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NATURAL HISTORY  
SURVEY



CENTER FOR WILDLIFE ECOLOGY

**EFFECTS OF PRESCRIBED BURNING AND SAVANNAH  
RESTORATION ON BREEDING BIRDS IN ILLINOIS FORESTS**

**First Year Report**

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## Introduction

In 1994, a study was undertaken to assess the effects of prescribed fire, removal of maples, and savannah restoration on breeding bird communities in Illinois. The motivation for this study was that oak and oak-hickory forests in the state are not sustaining themselves. Lack of periodic disturbance has led to a situation where forest canopies have become "closed" (i.e., > 80% closure) and shade-tolerant tree species such as maples (*Acer* spp.) have begun to dominate the understory. This dominance is inhibiting recruitment of oaks and to the point where oak forests may become maple forests in the next century. Managers in Illinois therefore face a dilemma: prescribed fire is a technique that will likely alleviate the problem, but the effects of fire on wildlife (especially in the Midwest) are uncertain.

The original study design was to concentrate efforts in "Singing Woods" a 1000 acre tract that is part of the Peoria Park District's "Peoria Wilds Project." Through the efforts of volunteers, Singing Woods is currently being converted to an open canopy, savannah-like woodland. At present, certain portions of Singing Wood have been subjected to burning and removal of maples, whereas other parts remain undisturbed.

The basic objective of the study was to characterize the species and the breeding success of birds in Singing Woods under closed canopy conditions and in the more open, conversion sites. The scope of the study was all breeding birds, but particular emphasis was placed on neotropical migrants. When possible, an experimental approach was taken. Specifically, it was deemed desirable to estimate abundances and reproductive success on a site before and after restoration techniques were employed, with other sites serving as controls. Cooperation from the Peoria Park District and The Nature Conservancy has proven extremely useful in attaining this goal within Peoria Wilds.

Preliminary census work during the 1993 breeding season and early results in the 1994 season, however, clearly identified the need to expand the scope of the study. Data from Singing woods will form the core of this study, but the current rate of conversion and unexpectedly low breeding densities within the tract strongly suggested the need to visit other areas as well. Otherwise, even after three years, data may not be sufficiently "deep" to provide reliable, empirically based management recommendations. Therefore, several other study sites were

established in central Illinois. These sites include other areas in the Peoria Wilds system and larger, well developed savannahs on state lands elsewhere - primarily those with sandy soils. The latter sites were established in order to gather baseline data on the natural history of savannah bird communities. Without these data, effects of forest conversion will remain unclear; that is, "benchmark" data are needed to judge changes subsequent to the application of restoration practices. In addition, eventual management recommendations will be applicable to a more diverse set of ecological conditions.

In this report, I will summarize accomplishments and findings for the 1994 breeding season and outline research activities for the coming two years.

### **Summary of Accomplishments: 1994 Breeding season**

General comments and new study sites. - Breeding densities and reproductive success were estimated in the following areas: Singing Woods; Robinson Park, Sand Ridge State Forest. In addition, birds were censused in the Iroquois County-Hooper Branch Savannah. The Robinson Park site is also part of Peoria Wilds and is a 770 acre tract south of Singing Woods. Portions of Robinson Park have already been burned and these areas were censused (see below) along with unburned, closed canopy areas. Sand Ridge State Forest includes large sandy soil savannahs and areas that have recently been subjected to experimental burning. Both burned and unburned (at least recently) were visited. The Hooper Branch savannah is a large sandy soil savannah located southeast of Kankakee and consists of well established oak savannah/ shrub prairie habitat. Research activities on each of these areas are summarized in Table 1.

All of the above areas will be visited each year for the duration of the study. Research activities on the Hooper Branch will be increased and other study areas will also be established (see "Anticipated Activities for 1995").

