

REPRODUCTIVE EFFICIENCY AND SITE ATTACHMENT OF TREE SWALLOWS AND MOUNTAIN BLUEBIRDS

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In March of 1973, 191 bird houses were erected as the initial phase of the Calgary Bluebird Trail. The number of nest boxes was doubled in 1974 to 382, and since 1975, 400 bird houses have been maintained. The trail is approximately 352 kilometers in length with the boxes being about 0.8 kilometers apart. The exact route of the trail is illustrated by Pinel and Robinson.¹⁰

Prior to 1973, personal observations indicated that Mountain Bluebirds maintained a fairly stable population in the badlands along the Red Deer River northeast of Calgary in the vicinity of Drumheller and Brooks, but west of Calgary in the foothills area, fewer Mountain Bluebirds were being seen during the nesting season as the years passed by. Tree swallows, like the bluebirds, were fairly common on migration, but during the nesting season, they were observed uncommonly as local pairs inhabiting the edge of Aspen or mixed White Spruce-Aspen woods in close proximity to a lake or slough in the foothills region. Pairs of Tree Swallows were also noted infrequently in Calgary, always near a nest box. More small acreages began to dot the landscape as the years passed, and with them came more buildings, more cultivation and more Starlings and House Sparrows. These visual assessments, plus the fact that other groups of people throughout the Prairie Provinces were concerned

about the population of Mountain Bluebirds led the author to initiate a trail for the Calgary area.

Table 1 summarizes the reproductive data for the Bluebird Trail from 1973 through 1978. These figures are a compilation of the annual data as recorded by Pinel *et al.*⁹⁻¹⁴ In its first year of operation, 1973, an astonishing 85% of the available nesting boxes were occupied. From 1975 through 1978 with the trail consisting of a constant 400 boxes, the occupancy rate varied only 3.8%. This fact, plus an average 6-year occupancy rate of 92.8%, illustrated a constant high demand for nesting boxes. This is further verified by the 1974 breeding data as compared to 1973. In 1974, the number of bird houses erected was exactly double that erected in 1973 — to see if the number of nests would double. The result was that the number of nests increased 2.2 times from 157 to 353. In two 4-year studies, Chapman lists the occupancy rate varying from 62.5% to 84.5% in Massachusetts, while Houston gives the rate varying from 65% to 98.7% near Saskatoon, Saskatchewan.⁶ The availability of nest sites as a factor limiting the population size of Tree Swallows and Mountain Bluebirds has been documented by Chapman,¹ Erskine,³ Holroyd,⁵ Von Haartman,⁴ and Whittle.¹⁶

Reproductive efficiency is the

TABLE 1 — Reproductive Data, Calgary Bluebird Trail 1973-1978

	1973	1974	1975	1976	1977	1978	TOTALS
Number nest boxes	191	382	400	400	400	400	2,173
Number nest boxes vandalized before nesting	34	42	34	55	43	39	247
Number nest boxes vandalized after nesting	16	4	9	6	15	0	50
Occupancy rate	85.0%	88.5%	97.3%	95.7%	93.5%	96.9%	92.8%
Number Tree Swallow nests	88	242	272	249	165	241	1,257
Number Mt. Bluebird nests	30	54	61	72	104	84	405
Number House Sparrow nests	25	49	110	100	116	65	465
Number House Wren nests	10	8	10	2	4	2	36
Number Black-capped Chickadee nests	1	—	1	—	2	—	4
Number Boreal Chickadee nests	—	—	—	2	—	—	2
Number Red Squirrel nests	—	—	—	—	1	1	2
Number Deer Mouse nests	—	—	7	1	3	4	15
TREE SWALLOW							
Number eggs laid	516	1,399	1,593	1,433	938	1,317	7,196
Number eggs hatched	374	1,194	1,293	1,194	755	1,189	5,999
Number young fledged	293	1,131	1,225	1,115	703	1,176	5,643
Reproductive efficiency (yg. fledged/eggs laid)	56.8%	80.8%	76.9%	77.8%	75.1%	89.3%	78.4%
MOUNTAIN BLUEBIRD							
Number eggs laid	152	302	325	374	534	442	2,129
Number eggs hatched	113	216	231	326	347	414	1,647
Number young fledged	113	214	204	314	323	410	1,578
Reproductive efficiency	74.3%	70.9%	62.8%	84.0%	60.0%	92.8%	74.1%
HOUSE SPARROW*							
Number eggs laid	111	201	463	434	485	287	1,981
Number eggs hatched	40	78	155	135	135	54	597
Number young fledged	0	3	0	9	2	0	14
Reproductive efficiency	0.0%	1.5%	0.0%	2.1%	0.4%	0.0%	0.7%
HOUSE WREN							
Number eggs laid	32+	32	40+	12	22	0	138
Number eggs hatched	26+	29	40+	10	22	0	127
Number young fledged	22+	29	40+	10	21	0	122
Reproductive efficiency	68.8%	90.6%	100.0%	83.3%	95.5%	—	88.4%
BLACK-CAPPED CHICKADEE							
Number eggs laid	7	—	7	—	14	—	28
Number eggs hatched	0	—	3	—	14	—	17
Number young fledged	0	—	0	—	14	—	14
Reproductive efficiency	0.0%	—	0.0%	—	100.0%	—	50.0%
BOREAL CHICKADEE							
Number eggs laid	—	—	—	12	—	—	12
Number eggs hatched	—	—	—	12	—	—	12
Number young fledged	—	—	—	12	—	—	12
Reproductive efficiency	—	—	—	100.0%	—	—	100.0%

