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REPRODUCTIVE SUCCESS OF FOREST-DEPENDENT SONGBIRDS NEAR AN AGRICULTURAL CORRIDOR IN SOUTH-CENTRAL INDIANA

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ABSTRACT.—Potential source populations of forest-breeding Neotropical migrant birds may be threatened by anthropogenic changes that increase brood parasitism by Brown-headed Cowbirds (*Molothrus ater*) and nest predation in heavily forested breeding areas. In south-central Indiana, corridors of agriculture and rural development, ranging from <50 m to several thousand meters in width, penetrate interior portions of the heavily forested landscape. These corridors provide habitat for cowbirds and nest predators. We monitored breeding success of six species of Neotropical migrants and one resident species near an agricultural corridor and in interior forest. We found that nest survival was lower near the agricultural corridor for most of the species in the nestling stage, but no consistent difference in nest survival was detected during the egg stage. Levels of cowbird parasitism were generally elevated near the agricultural corridor. Estimates of the number of fledglings per nesting attempt indicated that seasonal productivity was lower near the agricultural corridor for six of the seven species. Status of populations of birds in south-central Indiana as sources in the Midwest may be compromised by extensive intrusion of agricultural corridors within the contiguous, heavily forested landscape. *Received 18 November 1999, accepted 26 April 2001.*

CORRIDORS THAT DIVIDE heavily forested landscapes, such as powerline right-of-ways and roads, have been shown to alter avian community composition and reduce reproductive success of forest-dependent species (Ferris 1979, Chasko and Gates 1982, Askins 1994, Rich et al. 1994, Ortega and Capen 1999). Harris and Silva-Lopez (1992) referred to this type of anthropogenic disturbance as divisive fragmentation. Forest fragmentation is of special concern in the Midwest, where agricultural practices have reduced most forests to small fragments. In fragmented landscapes, reproductive success of forest species can drop below replacement levels, creating population sinks (Donovan et al. 1995a, b; Robinson et al. 1995). Populations in sink habitats can only be maintained by immigration from sources, areas where reproduction exceeds replacement. The extensively forested landscape of south-central Indiana (78% forest cover, mean patch size 10,962 ha; Thompson et al. 2000) is of great interest in this context, because it may serve as a population source for small forest fragments in Indiana and elsewhere in the lower Midwest.

In south-central Indiana, corridors of agriculture and rural development, varying in width from <50 m up to several thousand meters, penetrate the heavily forested landscape. Agricultural corridors may create edge effects and other fine-scale landscape effects (e.g. Wilcove 1985, Paton 1994), thereby reducing amount of core area (Temple 1986) within large tracts of contiguous forest. Habitats within corridors provide feeding locations for Brown-headed Cowbirds (*Molothrus ater*), allowing them to penetrate into the interior of large forest tracts. The edge created by these corridors can also provide habitat for many nest predators. As a result of higher rates of cowbird parasitism and nest predation, reproductive success of birds may be lower in forest adjacent to agricultural corridors than in more interior forest.

The objectives of this study were (1) to test the prediction that nest predation is higher in forest adjacent to an agricultural corridor than in more interior forest, (2) to test the prediction that parasitism is higher in forest adjacent to an agricultural corridor than in more interior forest, and (3) to make some initial estimates of