### Results of 1994 Census

Patterns of species richness and composition. - A single year's data are obviously preliminary, but the 1994 census indicated that burning has no strong deleterious

effects on overall species richness. Generally, 25-35 species were detected while censusing each transect in all habitats. Within Singing Woods, and Robinson Park, numbers of species were similar on the burned and unburned areas (Fig. 1). On Sand Ridge, burning may have had a positive effect as 36 and 27 species were detected on the burned and unburned sites, respectively. At present, without more replication (through years and spatially) the cause of this difference cannot be separated from random chance alone.

Not surprisingly, patterns of species composition did reveal differences between closed canopy forests and savannahs. Moreover, within a habitat, burning did appear to affect presence/absence. Overall, some species were found most habitats regardless of land use. These species included several species of permanent residents/short distance migrants such as American Robins, Blue Jays, Tufted Titmice, and Northern Cardinals (Table 2, see below for discussion of estimated abundances). Among the neotropical migrants, I observed Indigo Buntings, Ovenbirds, Red-eyed Vireos, and Scarlet Tanagers in nearly all habitats visited. Other species were more restricted in their choice of habitats. Acadian Flycatchers, Wood Thrushes, and Cerulean Warblers were generally absent from the well-developed sandy soil savannahs, whereas Chipping Sparrows and Summer Tanagers were largely restricted to open areas. Cerulean Warblers are interesting in this sense as they are known to favor areas with large oaks and open canopies. Thus, burning may favor Ceruleans over the long term if canopy trees are sufficiently mature. The Eastern Bluebird was observed on only one transect in the Iroquois Conservation area where nest boxes had been provided. Thus, while bluebirds are popularly viewed as an "open woodland" species, management techniques in addition to burning may be necessary to enhance their local abundances.

Burning within Singing Woods did not appear to cause local extirpations of Wood Thrushes; furthermore, I observed thrushes only on the burned areas in Sand Ridge (Table 2). Whip-poor-wills, while not efficiently censused during diurnal point counting, were also observed only on the burn unit in Sand Ridge.

Patterns in abundances within and among habitats. - Comparisons of estimated abundances revealed similar patterns as those above: certain species are more common in savannahs, burned areas, or closed canopy forests and others are general in their habitat associations. The generalists include Red-bellied Woodpeckers, Tufted Titmice, Blue Jays, Indigo Buntings, Northern Cardinals, Red-eyed Vireos, and Scarlet Tanagers (Table 2).

Savannah-like habitat structure and burning - even within a given type of habitat - had a strong positive effect on several species including: Red-headed Woodpeckers, American Robins, Eastern Wood-pewees, and Summer Tanagers.

Burning did appear to decrease abundances of Ovenbirds. Curiously, the Wood Thrush, also a ground nesting neotropical-migrant, was more common on the burn units within Singing Woods and Sand Ridge. Unfortunately, other ground nesters/foragers such as the Kentucky Warbler and Worm-eating Warbler were not observed within the Peoria Wilds sites.

Burning within Sand Ridge appeared to have an especially positive effect on relative abundances of most species - regardless of residency status (Table 2). With the exception of the Ovenbird, virtually all species were more common on the burned versus the nearby unburned habitat. The Eastern Wood-pewee and Rose-breasted Grosbeak in particular were especially common on the burn. In contrast, burning within Robinson Park had a far less discernible effect. Whether this difference stems from the size of the burns (much larger in Sand Ridge) the type of habitat (savannah versus woodland), or other ecological factors will require study in coming years. The landscape context of, say, a 40 acre burn, may be as influential as the extent of habitat changes resulting from the burn itself.

Brown-headed cowbirds, an important species in terms of management, were observed in all habitats. Within habitats, burning did not appear to affect cowbird abundances or the incidence of parasitism (see below). Cowbirds in central Illinois appear to be ubiquitous.

Mist-netting was not carried out in 1994 and will likely not be employed as a means of estimating abundances in coming years. The experience of other workers in the Midwest (e.g., Scott Robinson and John Faaborg) indicates that capture rates and, more importantly, recapture rates tend to be so low that estimating abundances or other demographic parameters such as survival rate will not be feasible or cost effective. Local "spot" mist netting may be carried out to color mark birds for observation of foraging activity.

