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REPORT TO THE CHICAGO WILDERNESS AND CONSERVATION-2000

ECOSYSTEM RESTORATION AND THE VIABILITY OF BIRD POPULATIONS IN THE CHICAGO WILDERNESS

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NOVEMBER, 1998

Final Report

ABSTRACT

The use of prescribed fire to restore oak savannas and woodlands is becoming a common management practice in the Midwest. Little is known, however, about the effects of fire and restoration on constituent animal populations and communities –especially in urban landscapes. A study was conducted in the Forest Preserve District of Cook County from 1997-1998 to assess these effects on birds. Studies were conducted at a series of established savannas/woodlands, sites undergoing restoration, and undisturbed closed-canopy forests. Abundances of breeding birds and rates of nest success were compared on disturbed and undisturbed habitats.

Reproductive success was generally greater within disturbed habitat. Data from over 275 nests indicated that 9 of 13 species had greater nesting success in savanna or woodland habitat. Habitat effects were especially large for Indigo Buntings and Northern Cardinals. Rates of brood parasitism by Brown-headed Cowbirds were unaffected by restoration, but generally low when compared with other regions in Illinois.

Analyses of estimated abundances indicated that several species were sensitive to the effects of restoration. The species favored by burning and periodic disturbance included Red - headed Woodpeckers, Indigo Buntings, and Baltimore Orioles. Those more common in closed-canopy forests included Wood Thrushes, Ovenbirds, and Northern Cardinals.

Historically, savannas were somewhat transitional habitats between grasslands and forest and may have been fragmented naturally. Small tracts may therefore be ideal sites for restoration. "Landscape burns" should be considered in moderate to large size tracts with the aim of introducing a habitat mosaic that may have formerly existed. Maintenance of some shrubs is an important management consideration for birds in restoration sites.

INTRODUCTION

Managers in Illinois are faced with a fundamental problem concerning the welfare and sustainability of forests and wildlife populations. Oak-hickory forests throughout the Midwest are apparently not regenerating at historical (i.e., post-glacial) levels (Ebinger 1986, Abrams 1992, Taft 1996, Packard and Mutel 1997). As a result, oaks are being gradually replaced by shade tolerant species - especially Sugar Maples (*Acer saccharum*). The oak-hickory forest-type has dominated much of the southern and central Midwest for nearly 8,000 years (McClain 1991). Thus, a process is ongoing that may fundamentally change the landscape and terrestrial ecosystems of Illinois and surrounding areas (Nuzzo 1986).

The ecological factors underlying this conversion process are not entirely understood, but lack of fire and disturbance are likely involved (Lorimer 1985, Abrams 1992, Taft 1996). Therefore, there is considerable interest in use of prescribed fire (and removal of maples or other mesophytic species) as a management technique to insure the perpetuation of oak woodlands in at least a semi-natural state (Packard and Mutel 1997). The specific effects of prescribed fire and savanna restoration will vary depending on the frequency of application and a myriad of physical and biotic factors (Johnson 1993), but two inevitable outcomes are changes in floristic composition and stand structure.

Juxtaposed with the problem of oak regeneration is concern for the viability of populations of forest wildlife and how it relates to fire and disturbance (Niemi and Probst 1990). The situation is ambiguous for birds. The population ecology of many species of birds in North America and the Midwest may be associated with periodic disturbance via fire or some other natural agent (Brawn et al. in prep). Therefore, in principle, many species may benefit from

comparatively open, savanna-like or woodland conditions. Many forest birds, however, benefit from a continuous, closed-canopy with a well developed layer of shade tolerant saplings. Studies of prescribed burning from geographic areas and forest types outside Illinois offer no consensus. In Florida, for example, cutting and burning within a forest-prairie interface had little effect on avian communities (Fitzgerald and Tanner 1992). In contrast, cool fires in the Ponderosa Pine (*Pinus ponderosa*) forests of Arizona and South Dakota had profound positive effects on several species (Bock and Bock 1983, Brawn and Balda 1988).

