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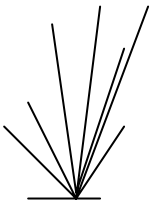
Grassland Bird Monitoring at Herbert Hoover National Historic Site, Iowa: 2005-2006 Status Report

Natural Resource Technical Report NPS/HTLN/NRTR—2007/024



ON THE COVER
Clip art of bird hovering over a bunch grass.
Image created by The Heartland Inventory and Monitoring Network and Prairie Cluster Prototype Monitoring Program.

Grassland Bird Monitoring at Herbert Hoover National Historic Site, Iowa: 2005-2006 Status Report

Natural Resource Technical Report NPS/HTLN/NRTR—2007/024

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Executive Summary

During 2005, the Heartland I&M Network and Prairie Cluster Prototype Monitoring Program (HTLN) initiated breeding bird surveys on nine plots in the reconstructed prairie at Herbert Hoover National Historic Site, Iowa to address two objectives through time. The first objective is to monitor changes in bird community composition and abundance in the prairie section of the park. Our second objective is to monitor the responses of bird communities to changes in habitat structure and other habitat variables related to management activities. Results from 2005 and 2006 serve as a baseline for monitoring future changes in bird populations and habitat. We recorded 21 species of breeding birds during the two years of surveys. Twelve species are permanent residents to Iowa. The remaining nine species are summer residents only. Partners in Flight have identified three species recorded on the park as species of continental importance, the Brown thrasher, Dickcissel and Grasshopper sparrow. The Red-winged blackbird, Common yellowthroat, Dickcissel and American goldfinch were most abundant. Twelve species were represented by a single observation in one of the two baseline years. Average species richness is less than 4.5 individuals for each plot visited. However, low avian diversities are common for grassland bird communities.

Herbert Hoover National Historic Site, Resource Stewardship Strategy (in draft) identifies a target of five or more breeding grassland obligate bird species. Three grassland obligates, Grasshopper sparrow, Dickcissel, and Eastern meadowlark were observed in 2005-2006, falling short of the goal. Addressing habitat is key to retaining and attracting more grassland obligate species. The Grasshopper sparrow is a species with a minimum area requirement of 30 ha. Therefore, the park may need to seek out grassland conservation partnerships with neighboring property owners to ensure adequate habitat to retain this species. Management decisions aimed at influencing bird populations through habitat manipulations should center on those grassland species identified as in need of conservation, either locally or continentally. However, even species common at the site such as the Red-winged blackbird face regional population declines.

Initial habitat assessments show that bird plots are located in prairie habitat, with a small amount of several other habitat types present. Current habitat structure is such that it may not support resource stewardship goals concerning grassland obligate species. The vegetation during the spring breeding season was dominated by forbs favored by only one grassland obligate, Dickcissel. Management activities aimed at increasing warm season grasses and reducing the amount of unvegetated habitat will favor more grassland obligates.

In summary, this report provides baseline information on populations and breeding habitat of birds in the reconstructed prairie at Herbert Hoover National Historic Site. Habitat conditions during the breeding season of 2005 and 2006 appear to have been insufficient to meet the parks Resource Stewardship Strategy. With our current information, park staff can better plan Resource Stewardship Strategies, with future monitoring aiding in assessing their effectiveness.

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 aimed at preserving 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). Moreover, birds have a tremendous following among the public and many parks provide information on the status and trends of birds in their parks through their interpretive programs.

Once covering vast areas of the North American continent, native Great Plains grasslands are rapidly disappearing. During the last century, large portions of grassland landscapes were plowed for cropland or converted to livestock pasture (29% of shortgrass, 41% of mixed-grass, and 99% of tallgrass prairie; Knopf and Sampson 1997). Remaining grasslands have been altered through continued fragmentation and isolation, interruption of driving ecological processes such as periodic wildfire, and loss of significant faunal species, including bison (*Bos bison*), elk (*Cervus elaphus*) and wolves (*Canis lupus*).

While not affected to the extent of large native ungulates and mammalian predators, many grassland bird species have also demonstrated declining abundance as prairie habitat loss continues. Data collected during the U.S. Geological Survey's annual North American Breeding Bird Surveys (BBS) between 1966 and 1999 indicates that 70% of 29 grassland bird species show evidence of population declines (Sauer et al. 2000). Many prairie species such as the Grasshopper sparrow (*Ammodramus savannarum*), Eastern meadowlark (*Sturnella magna*), Horned lark (*Eremophila alpestris*), Bobolink (*Dolichonyx oryzivorus*), Lark bunting (*Calamospiza melanocrys*) and Dickcissel (*Spiza americana*) have declined at alarming rates. The destruction and fragmentation of prairie landscapes, as well as structural degradation (e.g. fire suppression, changes in grazing regimes, etc.) of remaining prairie habitats have contributed to these declines.

Trends in the composition and abundance of grassland bird populations have been proposed as a long-term indicator of prairie ecosystem integrity, which is defined as the capability to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity and functional organization comparable to that of natural habitat 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 the bird community in the prairie may reflect management's effectiveness at restoring a tallgrass prairie community. At Herbert Hoover National Historical Site, Iowa, efforts to restore a native tallgrass prairie are underway. Bird monitoring, initiated in 2005 will aid in assessing the success of this prairie restoration effort. Long-term trends in community composition and abundance of breeding bird populations provide one measure for assessing the ecological integrity and sustainability of this prairie system.

Objectives

There are two primary objectives for monitoring breeding birds at Herbert Hoover National Historic Site:

- Identify significant temporal changes in the species composition and abundance of the bird communities that occur in the reconstructed prairie during the breeding season.
- Improve our understanding of breeding bird – habitat relationships and the effects of management actions such as 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).

This report summarizes survey results for the first two year of monitoring.

Methods

Site Selections

Permanent monitoring locations or 'plots' were selected by overlaying a systematic grid of 200 x 200 meter cells (originating from a random start point) on the park. The orientation of the grid was rotated 322 degrees to prevent monitoring sites from being influenced by man-made features (roads, fences, etc.) oriented along cardinal directions. Our sampling grid also matches an established grid used to assess plant communities. We established nine permanent plots at Herbert Hoover National Historic Site, Iowa (Fig. 1).

