et al. 1996). Therefore, these 82 species have some value in characterizing the breeding bird community of EFMO, and the habitat upon which they rely.

Habitat availability and quality dictates bird population trends within a region (in this case the Prairie Hardwood Transition Bird Conservation Region). Similarly, locally available habitat predicates the species expected to be represented at the locale. A local lack of habitat in sufficient quantity to sustain representatives of a regionally common species will limit the local distribution of that species. Identifying regional trends in breeding birds observed at EFMO is the first step in assessing natural variability, versus the potential local effects of habitat management. For instance, if the prevailing trend in a species regionally is negative, and abundances is low, then efforts to manage habitat for that species will in all likelihood have little success. However, for species that are regionally common or have populations trending upward, EFMO may be able to enhance local populations through habitat management.

With regard to local versus regional trends, 15 species recorded at EFMO have populations that are benefitted by the current habitat on the park and surrounding area. However, nine species may not find adequate habitat on the park and surrounding area relative to regional availability. Two of these species – Bald Eagle and Blue-winged Warbler are species of concern for the region. The remaining breeding species at EFMO have populations with trends similar to those of the region.

Similar to 2009 values reported by Peitz (2010), the American Redstart, Baltimore Oriole, Eastern Wood-pewee, and Red-eyed Vireo are some of the most common and widely distributed species at EFMO. Changes in population sizes of the most common and widely distributed species in the park make them good species for assessing changing habitat conditions locally. For example, reproductive success of relatively common species like the Northern Cardinal and Indigo Bunting has been shown to improve when shrub cover is dense and mid-canopy trees are present (Stokes and Stokes 1996). Therefore, a decline in either species' abundance could very well indicate changes in the understory and midstory of the woodlands or changes in woody species in the prairie. Currently both species have local populations trending upward, which could very well be the results of infrequent use of prescribed fire, leading to increased shrubby plants cover. Less common and widely distributed species will likely occur so infrequently that strong species-habitat relationships may not be established.

Although the mix of habitats at EFMO provides potentially satisfactory habitat for 73% of the breeding birds observed, this habitat is easily altered if trees are thinned, insect infestations occur, or the prairie is burned. Our survey data suggests that four species (i.e. American Redstart,

Baltimore Oriole, Eastern Wood-pewee, and Red-eyed Vireo) occur frequently enough at EFMO to aid in assessing the influence of habitat management actions on their numbers (Table 3, Appendix 1). Similar to the habitat requirements listed above for the Northern Cardinal and Indigo Bunting, the habitat requirement of these four species can be identified: American Redstart requires deciduous and mixed woods and thickets; Baltimore Oriole requires deciduous woods near open areas; Eastern Wood-pewee requires open woods; and Red-eyed Vireo requires deciduous woods (Stokes and Stokes 1996). Vegetation management decisions should consider the potential impacts to bird habitat especially for those species identified as species of concern for the Prairie Hardwood Transition Bird Conservation Region. However, species common to the park such as the Red-eyed Vireo need consideration in a broader context of bird conservation when making management decisions.

Conclusions

Since initiating breeding bird surveys at EFMO in 2009, HTLN staff and volunteers have surveyed between 21 and 45 plots annually, and recorded 84 different species. Eighty-two of the species recorded are permanent or summer residents to the area with the potential to breed within the park. Local and regional population trends from this study indicate that the park appears to have habitat favorable 15 bird species, but conditions have resulted in decreasing representation by nine species. The limited number of survey years within the park may provide a false trend. However, our reported data is a baseline for placing bird populations at the park into the context of those seen in the larger Prairie Hardwood Transition Bird Conservation Region.

Literature Cited

- Cairns Jr., J., P. V. McCormick, and B. R. Niederlehner. 2004. A proposed framework for developing indicators of ecosystem health. *Hydrobiologia* 263:1-44.
- Fancy, S. G. 1997. A new approach for analyzing bird densities from variable circular-plot counts. *Pacific Science* 51:107-114.
- Hop, K., S. Lubinski, S. Menard. 2005. USGS-NPS Vegetation Mapping Program: Effigy Mounds National Monument, Iowa. U.S. Geological Survey, Upper Midwest Environmental Sciences Center, LaCrosse, Wisconsin. 62 pp + Appendixes A-I.
- ITIS (Integrated Taxonomic Information System). Accessed 6 August 2013, <http://www.itis.usda.gov/>.
- Jackson, L. S., C. A. Thompson, and J. J. Dinsmore. 1996. The Iowa breeding bird atlas. University of Iowa Press, Iowa City. 484pp.
- James, K. M. and D. G. Peitz. In draft. Plant community monitoring at Effigy Mounds National Monument, Iowa 2013 status report. Natural Resource Technical Report NPS/HTLN/NRTR—xxxx/xxx. National Park Service, Fort Collins, Colorado.
- Karr, J. R. 1991. Biological integrity: a long-neglected aspect of water resource management. *Ecological Applications* 1:66-84.
- Karr, J. R., and D. R. Dudley. 1981. Ecological perspective on water quality goals. *Environmental Management* 5:55-68.
- Mallory, M. L., H. G. Gilchrist, B. M. Braune, and A. J. Gaston. 2006. Marine birds as indicators of arctic marine ecosystem health: linking the northern ecosystem initiative to long-term studies. *Environmental Monitoring and Assessment* 113:31-48.
- Maurer, B. A. 1993. Biological diversity, ecological integrity, and neotropical migrants: New perspectives for wildlife managers. Pages 24-31 in D.M. Finch and P.W. Stangel, editors.

