# A BASELINE STUDY OF BIRD COMMUNITIES RELATED TO FLOODPLAIN FOREST SUCCESSION AT EMIQUON NATIONAL WILDLIFE REFUGE, ILLINOIS

Thomas V. Lerczak  Emiquon Audubon Society  Illinois Nature Preserves Commission


## ABSTRACT

Retired agricultural fields are being restored to floodplain forests at the 2,114-acre Emiquon Refuge in Fulton County, near the Spoon and Illinois rivers. Bird communities were studied at old fields (2 sites), early successional forests (3 sites), and mature forests (2 sites) to establish a baseline for tracking bird community changes as fields planted to trees mature. Birds were recorded in 2004, 2005, 2006, and 2007 within and outside of 50-meter-diameter circles using 10-minute point counts (3 per site during the breeding season) and recorded monthly along standardized routes as encountered. For the entire project, 154 species of birds were recorded representing 43 families. Sixty-five species were recorded during all point counts to an unlimited distance, ranging from 29 to 38 per count date. Of these, 41 were recorded within the count circles, where mean species richness increased with successional stage, from 4.4 (old fields) to 8.7 (mature forest). Most species in forested habitats were those not very sensitive to fragmentation (e.g., eastern wood-pewee [*Contopus virens*]) or those that thrive in edge habitats (e.g., American robin [*Turdus migratorius*]). As forest fragmentation decreases, the number of area-sensitive species should increase.


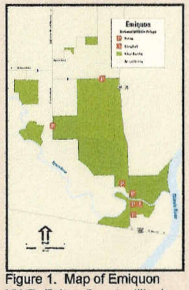

Figure 1. Map of Emiquon NWR, Fulton County, Illinois.
(Courtesy of U.S. Fish and Wildlife Service.)

## INTRODUCTION

Restoration of floodplain forests is a major management focus for the Emiquon National Wildlife Refuge, which was established in 1993. This is because tracts acquired for the Emiquon Refuge for the purpose of increasing the area of contiguous floodplain forests will likely have to be converted to forest from agricultural production. Information on the relationships between bird community succession and plant succession is needed for the Emiquon Refuge to help define expectations over time as plant communities change, and, ultimately, to determine if restorations are successful. Of course, an assumption is that plant and bird communities over time will parallel those found contemporaneously in different-aged habitats, as documented in this study.

## STUDY AREA AND METHODS

The Emiquon Refuge is located at the confluence of the Spoon and Illinois rivers in Fulton County (40° 19' 00" latitude, 90° 05' 00" longitude), just across the Illinois River from Havana, Illinois (Figure 1). The Emiquon Refuge currently consists of 2,114 acres, less than half of which is floodplain forest along the Spoon River, in various stages of succession (Figure 2).

Once per month, from 2004 through 2007, all birds were counted along standardized routes, each about 5 kilometers in length. In addition, beginning in late May and continuing through June, point counts (Gibbons et al. 1996), recording birds heard or seen within and outside of 50-meter diameter circles, were conducted three times at each of seven fixed locations in old fields (sites 5 and 7), young or early-successional forests (sites 1, 2, and 6) a little over a decade old, and mature forests (sites 3 and 4) (Figure 2). Plant community characteristics at each point-count site were sampled using the Braun-Blanquet method of estimating cover and the point-centered quarter method (Bullock 1996).

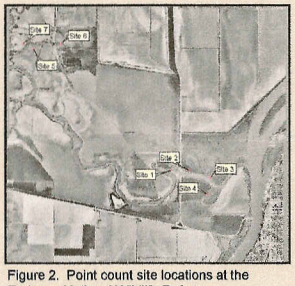


Figure 2. Point count site locations at the Emiquon National Wildlife Refuge.