Estimation of breeding success - Nests of 19 species (n = 101) were located within Sand Ridge State Forest and Peoria Wilds. Of these only 69 were monitored sufficiently long to generate usable data. Sample sizes were comparatively high for the American Robin, Northern Cardinal and Indigo Bunting. Overall, however, the

number of nests located and monitored in 1994 was somewhat less than expected. This stemmed in large part from a unexpectedly low density of nests within Peoria Wilds and a "late start" in Sand Ridge. The nest crew that worked Peoria Wilds was experienced; thus, it is likely that the area simply had few nests. One explanation for this is that a high proportion of the males singing (and counted) within Peoria Wilds were unmated. Observations in coming years will serve to evaluate this possibility.

Summary statistics for selected species are presented in Table 3. Levels of brood parasitism varied among species, but were similar to those reported for other parts of the state (S. K. Robinson, personal communication). As elsewhere, American Robins were not parasitized. Over one-half the nests of most other species were parasitized (Eastern Wood-pewees were exceptional, but sample sizes are presently low). Multiple parasitism was common - especially for the Wood Thrush.

Rates of depredation also varied among species (Table 3). Rates of loss did appear to be lower in unburned habitats, but, again, sample sizes are too low after one year to permit definitive analysis. Nest success for Wood Thrush was especially high within the unburned habitat in Singing Woods. This was an unexpected result since in other parts of the state, local abundances of breeding pairs and rates of nest success are often positively associated. No data are available for abundances of nest predators, but anecdotal observations taken during censusing and nest searching suggest that densities of mammalian predators are high in Singing Woods. Alternatively the density of the herpetofauna in Singing Woods may be low (C. Phillips, personal communication)

In sum, the results of the 1994 breeding season suggest that fire and conversion to savannah-like habitat does effect the breeding bird community. In most cases, species were positively affected by burning in terms of local abundances. Local abundances of the Ovenbird and, possibly, the Wood Thrush were not enhanced by burning and for some species, including the thrush, nesting success may be lower in burns. The "bottom line" for managers at this early stage is that changes in habitat structure associated with burning can enhance local abundances of several species. Importantly, certain species will be found only where expansive, open-canopy woodlands or savannahs are present. Burning within savannah habitat appears to have an especially positive effect.

## Planned Research Activities for 1995

Assuming the required resources can be found, research for the next breeding season will be further expanded. A new area, Sand Prairie-Scrub Oak Nature Preserve will be added. This area, along with Sand Ridge State Forest will be visited early and often to search for nests. Each area will also be censused. A crew of at least 4 persons will be required to cover these areas along with the Peoria Wilds sites (see below). A field crew will also be established at the Iroquois County Conservation Area to search for and monitor nests. The Palos area of the prospective "Chicago Wilderness Bioreserve" south of Chicago will also be visited and censused. The advantage of this area will be that it may offer a large, "black soil" type of savannah to contrast with the sandy soil savannahs. Prospective activities for the upcoming field season are summarized in Table 4

A top priority in 1995 will be to increase the number of nests that are located and monitored in order to assess the effects of burning on reproductive ecology.

Censusing and nest searching/monitoring will continue in Peoria Wilds. Negotiations are currently underway with the Peoria Park District and The Nature Conservancy to expand and hasten the progress of maple removal, burning, and habitat restoration within Singing Woods.

Characterization of foraging behavior and feeding ecology will also begin in 1995. Preliminary data on foraging were collected in 1994 to assess the feasibility of this effort. These data will hopefully prove useful in identifying the proximate mechanisms underlying habitat choice and changes in abundances among habitats.

At present levels, funding is adequate to support a small crew in the Peoria area. Therefore additional funding must be found for the 1995 and 1996 breeding seasons. Several governmental and non-governmental agencies have been approached and proposals will be submitted during off breeding season 1994-1995.