During bird surveys, monitoring plots are located using navigation way-points (Table 1) in a GPS unit and temporarily marked with 36 inch pin flags to aid in re-locating the plots for habitat assessment, thus eliminating the need for permanent plot markers. We collect pin flags from each plot once the habitat work is completed. Monitoring plots are re-located each year we conducted a bird survey.

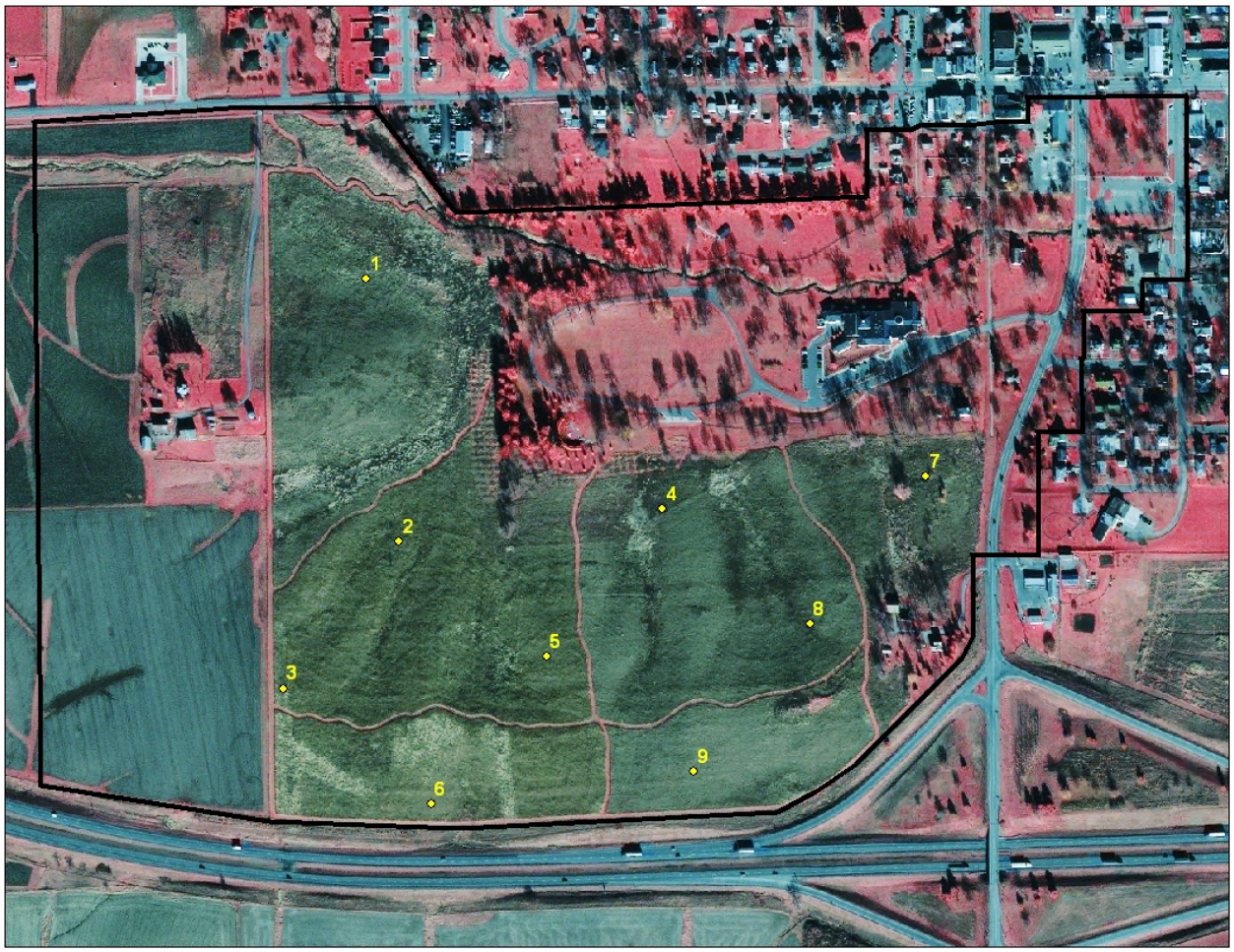

Figure 1. Bird plot locations on Herbert Hoover National Historic Site, Iowa.

Table 1. Plot I.D. and habitat type for each breeding bird survey plot at Herbert Hoover National Historic Site, Iowa. Also, given are x and y UTM coordinates for each plot. UTM zone is 15N.

Plot I.D.	Habitat type	X Coordinate	Y Coordinate
HEHOTweety1	Upland	636971.393115582	4614410.70040384
HEHOTweety2	Upland	637005.862971238	4614129.96595805
HEHOTweety3	Upland	636882.730676173	4613972.36380733
HEHOTweety4	Upland	637286.597417025	4614164.43581371
HEHOTweety5	Upland	637163.46512196	4614006.83366299
HEHOTweety6	Upland	637040.332826895	4613849.23151227
HEHOTweety7	Upland	637567.331862811	4614198.90566937
HEHOTweety8	Upland	637444.199567746	4614041.30351864
HEHOTweety9	Upland	637321.067272681	4613883.70136792

Grassland Bird Surveys

Bird surveys followed methods outlined in the bird monitoring protocol by Peitz et al. (2003) and outlined below. 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 counted 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 future 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. After completing a count at a plot and filling out the data sheet, the observer navigated to the next plot using a GPS unit. We sampled all nine plots on a single morning each year, June 4, 2005 and June 4, 2006. We sampled birds during a period when it was light enough to observe birds to four hours post sunrise.

When we conduct a variable circular plot count, we are attempting to get an "instantaneous count" of all birds present. The observer records birds flushed from a plot when approached and the counts were started as soon as the observer reached plot center. That way our method takes into account the fact that birds close to the observer have a higher probability of being detected (if they were not flushed) than birds far from the observer, and that different species have different detection functions (i.e., the probability of detecting a bird at different distances from the observer). An important assumption of the method is that a bird exactly at the center of the plot has a probability of $p = 1$ of being detected, and that there is a high probability of detecting birds within the first 5-10 meters of the plot center. The most important birds to detect are those very close to the observer (within the first 5-10 meters), and it is highly desirable that estimated distances, or those taken with a rangefinder be within 1-2 meters of actual distances for any bird within 20 meters of the observer. However, we recorded all birds seen or heard along with distance from the observer when possible. For this report, all birds seen or heard during the full 5-min are included.

