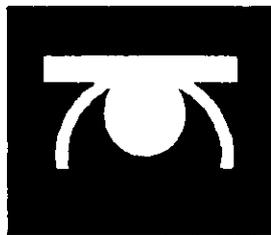


ILLINOIS
NATURAL HISTORY
SURVEY



CENTER FOR WILDLIFE ECOLOGY

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

Second Year Report

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Introduction

In 1994, a study was undertaken to assess the effects of prescribed fire, removal of maples, and savanna / woodland and 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, savanna-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.

In 1994, the scope of the study was increased owing to the need for more areas that satisfy the label of savanna or "oak woodland." Changes for the 1994 season included that addition of sites in Sand Ridge State Forest and additional areas within Peoria Wilds.

In this report, I will summarize accomplishments and findings for the 1995 breeding season and outline research activities for the final year.

Summary of Accomplishments: 1995 Breeding season

The study was further expanded in 1995 to include the Sand Prairie Scrub Oak Natural Area (SPSO, also known as the Mason County Wildlife Area); a sandy-soil savanna comprising about 1,500 acres that has been subjected to landscape burning and dominated by oaks. Abundances of breeding birds and nesting success were both estimated on SPSO.

Several census sites were also added in the Palos Sag Division of the Forest Preserve district of Cook County. This addition added large areas (burned and unburned) to the study that are more mesic and not dominated by sandy soil. In addition, the biogeographic setting of the Palos study sites contrasts with the Illinois River Valley sites; the area is also far more urban and relatively less agricultural activity may affect rates of cowbird parasitism. Sites in the Palos area have diverse land-use histories. Data from all these new areas will provide a more comprehensive view of the effects of burning and savanna restoration in Illinois.

With these additions, about 135 census points were visited in the 1995 breeding season (Table 1). Funding did not permit fielding nest searching crews into the northern Illinois sites. Breeding abundances will be estimated within all of the above areas in 1996. If funding permits (see section on Anticipated Activities for 1996), an additional crew will be assigned to the Palos sites and nest success will be estimated.

Note; information on the Palos study sites do not appear in this report as data from 1995 being only being entered as of this writing. A report to the Nature Conservancy and the Forest Preserve District of Cook County is due in November and copies will be furnished to the Natural Heritage Division of the Illinois Department of Natural Resources

Results of 1995 Census

Patterns of species richness and composition. - Data from the 1995 breeding confirmed patterns established in the 1994 season: burning and savanna/woodland restoration have no strong deleterious effects on overall species richness (Fig. 1). In fact, owing to annual variation in species richness, differences between burned/restored sites and unburned sites were smaller than in 1994. Generally, 20-25 species were detected in all habitats. The unburned area within Robinson Park was notable in 1995 in that only 16 species were detected.

Another overall pattern was that species richness in most areas tended to decrease between 1994 and 1995. Some of this change is certainly related to sampling error, but in the burned sites within Singing Woods and Sand Ridge, species richness decreased by nearly 10. Most of these changes were attributable to rare species that tend to "wink on and off" within woodlots in Illinois. No species was absent in 1995 that was relatively common in 1994. These annual changes in presence/absence patterns confirm the need for data from several years in order to assess changes associated with burning or any management technique.

Also consistent with the 1994 season, certain species were found in specific types of habitat, while others appeared more catholic in their habitat associations. Species found in all nearly all areas 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 and Red-eyed Vireos in nearly all habitats visited. Acadian Flycatchers, Wood Thrushes, and Scarlet Tanagers were generally absent from the well-developed sandy soil savannas, whereas Chipping Sparrows, Summer Tanagers and Bobwhite Quail were largely restricted to open areas. Whip-poor-wills, while not efficiently censused during diurnal point counting, were observed only on the burn units in Sand Ridge but not in SPSO.

The Eastern Bluebird colonized a burn unit in Singing Woods in 1995 where a nest box had been installed. As in 1994, bluebirds in 1995 were otherwise observed on only one transect in the Iroquois Conservation area where nest boxes had been provided. Again, management techniques in addition to burning may be necessary to enhance local abundances of Eastern Bluebirds. Another interesting colonization within the burn units in Singing Woods was by the Baltimore Oriole which was

detected there for the first time in three years of censusing. Orioles were generally absent from the closed- canopy sites in this study.