Understanding why animal species flourish in certain habitats and do poorly in others is important for devising effective conservation and restoration strategies. For birds, the ecological factors affecting reproduction are critical. Research in Illinois and throughout the Midwest indicates that nesting success is a key factor in determining whether a patch of habitat (or a large geographic region) supports viable populations. The research reported here examined the breeding success of species associated with woodland and savanna restoration in the Palos-Sag Valley Divisions of the Forest Preserve District of Cook County (FPDCC). The major objective was to compare nesting success in areas that are being restored versus that in control areas (e.g., undisturbed, closed-canopy forest). Data from other restoration sites in Illinois strongly suggest that nesting success of several species is enhanced in restored areas, but the effects of restoration in a comparatively urban landscape have not been assessed previously.

The specific objectives of the study were: 1) To monitor the breeding success of birds within the Palos-Sag Valley Divisions on sites that are being converted to open-canopy woodlands/savannas and on those areas that remain undisturbed. 2) To determine effects of restoration on the nesting habitat of woodland/savanna birds. 3) To provide land managers and resource agencies a set of guidelines and recommendations concerning the use of fire and

woodland/savanna restoration for birds in the FPDCC and the regions covered by the Chicago Region Biodiversity Initiative.

Reported herein are data on nesting success from the 1997 and 1998 breeding seasons. Logistic constraints led to some modifications from the original objectives. First, the time and labor needed to locate and monitor nests necessitated a curtailment of nest searching in prairie-grassland habitats. Thus the major study areas were within closed-canopy forests and restored woodlands and savannas. Second, analyses of nesting habitat from over 700 nests located downstate strongly suggest that micro-nesting habitat (i.e., those habitat traits located at or near nests) were very poor predictors of nesting success (Brawn 1998). Habitat analyses pertaining to variables such as ground over and local floristic composition were labor intensive. Therefore a small subset of habitat variables were measured at each nest (see below).

ACKNOWLEDGEMENTS

This research was supported by funds from The Forest Preserve District of Cook County, The Illinois Department of Natural Resource's Conservation-2000 Program (via the Chicago Wilderness), and the Chicago Wilderness. Special thanks go to Debbie Moskovits, Steve Packard, Laurel Ross, Kelly Thomas, Ralph Thornton, David Wachtel, and Tami Watson for help with funding, logistics, and local cooperation. Finally, we thank the following field assistants who worked long hours to locate and monitor nests: Than Boves, Nichole Davros, Sara Fernandez, Bill Malecki, Karin Nelson, Brian Rempert, and Jim Sullivan.

METHODS

Rates of Nest Success. - Reproductive success in restored and unrestored sites was estimated by locating and monitoring nests. Located nests were subsequently visited every three days until the nest failed or young were fledged. Contents of nests (i.e., eggs and fledglings) were recorded each visit. Nests were inspected carefully for the presence and number of Brown-headed Cowbird eggs or nestlings. Estimated rates of nest success were derived as daily predation rates (DPR) or the related quantity of daily survival rates (1 – DPR). DSR was calculated by methods developed by Mayfield (1975). Nests for a given species were generally pooled into those from restored (i.e., burned) and undisturbed habitat. Nest from different years were combined since, for this report, annual variation was not of intrinsic interest. Hypothesis tests for differences in DSR between habitat types were carried out using the program CONTRAST which implements methods developed by Sauer and Williams (1989) for general analyses of differences in rates.

Estimation of Avian abundances. - In 1996, avian abundances were estimated in restored and unrestored sites in the FPDCC. This effort was continued in 1997 and 1998 (note that census data from the 1998 season were still under analysis as of this writing). Avian abundances were estimated using the point count method (Ralph et al. 1995). Each point count consisted of an observer recording all visual and auditory contacts with birds for a five minute period. Unlimited radius counts were conducted, but distance and direction from observers to birds were estimated. Points were established at 150 m intervals along transects that were selected to systematically cover study sites or burn units. Each transect consisted of 5 to 12 points. All counts were conducted from dawn until about 10:00 AM and counts were not

Table 1. General descriptions of study areas visited in the FPDCC in 1997 and 1998.

Site	Size (ha)	Soil Texture	Status
Swallow Cliff	160	Fine	Unrestored/Restored[1]
Caps Sauers Holdings Nature Preserve	607	Fine	Restored
Spears Woods	220	Fine	Restored
McClaughry Springs	102	Fine	Unrestored
Redgate Woods	650	Fine	Unrestored
Palos/Paddock Woods	102	Fine	Unrestored/Restored[1]

[1]Burn units and closed-canopy forest were censused within this site

conducted in strong wind or rain. Each point was visited 2-4 times each breeding season and counts were typically conducted between 1 June and 10 July.