*House Sparrow nests, eggs, and young destroyed by author.



Tree Swallow.

Robert J. Long

percentage of eggs producing fledged young. The 6-year mean reproductive efficiency for Tree Swallows and Mountain Bluebirds was 78.4% and 74.1%, respectively. The slight difference in efficiency of the two species over the 6-year period was probably the result of a greater number of second broods by the bluebirds. In a number of cases, a female bluebird would lay a second clutch of eggs, but would desert them before hatching occurred. Other data on reproductive efficiency of Tree Swallows comes from Low who over a 3-year period recorded efficiencies varying from 38% to 58.6%, and Chapman who recorded efficiencies from 51.5% to 84% over a similar 3-year period.^{8 1}

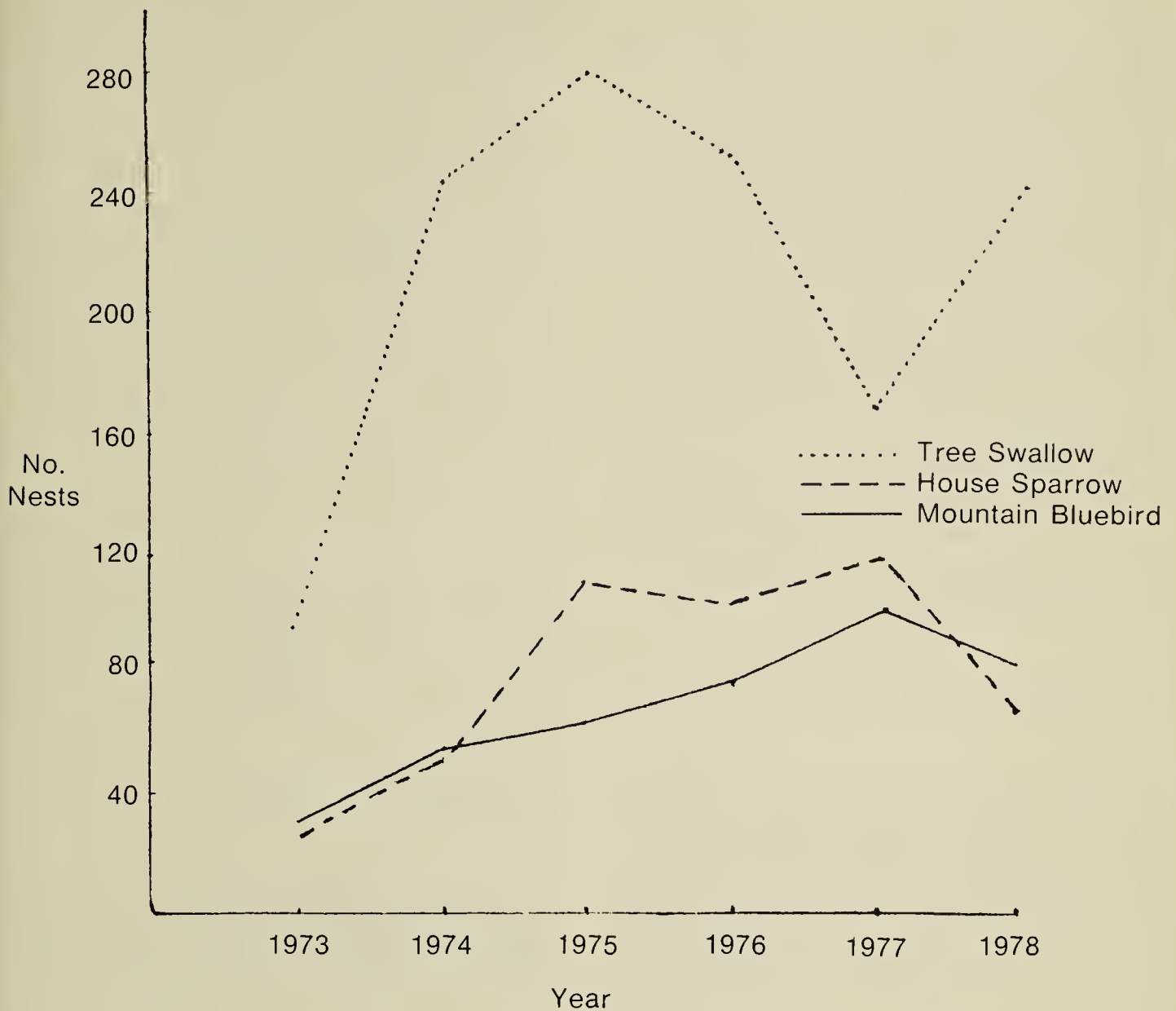
Throughout the length of the trail, the habitat varies from cultivated land to native grassland to Aspen Parkland. Tree Swallows nested anywhere along the trail but Mountain Bluebirds were restricted to Aspen Parkland. House Sparrows preferred to nest in boxes located in areas of cultivated land or in boxes located near human habitation or man-made structures. Because of the melding of the different habitat types, and the apparent non-restrictive habitat needs of Tree Swallows and House Sparrows, interspecific competition for nest boxes was prevalent. There were 191 occurrences of nesting by different species in the same bird house. Of these 191 occurrences, Tree Swallows were involved in 172 instances, House Sparrows in 104 instances, and Mountain Bluebirds in 87 instances. The two major trends observed in Table 2 were Tree Swallows occupying nesting boxes after House Sparrows and after Mountain Bluebirds. The reasons for both trends are quite different. In the case of the House Sparrows, it was the result of the author destroy-