Patterns in abundances within and among habitats. - Estimated abundances (Table 2), revealed similar patterns as those above: certain species were more common in savannas, burned areas, or closed canopy forests and others were general in their habitat associations. The generalists in 1995 (and 1994) included Red-bellied Woodpeckers, Tufted Titmice, Blue Jays, American Robins, Indigo Buntings, Northern Cardinals, and Brown-headed Cowbird (excepting Sand Ridge).

Savanna-like habitat structure and burning - even within a given type of habitat - had a generally positive effect on several species including: Red-headed Woodpeckers, Eastern Wood-pewees, Great Crested Flycatchers, and Summer Tanagers. Overall, burning within Sand Ridge appeared to have an positive effect on relative abundances of most species - regardless of residency status (Table 2).

Burning or savanna/woodland habitat did not, however, guarantee the presence of relatively large abundances within these species. For example, Great Crested Flycatchers and Red-headed Woodpeckers were not detected on the unburned sites within the established savanna Sand Ridge sites. Similarly, the Summer Tanager (generally considered to be a "savanna bird") was found in much greater numbers within the Iroquois Conservation Area than in SPSO. This species, and others like the Rufous-sided Towee, are often found within oak woodland habitats, but have yet to colonize the restoration units within Singing Woods. Clearly, factors such as landscape context, land use history, and biogeographic setting will affect the role of fire and restoration on Illinois' bird communities. The landscape context of, say, a 40 acre burn, may be as influential as the extent of habitat changes resulting from the burn itself. Time lags between habitat alteration and response by wildlife are also inevitable.

As in 1994, restoration does appear to decrease abundances of Ovenbirds. An exception to this was within Singing Woods, where Ovenbird numbers increased greatly on the "C" management unit. This area was not burned, but the shrub layer was removed with chainsaws previous to the 1995 breeding season. More data are needed, but a low density of small stems coupled with the presence of litter may benefit the Ovenbird. Other ground nesters/foragers such as the Kentucky Warbler and Worm-eating Warbler were not observed within any of study sites. The Wood Thrush was not common on any site, but was generally absent from the sandy-soil savanna habitats.

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.

Estimation of breeding success - Nests of over 25 species ($n > 375$) were located within the Illinois River Valley Sites. Of these only 256 were monitored sufficiently long to generate usable data. Sample sizes were comparatively high for the American Robin, Northern Cardinal and Indigo Bunting. Overall, sample sizes for 1995 were considerably greater than those attained in 1994. One major factor in this increase was the addition of SPSO and an earlier start in 1995 than in 1994.

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, but many species were heavily parasitized. Burning or habitat structure had no discernible effect on the incidence of brood parasitism.

Rates of depredation also varied among species, but were generally greater than those observed during the 1994 breeding season. Rates of loss did not appear to be lower in unburned habitats. In some cases, like the Indigo Bunting, the data were striking (all nests failed, $n = 31$) and confirm that Illinois breeding habitat can be inhospitable for birds, regardless of land use or intensity of habitat restoration (Table 3). After data for year three are collected, formal tests for differences in reproduction between burned and unburned areas will be carried out (see Table 5).

In sum, the results of the 1995 breeding season further indicated that fire and conversion to savanna-like habitat does effect the breeding bird community. The "bottom line" for managers at this early stage is that changes in habitat structure associated with burning will change local abundances of several species. Importantly, certain species will be found only where expansive, open-canopy woodlands or savannas are present. The 1995 data reinforce data from other studies in Illinois, however, that expansive sites may be needed is the problem of low reproductive success is to be solved. At present, burning and restoration do not appear to solve the problem.

Anticipated Activities for 1996

If additional resources can be found, more effort will be put into nest searching - especially within Palos. Nest data from Palos will provide valuable perspective. Preliminary analyses indicate that the breeding bird community and effects of are different in northeastern Illinois than in the Illinois River Valley Sites. The Palos areas are expansive and a crew of at least 4 persons will be required to cover these areas.

Prospective activities for the upcoming field season are summarized in Table 4.

Regardless of whether a field crew is assigned to Palos, funding in 1996 will be sufficient to cover the Illinois River Valley sites. Censusing and nest searching/monitoring will emphasize Peoria Wilds.

Characterization of foraging behavior and feeding ecology was initiated in 1995 and will be expanded as part of a Master's Thesis in 1996. These data will likely prove useful in identifying the proximate mechanisms underlying habitat choice and changes in abundances among habitats.