Grassland Bird Habitat

The collection of habitat data followed methods outlined in the bird monitoring protocol by Peitz et al. (2003) and summarized below. Habitat data collection started after the first variable circular plot count was completed. Observers visited plots for habitat measures in the same order they were surveyed for birds to avoid disturbing birds on a plot prior to a survey. Once the habitat crew arrived at a plot, they set up subplot one (plot center) and completed all habitat measures for this subplot and the 50-m radius plot. Next, subplots two, three and four were located and habitat measures completed (Fig. 2). The azimuth to subplot two was determined randomly, subplots three and four were positioned 120 degrees on either side of two. Azimuths were determined during the first year of monitoring and maintained in the subsequent year.

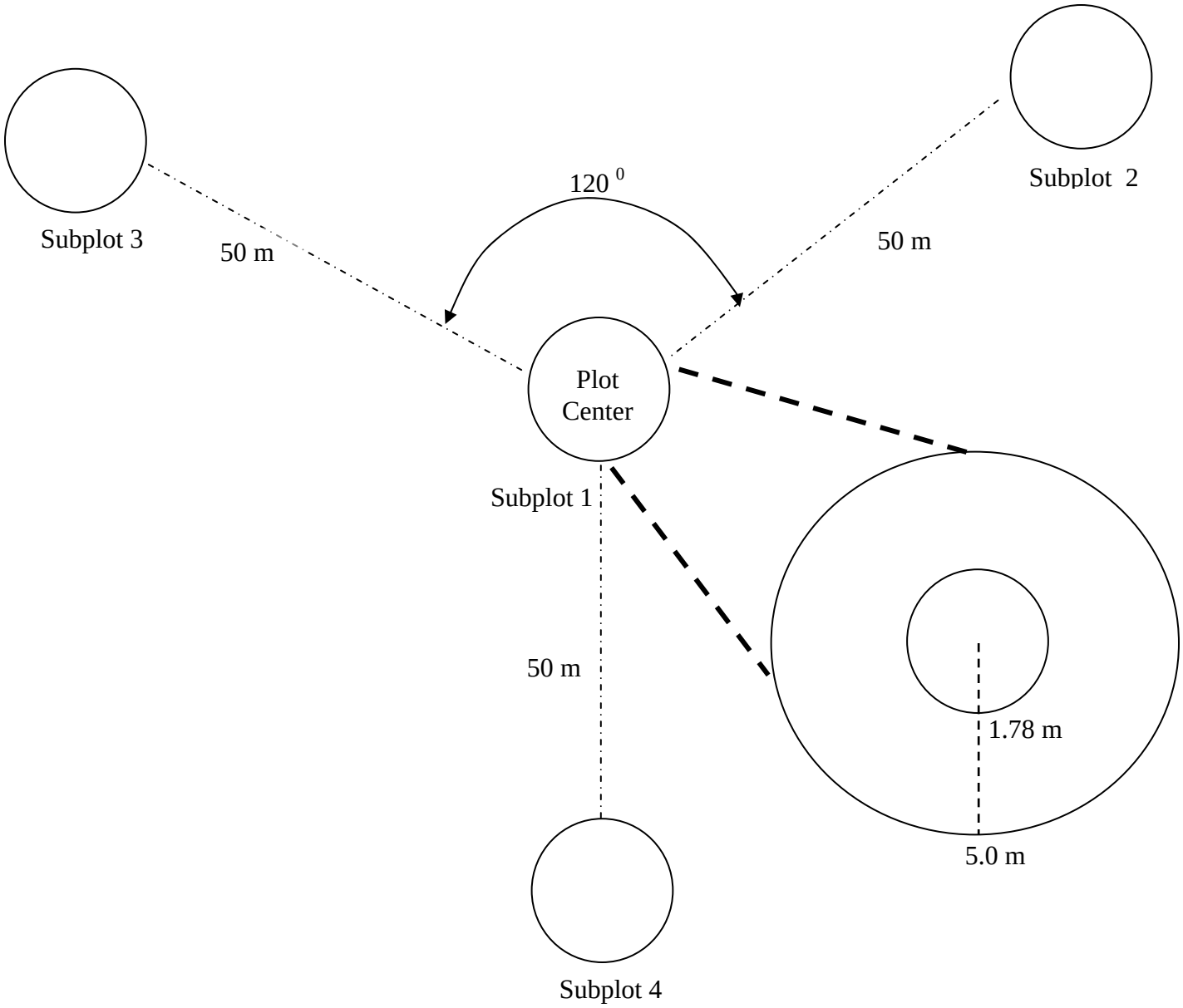

Figure 2. Spatial arrangement of vegetation subplots.

Habitat available to each bird species was characterized at a number of different scales. First, slope, slope variability, aspect, aspect variability and topographic position of each 50-m radius plot were determined and recorded. These measurements are recorded once during the first year of monitoring. Each year, the amount of various vegetation types and the amount of road and water cover on each plot were recorded. Second, azimuth (^{O}) to and slope (^{O}) and aspect (^{O}) of each 5-m subplot (Fig. 2) were determined and recorded once during the first year of monitoring. Each year a plot was sampled, horizontal vegetation cover was estimated in 0.5-m intervals from 0.0 to 2.0 meters above ground surface using a cover board. The area of the cover board obscured by vegetation was estimated at 5- and 15-m distances from the center of each subplot. Using a graduated measuring rod, vertical vegetation structure was measured in 1-m increments up to 7.5 meters in height at four locations around the perimeter of each subplot. Locations were in the four cardinal directions. Vertical structure was recorded for deciduous and herbaceous vegetation. Third, within each subplot, ground and foliar cover were recorded in 1.78-m radius nested sample plots. Ground cover included deciduous and grass litter, bare soil, rock, woody debris (>2.50 cm DBH) and un-vegetated. Foliar cover was estimated for six plant guilds,

including warm- and cool-season grasses, forbs, moss and lichens, shrubs and vines, and tree seedlings and for total foliar cover (<1.50 m tall).