RESULTS

Nesting Success - The primary study sites used in this study are listed in Table 1. Each of these sites was visited in 1997 and 1998 when searching for nests and censusing birds. A total of 377 nests were located in 1997 (N = 210) and 1998 (N = 167). Of these, 294 were for species where sample sizes were adequate or for species of interest to the FPDCC and the Chicago Wilderness (N = 13). Samples sizes for these 13 species ranged from 63 for the American Robin (see appendix for scientific nomenclature) to four for the Veery. Variation in sample size among species reflected differences in local abundances an variation in accessibility/detectability of nests.

Overall, daily survival rates of 9 of the 13 species were greater in the restored sites (Table 2). Differences between habitats were most pronounced for the Indigo Bunting (> on restored sites), the Northern Cardinal (< on the restored sites). Of the four species with greater survival rates of nests in undisturbed habitat, two forage and nest in canopy foliage (Red-eyed Vireos, and Scarlet Tanagers) one is a shrub nester (Northern Cardinals), and the other nest in the mid - to upper-canopy (Blue Jays). The species that experienced greater nesting success in burned or restored habitat were also ecologically diverse. Samples sizes were unfortunately low, but the greater nesting success in restored habitat for the Veery and the Wood Thrush.

A binomial test assessing the hypothesis that daily survival rates are greater in the

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Table 2. Rates of nesting success for selected species in burned and unburned habitats at several sites in the Forest Preserve District of Cook County (Palos-Sag Divisions). Data are from 1997 and 1998. "Burned" refers to habitat that has been restored or is in restoration. "Unburned" generally refers to undisturbed forest with ≥ 80 % canopy closure.

	1997		1998		Overall	
Species	Burned	Unburned	Burned	Unburned	Burned	Unburned
Eastern Wood-Pewee	.993 (.005) 11 (273)	.970 (.030) 2 (33)	.987 (.008) 10 (224)	.987 (.128) 4 (78)	.990 (.004) 21 (497)	.982 (.012) 6 (111)
Blue Jay	.989 (.007) 11 (261)	.993 (.007) 9 (146)	.982 (.018) 3 (54.5)	1.00 (0) 4 (51)	.987 (.005) 13 (315)	.995 (.005) 12 (197)
American Robin	.974 (.013) 23 (418.5)	.957 (.013) 18 (254.5)	.979 (.009) 11 (124.5)	.983 (.012) 11 (118.5)	.974 (.007) 34 (543)	.967 (.009) 29 (373)
Wood Thrush	1.00 (0) 3 (54)	.987 (.013) 8 (79)	1.0 (0) 1 (7)	.956 (.030) 4 (45.5)	1.0 (0) 4 (61)	.976 (.014) 12 (124.5)
Veery	1.00 (0) 1 (13.5)	.959 (.040) 2 (24)	1.0 (0) 1 (10.5)	--[2] --	1.0 (0) 2 (24)	.959 (.040) 2 (24)

Table 2, continued:

Species	1997 Burned	1997 Unburned	1998 Burned	1998 Unburned	Overall Burned	Overall Unburned
Gray Catbird	.966 (.019) 5 (89.5)	.933 (.021) 9 (136)	-- --	.963 (.026) 4 (54)	.966 (.019) 5 (89.5)	.942 (.017) 11 (190)
Northern Cardinal	.927 (.055) 4 (54.5)	.958 (.024) 6 (71.5)	.778 (.071) 5 (13.5)	.976 (.024) 4 (42)	.915 (.036) 9 (68)	.974 (.015) 10 (113.5)
Rose-breasted Grosbeak	.965 (.020) 7 (85.5)	.953 (.026) 7 (64)	.926 (.071) 5 (13.5)	.943 (.056) 3 (17.5)	.960 (0.20) 12 (99)	.951 (.024) 10 (81.5)
Indigo Bunting	.977 (.023) 4 (43)	.920 (.034) 6 (62.5)	.966 (.033) 4 (29.5)	.944 (.027) 8 (72)	.972 (.019) 8 (72.5)	.933 (.022) 14 (134.5)
Scarlet Tanager	1.00 (0) 4 (100.5)	1.00 (0) 2 (48)	.333 (.385) 1 (1.5)	1.00 (0) 1 (1.5)	.990 (.009) 5 (102)	1.00 (0) 3 (49.5)
Baltimore Oriole	.985 (.011) 10 (132.5)	.964 (.025) 4 (56)	.990 (.010) 18 (99)	1.00 (0) 4 (27)	.987 (.007) 28 (231.5)	.975 (.017) 8 (83)