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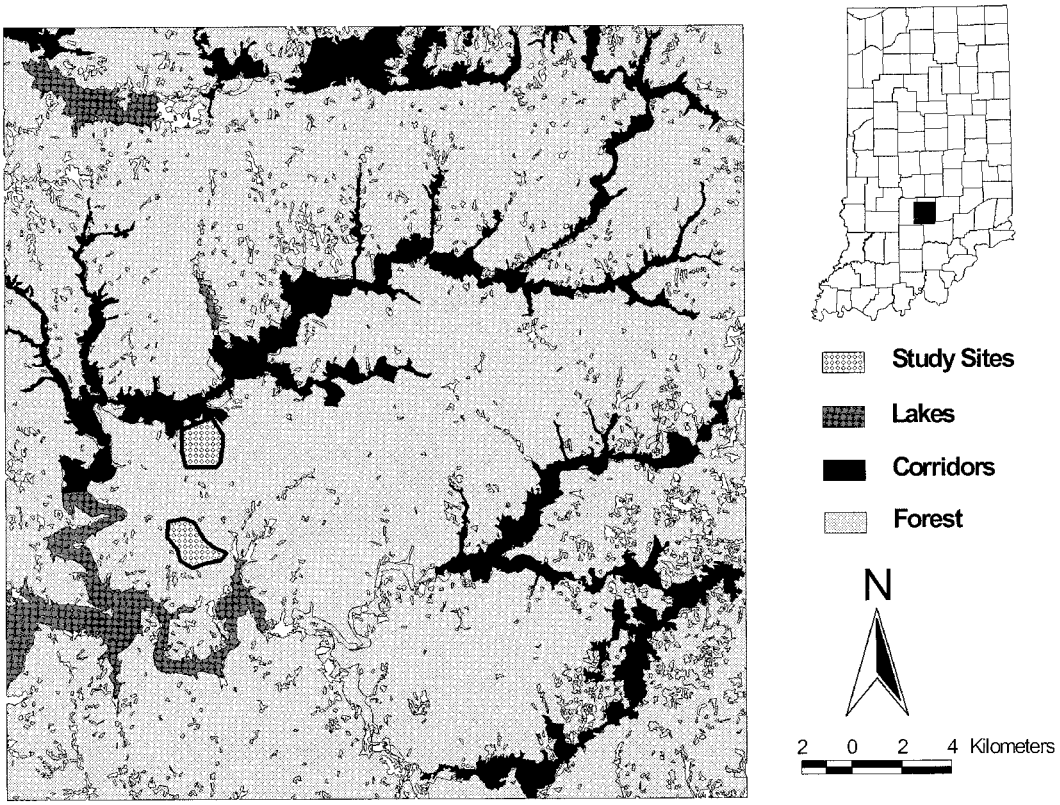

FIG. 1. Location of study sites in relation to agricultural corridors within the heavily forested landscape of south-central Indiana.

productivity levels in these two forest contexts to determine whether agricultural corridors threaten the potential of these populations to act as sources in the Midwest. This information will aid in developing management strategies that balance economic uses of land with maintenance of landscapes favorable to sustaining viable source populations of Neotropical migrants. We monitored nesting success of forest-breeding Neotropical migrants in several different management contexts in south-central Indiana from 1991–1997. Data from these studies have been published elsewhere (Robinson et al. 1995, Thompson et al. 1996, 2000; Winslow et al. 2000). Here we report data from a forest site adjacent to an agricultural corridor and an interior forest site (4.6 km from the agricultural corridor). We use these data to determine if brood parasitism, nest predation, or both are elevated in proximity to an agricultural corridor.

METHODS

Study sites.—We studied an agricultural corridor that lies along the floodplain of Salt Creek between Bloomington and Nashville, Indiana (Fig. 1). The corridor begins ~4.5 km east of Bloomington and runs east past Nashville. Several small branches of the corridor extend north and south of the main corridor. The corridor has an average width of ~1.1 km. Extensively forested land occurs to the north and south of the agricultural corridor. Yellowwood State Forest, Morgan-Monroe State Forest, and privately owned forested land are located immediately north of the corridor. The Pleasant Run Unit of the Hoosier National Forest, Yellowwood State Forest, Morgan-Monroe State Forest, Brown County State Park, and Selma Steele Nature Preserve are located immediately to the south of the corridor.

We monitored nests in mature forest at two sites near Belmont, Brown County, in south-central Indiana (Fig. 1). These two sites are described in Winslow et al. (2000). The interior forest site consists of three contiguous watersheds embracing an area of

TABLE 1. Bootstrap confidence intervals for the difference in daily survival rate between interior and corridor sites during the egg and nestling stages of the nesting cycle.

	Daily survival rate			No. of nests		95% bootstrap confidence interval	
	Interior	Corridor	Difference	Interior	Corridor	Lower bound	Upper bound
Egg stage							
Acadian Flycatcher	0.9754	0.9799	−0.0046	215	223	−0.0063	0.0063
Indigo Bunting	0.9515	0.9730	−0.0215	14	26	−0.0379	0.0344
Northern Cardinal	0.9612	0.9245	0.0366	18	17	−0.0501	0.0520
Ovenbird	0.9450	0.9747	−0.0297	42	5	−0.0553	0.1086
Red-eyed Vireo	0.9302	0.9545	−0.0244	70	28	−0.0318	0.0367
Worm-eating Warbler	0.9702	0.9632	0.0070	35	16	−0.0204	0.0229
Wood Thrush	0.9630	0.9602	0.0029	81	41	−0.0204	0.0229
Nestling stage							
Acadian Flycatcher	0.9623	0.9383	0.0240[a]	145	174	−0.0163	0.0161
Indigo Bunting	0.9474	0.9598	−0.0124	13	23	−0.0497	0.0425
Northern Cardinal	0.9310	0.9281	0.0030	13	11	−0.0639	0.0656
Ovenbird	0.9265	0.8909	0.0356	41	6	−0.0746	0.1197
Red-eyed Vireo	0.9441	0.9363	0.0077	43	24	−0.0381	0.0420
Worm-eating Warbler	0.9756	0.9127	0.0629[a]	33	24	−0.0352	0.0366
Wood Thrush	0.9699	0.9546	0.0153	61	30	−0.0211	0.0194

