adult females were banded in 1989, 26 unbanded adult females were present at the site in 1990. All 7 of the year-old, banded male nestlings that returned to nest at the Morton Arboretum in 1990 were paired with unbanded females. And, although all but 7 (17 out of 24) of the adult females and all nestlings (193) at the Morton Arboretum were banded in 1990, 18 of the 29 females nesting there in 1991 were unbanded.

Five bluebirds had a consecutive three-year history, and 5 bluebirds had a three-year history but with the middle year missing. Seventeen bluebirds returned for two consecutive years during the study. A few individuals returned to the same box from which they had fledged or in which they had raised young the previous year, but most birds moved to other boxes within the same study area from one year (or even from one brood) to the next.

While most of the returns were seen at the same site at which they had been banded, there was evidence of interaction between the three study areas. A female bluebird banded as a nestling at Fermilab in 1989, nested at the Arboretum in 1990; and, a male banded as a nestling at the Arboretum in 1989, nested at McKee Marsh in 1990. Also, two males banded as nestlings from the same nest at McKee Marsh in 1989, returned in 1991, after a year spent elsewhere, one to Fermilab and one to the arboretum. Therefore, Eastern Bluebird nestlings from each of the three study sites have appeared at the other sites.

Discussion and Management Recommendations

During our study, the number of Eastern Bluebird nesting pairs increased from 11 in 1988, before regular monitoring began, to a peak of 49 in 1990. The number dropped to 42 in 1991, despite a slight increase in the number of boxes available. Also, despite a relatively constant number of boxes available from 1989 - 1991, the number of nests peaked at 87 in 1990, up from 46 the year before, but dropped slightly to 75 in 1991. These results are consistent with the assumption that availability of suitable nesting cavities is but one of the many interdependent and complex factors involved in Eastern Bluebird population dynamics (Parren 1991).

Seventy-nine per cent of the bluebird nesting activity took place at the Morton Arboretum where the habitat consists of open grassy areas with scattered trees and shrubs. Discriminant analysis well distinguished the three sites. The two sites that had the least bluebird use (Fermilab and McKee Marsh) had the most between-group confusion, which supports the hypothesis that sites with suboptimal habitat would have the most misclassification with each other.

With the variables used in this study, discriminant analysis could not distinguish between boxes used versus those not used. The results were examined for indications of bluebird preference. Further studies may analyze a wider range of variables in greater detail as the interpretation of the data warrants. Overall, shorter grass height was found at the Arboretum (an average height of 62 cm as opposed to 70 cm at McKee Marsh and Fermilab). The preference for shorter grass was strengthened when hole height was also considered. The mean hole height for the arboretum, 171 cm, was higher than that found at the other two sites (124 cm for McKee Marsh, 152 cm for Fermilab).

Our discriminant analysis results concur with past studies of bluebird habitat, confirming the Eastern Bluebird's preference for open areas with scattered trees and sparse or relatively short herbaceous vegetation (Willner et al. 1983, Munro and Rounds 1985, Parren 1991, Pogue and Schnell 1994). The importance of short grass or sparse vegetation as foraging area for bluebirds may be a key factor in this habitat preference, more important than entrance hole height or the grass height to entrance hole height ratio (Pinkowski 1977b, Power 1980).

Competition from other cavity-nesting species is a factor that can greatly influence bluebird nesting success, and one that can never be completely eliminated (Munro and Rounds 1985). Although House Wren

Table 6. Return of banded Eastern Bluebirds at three DuPage County, Illinois study sites.

BANDED IN:	RETURNED IN:		
1988	**1989**	**1990**	**1991**
3 adults	2 adults (66.6%)	1 adult (33.3%	1 adult (33.3%)
44 nestlings	0 nestlings	0 nestlings	0 nestlings
47 total	2 (4.3%) total	1 (2.1%) total	1(2.1%) total
1989			
20 adults	—	7 adults (35%)	2 adults (10%)
135 nestlings	—	16 nestlings (11.9%)	12 nestlings (8.9%)*
155 total	—	23 (14.8%) total	14 total (9.0%)
1990	—	—	2 adults (9.5%)
21 adults	—	—	3 nestlings (1.4%)
221 nestlings	—	—	5 total (2.1%)
242 total	—		

* Seven of these nestlings were not seen in 1990 but returned to breed in 1991.