Table 2, continued:

Species	1997 Burned	1997 Unburned	1998 Burned	1998 Unburned	Overall Burned	Overall Unburned
Red-eyed Vireo	.964 (.020) (83.50)	1.00(0) 1 (26.5)	.333 (.385) 1 (1.5)	.972 (.016) 8 (107.5)	.953 (.023) 5 (85)	.970 (.015) 9 (134)
American Goldfinch	.938 (.021) 10 (129.5)	.924 (.026) 9 (106.5)	-- --	.952 (.033) 3 (41.5)	.938 (.021) 10(129.5)	.926 (.022) 12 (148)

[1]Daily survival rate (SE)
Number of nests (exposure days)

[2]No nests found.

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restored areas was only marginally significant (P = 0.13). A similar test using only those species with reasonably large sample sizes (arbitrarily set at $\geq$ 20) indicates that seven of nine species had greater daily survival rates within restored habitat. A binomial test for this result (i.e., equivalent to getting 7 heads in nine tosses of a coin) was also only marginally significant (P = 0.09). Analyses on a species by species basis using CONTRAST indicated that the differences among habitats were not significant in any case. Notwithstanding, the power of these tests were low owing to relatively large standard errors in many cases.

In terms of the expected proportion of nests fledging at least one young (derived by raising the DSR to the number of days in the nesting cycle), the differences between habitats were important large for several species (Fig. 1). For example, the overall probability of nest success was .22 for Indigo Buntings in unburned habitat and nearly .54 in burned sites. Conversely, the expected rates of nest success of the Northern Cardinal was .14 in restored habitat and .56 in unburned sites.

With some exceptions, the patterns of variation in nesting success observed in the FPDCC were similar to those found in less urban regions of Illinois. For example, Indigo Buntings, Rose-breasted Grosbeaks, and Eastern Wood Pewees, have greater estimated nest success in burned habitats throughout Illinois, whereas Northern Cardinals consistently experience lower nesting success in restored sites. One notable difference between results from the FPDCC and sites elsewhere in the state was for the Blue Jay, a species that generally has significantly greater nesting success in restored habitats. Overall, nesting success was greater in the FPDCC than in more agricultural regions in the state. The reasons underlying this regional difference are unknown and merit more detailed study.

Rates of parasitism by Brown-headed Cowbirds were not significantly different between

habitat types (Table 3). Generally, species that accept cowbirds eggs were parasitized at comparable levels within burned and unburned habitats. What was noteworthy was that overall rates of parasitism were lower than those observed elsewhere in Illinois. For example, the Rose-breasted Grosbeak, the Indigo Bunting, the Northern Cardinal, and the Eastern Wood Pewee are all parasitized at lower rates in the FPDCC than that observed in a similar study conducted in at several sites in the Illinois River Valley south of Peoria (Brawn 1998).

Abundances of Breeding Birds. - In several cases, appeared to effects estimated abundances of breeding birds. Species that are markedly more common in restored habitat include the Red-headed Woodpecker, the Yellow-shafted Flicker, the House Wren, the Indigo Bunting and the Baltimore Oriole. Species what were more common in the closed-canopy forests included the Wood Thrush, the Northern Cardinal. the Ovenbird, the Scarlet Tanager, and the Red-eyed Vireo (Table 4). These results are generally consistent with results from studies of restoration in other regions of Illinois. Species that favor more open habitat with shrubs are more common on restored habitat. Those favoring dense canopy foliage or a well-defined layer of litter tend to be less common. Census results of certain species bear special mention. The Veery and the Hooded Warbler Hooded Warbler did not decrease on the restored plot to the degree expected. In fact the Veery was slightly more common on the restored plot. These species are very patchy in their distribution in the FPDCC and they were absent at many census sites regardless of habitat structure. Brown-headed cowbirds were found in similar abundances within the two habitats, but were not especially uncommon when compared with other regions of the state. This result was somewhat of a surprise given that rates of parasitism are comparatively low. The dynamics of cowbird parasitism in urban habitats merits additional study.