ing all attempts at nesting by the sparrows, while in the case of the bluebirds, it was the result of the Tree Swallows waiting until the Mountain Bluebirds had reared their family before they commenced nesting. In Figure 1, it can be seen that up to 1975, all three species increased their number of nests due to an increase in nesting boxes, but from 1975 to 1978 when the number of nesting boxes was constant, some species increased, while others decreased.

Tree Swallows and Mountain Bluebirds were banded during 1976 and 1977. In 1976, 609 swallows and 84 bluebirds were banded, and in 1977, 410 swallows and 258 bluebirds were banded. Banding was done as opportunities arose and time permitted. Nestlings were banded from the time that they started to feather. Most of the adults were banded when they were incubating, or when they were feeding young more than 3 or 4 days old. After the young are half grown, it is more difficult to trap the adult birds because the young can reach up to the hole in the box, thereby eliminating the need for the parents to enter it. Table 3 summarizes banding and retrapping data.

The percentage of adult Tree Swallows retrapped was 13.7% as compared to 1.3% for those banded as nestlings. This ratio of approximately 10.5 to 1 adults to nestlings retrapped is even more interesting when you consider that only 197 adults were banded as compared to 822 nestlings. In a 14-year study of this species, Chapman found similar results.² The percentages of adult swallows returning one year after they were banded varied from 7% to 55% and averaged 39.6%. The percentages of banded nestlings returning the next year varied from 0% to 5.0% and averaged 2.4%.

Figure 1. Comparison of the annual number of Mountain Bluebird, Tree Swallow and House Sparrow nests.