Data Analysis

Prior to summary analysis, the residency status (permanent resident, summer resident, migrant) of each bird species recorded was determined. Identifying the residency of each species helps to exclude migrants from analysis of breeding birds within the park. The frequency and abundance of bird species is reported in four ways. For each species, the average number of individuals encountered per plot visit (individuals / plot visit) was calculated. Second, the proportion of plots occupied by each species was determined. Restricting the area of inference to 100-m radius around each plot center, we determined the average density ($\pm$ std dev) for each species across plots. To examine local density, density was calculated using data from only plots where the species was encountered. Distance software, which accounts for un-detected individuals, will be used in future species density estimates once there is enough observations to do so accurately, approximately 60 observations (Buckland et al. 1993, Buckland et al. 2001).

Annual bird diversity, richness and distribution evenness were calculated by plot, with averages ($\pm$ std dev) estimated for the reconstructed prairie. Bird diversity values for each plot were calculated using Shannon Diversity Index:

$$H' = -\Sigma(n_1/N)\ln(n_1/N)$$

were n_1/N is the proportion of the total number of individuals in a population consisting of the i^{th} species (Shannon, 1949). Species richness is the total number of bird taxa recorded per plot. Species distribution evenness is calculated for each plot using Pielou (J):

$$J' = H' / Hmax$$

were H' is the Shannon Diversity Index and Hmax is the maximum possible diversity for a given number of species if all species are present in equal numbers ((ln(species richness)). J' is a measure of how evenly individuals are distributed within a community when compared to the equal distribution and maximum diversity a community can have (Pielou, 1969).

Location and permanent abiotic measures on each plot and habitat subplot are reported. Annual averages ($\pm$ std dev) for semi-permanent plot data, including road and water cover were calculated from plot estimates. Using calculated plot averages or values, averages ($\pm$ std dev) for horizontal vegetation cover between 0 – 0.5, 0.25-0.75, 0.5 – 1.0, 0.75-1.25, 1.0 – 1.5, 1.25-1.75, and 1.5 – 2.0 meters were calculated for both 5- and 15-m distances. Average ($\pm$ std dev) annual vertical structure diversity were estimated and reported. Vertical structure diversity values were determined for each plot using a modified Shannon Diversity Index:

$$H' = -\Sigma(n_1/N)\ln(n_1/N)$$

were n_1/N is the proportion of vegetation touching a measuring rod in the i^{th} meter increment to the total number of touches from vegetation along the rod.

Within each plot, ground cover, including deciduous and grass litter, bare soil, rock, woody debris (>2.50 cm DBH) and unvegetated were averaged across subplots, with averages (± std dev) reported for the reconstructed prairie using these averages. Foliar cover, by guild of warm- and cool-season grasses, forbs, mosses and lichens, shrubs and vines, tree seedlings and total foliar cover (<1.50 m tall) were averaged across subplots with, averages (± std dev) reported for the reconstructed prairie using these values.

Results

Grassland Bird Surveys

Twenty-one bird species were recorded during the breeding bird surveys at Herbert Hoover National Historic Site, Iowa in 2005-2006 (Table 2). Twelve of the 21 species recorded are classified as permanent residents (Stokes and Stokes 1996a,b). Classification of the remaining nine is summer resident. Six of the 21 species observed were recorded as flyovers or outside the 5-min survey periods. Ten of the 21 species recorded were observed in both survey years. The remaining 11 species were recorded in only one year. Three species, Brown thrasher (*Toxostoma rufum*), Dickcissel (*Spiza americana*) and Grasshopper sparrow (*Ammodramus savannarum*) are considered species of continental importance (Rich et al. 2004).

Red-winged blackbird (*Agelaius phoeniceus*) are the most commonly occurring species in the reconstructed prairie during the breeding season based on the mean number of individuals per plot and the proportion of plots occupied (Tables 3 and 4). Common yellowthroat (*Spiza Americana*), Dickcissel and American goldfinch (*Carduelis tristis*) are moderately abundant. Twelve species were represented by a single observation in one of the two baseline years. Average density of each bird species in the reconstructed prairie during the breeding seasons of 2005 and 2006 are listed in Table 5. Average densities of each species for plots they occupied, are listed in Table 6. Red-winged blackbird had the highest densities of any species across the reconstructed prairie as well as on plots they occupied.

Based on average (± std dev) species richness, diversity and species distribution evenness values, the bird community at Herbert Hoover National Historical Site, Iowa during the breeding season demonstrated vary little differences between 2005 and 2006 (Fig. 3). Species richness was only slightly higher in 2006 compared to 2005.

Table 2. Bird species recorded during breeding bird surveys at Herbert Hoover National Historical Site, Iowa in 2005 – 2006. Residency status of each species is given.

Common name	Species name	AOU code	Residency
American goldfinch	*Carduelis tristis*	AMGO	R[1]
American robin	*Turdus migratorius*	AMRO	SR[2]
Barn swallow	*Hirundo rustica*	BARS	SR
Blue jay	*Cyanocitta cristata*	BLJA	R
Brown-headed cowbird	*Molothrus ater*	BHCO	R
Brown thrasher	***Toxostoma rufum***	**BRTH**	**R**
Common grackle	*Quiscalus quiscula*	COGR	R
Common yellowthroat	*Geothlypis trichas*	COYE	SR
Dickcissel	***Spiza americana***	**DICK**	**SR**
Eastern kingbird	*Tyrannus tyrannus*	EAKI	SR
Eastern meadowlark	*Sturnella magna*	EAME	R
Eastern wood-pewee	*Contopus virens*	EAWP	SR
European starling	*Sturnus vulgaris*	EUST	R
Grasshopper sparrow	***Ammodramus savannarum***	**GRSP**	**SR**
Mourning dove	*Zenaida macroura*	MODO	R
Northern cardinal	*Cardinalis cardinalis*	NOCA	R
Northern mockingbird	*Mimus polyglottos*	NOMO	R
Red-winged blackbird	*Agelaius phoeniceus*	RWBL	R
Ring-necked pheasant	*Phasianus colchicus*	RPHE	R
Tree swallow*	*Tachycineta bicolor*	TRES	SR
Yellow warbler	*Dendroica petechia*	YWAR	SR

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

[1] R = year around resident.

[2] SR = summer resident.

Residence status taken from:

Stokes, D.W. and L.Q. Stokes. 1996a. Stokes Field Guide to Birds: Eastern Region. Little, Brown and Company, New York, New York. Pp471.

