

FINAL REPORT

THE EFFECTS OF NATURE TRAILS ON BREEDING BIRDS

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INTRODUCTION

The effects of habitat fragmentation on breeding birds have been well documented (Whitcomb 1977; Robbins 1979, 1980; Samson 1980; Blake and Karr 1984). Many of our endangered, threatened and rare forest interior birds have been found to be area sensitive species which require large acreages of contiguous habitat for successful nesting. This finding has been of great importance to designers of nature preserves and others responsible for nongame habitat management. However, research to date has not determined whether or not nature trails constitute habitat fragmentation for any bird species. If nature trails do constitute habitat fragmentation they could negatively affect area sensitive birds two different ways. First, area sensitive species could be repulsed from the area immediately surrounding a nature trail because of human

activity or because the trail has altered the geometric structure of the habitat to the point that it will not be selected for territory sites. Potentially available habitat is thereby made unsuitable so that the species' total reproductive output is lessened. Second, area sensitive species could suffer greatly decreased reproductive success in the vicinity of nature trails even if they are not directly repulsed by them. Many area sensitive species are area sensitive due to their inability to cope with the increased predation rates, increased Brown-headed Cowbird (Molothrus ater) nest parasitism rates, and increased levels of competition (Stanley Temple pers. com.) that are associated with edge habitats (Gates and Gysef 1978). All of these problems would also be associated with nature trails if nature trails constitute edge habitat to edge preferring species of mammals and birds.

This study investigates the first hypothesis listed above, that some area sensitive species may be trail repulsed. It is the simpler of the two hypotheses and it is therefore logical that it should be investigated first. This study also investigates the possibility that some bird species may be trail attracted. Some field ornithologists have the impression that some species of birds are indeed attracted to nature trails while other species seem to be repulsed by them (Dale Birkenholz, pers. com.). Other ornithologists have not noted any such relationship between

birds and nature trails (John Fitzpatrick, pers. com.). The determination of whether or not some bird species (or which bird species) are trail sensitive will provide critically important information for those responsible for habitat management and the protection of endangered, threatened or rare birds.

METHODS

This study was conducted entirely within Lake County, Illinois. Dirt, wood chip, or lightly graveled nature trails (hereafter called test trails) within the woodlands of Ryerson Conservation Area and Captain Daniel Wright Woods (Trails i-q in Figs. 1-2) were slowly walked between 05:30 and 09:00 hrs. during June, 1985. Encountered males singing within approximately 130 m of each side of these test trails were identified to species and their territories were mapped. The perpendicular distances from their territory centroids to the test trails were then determined. The test trails chosen are approximately 2 m to 3 m wide and positioned so as to minimize the sampling of habitat interface edges (Figs. 1-2). Imaginary trails (hereafter called control trails) were marked with flagging tape within trailless sections of MacArthur Woods (Transects a-h in Fig. 3). These control trails were also slowly walked a minimum of 3 times each between 05:30 and 09:00 hrs. during June, 1985. Encountered males singing within approximately

Fig. 1. Nature trails in Ryerson Conservation Area.