Status and management of neotropical migratory birds. U.S. Forest Service General Technical Report RM-229.

NABCI (North American Bird Conservation Initiative). Accessed 25 September 2013, <http://www.nabci-us.org/bcr23.html>.

Peitz, D. G., G. A. Rowell, J. L. Haack, K. M. James, L. W. Morrison, and M. D. Debacker. 2008. Breeding bird monitoring protocol for the Heartland Network Inventory and Monitoring Program. Natural Resource Report NPS/HTLN/NRR-2008/044. National Park Service, Fort Collins, Colorado. 152pp.

Peitz, D. G. 2010. Bird Community Monitoring at Effigy Mounds National Monument, Iowa: 2009 - 2010 status report. Natural Resource Data Series NPS/HTLN/NRDS—2010/111. National Park Service, Fort Collins, Colorado.

Sauer, J. R., J. E. Hines, J. E. Fallon, K. L. Pardieck, D. J. Ziolkowski, Jr., and W. A. Link. 2012. The North American Breeding Bird Survey, Results and Analysis 1966 - 2011. Version 07.03.2013 USGS Patuxent Wildlife Research Center, Laurel, MD. Accessed 6 August 2013), <http://www.mbr-pwrc.usgs.gov/bbs/>.

Stokes, D. W. and L. Q. Stokes. 1996. Stokes Field Guide to Birds: Eastern Region. Little, Brown and Company, New York, New York. 471 pp.

U.S. Fish and Wildlife Service. 2008. Birds of Conservation Concern 2008. United States Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Virginia. 85 pp. [Online version available at <<http://www.fws.gov/migratorybirds/>>]

Wood, J. K., N. Nur, C. A. Howell, and G. R. Geupel. 2006. Overview of Cosumnes riparian bird study and recommendations for monitoring and management. A Report to the California Bay-Delta Authority Ecosystem Restoration Program. Petaluma, California. 18pp.

Appendix

Appendix 1. Number of individuals encountered per plot visit, and proportion of 21 plots occupied by breeding bird species at Effigy Mounds National Monument, Iowa during the 2013 bird surveys. Number of individuals per plot, and proportion of plots occupied include all individuals recorded on plots during a 5-min survey, including flyovers.

Common name	Individuals/plot visit	Proportion of plot occupied
Acadian Flycatcher	0.14	0.14
American Redstart	0.33	0.19
American Robin	0.10	0.10
Baltimore Oriole	0.38	0.38
Black-capped Chickadee	0.14	0.14
Blue Jay	0.14	0.14
Blue-gray Gnatcatcher	0.14	0.14
Brown Thrasher	0.05	0.05
Carolina Wren	0.05	0.05
Chipping Sparrow	0.10	0.05
Common Yellowthroat	0.10	0.10
Eastern Towhee	0.05	0.05
Eastern Wood-pewee	0.29	0.24
Gray Catbird	0.05	0.05
Great Blue Heron	0.05	0.05
Great Crested Flycatcher	0.14	0.14
House Wren	0.14	0.14
Indigo Bunting	0.14	0.14
Northern Cardinal	0.05	0.05
Ovenbird	0.14	0.14
Red-bellied Woodpecker	0.19	0.19
Red-eyed Vireo	0.48	0.38
Red-winged Blackbird	0.05	0.05
Song Sparrow	0.05	0.05
Tufted Titmouse	0.05	0.05
Warbling Vireo	0.14	0.14
White-breasted Nuthatch	0.05	0.05
Wild Turkey	0.10	0.10
Wood Thrush	0.10	0.10
Yellow Warbler	0.10	0.10
Yellow-bellied Sapsucker	0.05	0.05
Yellow-billed Cuckoo	0.19	0.19

Bolded species names are those species considered of concern for the Prairie Hardwood Transition Bird Conservation Region (U.S. Fish and Wildlife Service 2008).

The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

NPS 394/124011, March 2014

National Park Service
U.S. Department of the Interior



Natural Resource Stewardship and Science

1201 Oakridge Drive, Suite 150
Fort Collins, CO 80525

www.nature.nps.gov

EXPERIENCE YOUR AMERICA™