[a] Outside the 95% confidence interval generated by the bootstrap.

214 ha. Nests in all three watersheds were monitored in 1992 and 1993; in 1994 and 1995, we worked only in the two westernmost ravines. To eliminate this variation in coverage, we only report data from these two ravines in this analysis. The area within a 3 km radius of the interior forest site is heavily forested (87% forest cover with 4.7% cover of agriculture or short-grass habitat; P. J. Doran unpubl. data). The corridor site (''Exterior edge'' *in* Winslow et al. 2000) consists of five contiguous watersheds encompassing an area of 213 ha. Width of the agricultural corridor adjacent to this site is ~1.1 km. We include data from two ravines (easternmost and center of the five) that were monitored all four years. The area within 3 km radius of this site is 82% forested with 13.4% of the landscape containing agriculture or short-grass habitat (P. J. Doran unpubl. data).

Calculation of nesting success.—We monitored reproductive success of birds breeding at the sites described above between 1992 and 1995. Although we focused on the Acadian Flycatcher (*Empidonax virescens*), we also monitored nests of other Neotropical migrants and some resident species. We have large data sets (>20 nests for each site) for Acadian Flycatcher, Wood Thrush (*Hylocichla mustelina*), Red-eyed Vireo (*Vireo olivaceus*), and Worm-eating Warbler (*Helmitheros vermivorus*) (Table 1). We focused our analysis of reproductive success between interior and corridor sites on these four species. Data are also presented for three other species, Northern Cardinal (*Cardinalis cardinalis*), Indigo Bunting (*Passerina cyanea*), and Ovenbird (*Seiurus aurocapillus*), that were monitored at both sites. We attempted to find every Acadian Flycatcher nest within our study sites and probably succeeded in monitoring 80–90% of the nests of that species, although some were too high to monitor. We checked nests at intervals of three days or less using mirrors and extendable poles. On each visit, we determined if the nest was active and recorded contents of the nest (number of eggs and nestlings of both host and cowbird). We determined the fate of each nest. A nest that had been active was assumed to have failed if on a subsequent visit (1) all eggs (host and cowbird) were missing, or (2) all nestlings (host and cowbird) too young to have fledged were absent, or (3) the parents abandoned the nest. The majority of nest failures were due to predation.

Analysis of nest survival.—All data were pooled among years at each study site to provide sufficient sample sizes for valid comparisons. We used the Mayfield (1961) method to calculate daily nest survival rate (the probability that a given nest will survive any given day) for each species at each study site. Overall survival rate (probability that a given nest will survive the entire nesting cycle to fledge host or cowbird young) was calculated by multiplying nest survival over the egg stage by survival over the nestling stage. That permitted us to estimate magnitude of differences in nesting success. We used bootstrapping analysis to compare daily survival rate between the two sites for each species, using the RESAMPLING STATS software package (version 4.03; Arlington, Virginia). We decided to use bootstrapping instead of the parametric tests employed in other published studies of nest success (e.g. Hensler and Nichols 1981) because it is not clear to us

that the sampling unit used in these tests (number of exposure days) is independent and nonarbitrary. Variances derived from these parametric tests are underestimated, resulting in error similar to that found associated with pseudoreplication (Bart et al. 1998). To employ the bootstrap, nests of each species were sampled randomly with replacement from a pooled data set from both sites to create 10,000 simulated data sets. Difference in daily survival rates between the two sites was calculated from each of these simulations to generate a distribution of simulated differences. The observed difference in daily survival rate was compared to the 95% confidence interval for the mean simulated difference.

