**National Park Service**
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# Bird Community Monitoring at Homestead National Monument of America, Nebraska

*2009 Status Report*

Natural Resource Data Series NPS/HTLN/NRDS—2010/046

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# 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 through their interpretive programs.

We use trends in the composition and abundance of bird populations as long-term indicators of ecosystem integrity in the prairie and woodland habitats of Homestead National Monument of America, Nebraska (HOME). 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 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 bird communities in the prairie and woodland areas may reflect the effectiveness of management in restoring and maintaining these communities at HOME. Long-term trends in community composition and abundance of breeding bird populations provide one measure for assessing the ecological integrity and sustainability of these systems.

### Restored prairie

The importance of prairie as the historic landscape to early settlers has led the Park Service to restore former agricultural fields to native prairie at HOME. The first seed and sod transfer efforts date back to 1939, making the HOME prairie the second oldest prairie restoration in the United States. In subsequent years, park managers have been diligent towards their goal of prairie restoration, and have utilized increasingly sophisticated techniques to restore and maintain the tallgrass prairie.

### Woodland

The hardwood forest area along Cub Creek is comprised of two distinct zones based on past land use. The woodland in the northern part of the monument is consistent with the description of a mesic bur oak forest, a critically imperiled (S1) community in Nebraska (Steinauer & Rolfsmeier 2000). The southern portion is characterized as an eastern lowland forest and was heavily logged in the 1930's. Fire suppression, grazing cessation, and changes in the hydrology of Cub Creek have produced significant changes in the woodlands since the establishment of the first homestead. For a complete description, inventory and evaluation of the lowland forest along Cub Creek, see Mlekush and DeBacker (2003) and Rolfsmeier (2007).

# Methods

## Site Selection for Bird Plots

Permanent monitoring locations or 'plots' were created by overlaying a systematic grid of 100 x 100 meter cells (originating from a random start point) across the monument. The orientation of the systematic grid was rotated 45 degrees from north. The prairie and woodland were identified as separate stratum, with sampling plots distributed relative to the coverage of each stratum on the monument. We established 30 prairie and 18 woodland plots (Figure 1). However, only 14 of the woodland plots were sampled as the remaining four were located in Cub Creek, a small stream that flows through the monument.

This systematic approach to selecting sampling sites allows flexibility to choose the appropriate reference frame to answer different monitoring questions. When making park-wide inferences, results from each stratum can be weighted by area and combined to give an overall park mean and variance. The systematic grid also allows us to limit the reference frame appropriately when asking more specific monitoring questions (e.g. do avian species respond to different management regimes in woodland and prairie habitats?).

During bird surveys, monitoring plots were located using navigation waypoints (Appendix 1) in a GPS unit and temporarily marked with 36-inch pin flags to aid in re-locating 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.