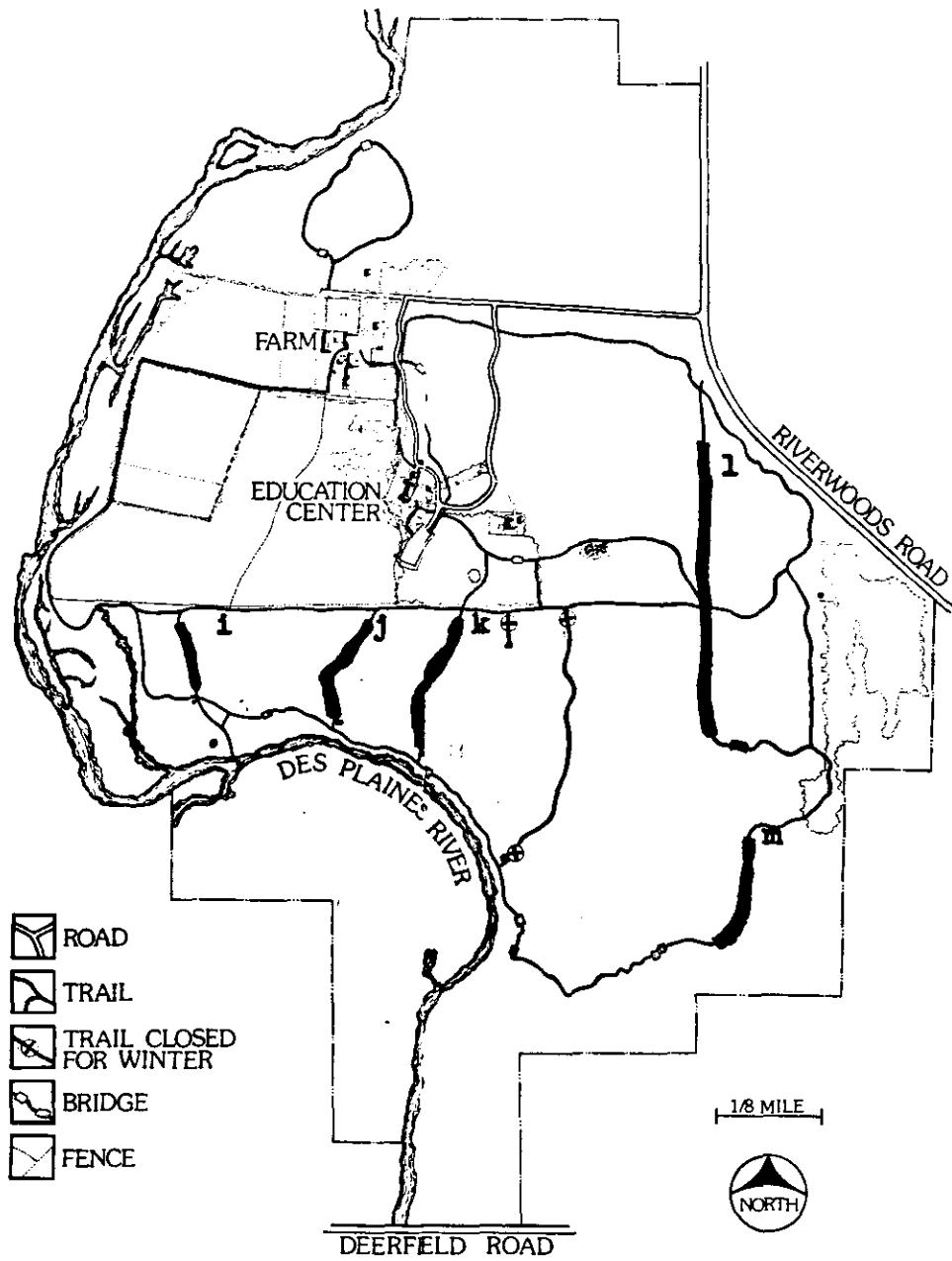