To estimate number of fledglings each species produced per nesting attempt, we multiplied nest survival rate over the entire nesting cycle by average number of host young produced per successful nest (including both parasitized and unparasitized nests). We also employed the analysis described by Donovan et al. (1995b) to calculate number of female offspring per adult female per year. This enabled us to evaluate whether the agricultural corridor reduces ability of populations in forests of south-central Indiana to act as sources in the Midwest region.

Analysis of cowbird parasitism.—We used contingency table analysis to compare proportion of nests parasitized between interior and corridor sites for each of the four species, pooling among years. Only nests that were initiated before the end of the cowbird breeding season (10 July) were included in analysis. We used the Mantel-Haenszel chi-square statistic to examine the relationship between landscape context (interior or corridor) and parasitism independent of the effect of species of breeding bird (Acadian Flycatcher, Red-eyed Vireo, Worm-eating Warbler, and Red-eyed Vireo; SYSTAT 1992). For species with sufficient sample sizes, the Mantel-Haenszel chi-square statistic was also used to determine the same relationship for each species independent of effect of the year the nest was monitored. We then used Fisher's exact tests to make the same comparison, pooling among years, for individual species with low sample sizes.

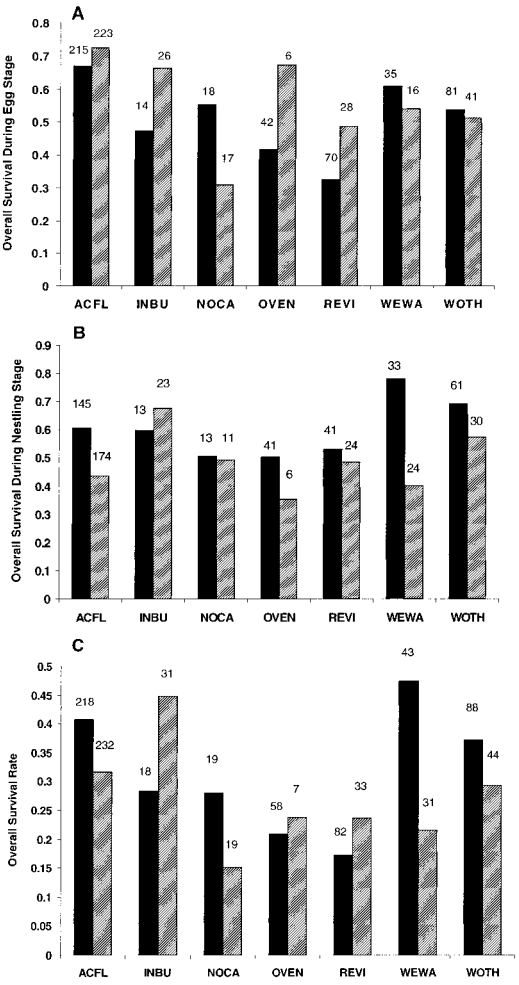

FIG. 2. Comparison of nest survival rates of songbird nests at the interior (solid bars) and corridor (hatched bars) sites during: (A) egg stage, (B) nestling stage, and (C) entire nesting cycle. Species abbreviations are as follows: Acadian Flycatcher, ACFL; Indigo Bunting, INBU; Northern Cardinal, NOCA; Ovenbird, OVEN; Red-eyed Vireo, REVI; Worm-eating Warbler, WEWA; Wood Thrush, WOTH. The sample size (number of nests) appears above each bar.

RESULTS

Nest survival rates.—During the egg stage, nest survival rates were higher at the interior site for three of the seven species (Northern Cardinal, Worm-eating Warbler, and Wood Thrush), whereas rates were higher at the corridor site for four of the species (Acadian Flycatcher, Indigo Bunting, Ovenbird, and Red-eyed Vireo; Fig. 2A). None of the observed differences in survival rates between sites during the egg stage lay outside the bootstrap-generated 95% confidence interval (Table 1).