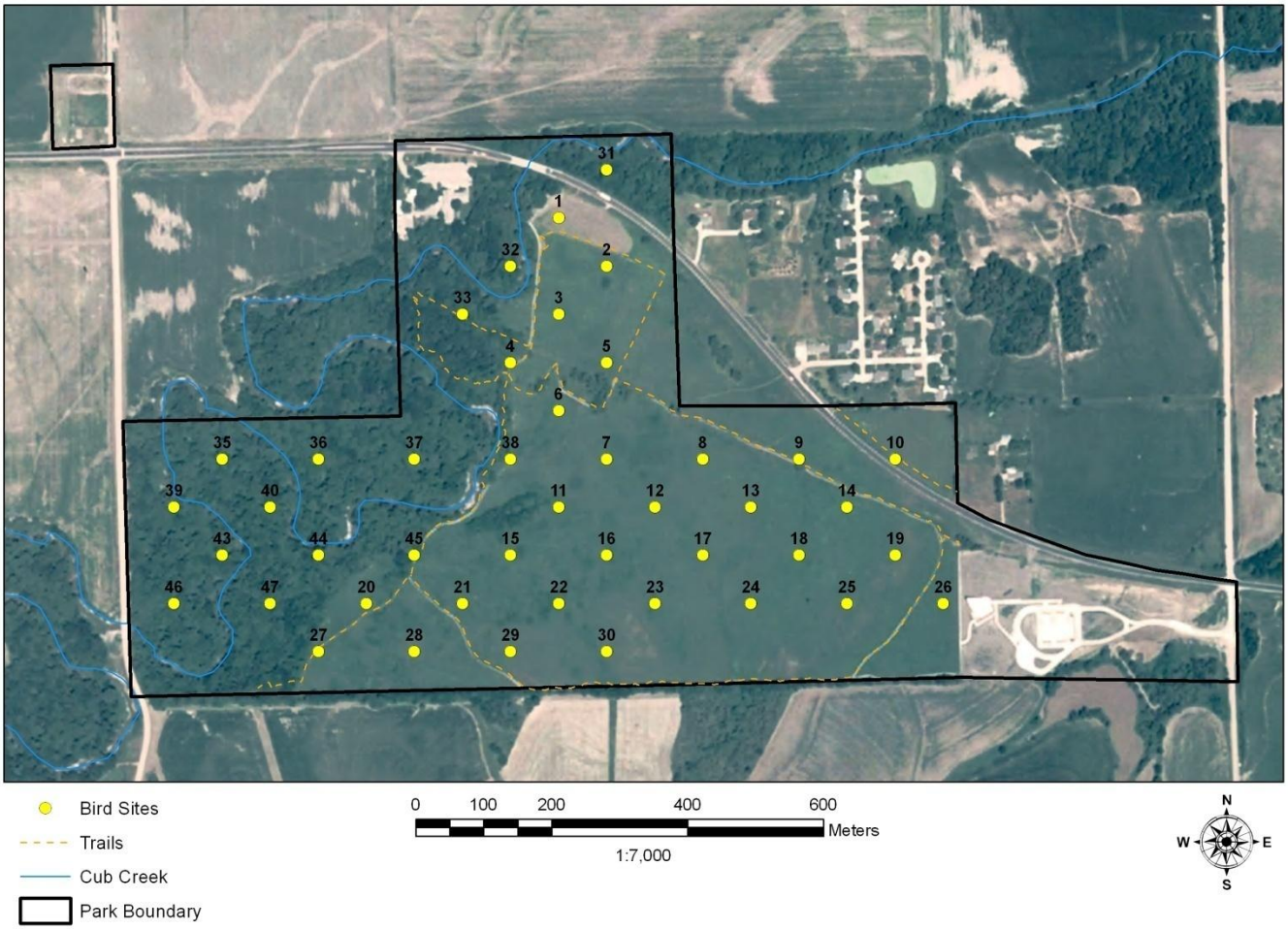


Figure 1. Bird plot locations on Homestead National Monument of America, Nebraska.

## Bird Surveys

Bird surveys followed methods outlined in the bird monitoring protocol by Peitz et al. (2008) and summarized 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. During analysis, each individual in a cluster or flock were treated as separate observations. 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. A total of 44 plots were sampled in 2009.

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. An important assumption of the method is that birds exactly at the center of the plot have a 100% probability 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.

### Bird Habitat

The collection of habitat data followed methods outlined in the bird monitoring protocol by Peitz et al. (2008). A summary of the sampling method's follows: 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 the survey. Once the habitat crew arrived at a plot, they set up the center subplot and completed all habitat measures for this subplot and the 50-m radius plot.

We characterized habitat available for each bird species on a number of different scales. Slope, slope variability, aspect, aspect variability, and topographic position of each 50-m radius plot were determined and recorded first. Measurements were recorded during this first year of monitoring, and will not be re-measured in subsequent years. The amount of various vegetation types and the amount of road and water cover on each plot sampled were recorded. As plots were sampled, horizontal vegetation cover was estimated on subplots in 0.25-cm intervals from 0.0 to 2.0 meters above ground surface using a 0.15-cm wide cover board. Area of the cover board obscured by vegetation was estimated at a 15-m distances from plot center. 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 the subplot. Locations were in the four cardinal directions. Vertical structure was recorded for deciduous, coniferous, and herbaceous vegetation. Trees were tallied by species and size class (<1.0 cm, 1.1 – 2.5 cm, 2.6 – 8.0 cm, 8.1 – 15.0 cm, 15.1 – 23.0 cm, 23.1 – 38.0 or >38.0 cm) on the subplot. Lastly, at the subplot, ground and foliar cover were recorded in a 1.78-m radius nested sample plot. Ground cover included deciduous and grass litter, bare soil, rock, woody debris (>2.5 cm diameter), and unvegetated. Foliar cover was estimated for six plant guilds, including warm- and cool-season grasses, forbs, moss and lichens, shrubs and vines, tree seedlings, and total foliar cover (<1.5 m tall). Average parameter values were reported for the prairie and woodland habitats.

### Data Analysis

Prior to summary analysis, the residency status (permanent resident, summer resident, migrant, and out of normal residency range) of each bird species recorded was determined. Identifying the residency of each species helps to exclude migrants and those out of their normal range from analysis of breeding birds within HOME. Hereafter, permanent and summer resident birds are

referred to as breeding species. The frequency and abundance of breeding bird species were determined two ways. First, for each breeding species, the number of individuals encountered per plot visit within a habitat was determined (individuals / plot visit). And second, the proportion of plots occupied by each breeding species within each habitat was determined (total number of plots occupied by a species / total number of plots visited).