Fig. 1. Expected rates of nest success of selected species in restored (black bars) and unrestored (open bars) habitat in the FPDCC. Rates are based on Mayfield estimates of daily nest survival. Species abbreviations are: EWPE(Eastern Wood Pewee), BLJA (Blue Jay), AMRO (American Robin), GRCA (Grey Catbird), NOCA (Northern Cardinal), RBGR (Rose-breasted Grosbeak), INBU (Indigo Bunting), BAOR (Baltimore Oriole).

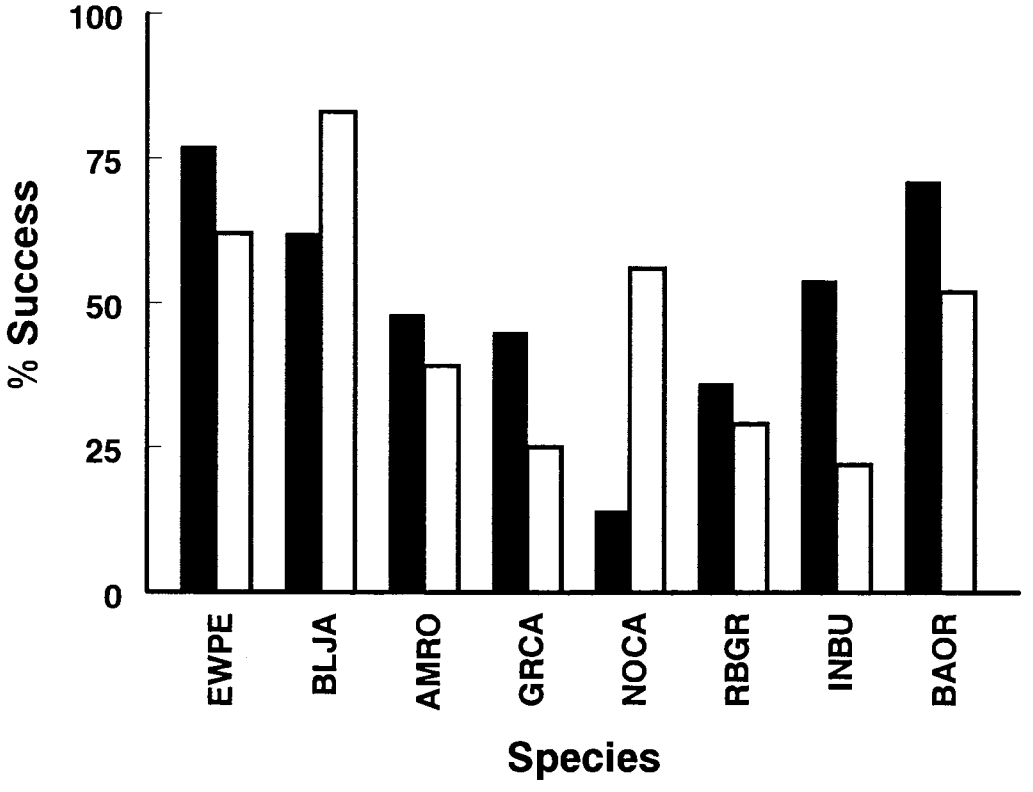

Table 3. Rates of brood parasitism (% of nests [N]) by Brown-headed Cowbirds in burned and unburned habitats in the Forest preserve District of Cook County (Palos-Sag Divisions). Data are from 1997 and 1998 breeding seasons.

	Habitat	
Species	Burned	Unburned
Eastern Wood-Pewee	9.5 (21)	0 (6)
Blue Jay	0 (12)	0 (12)
American Robin	0 (34)	0 (34)
Wood Thrush	50 (4)	58 (12)
Northern Cardinal	0 (5)	10 (10)
Rose-breasted Grosbeak	0 (12)	10 (10)
Indigo Bunting	50 (8)	25 (16)
Scarlet Tanager	20 (5)	33 (3)
Red-eyed Vireo	20 (5)	67 (9)
American Goldfinch	0 (9)	0 (13)
Overall	8 (115)	18 (125)

Table 4. Analyses of estimated abundances 30 bird species during the breeding season in savanna/woodland habitat and closed-canopy forests. For habitats comparisons, average abundances from the 1994 to 1996 breeding seasons were combined .