Nesting habitat was measured around each nest in 1995 and this effort will continue in 1996.

Top priorities for 1996 will be to expand the data set and begin formal analyses on a diverse set of questions (Table 5). The goal of these test will be to predict and explain changes in the avian community if prescribed burning is introduced.

Acknowledgments

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Table 1. Summary of research activities during 1995 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) ¹	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
<u>Sand Prairie Scrub-oak Natural Area</u>		
	14 points	yes
<u>Palos Sag Division of the Forest</u>		
<u>Preserve District of Cook County</u>	25 points	No

¹ Understory removed mechanically.

Table 2. Estimated abundances of selected breeding species - 1995 (number/10 points).

Species	Area							
	<u>Singing Woods</u>		<u>Robinson Park</u>		<u>Sand Ridge</u>		<u>Iroquois County</u>	<u>Sand-prairie</u>
	Burned ¹	Unburned	Burn	Unburned	Burned	Unburned	Burned	Scrub-oak Burned
Mourning Dove	-	0.2	2.0	-	5.0	2.9	6.5	2.3
Bobwhite Quail	-	-	-	-	-	-	5.8	4.6
Red-bellied Woodpecker	7.0	6.7	3.3	8.0	9.0	0.71	3.6	7.7
Red-headed Woodpecker	1.0	0.2	1.7	-	2.0	-	7.6	4.0
Blue Jay	9.0	12.4	13.3	8.0	16.0	15.0	8.8	15.4
Tufted Titmouse	10.0	7.1	13.3	4.0	13.0	8.6	5.3	8.3
American Robin	9.0	6.5	21.7	14.0	3.0	0.71	8.2	1.4
Northern Cardinal	2.7	3.0	10.0	4.0	7.0	2.9	2.4	2.3
Eastern Bluebird	-	-	-	-	-	-	1.8	-
Brown-headed Cowbird	7.3	5.7	1.6	18.0	-	-	7.1	2.3
Great Crested Flycatcher	5.3	4.0	6.7	-	2.0	-	0.6	5.1
Eastern Wood Pewee	7.0	3.3	1.7	2.0	2.0	0.71	7.1	6.3
Blue-gray Gnatcatcher	0.7	-	1.7	-	-	-	-	-
Wood Thrush	1.3	1.6	3.3	4.0	1.0	-	1.2	-
Red-eyed Vireo	1.0	2.7	5.0	2.0	1.0	-	-	0.6
Ovenbird	6.0	6.3	-	12.0	2.0	3.6	-	3.9
Rose-breasted Grosbeak	1.0	0.8	-	-	-	-	-	5.4
Rufous-sided Towhee	-	0.2	-	-	8.0	4.2	11.7	2.9
Indigo Bunting	3.7	2.9	13.3	-	5.0	2.9	4.7	2.3
Scarlet Tanager	4.3	2.9	-	-	-	1.4	1.3	-
Summer Tanager	-	-	-	-	4.0	5.0	7.1	0.9
Baltimore Oriole	0.7	0.4	-	-	6.0	0.71	1.8	2.0

¹ Includes areas where understory was removed only by mechanical means.

Table 3. Nesting success data for selected species: 1995.

Species	% Parasitized (N)		% Depredated (N)		% Daily Predation Date (N, exposure days)	
	Burn/Savannah	Unburned	Burn/Savannah	Unburned	Burn/Savannah	Unburned
American Robin	0 (18)	0 (25)	70 (10)	68 (25)	6.0 (8,90)	7.0 (25,277)
Eastern Wood-Pewee	33 (3)	-- --	67 (15)	-- -- ¹	1.5 (7,148)	-- --
Northern Cardinal	43 (7)	33 (12)	71 (7)	82 (11)	10.0 (7,49)	7.0 (11,99)
Indigo Bunting	93 (15)	80 (15)	93 (15)	100 (16)	6.5 (12,118)	8.0 (15,121)
Wood Thrush	-- --	100 (5)	-- --	80 (5)	-- --	3.0 (5,109)

¹ Insufficient data.

Table 4. Prospective research activities for 1996.

Area	Activity		
	Nest Search ¹	Census	Foraging Observations
Peoria Wilds	X	X	X
Sand Ridge State Forest	X	X	X
Sand Prairie Scrub Oak	X	X	X
Iroquois County Conservation Area		X	
Palos	X	X	

¹ Vegetation measurements will be taken around all nests.