Location and permanent abiotic measures on each plot and habitat subplot were determined. Averages ($\pm$ std dev) for semi-permanent plot data, including road and water cover were calculated from plot estimates for both prairie and woodland habitats. Using plot values, averages ($\pm$ std dev) for horizontal vegetation cover between 0 – 0.25, 0.25-0.5, 0.5 – 0.75, 0.75-1.0, 1.0 – 1.25, 1.25-1.5, 1.5 – 1.75, and 1.75 – 2.0 meters were calculated by habitat type. Average ($\pm$ std dev) vertical structure diversity was estimated and reported by habitat type as well.

$$\text{Structural Diversity Index} = \frac{((\sum p_i / 8) + a) * 100}{2}$$

Where $p_i$ – is the observed frequency for vegetation in the $_i$th interval touching a measuring rod out of twelve measuring events, and a – is the percent of intervals with recorded vegetation in eight height increments. Vertical structure diversity values are weighted equally to represent both the vertical height of vegetation and how dense the vegetation is within each height increment.

Within each plot, ground cover, including deciduous and grass litter, bare soil, rock, woody debris (>2.5 cm DBH), and unvegetated were averaged ($\pm$ std dev) across plots within each habitat type. Foliar cover, by guild of warm- and cool-season grasses, forbs, mosses and lichens, shrubs and vines, tree seedlings and total foliar cover (<1.5 m tall) were averaged ($\pm$ std dev) across plots within habitat types as well. Also reported is species composition and size classes of trees in the prairie and woodland habitats.

# Results

## Bird Surveys

Forty-seven avian species were recorded on HOME between May 12 and 13, 2009 (Table 1). Forty-three of the 47 species are year round or summer residents. Two species, Least flycatcher (*Empidonax minimus*) and Wood duck (*Aix sponsa*) are migrants through the area. The Summer tanager (*Piranga rubra*) is outside its normal range, and the Yellow-bellied sapsucker (*Sphyrapicus varius*) is a winter resident on the monument. Nineteen breeding bird species were recorded solely in prairie habitat, 13 species in woodland habitat, and 11 species in both habitats. Two species, Dickcissel (*Spiza americana*) and Grasshopper sparrow (*Ammodramus savannarum*) are grassland obligate species. Both species are species of continental importance as well, along with seven other breeding birds: Brown thrasher (*Toxostoma rufum*), Eastern towhee (*Pipilo erythrophthalmus*), Indigo bunting (*Passerina cyanea*), Red-bellied woodpecker (*Melanerpes carolinus*), Red-headed woodpecker (*Melanerpes erythocephalus*), Worm eating warbler (*Helmitheros vermivorus*), and Yellow-throated vireo (*Vireo flavifrons*). Brown-headed cowbird (*Molothrus ater*) was the most commonly encountered and widely distributed species in prairie habitat on the monument in 2009 (Table 2). House wren (*Troglodytes aedon*) was the most commonly encountered and widely distributed species in woodland habitat.

Table 1. Species recorded at Homestead National Monument of America, Nebraska during breeding bird surveys in 2009.

| Common name | Species name | AOU code | Residency Status[1] |
|---|---|---|---|
| American crow | *Corvus brachyrhynchos* | AMCR | R |
| American goldfinch | *Carduelis tristis* | AMGO | R |
| American redstart | *Setophaga ruticilla* | AMRE | SR |
| American robin | *Turdus migratorius* | AMRO | SR |
| Barn swallow | *Hirundo rustica* | BANS | SR |
| Baltimore (Northern) oriole | *Icterus galbula* | BAOR | SR |
| Black-capped chickadee | *Parus atricapillus* | BCCH | R |
| Barred owl | *Strix varia* | BDOW | R |
| Brown-headed cowbird | *Molothrus ater* | BHCO | SR |
| Blue jay | *Cyanocitta cristata* | BLJA | R |
| **Brown thrasher** | ***Toxostoma rufum*** | **BRTH** | **R** |
| Cedar waxwings | *Bombycilla cedrorum* | CEDW | R |
| Common yellowthroat | *Geothlypis trichas* | COYE | SR |
| **Dickcissel*** | ***Spiza americana*** | **DICK** | **SR** |
| Downy woodpecker | *Picoides pubescens* | DOWO | R |
| Eastern kingbird | *Tyrannus tryannus* | EAKI | SR |
| **Eastern (Rufus-sided) towhee** | ***Pipilo erythrophthalmus*** | **EATO** | **R** |
| (Eastern) Tufted titmouse | *Parus bicolor* | ETTI | R |
| Field sparrow | *Spizella pusilla* | FISP | R |
| Great crested flycatcher | *Myiarchus crinitus* | GCFL | SR |
| Gray catbird | *Dumetella carolinensis* | GRCA | SR |
| **Grasshopper sparrow*** | ***Ammodramus savannarum*** | **GRSP** | **SR** |
| House wren | *Troglodytes aedon* | HOWR | SR |
| **Indigo bunting** | ***Passerina cyanea*** | **INBU** | **SR** |
| Killdeer | *Charadrius vociferous* | KILL | SR |
| Least flycatcher | *Empidonax minimus* | LEFL | M |
| Mourning dove | *Zenaida macroura* | MODO | R |
| Northern bobwhite | *Colinus virginianus* | NOBO | R |
| Northern cardinal | *Cardinalis cardinalis* | NOCA | R |
| Rose-breasted grosbeak | *Pheucticus ludovicianus* | RBGR | SR |
| **Red-bellied woodpecker** | ***Melanerpes carolinus*** | **RBWO** | **R** |
| Red-eyed vireo | *Vireo olivaceus* | REVI | SR |
| **Red-headed woodpecker** | ***Melanerpes erythocephalus*** | **RHWO** | **R** |
| Ring-necked pheasant | *Phasianus colchicus* | RNPH | R |
| Red-tailed hawk | *Buteo jamaicensis* | RTHA | R |
| Red-winged blackbird | *Agelaitus phoeniceus* | RWBL | R |
| Song sparrow | *Melospiza melodia* | SOSP | R |
| Summer tanager | *Piranga rubra* | SUTA | O |