	Estimated Abundance $\bar{x}$ / 10 points[1] (SE)	
Species	Savanna/Woodland	Closed Canopy
Red-bellied Woodpecker	5.2 (2.21)	4.1 (1.70)
Red-headed Woodpecker	4.4 (1.97)	0.0 (0.00)
Yellow-shafted Flicker	4.3 (1.57)	0.8 (0.47)
Eastern Wood-Pewee	8.7 (0.43)	6.3 (0.72)
Great Crested Flycatcher	6.7 (2.30)	4.8 (1.10)
Blue Jay	11.5 (1.36)	10.4 (1.10)
Eastern Tufted Titmouse	1.9 (1.12)	1.5 (0.16)
Black-capped Chickadee	3.2 (0.26)	3.0 (1.90)
House Wren	5.1 (0.67)	0.0 (0.00)
American Robin	17.3 (1.57)	14.6 (2.75)
Wood Thrush	1.5 (0.90)	3.4 (1.93)
Veery	1.4 (1.42)	1.1 (0.64)
Gray Catbird	1.0 (0.61)	0.7 (0.43)
Red-eyed Vireo	2.1 (0.60)	4.1 (0.66)
Ovenbird	1.1 (0.38)	5.1 (0.97) 1
Hooded Warbler	0.8 (0.56)	1.3 (0.41)

Table 4, continued:

	Estimated Abundance $\bar{x}$ / 10 points[1] (SE)	
Species	Savanna/Woodland	Closed Canopy
Northern Cardinal	2.3 (1.29)	4.1 (1.55)
Rose-breasted Grosbeak	2.2 (0.93)	1.7 (1.18)
Eastern Towhee	1.1 (0.55)	0.0 (0.00)
Indigo Bunting	3.1 (1.80)	0.6 (0.36)
Brown-headed Cowbird	4.9 (0.67)	5.2 (0.97)
Baltimore Oriole	4.2 (2.60)	2.1 (1.20)
Scarlet Tanager	2.7 (0.77)	4.5 (1.75)

[1]Estimates based on 5 minute, unlimited radius point counts (see text)

CONCLUSIONS AND IMPLICATIONS FOR MANAGEMENT

The fundamental result from this study is that management and restoration for savannas or woodlands in Illinois has an important effects on population of breeding birds. Local abundances of most species change in response to restoration and, as a consequence, bird community structure is significantly different. Moreover, although the mechanism is unknown, the general effect of burning is to increase reproductive success. More demographic comprehensive data are needed, but these results suggest that, for several species, burning and restoration can drive populations of certain species to increased viability.

Given that savanna and woodland habitats and ecosystems are extremely rare in Illinois and the Midwest, the results presented here suggest that at least some tracts may better serve avian conservation if they are restored into oak savanna or woodland habitat. Further, savanna birds appear to be less prone to the adverse effects of fragmentation that forest birds. Presence /absence of these birds appears to be more a function of habitat type than tract size in the FPDCC and elsewhere in Illinois (Brawn 1998). In addition, unlike many forest birds, reproductive success in savanna and woodland birds does not change appreciably with proximity to edge or tract size. Historical accounts suggest that pre-settlement savanna and woodlands were not necessarily extensive tracts of contiguous habitat (Taft 1997). Rather, these habitats or ecosystems may have always existed in a fragmented state as transitions between prairie and closed-canopy forests. If so, then the constituent animal populations may be less prone to the adverse effects of anthropogenic fragmentation. While not conclusive, results of this study support this possibility. For many savanna and woodland birds, habitat "quality" seems to be more important than tract size. Results from this study indicate that if suitable habitat is made

available, then savanna and woodland birds will colonize and breed with comparatively high prospect for success.

The question therefore arises concerning choice of tracts for restoration - a decision with complex considerations. Notwithstanding, to the extent that bird conservation is a management priority, it is recommended that small tracts (≈ 100 ha or less) of closed-canopy forest be given strong consideration for restoration – especially where soil, topography, and floristic traits (see Taft 1997, Packard and Mutel 1997) indicate that savanna or woodland habitats were once predominant . The latter caveat is important as this recommendation should not be interpreted as a "carte blanche" to burn all small tracts. In relatively mesic sites such a ravines, for example, it is less likely that fires were less frequent. General physical and phytosociological correlates of presettlement savanna and woodlands can be found in Taft (1997). Note that in small tracts, burning and management tends to be relatively intense; the effects of intensive management viz. the importance of shrubs is discussed below.