## Acknowledgments

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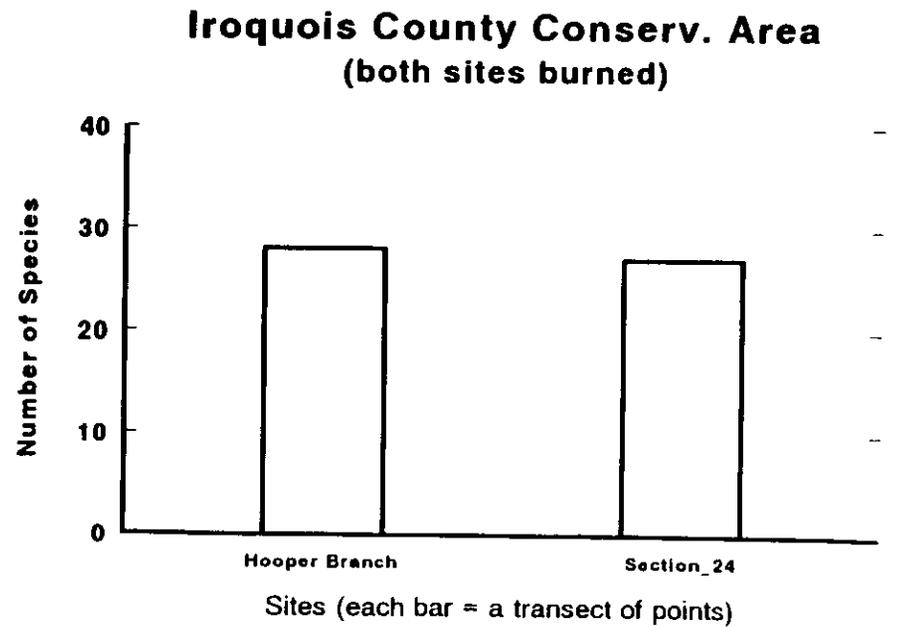