Table 1. Species recorded at Homestead National Monument of America, Nebraska during breeding bird surveys in 2009 (continued).

| Common name | Species name | AOU code | Residency Status[1] |
|---|---|---|---|
| Turkey vulture | *Cathartes aura* | TUVU | SR |
| White-breasted nuthatch | *Sitta carolinensis* | WBNU | R |
| **Worm-eating warbler** | ***Helmitheros vermivorus*** | **WEWA** | **SR** |
| Wild turkey | *Meleagris gallopavo* | WITU | R |
| Wood duck | *Aix sponsa* | WODU | M |
| **Yellow-bellied sapsucker** | ***Sphyrapicus varius*** | **YBSA** | **WR** |
| Northern (Yellow-shafted) flicker | *Colaptes auratus* | YSFL | R |
| **Yellow-throated vireo** | ***Vireo flavifrons*** | **YTVI** | **SR** |
| Yellow warbler | *Dendroica petechia* | YWAR | SR |

[*] Obligate grassland species. These species require relatively treeless grasslands for all or most of their breeding cycle (Northern Prairie Wildlife Research Center. Accessed in 2009, http://www.npwrc.usgs.gov/).

[1] Residency status: SR = summer resident; R = year around resident; M = late season migrant; WR = winter resident; O = outside of normal range (Stokes and Stokes 1996).

Species names are valid and verified names obtained from ITIS. (Integrated Taxonomic Information System. Accessed in 2009, http://www.itis.gov/).

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

Table 2. Number of individuals encountered per plot visit, and proportion of plots occupied for breeding bird species recorded at Homestead National Monument of America, Nebraska during the 2009 breeding bird surveys, by habitat type. Number of individuals per plot, and proportion of plots occupied includes all individuals recorded on plots during a 5-min survey, including flyovers.

| Common name | Prairie (n = 30 plots) | | Woodland (n = 14 plots) | |
|---|---|---|---|---|
| | Individuals / plot visit | Proportion of plots occupied | Individuals / plot visit | Proportion of plots occupied |
| American crow | 0.03 | 0.03 | -- | -- |
| American goldfinch | 0.70 | 0.37 | -- | -- |
| American redstart | -- | -- | 0.07 | 0.07 |
| American robin | 0.37 | 0.30 | -- | -- |
| Barn swallow | 0.07 | 0.03 | -- | -- |
| Baltimore (Northern) Oriole | 0.07 | 0.07 | 0.29 | 0.29 |
| Black-capped chickadee | -- | -- | 0.07 | 0.07 |
| Barred owl | -- | -- | 0.14 | 0.14 |
| Brown-headed cowbird | 1.17 | 0.63 | 0.14 | 0.07 |
| Blue jay | 0.03 | 0.03 | -- | -- |
| **Brown thrasher** | **0.30** | **0.30** | **--** | **--** |
| Cedar waxwings | 0.27 | 0.03 | -- | -- |
| Common yellowthroat | 0.67 | 0.53 | 0.14 | 0.14 |
| **Dickcissel** | **0.67** | **0.43** | **--** | **--** |
| Downy woodpecker | 0.07 | 0.07 | -- | -- |
| Eastern kingbird | 0.10 | 0.07 | -- | -- |
| **Eastern (Rufus-sided) towhee** | **0.07** | **0.07** | **0.14** | **0.14** |
| (Eastern) Tufted titmouse | -- | -- | 0.07 | 0.07 |
| Field Sparrow | 0.07 | 0.07 | -- | -- |
| Great crested flycatcher | -- | -- | 0.29 | 0.29 |
| Gray catbird | 0.20 | 0.13 | -- | -- |
| **Grasshopper sparrow** | **0.03** | **0.03** | **--** | **--** |
| House wren | 0.03 | 0.03 | 1.14 | 0.57 |
| Killdeer | 0.03 | 0.03 | -- | -- |
| **Indigo bunting** | **--** | **--** | **0.29** | **0.29** |
| Mourning dove | 0.10 | 0.07 | 0.14 | 0.14 |
| Northern bobwhite | 0.13 | 0.10 | -- | -- |
| Northern cardinal | 0.07 | 0.07 | 0.21 | 0.14 |
| Rose-breasted grosbeak | -- | -- | 0.64 | 0.29 |
| **Red-bellied woodpecker** | **--** | **--** | **0.21** | **0.21** |
| Red-eyed vireo | -- | -- | 0.07 | 0.07 |
| **Red-headed woodpecker** | **0.10** | **0.07** | **0.43** | **0.36** |
| Ring-necked pheasant | 0.17 | 0.17 | -- | -- |
| Red-tailed hawk | 0.03 | 0.03 | 0.07 | 0.07 |
| Red-winged blackbird | 0.70 | 0.30 | 0.07 | 0.07 |
| Song sparrow | -- | -- | 0.14 | 0.14 |
| Turkey vulture | 0.07 | 0.07 | -- | -- |