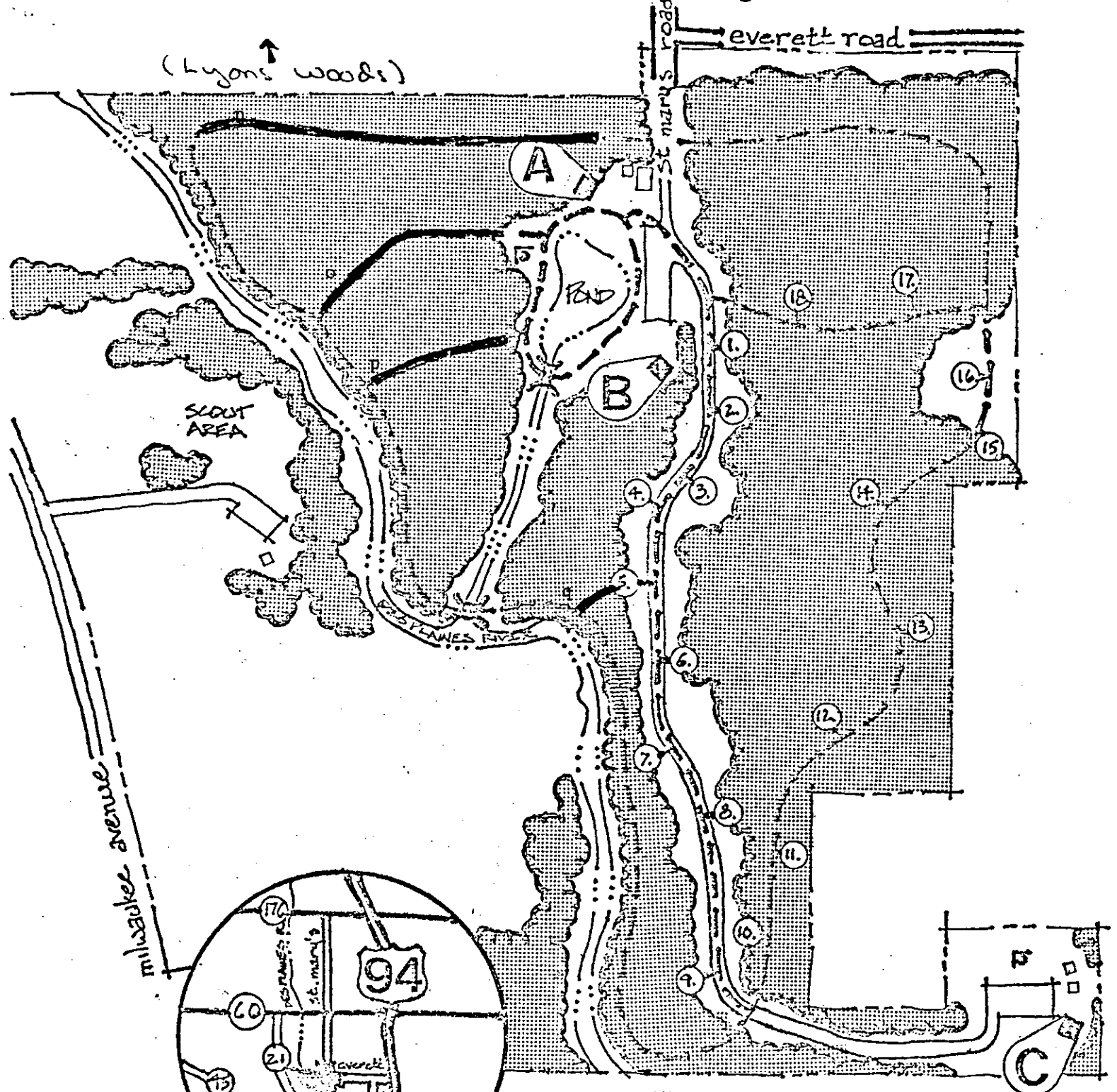