For moderate sized tracts (≈ 200 to 800 ha), where evidence clearly indicates a likelihood of pre-settlement savannas and woodland, it is recommended that the "landscape burn" method of restoration be adopted. This, somewhat less intensive, style of management facilities habitat heterogeneity since some areas will burn more frequently and intensively than others. Ideally, a landscape mosaic will result (Taft 1997).

Large tracts (≈ 1500 ha or more) are rare in Illinois and can be comparatively valuable for forest birds (S. Robinson, *personal communication*). Therefore, restoration within these sites needs to be considered carefully with respect to avian conservation. Again, many factors will influence this decision, but a large tract that is configured with considerable area away from edges may be relatively valuable for forest birds. Alternatively, a large tract that is

comparatively linear with a lot of edge habitat would be a better candidate for restoration. This is especially true in the FPDCC where cowbird parasitism is relatively low and rates of nest loss and not pathologically high when compared to other fragmented landscapes in Illinois. The bottom line is that a mix of habitat types will be the most beneficial for maximizing species diversity. For enhancing viability, the best strategy may be to aggressively restore small tracts where savanna and woodland habitat once existed, landscape burn moderate sized tracts and, if possible, leave some large contiguous tracts undisturbed.

Many of the species that responded favorably to restoration either nest or forage in shrubs or small trees. These species include Indigo Buntings, Brown Thrashers, and Summer Tanagers. Restoration for a full compliment of savanna and woodland birds must accommodate these species. Historically, shrubs were associated with savanna-like habitats (McPherson 1997, Taft 1997), but intensive management with annual burning could result in a shrubless understory. This possibility is more likely in small tracts than large (Taft 1997). Therefore, restoration that allows for the continued presence of shrubs on at least part of the burn unit should be considered. Specific recommendations for the frequency of burning are not feasible since local conditions vary; the "bottom-line" consideration for savanna birds is that even within restoration sites, a mosaic of habitats is desirable.

RESEARCH NEEDS

Several important issues remain unanswered or were prompted by this study. Information about these questions are needed to develop a full understanding of the associations between savanna restoration and avian conservation in the FPDCC and the Chicago Wilderness.

1) What are the factors underlying the general trend of increased reproductive success in burn units? A fundamental question is whether there are simply fewer nest predators in savannas or whether the nest are less vulnerable. A related question is the extent to which variation in reproductive success and variation in local abundances are coupled for savanna birds. Are return rates of adults or fledged-young different in savanna-like habitats versus those in closed-canopy forests?

3) Why are rates of parasitism by cowbirds less in a urban setting than elsewhere?

4) How are migrants affected by restoration? This study was conducted during the breeding season, but an important aspect of restoration may be the use of savanna-like habitats as stop-over sites for spring and fall migrants.

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Appendix 1. Common and scientific names of birds mentioned in text.

Common Name	Scientific Name
Red-headed Woodpecker	*Melanerpes erythrocephalus*
Northern Flicker	*Colaptes auratus*
Eastern Wood-Pewee	*Contopus virens*
Great Crested Flycatcher	*Myiarchus crinitus*
Blue Jay	*Cyanositta cristata*
Eastern Tufted Titmouse	*Parus bicolor*
Black-capped Chickadee	*Parus atricapillus*
House Wren	*Troglodytes aedon*
Veery	*Catharus fuscescens*
Wood Thrush	*Hylocichla mustelina*
American Robin	*Turdus migratorius*
Gray Catbird	*Dumetella carolinensis*
Red-eyed Vireo	*Vireo olivaceus*
Ovenbird	*Seiurus aurocapillus*
Hooded Warbler	*Wilsonia citrina*
Scarlet Tanager	*Piranga olivacea*
Northern Cardinal	*Cardinalis cardinalis*
Rose-breasted Grosbeak	*Pheucticus ludovicianus*
Indigo Bunting	*Passerina cyanea*

Common Name	Scientific Name
Eastern Towhee	*Pipilo erythrophthalmus*
Brown-headed Cowbird	*Molothrus ater*
Baltimore Oriole	*Icterus galbula*