Table 2. Number of individuals encountered per plot visit, and proportion of plots occupied for breeding bird species recorded at Homestead National Monument of America, Nebraska during the 2009 breeding bird surveys, by habitat type. Number of individuals per plot, and proportion of plots occupied includes all individuals recorded on plots during a 5-min survey, including flyovers (continued).

| Common name | Prairie (n = 30 plots) | | Woodland (n = 14 plots) | |
|---|---|---|---|---|
| | Individuals / plot visit | Proportion of plots occupied | Individuals / plot visit | Proportion of plots occupied |
| White-breasted nuthatch | -- | -- | 0.07 | 0.07 |
| **Worm-eating warbler** | **--** | **--** | **0.07** | **0.07** |
| Wild turkey | 0.03 | 0.03 | -- | -- |
| Northern (yellow-shafted) flicker | 0.10 | 0.10 | -- | -- |
| **Yellow-throated vireo** | **--** | **--** | **0.07** | **0.07** |
| Yellow warbler | 0.07 | 0.07 | 0.50 | 0.50 |

## Bird Habitat

Abiotic features of plots sampled for breeding birds and habitat composition are given in Table 3. The variability of slope and aspect measurements are mostly low for prairie plots, and anywhere from low to high for woodland plots. Variability in slope and aspect of an individual woodland plot is influenced by its proximity to Cub creek. The slopes of all plots on the monument were ≤10 degrees.

Habitats on prairie plots on the monuments consist primarily of the field / prairie type, with much lesser amounts of other types present (Table 4). Habitat on the woodland plots consists of riparian woodland, floodplain, river terrace, field / prairie, and stream types, in that order of occurrence. Lesser amounts of other habitat types are present as well. Canopy cover averaged 4% on prairie plots and 90 % on woodland plots, with cover provided by hardwood trees. Basal area of hardwood trees averaged 0.3 $m^2$ / ha on prairie plots and 8.3 $m^2$ / ha on woodland plots. Hardwood tree species from nine different families contributed to the canopy cover and basal area, with family richness greater in the woodland habitat (Table 5).

In both prairie and woodland habitats, the densest vegetation occurred in profile classes below 0.75 meters when read from a 15-m distance (Table 4). However, vegetation cover was recorded in all height classes within both habitat types. Average vertical structure diversity estimates are 11% for the prairie and 30% for the woodland habitat type.

Grass litter was the dominant litter type recorded on prairie plots, with deciduous litter prominent on woodland plots (Table 4). Plots in both habitat types were primarily unvegetated at the ground level. Cool-season grass and forbs dominated the forage guilds on both prairie and woodland plots during our mid-May bird surveys. Total foliar coverage averaged slightly over 23% across prairie plots and 70% across woodland plots. Prescribed fire, implemented shortly before the bird surveys, in all likelihood reduced the amount of grass litter and foliar cover recorded on prairie plots.

Table 3. Abiotic features of 50-m radius plots sampled for breeding birds at Homestead National Monument of America, Nebraska.