Fig. 2. Nature trails in Captain Daniel Wright Woods.

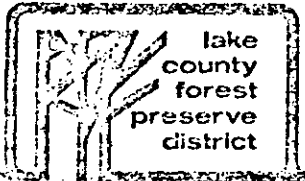


legend

- ROADS & PARKING
- PICNIC SHELTERS
- COMFORT STATIONS
- FALL FIELDS
- MULTIPLE USE HIKING & BRIDLE TRAIL
- PHYSICAL FITNESS EXERCISE STATIONS
- FOREST PRESERVE BOUNDARY

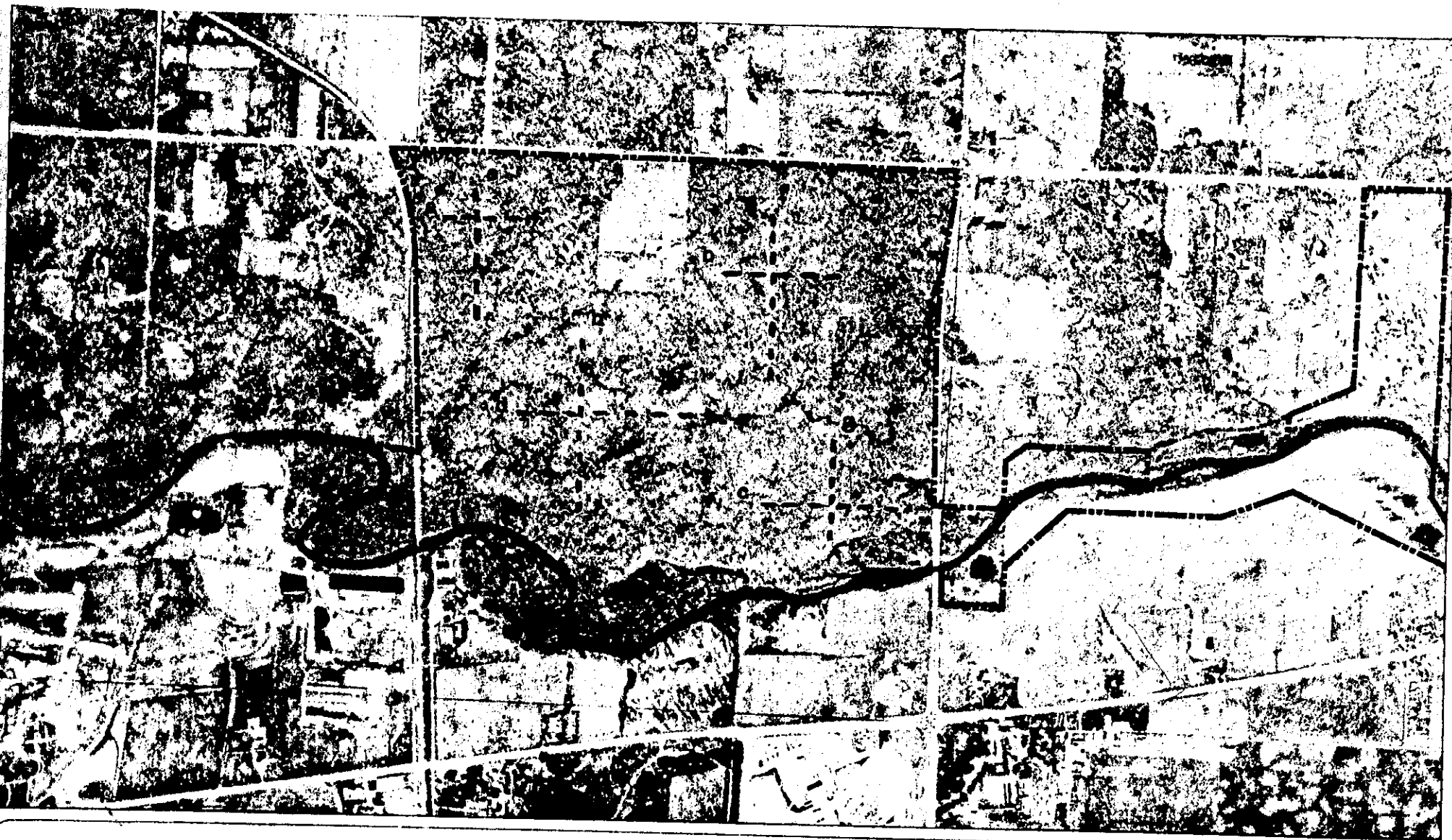
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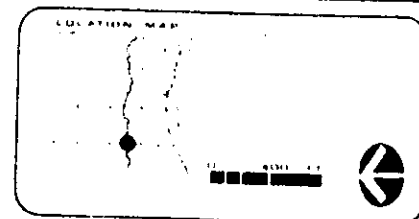


Captain Daniel Wright Woods

Fig. 3. Control "trails" in MacArthur Woods.



MACARTHUR WOODS



130 m of the control trails were sampled as described above for test trails and the perpendicular distances of their territory centroids from the control trails were determined. The censusing of birds surrounding control trails a-d (Fig. 3) was conducted on mornings following the censusing of Ryerson's test trails (Fig. 1). The censusing of birds surrounding control trails e-h (Fig. 3) was conducted on mornings following the censusing of Captain Daniel Wright Wood's test trails (Fig. 2). This daily alternation of control and test trail censusing was done to minimize error that might be caused if bird density changed as the breeding season progressed.

