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DECLINE IN BREEDING RED-WINGED BLACKBIRDS IN THE DAKOTAS, 1965–1981

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North Dakota and South Dakota contain extensive wetlands (Shaw and Fredine 1971) that provide excellent nesting habitat for Red-winged Blackbirds (*Agelaius phoeniceus*) (Dolbeer and Stehn 1979). Red-wings are the dominant species in the large blackbird congregations feeding on ripening sunflower (Besser 1978), corn (De Grazio et al. 1971), and small grain fields (W. K. Pfeifer, pers. comm.) in late summer and early fall in the Dakotas. Losses of sunflower and corn to blackbirds in the Dakotas are in excess of $3 million annually in each of these crops (Henne et al. 1979, Stone et al. 1972). The numbers and breeding locations of red-wings causing these losses are of importance in the search for control methods suitable for protecting these crops.

In 1959, intensive studies of methods to alleviate losses of ripening field corn to blackbirds were undertaken in Brown County, South Dakota (De Grazio 1964). As part of these studies, breeding red-wings were censused in a 77,700 km^2 area of North Dakota and South Dakota in 1965–1968 and 1972. Selection of the area was based on a few band returns and on the most likely late-summer migratory routes of blackbirds in the drainages of the James and Souris rivers to the north of Brown County. The area is located chiefly in the Drift Plains physiographic region (Fenneman 1938).

With the reintroduction of sunflower as a major agricultural crop in the Dakotas in the 1970's and the severe bird damage reported to that crop, interest in the size of the breeding red-wing population in the Dakotas was renewed. The census was again conducted in the same 77,700 km^2 area in 1977, 1979, 1980, and 1981. Therefore, the data presented in this paper were gathered in 9 censuses during a 17-year period.

METHODS

In 1965, six 161 km east-west transects, each located 80.5 km apart, were systematically selected for sampling a 77,700 km^2 area in North Dakota and South Dakota. The southern transect was located 80.5 km south of the North Dakota-South Dakota border; the northern one 24 km south of the Canadian border. The midpoint of the 4 southern transects was the James River; the midpoint of the northern transect was the downstream loop of the Souris River in North Dakota; and the midpoint of the other transect was midway between the James and Souris rivers. Two 40-km routes were randomly chosen from both the eastern and western portions of each transect for censusing roadside habitat.