During the nestling stage, nest survival rates were higher at the interior site than at the corridor site for six of the seven species (Fig. 2B), although difference between sites for Northern Cardinals was negligible. Only Indigo Buntings had a higher survival rate at the corridor site. Both Acadian Flycatchers and Worm-eat-

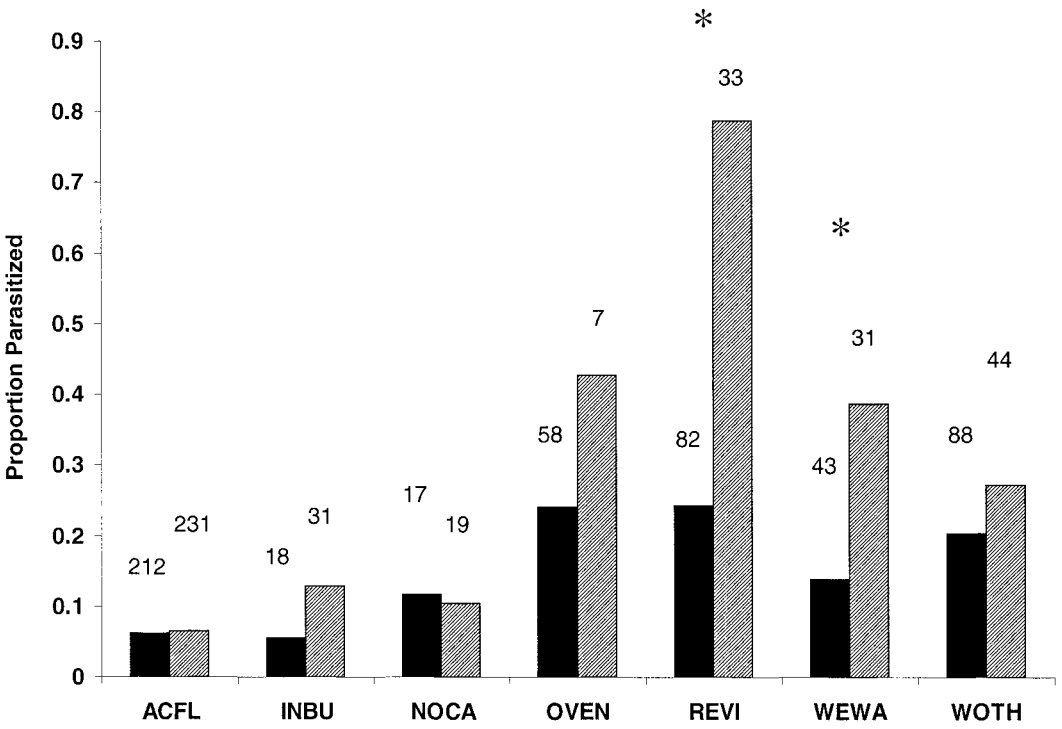

FIG. 3. Comparison of frequencies of Brown-headed Cowbird parasitism of songbird nests at the interior (solid bars) and corridor (hatched bars) sites. Species abbreviations are noted in Figure 2. Sample size (number of nests) appears above each bar. An asterisk above the bars indicates a statistically significant difference.

ing Warblers had large enough differences in survival rates between the two sites to occur outside the 95% confidence interval generated by the bootstrap (Table 1). Difference in survival rates for Wood Thrushes during the nestling stage was close to the upper bound of the 95% confidence interval.

Nest survival rate over the entire nesting cycle was higher at the interior site than at the corridor site for four of the seven species (Fig. 2C). Of our four focal species, Acadian Flycatchers, Worm-eating Warblers, and Wood Thrushes had higher nest-survival rates at the interior site.

Cowbird parasitism.—Parasitism frequency was higher at the corridor site for six of the seven species included in this analysis (Fig. 3), although the difference in parasitism was negligible for Acadian Flycatchers. Cowbird parasitism was significantly higher at the corridor site than at the interior site when effect of interspecific differences among the four focal species was removed (Mantel-Haenszel $\chi^2 = 18.57$, $P < 0.001$). Cowbird parasitism rates were not significantly higher for Acadian Flycatchers (Mantel-Haenszel $\chi^2 = 0.20$, $P > 0.50$) and Wood Thrushes (Mantel-Haenszel $\chi^2 = 2.20$, $P > 0.10$) at the corridor site when effect of year was removed. Both Red-eyed Vireos (with 1995 data excluded because of low sample size) and Worm-eating Warblers experienced significantly higher cowbird parasitism at the corridor site when effect of year was removed (Red-eyed Vireo: Mantel-Haenszel $\chi^2 = 30.13$, $P < 0.001$; Worm-eating Warbler: Mantel-Haenszel $\chi^2 = 4.72$, $P < 0.05$). Parasitism levels were not significantly different for Indigo Buntings, Northern Cardinals, or Ovenbirds between the two sites (Fisher's exact tests, $P > 0.05$).