Stokes, D.W. and L.Q. Stokes. 1996b. Stokes Field Guide to Birds: Western Region. Little, Brown and Company, New York, New York. Pp519.

Species names are valid and verified names taken from ITIS (Integrated Taxonomic Information System). http://www.itis.usda.gov/.

Bolded species names are those species considered of continental importance (Rich et al. 2004).

Table 3. Number of individuals encountered per plot visit for bird species recorded in the reconstructed prairie at Herbert Hoover National Historic Site, Iowa during breeding bird surveys. Individual species results are listed by year (2005-2006). Average number of individuals per plot includes all individuals recorded on plots during a 5-min survey, including flyovers.

Common name	Species name	AOU code	2005 Freq.	2006 Freq.
American goldfinch	*Carduelis tristis*	AMGO	0.33	0.78
American robin	*Turdus migratorius*	AMRO	0.44	0.33
Barn swallow	*Hirundo rustica*	BARS	0.11	--
Blue jay	*Cyanocitta cristata*	BLJA	0.11	--
Brown-headed cowbird	*Molothrus ater*	BHCO	0.22	0.11
Brown thrasher	***Toxostoma rufum***	**BRTH**	**--**	**0.11**
Common grackle	*Quiscalus quiscula*	COGR	0.56	0.33
Common yellowthroat	*Geothlypis trichas*	COYE	0.67	1.11
Dickcissel	***Spiza Americana***	**DICK**	**0.56**	**0.78**
Eastern kingbird	*Tyrannus tyrannus*	EAKI	0.11	--
Eastern meadowlark	*Sturnella magna*	EAME	0.22	0.33
Eastern wood pewee	*Contopus virens*	EAWP	--	0.11
European starling	*Sturnus vulgaris*	EUST	0.33	--
Grasshopper sparrow	***Ammodramus savannarum***	**GRSP**	**--**	**0.11**
Mourning dove	*Zenaida macroura*	MODO	0.11	0.11
Northern cardinal	*Cardinalis cardinalis*	NOCA	--	0.11
Northern mockingbird	*Mimus polyglottos*	NOMO	--	0.11
Red-winged blackbird	*Agelaius phoeniceus*	RWBL	2.78	3.78
Ring-necked pheasant	*Phasianus colchicus*	RPHE	0.11	0.22
Yellow warbler	*Dendroica petechia*	YWAR	--	0.11

Bolded species names are those species considered of continental importance (Rich et al. 2004).

Table 4. Proportion of plots occupied by bird species recorded in the reconstructed prairie at Herbert Hoover National Historic Site, Iowa during breeding bird surveys. Individual species results are listed by year (2005-2006). Proportion of plots occupied is determined using individuals recorded on plots during a 5-min survey, including flyovers.

Common name	Species name	AOU code	2005 Freq.	2006 Freq.
American goldfinch	*Carduelis tristis*	AMGO	0.33	0.44
American robin	*Turdus migratorius*	AMRO	0.44	0.22
Barn swallow	*Hirundo rustica*	BARS	0.11	--
Blue jay	*Cyanocitta cristata*	BLJA	0.11	--
Brown-headed cowbird	*Molothrus ater*	BHCO	0.22	0.11
Brown thrasher	***Toxostoma rufum***	**BRTH**	**--**	**0.11**
Common grackle	*Quiscalus quiscula*	COGR	0.22	0.33
Common yellowthroat	*Geothlypis trichas*	COYE	0.67	0.78
Dickcissel	***Spiza Americana***	**DICK**	**0.44**	**0.44**
Eastern kingbird	*Tyrannus tyrannus*	EAKI	0.11	--
Eastern meadowlark	*Sturnella magna*	EAME	0.22	0.33
Eastern wood pewee	*Contopus virens*	EAWP	--	0.11
European starling	*Sturnus vulgaris*	EUST	0.11	--
Grasshopper sparrow	***Ammodramus savannarum***	**GRSP**	**--**	**0.11**
Mourning dove	*Zenaida macroura*	MODO	0.11	0.11
Northern cardinal	*Cardinalis cardinalis*	NOCA	--	0.11
Northern mockingbird	*Mimus polyglottos*	NOMO	--	0.11
Red-winged blackbird	*Agelaius phoeniceus*	RWBL	0.89	1.00
Ring-necked pheasant	*Phasianus colchicus*	RPHE	0.11	0.22
Yellow warbler	*Dendroica petechia*	YWAR	--	0.11

Bolded species names are those species considered of continental importance (Rich et al. 2004).

Table 5. Average density (± std. dev.) of bird species recorded in the reconstructed prairie at Herbert Hoover National Historic Site, Iowa during breeding bird surveys. Individual species results are listed by year (2005-2006). Species densities are for individuals recorded within 100-m of plot center during a 5-min survey, excluding flyovers.

Common name	Species name	AOU code	2005 Individuals / ha	2006 Individuals / ha
American goldfinch	*Carduelis tristis*	AMGO	0.035 (0.106)	0.212 (0.318)
American robin	*Turdus migratorius*	AMRO	0.071 (0.140)	--
Blue jay	*Cyanocitta cristata*	BLJA	0.035 (0.106)	--
Brown-headed cowbird	*Molothrus ater*	BHCO	0.035 (0.106)	--
Common grackle	*Quiscalus quiscula*	COGR	0.142 (0.425)	0.106 (0.318)
Common yellowthroat	*Geothlypis trichas*	COYE	0.106 (0.159)	0.142 (0.231)
Dickcissel	***Spiza Americana***	**DICK**	**0.142 (0.168)**	**0.106 (0.159)**
Eastern kingbird	*Tyrannus tyrannus*	EAKI	0.035 (0.106)	--
Eastern meadowlark	*Sturnella magna*	EAME	0.035 (0.106)	0.035 (0.106)
Grasshopper sparrow	***Ammodramus savannarum***	**GRSP**	**--**	**0.035 (0.106)**
Mourning dove	*Zenaida macroura*	MODO	--	0.035 (0.106)
Northern cardinal	*Cardinalis cardinalis*	NOCA	--	0.035 (0.106)
Northern mockingbird	*Mimus polyglottos*	NOMO	--	0.035 (0.106)
Red-winged blackbird	*Agelaius phoeniceus*	RWBL	0.354 (0.336)	0.849 (0.764)
Ring-necked pheasant	*Phasianus colchicus*	RPHE	0.035 (0.106)	--

Bolded species names are those species considered of continental importance (Rich et al. 2004).