| Plot number | Slope (°) | Slope variability | Aspect (°) | Aspect variability | Topographic position | Habitat type |
|---|---|---|---|---|---|---|
| HOMETweety1 | 0.0 | Low | 269 | Low | Level | Woodland |
| HOMETweety2 | 3.0 | Low | 3 | Low | Lower-slope | Prairie |
| HOMETweety3 | 2.0 | Low | 116 | Low | Level | Prairie |
| HOMETweety4 | 1.0 | Medium | 267 | Medium | Level | Prairie |
| HOMETweety5 | 0.5 | Low | 302 | Low | Level | Prairie |
| HOMETweety6 | 0.0 | Low | 9 | Low | Level | Prairie |
| HOMETweety7 | 1.0 | Low | 346 | Low | Level | Prairie |
| HOMETweety8 | 1.0 | Low | 12 | Low | Level | Prairie |
| HOMETweety9 | 2.0 | Low | 352 | Low | Level | Prairie |
| HOMETweety10 | 3.0 | Medium | 303 | Medium | Mid-slope | Prairie |
| HOMETweety11 | 1.0 | Low | 333 | Low | Level | Prairie |
| HOMETweety12 | 1.0 | Low | 349 | Low | Level | Prairie |
| HOMETweety13 | 2.0 | Low | 354 | Low | Level | Prairie |
| HOMETweety14 | 5.0 | Low | 319 | Low | Lower-slope | Prairie |
| HOMETweety15 | 0.5 | Low | 347 | Low | Level | Prairie |
| HOMETweety16 | 4.0 | Low | 348 | Low | Lower-slope | Prairie |
| HOMETweety17 | 1.0 | Low | 338 | Low | Lower-slope | Prairie |
| HOMETweety18 | 3.0 | Low | 315 | Low | Lower-slope | Prairie |
| HOMETweety19 | 6.0 | Low | 275 | Low | Mid-slope | Prairie |
| HOMETweety20 | 1.0 | Low | 6 | Low | Level | Prairie |
| HOMETweety21 | 2.0 | Low | 340 | Low | Lower-slope | Prairie |
| HOMETweety22 | 3.0 | Low | 3 | Low | Lower-slope | Prairie |
| HOMETweety23 | 5.0 | Low | 51 | Low | Level | Prairie |
| HOMETweety24 | 2.0 | Low | 12 | Low | Level | Prairie |
| HOMETweety25 | 5.0 | Low | 289 | Low | Lower-slope | Prairie |
| HOMETweety26 | 3.0 | Low | 283 | Low | Mid-slope | Prairie |
| HOMETweety27 | 2.0 | Low | 311 | Low | Lower-slope | Prairie |
| HOMETweety28 | 3.0 | Low | 308 | Low | Mid-slope | Prairie |
| HOMETweety29 | 5.0 | Low | 324 | Low | Mid-slope | Prairie |
| HOMETweety30 | 3.0 | Medium | 279 | Medium | Mid-slope | Prairie |
| HOMETweety31 | 4.0 | Medium | 316 | Medium | Lower-slope | Woodland |
| HOMETweety32 | 4.0 | Medium | 93 | Medium | Lower-slope | Woodland |
| HOMETweety33 | 1.0 | Low | 224 | Low | Level | Woodland |
| HOMETweety34 | | | | Not sampled | | |
| HOMETweety35 | 2.0 | Low | 81 | Low | Level | Woodland |
| HOMETweety36 | 1.5 | Low | 110 | Low | Level | Woodland |
| HOMETweety37 | 2.0 | Low | 102 | Low | Level | Woodland |
| HOMETweety38 | 1.0 | Low | 108 | Low | Level | Prairie |
| HOMETweety39 | 6.0 | High | 70 | High | Ledge | Woodland |
| HOMETweety40 | 2.0 | Medium | 52 | Medium | Level | Woodland |
| HOMETweety41 | | | | Not sampled | | |
| HOMETweety42 | | | | Not sampled | | |
| HOMETweety43 | 2.0 | Medium | 92 | Medium | Level | Woodland |
| HOMETweety44 | 10.0 | High | 359 | High | Ledge | Woodland |
| HOMETweety45 | 1.0 | Low | 355 | Low | Level | Woodland |
| HOMETweety46 | 0.5 | Low | 105 | Low | Level | Woodland |
| HOMETweety47 | 1.0 | Low | 156 | Low | Draw | Woodland |
| HOMETweety48 | 1.0 | High | 3 | High | Level | Woodland |