Fledglings per nesting attempt.—Estimated number of fledglings per nesting attempt was higher at the interior site than at the corridor site for six of the seven species monitored (Fig. 4). Indigo Bunting was the only species with a higher number of fledglings per nesting attempt at the corridor site. Northern Cardinals, Red-eyed Vireos, and Worm-eating Warblers

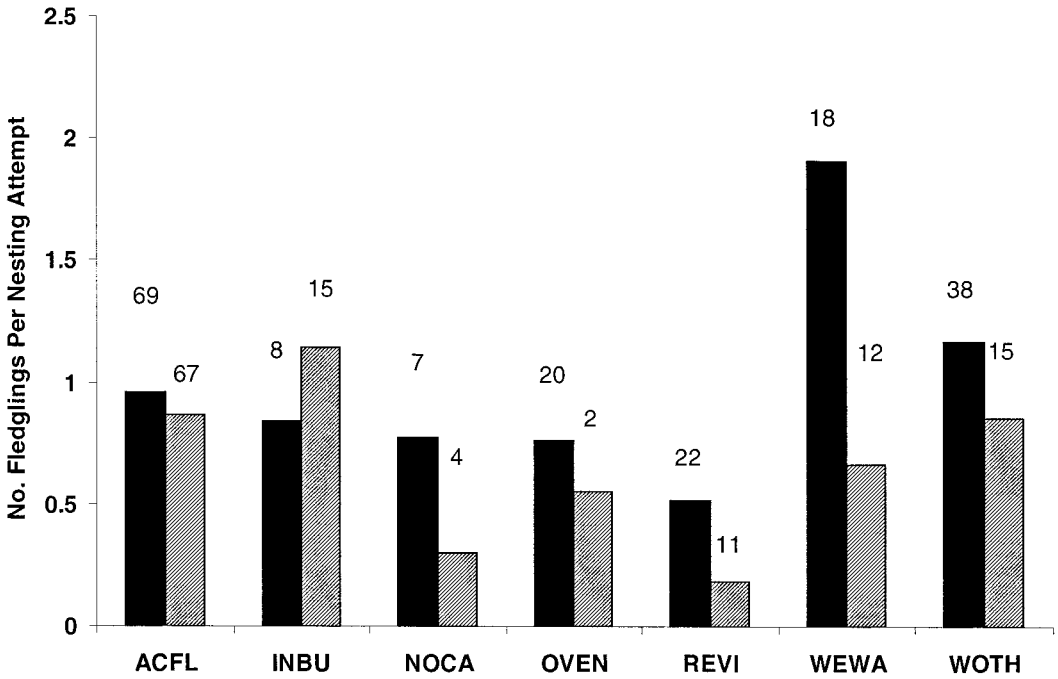

FIG. 4. Number of fledglings produced per nesting attempt for songbirds nesting in the interior (solid bars) and corridor (hatched bars) sites. Species abbreviations are noted in Figure 2. The sample size (number of nests used to calculate number of fledglings per successful nest) appears above each bar.

produced over twice as many fledglings per nesting attempt at the interior site as the corridor site.

DISCUSSION

Nest survival and brood parasitism.—Our results suggest that reproductive success of birds nesting in the forests near an agricultural corridor is lower than in the forest interior. Nest survival during the nestling stage was lower near the agricultural corridor. Brood parasitism by cowbirds was higher near the agricultural corridor. The effect of the agricultural corridor on cowbird parasitism was more evident than the effect on nest survival. There were also interspecific differences in the effect of the agricultural corridor on both nest survival and cowbird parasitism.

It is not clear that all predator populations respond in the same fashion to edges (Haskell 1995). Therefore, effects of edges on nest predation may vary among landscapes and geographic regions, depending on composition of predator communities. A more consistent reduction in nest survival near the agricultural corridor was observed during the nestling stage than during the egg stage. A larger number of predators that cue on nestling activity near the agricultural corridor may account for the lower nest survival rates during the nestling stage. In a study of avian communities near edges in south-central Indiana, Frazer (1992) observed a greater number of two species of nest predators, Blue Jays (*Cyanocitta cristata*) and American Crows (*Corvus brachyrhynchos*), near agricultural edges than in the forest interior. We have witnessed acts of predation by snakes and mammalian predators on nests within our sites. However, we have no reliable data on how nonavian predator populations respond to edges created by agricultural corridors in south-central Indiana.