Table 5. Projected Analyses for Final Report

<u>Type of Data</u>	<u>Question</u>	<u>Technique</u>
Abundance Estimates	Overall Community Structure in Burned versus Unburned Sites	Multivariate Ordination (PCA, DFA, MANOVA). Note: several sites will be considered before and after burning.
	Assessment of effects of burning / restoration on selected species	Analysis of Variance with repeated measures
Nesting Success	Effects of burning / rest. on nest success and rates parasitism / depredation	Contrast Analyses, Anova with repeat. measures. Note: these tests will be for ind. species and guilds.
Vegetation Analyses	Effects of burning / rest. on structure of nesting habitat.	Multivariate analyses as above

Species Richness

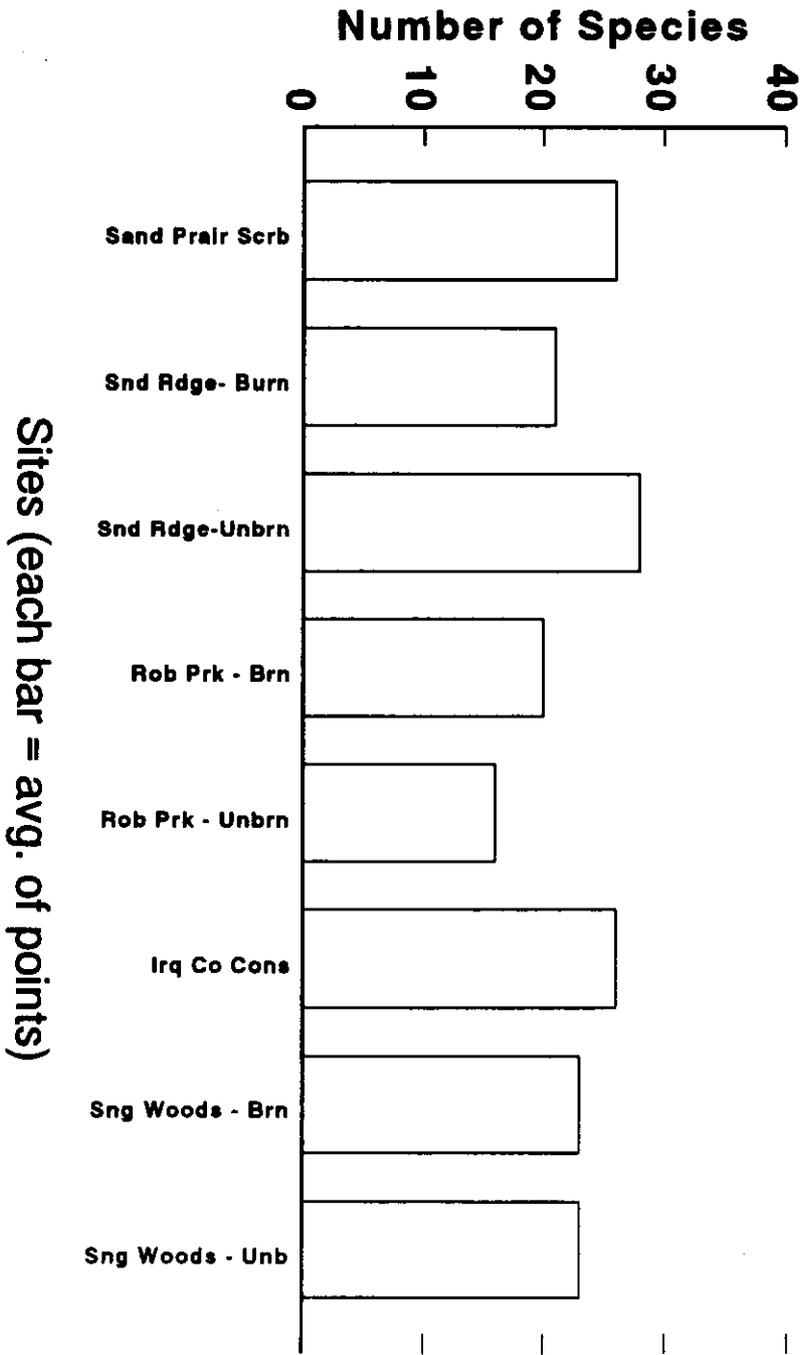


Fig. 1. Species richness on study plots in 1995