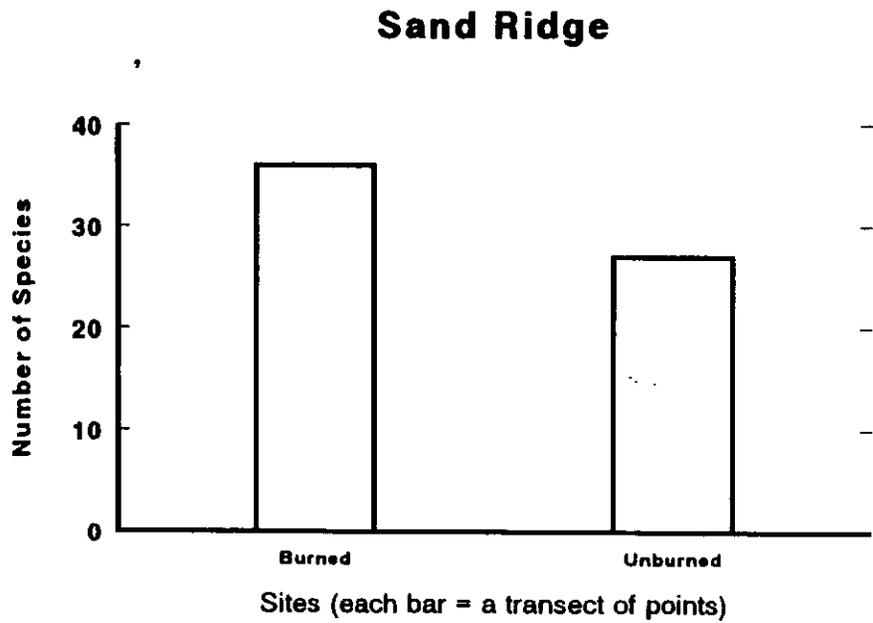
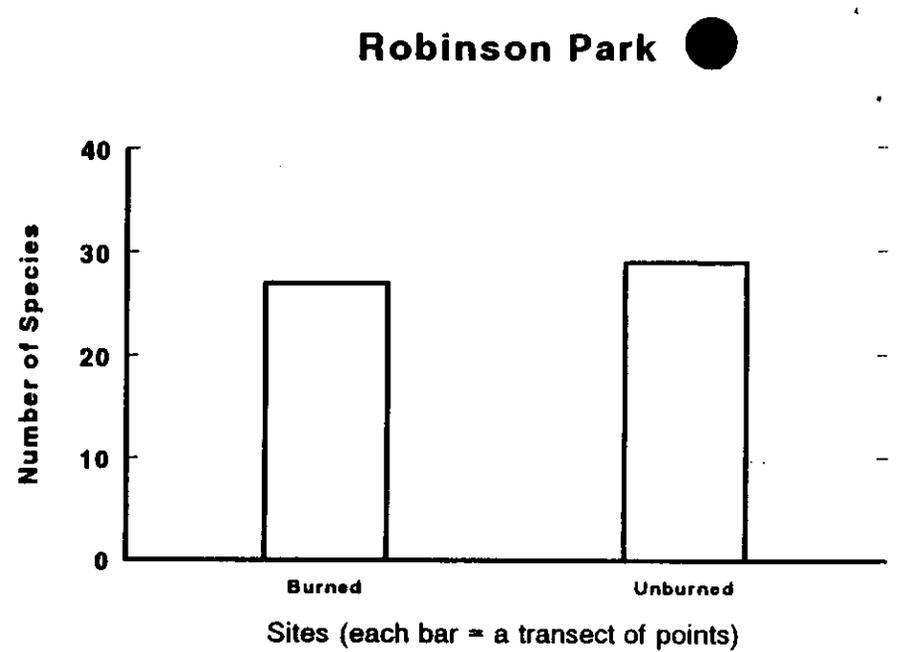
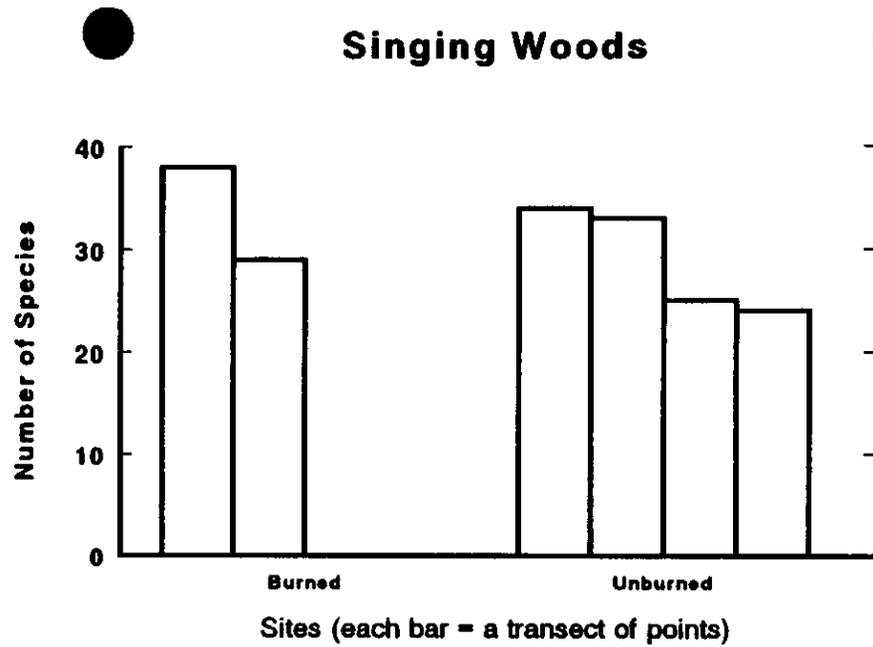