Most species we monitored experienced elevated levels of cowbird parasitism near the agricultural edge (Fig. 3). O'Conner and Faaborg (1992) found that cowbird abundance decreased from 0 to 400 m away from agricultural edges in the Missouri Ozarks. We might expect that cowbird densities would be higher at the site near the agricultural corridor given that the amount of potential cowbird feeding habitat

within 3 km is twice as high as at the forest interior site. Cowbirds forage primarily in short-grass habitats, feedlots, farms, and row crops, but may commute several kilometers each day to breeding areas (Rothstein et al. 1986, Thompson 1994). However, point-count data from south-central Indiana do not indicate that female cowbirds occur at higher abundance near agricultural edges than in interior forest (>200 m from any edge; Winslow et al. 2000). Donovan et al. (1997) also found that cowbird abundance was not different in core (>250 m from any edge) and edge habitats in moderately and heavily forested landscapes in the Midwest. On the other hand, we have observed groups of 2 to 35 cowbirds feeding within agricultural corridors and in lawns along roads during the early afternoon throughout our study area (T. B. Ford unpubl. data). Despite lack of direct evidence from point counts, higher parasitism levels at the corridor site could be due to a higher abundance of female cowbirds.

Alternatively, proportion of parasitized nests may increase in proximity to edges if the densities of nests of one or more host species vary. For instance, Frazer (1992) found that densities of singing male Red-eyed Vireos and Ovenbirds were reduced near several edge types. If density of female cowbirds does not vary with proximity to edge, and if cowbirds do not switch to other hosts, we would expect that proportion of parasitized nests for these species would be higher near edges (Winslow 2000). Host preferences by individual female cowbirds and host behavior (e.g. nest building and nest defense) may play roles in whether parasitism of different hosts is elevated near edges.

Of our four focal species, Acadian Flycatcher was the only species that did not show a clear increase in cowbird parasitism near the agricultural corridor. Despite being one of the most abundant species in the forests of south-central Indiana, Acadian Flycatchers typically have one of the lowest parasitism rates (Winslow et al. 2000). Cowbirds may avoid Acadian Flycatchers for two reasons. Cowbird reproductive success in Acadian Flycatcher nests is lower than in most other host nests (T. B. Ford unpubl. data). Also, cowbirds may be swamped by availability of other hosts, such as Red-eyed Vireos, when number of nest initiations peak for Acadian Flycatchers.

Seasonal productivity.—With the exception of Worm-eating Warblers and Wood Thrushes at the interior site and Indigo Buntings at the corridor site, fledgling output was <1.0 fledglings per nesting attempt at both sites. Evaluating seasonal productivity from these data is not entirely reliable when individual pairs of birds have not been followed throughout the breeding season. With the exception of the Acadian Flycatcher, we have sparse information on individual females of the species from our sites. Number of nesting attempts following predation by a female in a breeding season is a critical variable in determining seasonal productivity. For Acadian Flycatchers, many of the pairs at the interior site made at least two nesting attempts, whereas some pairs made up to three or four nesting attempts (Whitehead and Taylor 2001). Given the possibility of three nest attempts per pair and higher nest survival rates toward the end of the breeding season (T. B. Ford unpubl. data), some species we monitored would likely produce at least one full clutch per female during a single breeding season.

Of the four focal species, seasonal productivity may be most seriously compromised near the agricultural corridor for Red-eyed Vireos and Worm-eating Warblers. It is unlikely that Red-eyed Vireos are able to replace themselves within a single breeding season either at the interior or corridor site. The reduction in productivity of this species at the corridor site, due to the higher parasitism frequency, further endangers the potential for this population to act as source in the Midwest region. Worm-eating Warblers exhibited the most dramatic reduction in productivity near the agricultural corridor. Wood Thrushes also suffered a potentially significant drop in productivity at the corridor site. Reductions in productivity for the Worm-eating Warblers and Wood Thrushes were caused by increases in cowbird parasitism and predation. Only a negligible drop in productivity appears to occur for Acadian Flycatchers near the corridor.

Ability to initiate second broods may be compromised near the agricultural corridor. Both Acadian Flycatchers and Wood Thrushes are known to be double-brooded at our sites. Data from 1993 and 1994 indicated that 13.6 and 2.5% of Acadian Flycatcher females from the interior and corridor sites, respectively, initiated second broods (Whitehead and Taylor

TABLE 2. Source–sink analysis for four Neotropical migrant species at the interior and corridor sites in south-central Indiana.