Table 4. Averages (± std dev) for habitat parameters in the prairie and woodland habitats at Homestead National Monument of America, Nebraska during the 2009 bird breeding season. 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 | Prairie (n = 30 plots) | Woodland (n = 15 plots) |
|---|---|---|
| | **50 meter plot** | |
| Disturbed Prairie (%) | 1.25 (6.85) | -- |
| Field / Prairie (%) | 93.08 (12.74) | 9.83 (26.30) |
| Floodplain (%) | -- | 13.40 (25.55) |
| Highway Right-of-way (%) | 0.5 (2.74) | 1.00 (3.87) |
| Lawn (%) | 0.5 (2.74) | -- |
| Paved Road (%) | 0.5 (2.74) | 1.00 (3.87) |
| Riparian Woodland (%) | 1.75 (7.29) | 69.33 (32.92) |
| River Terrace (%) | -- | 10.20 (13.05) |
| Stream (%) | -- | 6.40 (7.34) |
| Trail (%) | 1.40 (3.84) | 1.20 (3.90) |
| | **5 meter subplot** | |
| Canopy cover | | |
| Hardwood (%) | 3.82 (13.74) | 90.13 (25.13) |
| Canopy Height | | |
| Hardwood (m) | 3.16 (8.28) | 20.13 (8.73) |
| Basal Area | | |
| Hardwood ($m^2$ / ha) | 0.33 (0.88) | 8.33 (3.60) |
| Horizontal vegetation profile at 15-m | | |
| 0.00 – 0.25 m (%) | 55.00 (45.45) | 90.37 (24.38) |
| 0.25 – 0.50 m (%) | 43.37 (42.49) | 83.70 (34.03) |
| 0.50 – 0.75 m (%) | 18.92 (32.26) | 26.27 (38.25) |
| 0.75 – 1.00 m (%) | 12.17 (24.52) | 9.39 (26.22) |
| 1.00 – 1.25 m (%) | 5.43 (13.32) | 10.23 (26.16) |
| 1.25 – 1.50 m (%) | 3.72 (15.61) | 2.40 (5.22) |
| 1.50 – 1.75 m (%) | 3.50 (15.64) | 10.23 (26.16) |
| 1.75 – 2.00 m (%) | 3.28 (17.880) | 12.87 (28.52) |
| Vertical structure diversity (%) | 8.75 (5.61) | 24.17 (14.65) |
| | **1.78 meter sample plot** | |
| Deciduous litter (%) | 4.20 (7.99) | 24.53 (30.31) |
| Grass litter (%) | 62.17 (30.08) | 15.30 (16.10) |
| Bare soil (%) | 5.12 (5.65) | 10.80 (24.62) |
| Rock (%) | 0.08 (0.19) | -- |
| Woody debris (%) | 3.17 (4.88) | 15.03 (15.07) |
| Unvegetated (%) | 88.67 (11.92) | 88.33 (5.72) |
| Warm-season grass (%) | 3.33 (7.83) | 2.50 (9.68) |
| Cool-season grass (%) | 9.75 (22.09) | 45.87 (29.07) |
| Forb (%) | 10.50 (17.54) | 19.07 (12.53) |
| Moss and lichen (%) | 0.02 (0.09) | -- |
| Woody shrub and vine (%) | 1.15 (2.88) | 2.03 (5.27) |
| Tree seedling (%) | 0.02 (0.09) | 0.30 (0.77) |
| Total foliar (%) | 23.45 (29.99) | 70.20 (24.11) |

Table 5. Stems per hectare of trees found in the prairie and woodland habitats on Homestead National Monument of America, Nebraska by size class, during the 2009 bird breeding season. Stems per hectare of trees are reported by family.

| Family | <1.0 cm | 1.1 – 2.5 cm | 2.6 – 8.0 cm | 8.1 – 15.0 cm | 15.1 – 23.0 cm | 23.1 – 38.0 cm | >38.0 cm |
|---|---|---|---|---|---|---|---|
| | **Prairie (n = 30 plots)** | | | | | | |
| Cornaceae | 21.22 | 4.24 | -- | -- | -- | -- | -- |
| Fagaceae | -- | -- | -- | 8.49 | -- | -- | -- |
| Rosaceae | -- | 12.73 | 42.44 | -- | -- | -- | -- |
| **Total stems** | **21.22** | **16.97** | **42.44** | **8.49** | **--** | **--** | **--** |
| | **Woodland (n = 15 plots)** | | | | | | |
| Aceraceae | -- | -- | -- | -- | 16.98 | -- | -- |
| Juglandaceae | -- | -- | -- | -- | -- | -- | 8.49 |
| Moraceae | -- | -- | -- | -- | 16.98 | -- | -- |
| Oleaceae | 8.49 | 8.49 | -- | 8.49 | 25.47 | 8.49 | -- |
| Rosaceae | 59.42 | -- | 8.49 | -- | -- | -- | -- |
| Salicaceae | -- | -- | -- | -- | -- | -- | 8.49 |
| Ulmaceae | 8.49 | 8.49 | 101.87 | 76.40 | 84.89 | 67.91 | 33.96 |
| **Total stems** | **76.40** | **16.98** | **110.36** | **84.89** | **144.32** | **76.40** | **50.94** |
| Snags | -- | 314.09 | 76.40 | 8.49 | -- | -- | -- |

# Discussion

Bird surveys and habitat assessment work were initiated at Homestead National Monument of America, Nebraska in 2009, to assist the park in assessing the ecological integrity of both the prairie and woodland habitats through time. Forty-three of the 47 bird species are permanent or summer residents to the area (Stokes and Stokes 1996). Two grassland obligates species were recorded in the prairie, the Dickcissel and Grasshopper sparrow. Three species--Barred owl (*Strix varia*), Worm-eating warbler, and Yellow-throated vireo (*Vireo flavifrons*)--are more or less obligates to mature hardwood forest (Stokes and Stokes 1996). The remaining 38 resident species are habitat generalist, mixed woodland species, shrub species, or edge specialist.