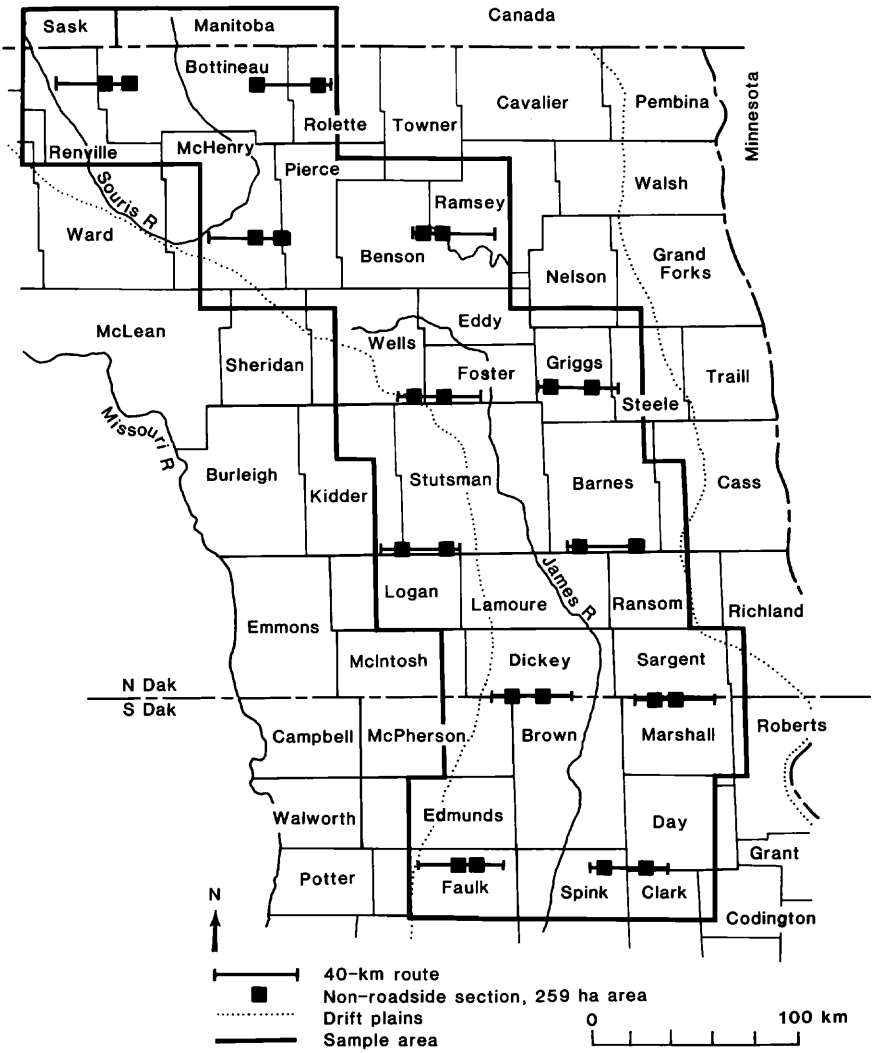

FIGURE 1. Location of roadside routes and non-roadside areas censused.

Two 259-ha areas, bisected by an east-west road, were randomly chosen along each 40-km route for censusing non-roadside habitat. The locations of sample routes and 259-ha areas are shown in Fig. 1. The same routes and areas were used in all succeeding censuses. The censuses were conducted by 2 persons between 30 May and 18 June, usually in a 6-day period.

Roadside habitats were censused from an automobile at speeds varying

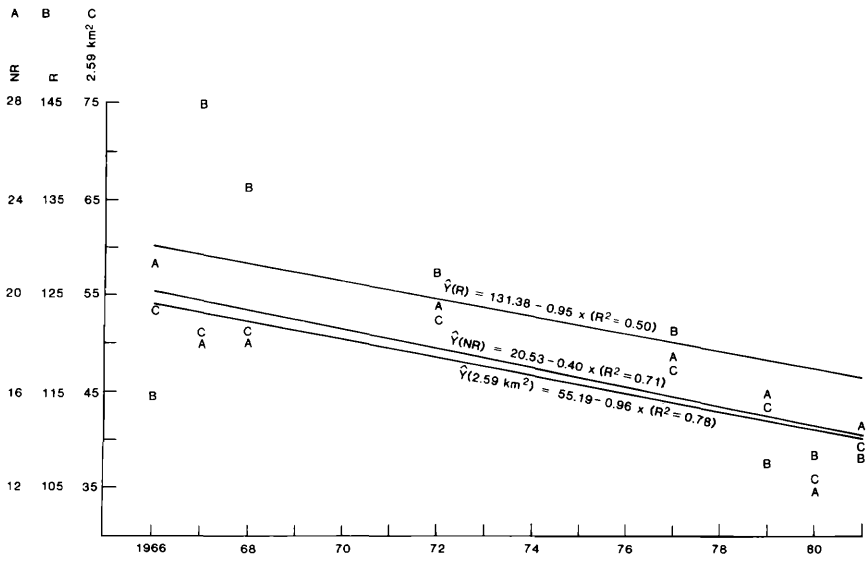

FIGURE 2. Decline in numbers of Red-wing males counted on (A) non-roadside areas (NR), (B) roadside routes (R), and (C) on 2.59 km² areas from 1966 to 1981.

from 24 kmph in wetland areas and poor road conditions to 72 kmph in cultivated upland areas with minimal roadside habitat (mostly plowed or newly planted fields) and good road conditions. Territorial males were counted in a 69-m strip on either side of the road, therefore the observers censused 22 ha of roadside habitat for each 1.6 km driven.

Non-roadside habitats were censused by counting territorial males within 69 m of the observer while walking four 1.14 km compass lines diagonally through four 64.8-ha areas in the form of a diamond. As territorial male red-wings often move toward a walking observer (Hewitt 1967), it was frequently necessary to use binoculars, in such favorite breeding areas as wetlands and fields with dense nesting cover, to fix the location of the first sighting of a territorial male, and then to measure the perpendicular distance from the line to determine if the sighting was within 69 m of the center of the line.