Table 6. Average bird density (± std. dev.) for plots occupied by species recorded in the reconstructed prairie at Herbert Hoover National Historic Site, Iowa during breeding bird surveys. Individual species results are listed by year (2005-2006). Species densities are for individuals recorded within 100-m of plot center during a 5-min survey, excluding flyovers.

Common name	Species name	AOU code	2005 Individual / ha	2006 Individuals / ha
American goldfinch	*Carduelis tristis*	AMGO	0.318	0.478 (0.318)
American robin	*Turdus migratorius*	AMRO	0.318 (0)	--
Blue jay	*Cyanocitta cristata*	BLJA	0.318	--
Brown-headed cowbird	*Molothrus ater*	BHCO	0.318	--
Common grackle	*Quiscalus quiscula*	COGR	1.274	0.955
Common yellowthroat	*Geothlypis trichas*	COYE	0.318 (0)	0.425 (0.184)
Dickcissel	***Spiza Americana***	**DICK**	**0.318 (0)**	**0.318 (0)**
Eastern kingbird	*Tyrannus tyrannus*	EAKI	0.318	--
Eastern meadowlark	*Sturnella magna*	EAME	0.318	0.318
Grasshopper sparrow	***Ammodramus savannarum***	**GRSP**	**--**	**0.318**
Mourning dove	*Zenaida macroura*	MODO	--	0.318
Northern cardinal	*Cardinalis cardinalis*	NOCA	--	0.318
Northern mockingbird	*Mimus polyglottos*	NOMO	--	0.318
Red-winged blackbird	*Agelaius phoeniceus*	RWBL	0.531 (0.260)	0.955 (0.742)
Ring-necked pheasant	*Phasianus colchicus*	RPHE	0.318	--

Bolded species names are those species considered of continental importance (Rich et al. 2004).

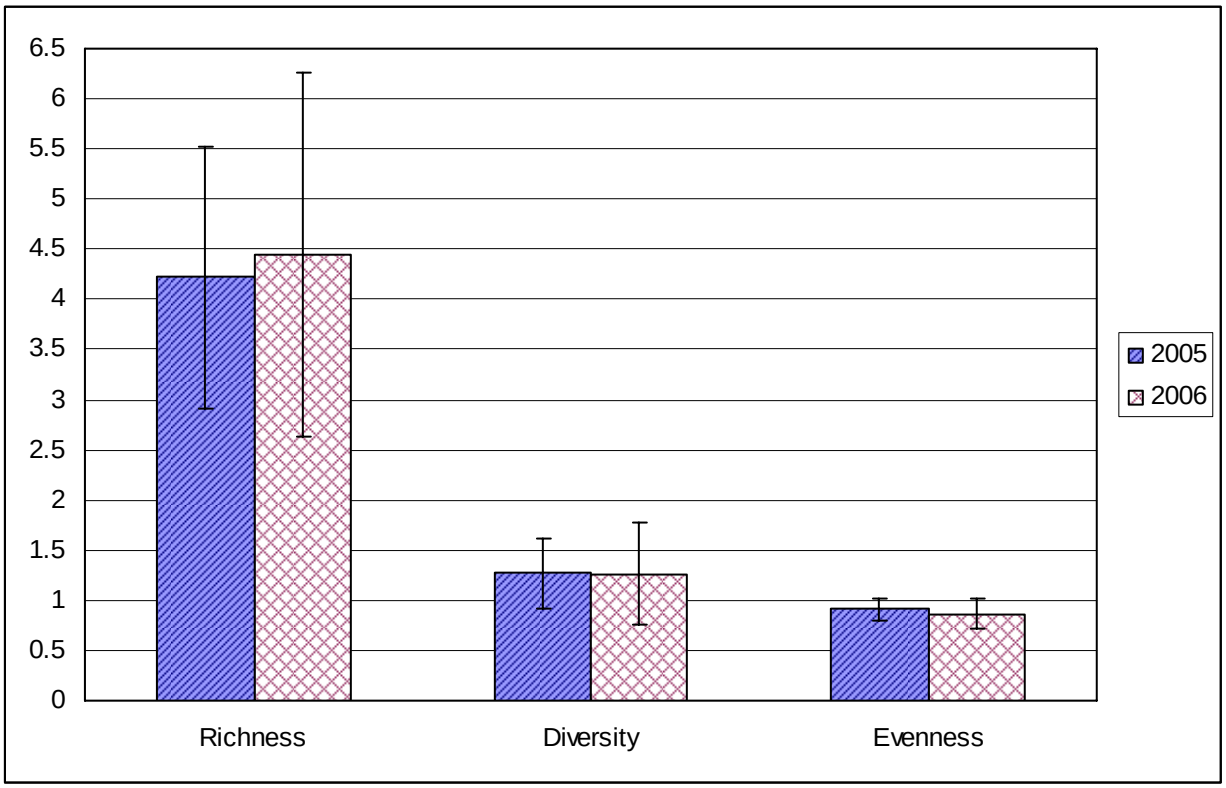

Figure 3. Average (± std dev) species richness, diversity and species distribution evenness values for the bird community at Herbert Hoover National Historical Site, Iowa during the breeding seasons of 2005 and 2006.

Grassland Bird Habitat

Abiotic features of plots sampled for breeding birds and habitat composition are given in Table 7. Slope and aspect variability is low to medium for plots sampled. Plots are distributed somewhat evenly across topographic position, with only one plot located in a shallow draw. Slope across all survey plots is low, 6^{o} or less. Location and abiotic features of the smaller habitat subplots are given in Table 8. Slopes across the smaller habitat subplots are similar to the larger survey plots and never exceeded 9^{o}.

Bird survey plots averaged over 88 % upland prairie habitat type, with smaller amounts of several other habitat types present (Table 9). Vegetation during the bird-breeding season was slightly taller in 2006 and was most dense below one meter from the soil surface. The highest horizontal vegetation cover observations were in the 0.00 – 0.50 and 0.25 – 0.75 meter profile classes when read from both 5- and 15-m distances (Table 9). Vertical structure diversity estimates were similar between years and appear to be quite low.