Uchida showed a 46% return of adults banded the previous year in his 3-year study of two species of swallows in Japan.¹⁵

The above figures illustrate the tendency of Tree Swallows to return to their natal territory or environs and is termed site attachment or place faithfulness. This attachment to a place is further illustrated by the distances recorded from banding site to recapture site. The 27 adult Tree

Swallows that were recaptured averaged 3.17 km from the point of banding, with 16 of the recaptured adults being within 1.6 km or 2 birdhouses of the place where they were banded. This average of 3.17 km would be considerably less if the longest retrapped distance of 20 km by bird 880-40783 was disregarded due to apparent disturbance by the author. This bird was retrapped twice in 1977. On the first occasion, it was

TABLE 2 — Occurrence of Nesting by Different Species in the Same Nest Box

	1973	1974	1975	1976	1977	1978	Total
House Sparrow then Tree Swallow	5	11	18	12	21	7	74
House Sparrow then Mt. Bluebird	1	—	1	1	1	1	5
House Sparrow then House Wren	1	1	2	1	—	—	5
Tree Swallow then House Sparrow	—	4	3	2	4	—	13
Tree Swallow then Mt. Bluebird	2	1	—	—	—	—	3
Tree Swallow then House Wren	1	3	2	—	3	—	9
Mt. Bluebird then House Sparrow	—	1	3	—	1	—	5
Mt. Bluebird then Tree Swallow	2	4	9	19	27	8	69
Mt. Bluebird then House Wren	2	—	1	—	—	—	3
House Wren then Tree Swallow	—	—	—	—	—	—	0
House Wren then Mt. Bluebird	—	—	—	—	—	—	0
House Wren then House Sparrow	—	—	—	—	—	0	0
Black-capped Chickadee then House Wren	1	—	—	—	—	—	1
Mt. Bluebird then Tree Swallow then Mt. Bluebird	—	—	—	1	1	—	2
House Sparrow then Tree Swallow then House Sparrow	—	—	—	—	2	—	2
TOTALS:	15	25	39	36	60	16	191

nesting only 1.6 km from the box it was banded in, but a month later, it was retrapped 20 km from the original banding place. Two birds banded as adults in 1976 were recaptured in 1979, making them a

minimum of 4 years old.

The 11 nestling Tree Swallows that were recaptured travelled an average distance of 20 km to nest from the

TABLE 3 — Quantitative Summary of Banding Data

	Year Banded	Age	No. Banded	No. Retrapped 1977	No. Retrapped 1978	No. Retrapped 1979
Mountain Bluebird	1976	Adult	11	3	0	0
		Nestling	73	1	0	0
	1977	Adult	42	—	2	1
		Nestling	217	—	0	0
	TOTAL:		342	4	2	1
Tree Swallow	1976	Adult	89	8	3	2
		Nestling	520	3	5	0
	1977	Adult	108	—	11	3
		Nestling	302	—	1	2
	TOTAL:		1,019	11	20	7

box in which they were born. An interesting question is why were there only 11 nestling returns out of 822 nestlings banded. Part of the answer is no doubt higher mortality among young than adults. Perhaps the survivors spread indiscriminately throughout their natural range and only by chance return to their natal area, as suggested by Lincoln.⁷ This theory does not seem to be true as it applies to Tree Swallows. If it was, then how come people with established trails in Hinton and Edmonton, Alberta, and throughout Saskatchewan and Manitoba are not recovering birds banded by me, and vice versa? It was not until Andrew Stiles developed a trail just north of my northeastern section that I started to get returns other than from my trail. On top of this, all the banded birds that showed up in Andrew's boxes were from the northeastern section of my trail. Of the 11 nestling returns, 6 were the result of Andrew's trail with distances travelled by the nestlings of 8.8, 11.2, 16, 17.6, 19.2, and 97.6 km being recorded. There was only one instance of an adult bird (850-98458) moving from my trail to Andrew's trail or vice versa. All this information indicates that the young Tree Swallows coming north on migration to breed return to their natal site, and then radiate out from these to the nearest available nesting sites in response to the pressure and greater territorial dominance of the older birds.

Although the recovery data for Mountain Bluebirds was much less comprehensive, the same general trend appears to apply. Of the 7 recaptures, 6 were adults recovered an average of 0.4 km from the point of banding, and only one nestling was recaptured, 14.4 km from the nest in which it was banded. (Includes one bird from Dan Sikorski's trail.)

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