I chose MacArthur Woods as the location for all control trails because it was impossible to position control trails within Ryerson or Captain Daniel Wright Woods without risking the sampling of birds affected by nearby nature trails. Lake County simply contains no other woods besides MacArthur that are sufficiently trailless for use as control sites. Fortunately, the vegetation structure and vegetation species composition of MacArthur Woods is very similar to that of both Ryerson and Captain Daniel Wright Woods. All 3 forest preserves are mesic woods bordering the eastern bank of the DesPlaines River and are in close proximity to one another in the southern portion of Lake County. For a more complete description of the vegetation of MacArthur Woods see Hickman (1982).

Repulsion from, or attraction to, nature trails was determined by comparing the average distance of a species' territories from test (actual) trails with the average distance of the same species' territories from control (imaginary) trails. This comparison was conducted for all species encountered. Species with territories significantly closer to test trails than control trails are considered to be trail attracted. Species with territories significantly closer to control trails than test trails are considered to be trail sensitive (repulsed). Significant differences were determined by the MINITAB t-test subprogram (Ryan et al. 1976) with $p < .05$.

RESULTS

Thirtythree species of birds held territories within 130 m of each side of the control and test trails. The number of territories each of these species held along with the average distance of each species' territories from control vs. test trails is shown in Table 1. Table 1 also provides the results of the t-tests conducted to determine whether the difference between the average distance of each species' territories from control vs. test trails was statistically significant.

Only 5 species had territories that were significnatly different in distance from control vs. test trails. Acadian Flycatcher (Empidonax virescens), Blue Jay (Cyanocitta

Table 1. T-test comparisons of average territory distances from test (actual) vs. control (imaginary) trails. N indicates number of territories.

SPECIES	TEST			CONTROL			T	Prob.
	N	xd(m)	sd	N	xd(m)	sd		
Red-tailed Hawk				1	30			
Red-headed Woodpecker				2	38			
Red-bellied Woodpecker	6	70	34	6	47	32	-1.05	.32
Downy Woodpecker	10	50	34	5	35	15	-1.13	.28
Hairy Woodpecker	8	53	40	7	45	14	-.52	.62
Northern Flicker	7	51	32	8	67	50	.75	.47
Eastern Wood-Pewee	6	68	60	11	66	53	-.06	.62
Acadian Flycatcher	5	26	14	8	62	27	3.26	.01
Great Crested Flycatcher	15	40	20	7	63	53	1.14	.30
Blue Jay	21	46	40	12	89	24	3.88	.01
Black-capped Chickadee	17	27	27	17	43	39	1.41	.18
Tufted Titmouse	1	60						
White-breasted Nuthatch	10	60	29	10	35	26	-2.15	.05
Blue-gray Gnatcatcher				1	35			
Veery	18	35	26	14	43	28	.82	.42
Wood Thrush	21	63	37	26	58	41	-.43	.67
American Robin	20	15	15	17	68	38	5.40	.01
Gray Catbird	1	50						
Cedar Waxwing	2	37						
Yellow-throated Vireo	3	53	35	2	51	49	-.05	.97
Red-eyed Vireo	15	51	34	23	55	41	.34	.70
Cerulean Warbler				4	106			

Table 1. Continued.

SPECIES	TEST			CONTROL			T	Prob.
	N	xd(m)	sd	N	xd(m)	sd		
Ovenbird	10	50	32	25	65	38	1.2	.24
Kentucky Warbler	1	120						
Hooded Warbler	2	31						
Scarlet Tanager	11	69	43	14	72	34	.14	.89
Northern Cardinal	13	50	39	11	79	49	1.58	.13
Rose-breasted Grosbeak	3	40	8	6	37	27	-.25	.81
Indigo Bunting	1	18						
Rufous-sided Towhee	1	25		2	60	14		
Common Grackle	15	15	15	2	9	9	-.86	.55
Brown-headed Cowbird	8	23	15	10	50	15	3.96	.01
Northern Oriole	2	29						

cristata), American Robin (Turdus migratorius) and Brown-headed Cowbird all held territories that were significantly closer to test (actual) than control (imaginary) trails (Table 1). White-breasted Nuthatch (Sitta carolinensis) territories were significantly closer to control than test trails (Table 1). The distances of all other species' territories from control vs. test trails was not significantly different (Table 1).