Habitat diversity (structural composition) is important to high priority species, as their microhabitat requirements will vary (Pashley and Barrow 1993). For example, Red-bellied woodpecker prefers woodlands and urban / suburban forest, and Grasshopper sparrow prefers prairie, dry weed fields and pastures, but most other species of continental importance observed require thick shrubby or old field habitat (Stokes and Stokes 1996). Current efforts to restore and maintain the prairie and woodlands at HOME should provide a diversity of habitats necessary to support the nine species of continental importance observed in the survey.

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# Appendix

Appendix 1. Waypoints for Homestead National Monument of America, Nebraska – UTM Zone 14 North, Datum 1983 (Conus).

| Plot I.D. | X Coordinate (Easting) | Y Coordinate (Northing) | Inventory I.D. Number |
|---|---|---|---|
| HOMETweety1 | 684124.165 | 4462295.543 | HOME_1 |
| HOMETweety2 | 684194.876 | 4462224.832 | HOME_2 |
| HOMETweety3 | 684124.165 | 4462154.122 | HOME_3 |
| HOMETweety4 | 684053.455 | 4462083.411 | HOME_4 |
| HOMETweety5 | 684194.876 | 4462083.411 | HOME_5 |
| HOMETweety6 | 684124.165 | 4462012.701 | HOME_6 |
| HOMETweety7 | 684194.876 | 4461941.990 | HOME_7 |
| HOMETweety8 | 684336.297 | 4461941.990 | HOME_8 |
| HOMETweety9 | 684477.719 | 4461941.990 | HOME_9 |
| HOMETweety10 | 684619.140 | 4461941.990 | HOME_10 |
| HOMETweety11 | 684124.165 | 4461871.279 | HOME_11 |
| HOMETweety12 | 684265.587 | 4461871.279 | HOME_12 |
| HOMETweety13 | 684407.008 | 4461871.279 | HOME_13 |
| HOMETweety14 | 684548.430 | 4461871.279 | HOME_14 |
| HOMETweety15 | 684053.455 | 4461800.568 | HOME_15 |
| HOMETweety16 | 684194.876 | 4461800.568 | HOME_16 |
| HOMETweety17 | 684336.297 | 4461800.568 | HOME_17 |
| HOMETweety18 | 684477.719 | 4461800.568 | HOME_18 |
| HOMETweety19 | 684619.140 | 4461800.568 | HOME_19 |
| HOMETweety20 | 683841.323 | 4461729.858 | HOME_20 |
| HOMETweety21 | 683982.744 | 4461729.858 | HOME_21 |
| HOMETweety22 | 684124.165 | 4461729.858 | HOME_22 |
| HOMETweety23 | 684265.587 | 4461729.858 | HOME_23 |
| HOMETweety24 | 684407.008 | 4461729.858 | HOME_24 |
| HOMETweety25 | 684548.429 | 4461729.858 | HOME_25 |
| HOMETweety26 | 684689.851 | 4461729.858 | HOME_26 |
| HOMETweety27 | 683770.612 | 4461659.147 | HOME_27 |
| HOMETweety28 | 683912.033 | 4461659.147 | HOME_28 |
| HOMETweety29 | 684053.455 | 4461659.147 | HOME_29 |
| HOMETweety30 | 684194.876 | 4461659.147 | HOME_30 |
| HOMETweety31 | 684194.876 | 4462366.254 | HOME_31 |
| HOMETweety32 | 684053.455 | 4462224.832 | HOME_32 |
| HOMETweety33 | 683982.744 | 4462154.122 | HOME_33 |
| HOMETweety34 | 683982.744 | 4462012.700 | HOME_34 |
| HOMETweety35 | 683629.191 | 4461941.990 | HOME_35 |
| HOMETweety36 | 683770.612 | 4461941.990 | HOME_36 |
| HOMETweety37 | 683912.033 | 4461941.990 | HOME_37 |
| HOMETweety38 | 684053.455 | 4461941.990 | HOME_38 |
| HOMETweety39 | 683558.480 | 4461871.279 | HOME_39 |
| HOMETweety40 | 683699.901 | 4461871.279 | HOME_40 |
| HOMETweety41 | 683841.323 | 4461871.279 | HOME_41 |
| HOMETweety42 | 683982.744 | 4461871.279 | HOME_42 |
| HOMETweety43 | 683629.191 | 4461800.568 | HOME_43 |
| HOMETweety44 | 683770.612 | 4461800.568 | HOME_44 |
| HOMETweety45 | 683912.033 | 4461800.568 | HOME_45 |
| HOMETweety46 | 683558.480 | 4461729.858 | HOME_46 |
| HOMETweety47 | 683699.901 | 4461729.858 | HOME_47 |
| HOMETweety48 | 683629.191 | 4461659.147 | HOME_48 |