Fig. 1. Species richness on four study sites in Illinois in 1994.

Table 1. Summary of research activities during 1994 breeding season.

Main Site and Subsections	Census Effort (1-3 visits/point)	Nest Searching?
<u>Singing Woods</u>		
A (burned)	14 points	yes
B (unburned)	6 points	yes
C (unburned)	8 points	yes
D (unburned)	12 points	yes
E1 (burned)	6 points	yes
E2 (unburned)	6 points	yes
<u>Robinson Park</u>		
Center (burned)	7 points	yes
East Ridge (unburned)	7 points	yes
<u>Sand Ridge State Forest</u>		
Burned (burned)	10 points	yes
North (unburned)	10 points	yes
<u>Iroquois County</u>		
Hooper Branch (also Trail 24, both burned)	20 points	no

Table 2. Estimated abundances of breeding birds - 1994 (number/10 points).

Species	Area						
	<u>Singing Woods</u>		<u>Robinson Park</u>		<u>Sand Ridge</u>		<u>Iroquois County</u>
	Burned	Unburned	Burn	Unburned	Burned	Unburned	Burned
Red-bellied Woodpecker	5.6	4.4	3.3	-	7.0	3.9	2.1
Red-headed Woodpecker	2.7	1.7	1.4	1.7	6.5	3.5	8.9
Blue Jay	10.0	10.0	6.2	10.8	20.0	13.9	12.8
Tufted Titmouse	8.9	8.4	10.5	11.3	12.5	7.7	3.1
American Robin	14.5	4.2	11.0	5.9	3.5	1.3	4.5
Brown Thrasher	-	.3	-	-	3.5	3.5	1.1
Chipping Sparrow	-	-	-	-	1.0	1.0	-
Northern Cardinal	3.6	3.7	8.1	5.8	6.5	0.5	0.6
Eastern Bluebird	-	-	-	-	-	-	6.7
Brown-headed Cowbird	6.7	5.7	5.7	8.9	6.0	4.9	2.8
Great Crested Flycatcher	3.2	3.7	6.2	8.0	1.0	2.0	1.1
Eastern Wood-Pewee	11.6	3.9	0.9	4.8	5.0	0.5	8.9
Blue-gray Gnatcatcher	0.9	0.35	-	.5	-	-	-
Wood Thrush	3.2	1.7	.6	4.7	4.0	-	-
Red-eyed Vireo	5.9	5.8	4.3	10.6	7.0	3.9	1.1
Cerulean Warbler	0.8	1.1	0.5	.8	-	-	-
Ovenbird	1.8	7.7	0.5	-	3.5	6.2	-
Rose-breasted Grosbeak	2.9	1.2	-	-	6.0	0.5	-
Indigo Bunting	7.2	2.1	1.5	7.2	11.5	7.7	7.5
Scarlet Tanager	1.8	3.0	3.6	2.8	1.5		0.6
Summer Tanager	-	-	1.3	0.5	4.5	1.3	3.0

Table 3. Nest data for selected species: 1994.

Species	% Parasitized (N)		% Depredated (N)		% Daily Predation Date (N, exposure days)	
	Burn/Savannah	Unburned	Burn/Savannah	Unburned	Burn/Savannah	Unburned
American Robin	0 (10)	0 (7)	43 (7)	22 (9)	4.2 (7,70.5)	1.69 (1,21.5)
Eastern Wood-Pewee	0 (2)	0 (1)	0 (2)	0 (1)	0 (2,28)	0 (1,16.5)
Northern Cardinal	100 (3)	57 (7)	66 (3)	14 (7)	4.9 (3,40-5)	.87 (7,121)
Indigo Bunting	70 (10)	100 (2)	54 (11)	100 (2)	4.4 (11,138)	6.25 (2,32)
Wood Thrush	100 (1)	100 (7)	100 (1)	14.3 (7)	- - *	.79 (7,126)

\* Insufficient data.

Table 4. Prospective research activities for 1995.

Area	Activity		
	Nest Search	Census	Foraging Observations
Peoria Wilds	X	X	X
Sand Ridge State Forest	X	X	X
Sand Prairie Scrub Oak	X	X	
Iroquois County Conservation Area	X	X	X
Palos		X	