Grass litter was the only litter type found in any significant amount (Table 9). Ground cover was mostly grass litter and bare soil. Forbs had the greatest foliar cover, followed by warm-season grasses, cool-season grasses and woody shrubs and vines. Total foliar coverage averaged from 45.91 % (2006) to 46.20 % (2005) across plots.

Table 7. Abiotic features of 50-m radius plots sampled for breeding birds at Herbert Hoover National Historic Site, Iowa.

Plot number	Slope (^{O})	Slope variability	Aspect (^{O})	Aspect variability	Topographic position	Habitat type
HEHOTweety1	2	Low	22	Low	Lower-slope	Upland
HEHOTweety2	4	Medium	31	Medium	Lower-slope	Upland
HEHOTweety3	4.5	Medium	36	Medium	Upper-slope	Upland
HEHOTweety4	4	Medium	310	Medium	Draw	Upland
HEHOTweety5	6	Medium	281	Medium	Upper-slope	Upland
HEHOTweety6	6	Medium	116	Medium	Mid-slope	Upland
HEHOTweety7	5	Medium	292	Medium	Mid-slope	Upland
HEHOTweety8	5	Medium	316	Medium	Mid-slope	Upland
HEHOTweety9	5	Medium	122	Medium	Upper-slope	Upland

Table 8. Location, with respect to their appropriate 50-m plot and abiotic features of each subplot sampled for breeding bird habitat at Herbert Hoover National Historic Site, Iowa.

Plot number	Subplot number	Azimuth (^{O})	Slope (^{O})	Aspect (^{O})	Comments
HEHOTweety1	1	C	2	20	
HEHOTweety1	2	294	1.5	0	
HEHOTweety1	3	174	6	28	
HEHOTweety1	4	54	0	44	
HEHOTweety2	1	C	3	22	
HEHOTweety2	2	255	4.5	49	
HEHOTweety2	3	15	2	56	
HEHOTweety2	4	135	4	8	
HEHOTweety3	1	C	3	44	
HEHOTweety3	2	123	5	51	
HEHOTweety3	3	3	4.5	74	
HEHOTweety3	4	243	--	--	Subplot located in cornfield next to prairie - not sampled.
HEHOTweety4	1	C	4.5	296	
HEHOTweety4	2	6	4	324	
HEHOTweety4	3	126	9	51	
HEHOTweety4	4	246	5	81	
HEHOTweety5	1	C	5	279	
HEHOTweety5	2	332	6	295	
HEHOTweety5	3	92	4.5	29	
HEHOTweety5	4	212	6	338	
HEHOTweety6	1	C	5	114	
HEHOTweety6	2	88	1	223	
HEHOTweety6	3	328	2	130	
HEHOTweety6	4	280	--	--	Subplot located in highway right of way - not sampled.
HEHOTweety7	1	C	5	308	
HEHOTweety7	2	48	5	54	
HEHOTweety7	3	288	1	255	
HEHOTweety7	4	168	2	317	
HEHOTweety8	1	C	4	288	
HEHOTweety8	2	338	5	290	
HEHOTweety8	3	98	4	262	
HEHOTweety8	4	218	7	346	
HEHOTweety9	1	C	4	133	
HEHOTweety9	2	3	2	104	
HEHOTweety9	3	123	5	80	
HEHOTweety9	4	243	1	85	

Table 9. Averages (± std dev) for habitat parameters at Herbert Hoover National Historic Site, Iowa during the bird breeding season, 2005-2006. Within the scale in which habitat parameters are collected, 50-m plot, 5-m subplot and 1.78-m sample plot, percentages of coverage may not necessarily sum to 100% as values are averaged over mid-point values of cover classes (i.e. class 1 = 0.5%, class 2 = 3.0%, class 3 = 15.0%, class 4 = 37.5%, class 5 = 62.5%, class 6 = 85.0%, and class 7 = 97.5%).

Habitat Parameter	2005		2006	
	Mean	std dev	Mean	std dev
50 meter plot coverage				
Upland prairie (%)	88.06	11.44	88.33	15.21
Cornfield (%)	0.33	1.00	1.67	5.00
Lawn (%)	0.39	0.99	0.00	0.00
Road (%)	0.06	0.17	1.06	1.47
Road right-of-way (%)	4.50	12.41	1.67	5.00
Shrubland (%)	0.33	1.00	0.33	1.00
5 meter subplot				
Horizontal vegetation profile at 5-m				
0.0 – 0.5 m (%)	88.52	10.23	94.39	5.88
0.25 – 0.75 m (%)	31.98	17.96	54.10	20.32
0.5 – 1.0 m (%)	18.62	29.51	19.26	21.56
0.75 – 1.25 m (%)	5.98	13.27	20.34	32.43
1.0 – 1.5 m (%)	4.22	12.48	8.61	20.81
1.25 – 1.75 m (%)	6.94	20.83	8.61	20.81
1.5 – 2.0 m (%)	6.94	20.83	10.89	32.47
Horizontal vegetation profile at 15-m				
0.0 – 0.5 m (%)	95.03	4.18	97.5	0.00
0.25 – 0.75 m (%)	53.62	19.95	70.56	19.74
0.5 – 1.0 m (%)	20.86	32.43	30.57	31.62
0.75 – 1.25 m (%)	7.42	12.07	25.52	30.66
1.0 – 1.5 m (%)	7.00	20.81	27.37	37.12
1.25 – 1.75 m (%)	9.44	28.33	18.67	36.97
1.5 – 2.0 m (%)	9.44	28.33	16.61	34.34
Vertical structure diversity	1.39	0.26	1.47	0.32
1.78 meter sample plot coverage				
Deciduous litter (%)	0.03	0.07	1.08	1.97
Grass litter (%)	24.94	26.57	27.84	10.33
Bare soil (%)	49.96	18.34	49.37	10.73
Rock (%)	0.01	0.03	0.13	0.21
Woody debris (%)	0.44	1.33	0.43	1.30
Unvegetated (%)	69.32	9.36	77.51	8.81
Warm-season grass (%)	19.30	10.03	20.32	7.78
Cool-season grass (%)	1.51	3.06	1.80	1.47
Forb (%)	22.29	9.07	24.33	12.93
Moss and lichen (%)	0.00	0.00	0.84	1.31
Woody shrub and vine (%)	0.80	1.49	2.04	2.75
Tree seedling (%)	0.03	0.07	0.00	0.00
Total foliar (%)	46.20	14.15	45.91	12.47

Discussion

Bird surveys and habitat assessment work was initiated at Herbert Hoover National Historic Site, Iowa in 2005, to assist the park in assessing the integrity of their reconstructed prairie through time. The park's Resource Stewardship Strategy Plan (in draft) establishes management goals for the prairie. Objectives of monitoring are to track changes in prairies bird community composition and abundance, and the responses of bird communities to changes in habitat structure, and to use this information to assist in attaining Resource Stewardship goals. Our 2005-2006 survey results serve as a baseline for monitoring future changes in the bird community.