Table 1. Vegetation characteristics[a] at Emiquon NWR from bird point-count locations using the point-centered quarter method and the Braun-Blanquet method of estimating cover (Bullock 1996:114, 123).

| | Point Count Locations [c] | | | | |
|---|---|---|---|---|---|
| | Site #1 | Site #2 | Site #3 | Site #4 | Site #6 |
| Mean Sapling Distance (m) N= 4 | 1.4 | 2.8 | 9.6 | 7.9 | 1.2 |
| Mean Sapling DBH (cm) N = 4 | 6.4 | 6.8 | 5.4 | 9.9 | 3.9 |
| Mean Tree Distance (m) N = 4 | 4.5 | 5.6 | 7.3 | 4.7 | 7.3[d] |
| Mean Tree DBH (cm) N = 4 | 17.8 | 23.4 | 26.7 | 35.8 | 16.0[d] |
| Cover Class | | | | | |
| Herbaceous Layer | 3 | 4 | 5 | 5 | 5 |
| Sub-canopy | 3 | 3 | 3 | 2 | 5 |
| Canopy | 5 | 3 | 4 | 4 | 3 |
| Dominant Ground Cover[b] | F | F | SN | SN | F, G |
| Dominant Sapling Species[b] | SM, E | SM | SM, H | SM | SM, BW |
| Dominant Canopy Species[b] | SM | CW | SM, CW | SM, CW | SM, CW |

[a]In this survey, a sapling is defined as any tree species less then 15 cm diameter at breast height (DBH); a tree is defined as any tree species with DBH greater than or equal to 15 cm.
[b]SM = silver maple (*Acer saccharinum*), E = elm (*Ulmus* spp.), H = hackberry (*Celtis occidentalis*), BW = black willow (*Salix nigra*), CW = eastern cottonwood (*Populus deltoides*), F = forbs, G = grass, SN = stinging nettles.
[c]Vegetation at Sites 5 and 7 consisted of a complex mixture of tall, weedy old-field vegetation with occasional surviving saplings that were planted on elevated rows and volunteer tree species such as eastern cottonwood.
[d]Tree Distance and Tree DBH on Site #6 are not means, but represent one measured value each.

Figure 3. Old field habitat with tree plantings in rows at Site #5

Figure 4. Early successional forest at Site #1.

Figure 5. Mature forest at Site #3.

## RESULTS AND DISCUSSION

Altogether, 154 bird species representing 43 families were recorded during this project. This represents nearly half of the 319 species that may annually be found in Illinois (DeVore et al. 2004).

Forty-one species were recorded within the seven count circles during 63 point counts. Twenty-four additional species were recorded during the point counts including areas beyond the 25-meter radius. A summary of vegetation characteristics at each point-count location is shown in Table 1 and illustrated in Figures 3, 4, and 5.

Figure 6, Figure 7, and Table 2 show a summary of data recorded within the count circles, where, in total, 14 species were recorded in old field habitats, 30 species in early successional forested habitats, and 28 species in mature forests. The summary shows that the number of species recorded per point-count period increased with successional stage, from old field to mature forest, while the number of individuals recorded was lower within the early successional stage than the old field or mature forest habitats. This suggests that as younger forests mature and fragmentation decreases, species richness in forests at the Emiquon Refuge should increase.

Table 2 shows, as expected, that the old-field bird community is highly distinct from those found in the early successional and mature forests, both of which showed considerable overlap. Species sensitive to forest fragmentation (i.e., those marked by an asterisk in Table 2) were generally more common in mature forests.

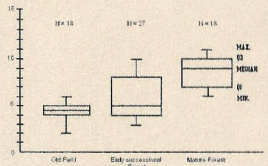


Figure 6. Box plots of species richness from point counts.

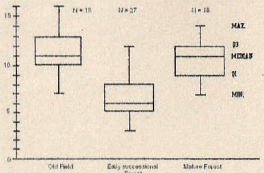


Figure 7. Box plots of individual birds from point counts.

Table 2. Bird communities as determined by presence during 63 10-minute point counts (within 50-meter-diameter circles at Emiquon National Wildlife Refuge).