Site	Overall nest survival rate	No. fledglings/successful nest	Second brood[a]	No. female offspring/pair/year[b]
Acadian Flycatcher				
Interior	0.426	2.25	Yes	1.12
Corridor	0.360	2.42		1.05
Red-eyed Vireo				
Interior	0.168	3.05	No?	0.65
Corridor	0.228	0.82		0.22
Worm-eating Warbler				
Interior	0.478	4.00	No	1.72
Corridor	0.201	3.33		0.81
Wood Thrush				
Interior	0.375	3.13	Yes	1.40
Corridor	0.293	2.93		1.07

[a] Indicates whether species has the capability of producing a second brood. In the calculation of female offspring per pair per year, only females that successfully produced a brood on the first nesting attempt were given the opportunity to produce a second brood.

[b] Calculated by determining number of female offspring produced with a maximum of three nesting attempts using the method described by Donovan et al. (1995b).

2001). Even the small reduction in nest survival experienced by Acadian Flycatchers near the agricultural corridor appears to have an effect on the ability to produce a second brood.

Do agricultural corridors lower potential for populations of Neotropical migrants in south-central Indiana to act as source populations for the lower Midwest? This question is difficult to answer. One of the major problems is the difficulty of measuring between-year adult and juvenile survival. Very little is known concerning adult and juvenile survival for most species of Neotropical migrant birds. Donovan et al. (1995b) evaluated source–sink dynamics of populations of birds breeding in fragmented and continuous landscapes in Illinois and Wisconsin. In their analysis, they used an adult survival rate of 62% and a juvenile survival rate of 31%, which would require each female of a population to produce 1.2 female offspring per year in order to maintain the current population size. Using the same analysis that Donovan et al. (1995b) employed, we estimated that Acadian Flycatchers at both sites were producing slightly lower numbers of offspring than necessary to replace themselves in the population (Table 2). Wood Thrushes, although producing a surplus of offspring in the interior, fell below the necessary level for replacement near the agricultural corridor. Worm-eating Warblers experienced a similar pattern in productivity at the two sites. Red-eyed Vireos at both sites were producing offspring far below replacement level. However, because of the dearth of information concerning between-year survival, this analysis can provide only a gross description of the source–sink dynamics for these populations.

Conservation implications.—Because we worked at only one site near the agricultural corridor and one site in interior forest, we cannot discount local intrinsic factors in addition to proximity to the corridor that could have affected cowbird parasitism and nest survival rates at our sites. Statistical inferences can be made concerning differences between the two sites, but cannot be extended with full confidence to populations of birds nesting in interior forest and near agricultural corridors throughout south-central Indiana. If the nest survival and parasitism rates from the two study sites are representative of populations near agricultural corridors and forest interior, our results indicate that the potential source populations of some species of Neotropical migrant birds may be compromised by extensive intrusion of agricultural corridors into large, contiguous forests. Populations of breeding birds near the agricultural corridor tended to have higher cowbird parasitism rates and lower nest survival during the nestling stage than in more interior forest.

The large fragment of relatively contiguous forest in south-central Indiana encompasses ~150,000 ha. We digitized the extent of the agricultural corridors throughout that large fragment on top of forest cover data from the Indiana GAP Analysis Project. We also constructed a 500 m wide buffer around the corridors to determine amount of adjacent forest that might be affected by higher nest predation and brood parasitism. The area of forest within this buffer was 26,000 ha (17% of the fragment). Much of that land occurs within the core area of the fragment, away from the periphery of the heavily forested area. In conjunction with disturbances created by forest management, agricultural corridors can potentially reduce the proportion of the fragment where birds can reproduce above replacement level.

Because the majority of land within the agricultural corridors in south-central Indiana is privately owned, it might be difficult to implement a management plan to ameliorate possible negative effects of these corridors. However, private landowners should be encouraged to eliminate or reduce number of feedlots and grazed grassland areas, which are preferred feeding habitat for Brown-headed Cowbirds (Morris and Thompson 1998), within the agricultural corridors.

Federal and state agencies controlling forested land abutting these corridors should be encouraged to purchase parcels of land within the corridors from willing sellers. Acquisition of those lands would also allow for restoration of bottomland forests in the region because a majority of the agricultural corridors occur along floodplains. Policies that create or widen existing corridors within heavily forested landscapes should be discouraged. Many tracts of publicly owned land within these corridors are maintained in an open condition by the agencies that administer them. Open land provides habitat for cowbirds and nest predators. We urge government agencies to allow forest regeneration within these parcels of land.

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