All twenty-one bird species recorded during the breeding bird surveys are permanent or summer residents to the area (Stokes and Stokes 1995a, b). Therefore, all 21 species have some value in characterizing the breeding bird community of the reconstructed prairie. However, changes in the numbers of the most common and widely distributed species on the prairie, Red-winged blackbirds, Common yellowthroat, Dickcissel and American goldfinch will serve as better measures for assessing changing prairie conditions. For example, species like the Dickcissel have improved reproductive success when grass cover is dense, forbs presence is heavy and litter cover is thick (Johnson et al. 1998, Winter 1998). Therefore, a decline in Dickcissel numbers could very well indicate changes in any one or all three of these measures. Less common and widely distributed species will likely occur so infrequently that strong species-habitat relationship may not be established.

Changes in the populations of three species; Brown thrasher, Dickcissel and Grasshopper sparrow are of special interest and need investigated each time a survey is completed. All three are species of continental importance (Rich et al. 2004). Our baseline date suggest that two (i.e. Brown thrasher and Grasshopper sparrow) of the three species occur infrequently or rarely in this prairie and this will likely remain unchanged unless significant alterations to the habitat or surrounding area occur. Brown thrasher is a species with a strong affinity to shrubs, usually within one to three meters of the ground (Johnson et al. 1998). Shrubs, vines and tree seedlings were nearly nonexistent during our surveys. However, allowing shrubs to invade on the reconstructed prairie may be counter to management goals for grassland obligates. Grasshopper sparrow, a grassland obligate is a species with a minimum area requirement of 30 ha (74 acres: Herkert 1994a, b; Johnson et al 1998), unless the grassland is situated within a larger matrix of grasslands (Winter 1998). Therefore, the park should actively seek out grassland conservation partnerships with neighboring property owners to improve numbers of this species to meet the park's desired prairie condition.

Herbert Hoover National Historic Site, Resource Stewardship Strategy (in draft) identifies a target of five or more breeding grassland obligate bird species. Inventories by Stavers et al. (2004) suggest desired prairie conditions were being met on the park in 2003. However, four of the six grassland obligates observed by Stravers et al. (2004) were recorded in very low numbers, less than six individuals of each species, over 32 plot visits. The Grasshopper sparrow, Dickcissel and Eastern meadowlark were observed in the current monitoring, falling short of the target. The additional grassland obligates reported by Stravers et al. (2004) included; Bobolink, Henslow's sparrow (*Ammodramus henslowii*) and Sedge wren (*Cistothorus platensis*).

Addressing habitat is key to retaining and attracting more grassland obligate species. For reasons stated earlier, observations of one of the three species, Grasshopper sparrow will likely always be low unless additional areas in and around the park are converted to grasslands.

Red-winged blackbirds, the most common species at Herbert Hoover National Historical Site has shown precipitous declines in other areas of North America (Sauer et al. 2000). Blackwell and Dolbeer (2001) found the species to have declined by over 53 % in Ohio, do in part to changing agriculture practices similar to those occurring in Iowa. Therefore, the importance of the park to conservation of even its most common species cannot be underestimated. Management decisions aimed at influencing bird populations should center on those species identified as locally and/or of continental importance. However, species common to the park, such as the Red-winged blackbird need consideration in a broader context of bird conservation when making management decisions.

Low species richness, diversity and evenness values are common for grassland bird communities (Cody 1966, Knopf 1996, Wiens 1973, Wiens 1974, Zimmerman 1992). Therefore, species richness, diversity and distribution evenness values for the breeding bird community at Herbert Hoover National Historic Site, which appears low when compared to other ecotypes, is quit normal. Average species richness on plots surveyed is less than 4.5 individuals. Cody (1966) reported species richness in grasslands is generally less than ten. Weins (1973) reported breeding species richness much less than this. Our distribution evenness values also suggest that only a few breeding species contributed significantly to diversity measures. One might say that a defining aspect of the reconstructed prairie is a bird community dominated by a relatively few common species. Though hard to discern now, the real value of richness, diversity and evenness values will be realized when we examine changes in the bird community through time, 20, 30 or more years, and these changes can be linked to management activity rather than innate variability of the tallgrass prairie ecotype.

Initial habitat assessments show that bird plots are located in upland prairie habitats, with a small amount of several other habitat types present. Vegetation was most dense below 0.75-m from the ground surface, and vertical structure diversity estimates were low. Most grassland obligates favor dense grass cover with some height in vertical structure (Johnson et al. 1998) suggesting current habitat structure may not meet resource stewardship goals. Significant deviations from the present vegetation, such as woody plant encroachments, will be captured with future measures of vegetation structure. The plant community during sampling was dominated by forbs followed by warn-season grasses, cool-season grasses (2005) and woody shrubs and vines (2006). Dickcissel favor a heavy forb component in a grassland environment (Johnson et al. 1998). Grass litter was the most abundant ground cover, but it may be insufficient to attract some grassland obligates (Johnson et al. 1998). The soil surface was between 69 and 78% unvegetated during sampling. Therefore, numbers of grassland obligate species should increase with management activities aimed at increasing warm season grass cover and reducing the amount of unvegetated habitat.

In summary, this report provides baseline information on populations and breeding habitat of birds in the reconstructed prairie at Herbert Hoover National Historic Site. Habitat conditions during the breeding season of 2005 and 2006 appear to have been insufficient to meet the parks

Resource Stewardship Strategy. With our current information, park staff can better plan Resource Stewardship Strategies, with future monitoring aiding in assessing their effectiveness. Monitoring information also provides park staff with another tool for interpreting their prairie resources.

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