DISCUSSION

I had anticipated that several known area sensitive species such as Veery (Catharus fuscenscens), Yellow-throated Vireo (Vireo flavifrons), Acadian Flycatcher, and the slightly area sensitive Scarlet Tanager (Piranga olivacea) might be found to be repulsed by nature trails. But this was not the case (Table 1). The only species that had territories significantly closer to control (imaginary) than test (actual) trails was the White-breasted Nuthatch (Table 1) and this species does not fit the area sensitive pattern of being a long distance neotropical migrant. I remain unsure as to why the White-breasted Nuthatch should be trail sensitive. It could be possible that it is repelled by human activity but its presence at bird feeders makes this seem unlikely. It is possible that a small, easily noticed bark gleaner such as this nuthatch would be easy prey for accipiters. A sit and wait predator

such as an accipiter may preferentially hunt nature trails due to the increased visibility they afford but I have not read this in the literature and do not know if this is the case. The reason for White-breasted Nuthatch sensitivity to nature trails remains obscure.

The Cerulean Warbler (Dendroica caerulescens) is known to be area sensitive (Robbins 1979). This study indicates that the Cerulean Warbler may also be trail sensitive since it was only observed along control and not test trail corridors (Table 1). However, since only 4 birds were observed this is light evidence at best and can only be used to indicate that more study on the response of this species to nature trails is warranted.

The trail attraction of the Acadian Flycatcher (Table 1) was also surprising. This forest interior species is a long distance neotropical migrant and was suspected of being area sensitive by MacClintock et al. (1977). An Illinois Natural History Bulletin (1984) reports that John Blake and James Karr found the critical minimum size of contiguous forest to be 70 acres for this species which would make it moderately area sensitive. However, the flycatching habit of this species requires space for sallying flights which nature trails provide. I have even seen an Acadian Flycatcher nest directly over a nature trail at Warren Woods, Michigan. It is therefore not totally incongruous

that this species would be trail attracted even though it is area sensitive.

The trail attraction of the Blue Jay, American Robin, and Brown-headed Cowbird (Table 1) was expected. These species are all recognized as generalists that thrive in edge or second growth habitats. This study indicates that trails constitute preferred habitat for these edge species.

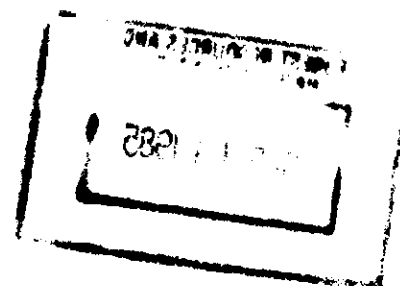
Forest interior species did not evolve in close contact with edge species and, therefore, often do not possess effective defenses against the problems associated with edge habitats that edge species cause. Forest interior, area sensitive species seem excessively susceptible to predation by Blue Jays and mammals as well as nest parasitism by Brown-headed Cowbirds (Blake 1983, Whitcomb 1977). Area sensitive, forest interior species may also be unable to effectively handle competition from edge species such as the American Robin (Stanley Temple pers. com.). The attraction to trails exhibited by Blue Jay, Brown-headed Cowbird, and American Robin therefore indicates that nature trails probably cause a decrease in the reproductive success of forest interior, area sensitive species even though area sensitive species were not found to be trail repulsed. Area sensitive birds may be present around nature trails but their reproductive success in these areas should be in doubt

since nature trails attract species known to negatively affect the reproductive success of forest interior birds.

Direct measurement of the reproductive success of birds along nature trails vs. forest interior regions lacking trails will have to be conducted to substantiate the extent to which the reproductive output of areas sensitive birds may be diminished around nature trails. However, the accelerating decrease in populations of area sensitive, forest interior species makes it imperative that individuals responsible for nongame management and the protection of endangered, threatened, and rare birds consider the negative effects on the reproductive success of these birds that nature trails probably cause. Excessive fragmenting of the forest interior with nature trails should probably be avoided.

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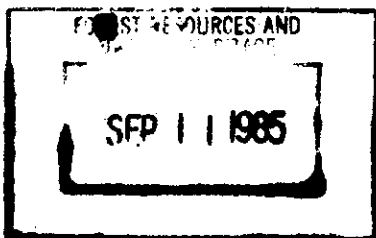
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