| | | Percentage of point counts at which a species was present (N= number of counts) | | |
|---|---|---|---|---|
| Species[a] | | Old Field N=18 | Early Successional Forest N=27 | Mature Forest N=18 |
| *Zenaida macroura* | Mourning Dove | 5.6 | 37.0 | 22.2 |
| **Coccyzus americanus* | Yellow-billed Cuckoo | | 11.1 | 5.6 |
| *Melanerpes erythrocephalus* | Red-headed Woodpecker | | | 11.1 |
| *Melanerpes carolinus* | Red-bellied Woodpecker | | 7.4 | 55.6 |
| *Picoides pubescens* | Downy Woodpecker | | 14.8 | 11.1 |
| **Picoides villosus* | Hairy Woodpecker | | | 5.6 |
| *Colaptes auratus* | Northern Flicker | | 18.5 | |
| **Dryocopus pileatus* | Pileated Woodpecker | | 3.7 | |
| *Contopus virens* | Eastern Wood-Pewee | | | 44.4 |
| *Mylarchus crinitus* | Great Crested Flycatcher | | 7.4 | 5.6 |
| *Tyrannus tyrannus* | Eastern Kingbird | | 3.7 | |
| **Vireo flavifrons* | Yellow-throated Vireo | | 3.7 | 27.8 |
| *Vireo gilvus* | Warbling Vireo | | 33.3 | 77.8 |
| **Vireo olivaceus* | Red-eyed Vireo | | 3.7 | 55.6 |
| *Cyanocitta cristata* | Blue Jay | | 11.1 | 11.1 |
| *Corvus brachyrhynchos* | American Crow | | 3.7 | |
| *Stelgidopteryx serripennis* | Northern Rough-winged Swallow | 16.7 | | |
| *Poecile atricapillus* | Black-capped Chickadee | 5.6 | 37.0 | 11.1 |
| **Baeolophus bicolor* | Tufted Titmouse | | | 16.7 |
| **Sitta carolinensis* | White-breasted Nuthatch | | 7.4 | 33.3 |
| *Thryothorus ludovicianus* | Carolina Wren | | 7.4 | 16.7 |
| *Troglodytes aedon* | House Wren | | 29.6 | 88.9 |
| **Polioptila caerulea* | Blue-gray Gnatcatcher | | | 5.6 |
| **Hylocichla mustelina* | Wood Thrush | | 14.8 | 16.7 |
| *Turdus migratorius* | American Robin | | 44.4 | 66.7 |
| *Dumetella carolinensis* | Gray Catbird | | 51.9 | |
| *Toxostoma rufum* | Brown Thrasher | | 3.7 | |
| *Sturnus vulgaris* | European Starling | 5.6 | | |
| **Setophaga ruticilla* | American Redstart | | | 22.2 |
| *Geothlypis trichas* | Common Yellowthroat | 33.3 | 7.4 | |
| *Melospiza melodia* | Song Sparrow | 72.2 | | |
| *Cardinalis cardinalis* | Northern Cardinal | | 29.6 | 55.6 |
| *Pheucticus ludovicianus* | Rose-breasted Grosbeak | | 55.6 | 27.8 |
| *Passerina cyanea* | Indigo Bunting | 33.3 | 37.0 | 61.1 |
| *Spiza americana* | Dickcissel | 100.0 | | |
| *Agelaius phoeniceus* | Red-winged Blackbird | 100.0 | 7.4 | |
| *Quiscalus quiscula* | Common Grackle | 5.6 | 25.9 | 5.6 |
| *Molothrus ater* | Brown-headed Cowbird | 5.6 | 14.8 | 44.4 |
| *Icterus spurius* | Orchard Oriole | 5.6 | | |
| *Icterus galbula* | Baltimore Oriole | 11.1 | 29.6 | 55.6 |
| *Carduelis tristis* | American Goldfinch | 50.0 | 18.5 | 11.1 |
| Total number of species | | 14 | 30 | 28 |

[a]Species preceded by an asterisk are known to be sensitive to forest fragmentation.

## LITERATURE CITED


Bullock, J. 1996. Plants. Pages 111-138 *in* W.J. Sutherland, editor. Ecological census techniques: a handbook. Cambridge University Press, New York. 336 pp.

DeVore, S., S.D. Bailey, G. Kennedy. 2004. Birds of Illinois. Lone Pine Publishing, Auburn, Washington. 376 pp.

Gibbons, D.W., D.A. Hill, and W.J. Sutherland. 1996. Birds. Pages 227-259 *in* W.J. Sutherland, editor. Ecological census techniques: a handbook. Cambridge University Press, New York. 336 pp.


## ACKNOWLEDGMENTS


This project is part of a North American Wetland Conservation Act acquisition partnership, between the Emiquon Audubon Society and the U.S. Fish and Wildlife Service, entitled *Emiquon National Wildlife Refuge Partnership Project Phase II*. A special thanks is extended to Ross Adams, refuge manager of the Illinois River Refuges from 1997 to 2005, who first suggested this project, and who provided guidance and expertise. For continuing to support this project, thanks are extended to Matt Sprenger, current Illinois River Refuges manager. And thanks to the Illinois Department of Natural Resources for use of their equipment to produce this poster, specifically Ann Holtrop and Laura Sass.