To avoid recounting males in the 69-m roadside strip, we did not count males in the first and last 97 m of the 2.28 km traversed by each observer; and for 69 additional m, we counted only those males that were closer to the line than the distance walked beyond 97 m (between 97–167 m). To avoid counting some males twice near the center of the section, we counted only those males within 69 m of the center of the section that were closer to the observer than the distance from the observer to the center of the section. Each 4.56-km diamond walked resulted in censusing males in 53.3 ha of non-roadside habitat.

TABLE 1. Number of breeding male Red-winged Blackbirds counted on 12 40-km roadside routes in the Dakotas, 1965–1981.

Routes and counties transected	Number of males by years								
	1965	1966	1967	1968	1972	1977	1979	1980	1981
1. Day–Spink, SD	127	123	202	119	125	119	97	79	63
2. Faulk, SD	226	185	184	245	235	233	260	375	244
3. Marshall, SD–Sargent, ND	79	92	110	105	82	81	39	37	49
4. Brown, SD–McPherson–Dickey, ND	168	154	176	182	191	166	116	109	102
5. Barnes, ND	198	122	152	133	140	104	126	122	119
6. Stutsman–Kidder, ND	179	151	211	181	175	189	121	146	221
7. Steele–Griggs, ND	66	57	99	92	78	89	58	52	28
8. Foster–Wells, ND	163	156	174	189	140	92	115	85	103
9. Ramsey–Benson, ND	123	114	127	130	127	121	141	103	162
10. Pierce–McHenry, ND	37	41	44	37	66	61	58	37	42
11. Rolette–Bottineau, ND	43	16	44	48	21	61	23	51	40
12. Bottineau–Renville, ND	201	161	215	173	138	179	196	163	141
Total	1610	1372	1738	1634	1518	1495	1350	1359	1314
Mean	134.2[a]	114.3	144.8	136.2	126.5	124.6	112.5	113.3	109.5[a]

[a] $P = .11$.

TABLE 2. Number of breeding male Red-winged Blackbirds counted on 24 4.6-km non-roadside line transects in the Dakotas 1965–1981.

Routes and counties transected	Number of males by years								
	1965	1966	1967	1968	1972	1977	1979	1980	1981
1. Day–Spink, SD	34	24	26	21	19	9	18	16	20
2. Faulk, SD	47	26	24	23	25	28	14	10	9
3. Marshall, SD–Sargent, ND	10	26	15	18	17	21	7	1	0
4. Brown, SD–McPherson–Dickey, ND	26	21	19	19	27	8	10	11	11
5. Barnes, ND	25	18	16	14	11	19	11	9	8
6. Stutsman–Kidder, ND	35	30	24	45	29	35	33	37	38
7. Steele–Griggs, ND	23	35	28	24	15	13	18	10	0
8. Foster–Wells, ND	37	17	20	21	15	18	16	13	36
9. Ramsey–Benson, ND	35	16	11	12	11	27	12	11	25
10. Pierce–McHenry, ND	11	11	12	11	39	8	12	5	8
11. Rolette–Bottineau, ND	6	7	3	3	3	6	7	8	3
12. Bottineau–Renville, ND	38	26	18	9	21	26	32	10	14
Total	327	257	216	220	232	208	190	141	172
Mean	27.2[a]	21.4	18.0	18.3	19.3	17.3	15.8	11.8	14.3[a]

[a] $P = .002$.

TABLE 3. Estimated numbers of breeding male Red-winged Blackbirds on 12 routes in a 77,700-km² area censused in the Dakotas 1965–1981.

Year	No. of males/2.59 km²			Extrapolated total[b] (1000's)
	Non-roadsides	Roadsides[a]	Total	
1965	55.4	13.3	68.7[c]	2061
1966	43.5	11.3	54.8	1644
1967	36.6	14.4	51.0	1530
1968	37.2	13.5	50.7	1521
1972	39.3	12.5	51.8	1554
1977	35.2	12.4	47.6	1428
1979	32.2	11.1	43.3	1299
1980	23.9	11.2	35.1	1053
1981	29.1	10.9	40.0[c]	1200

[a] No. observed × 1.295.
[b] 77,700 km² area.
[c] $P = .003$.

No more than two 40-km routes were censused each day, one in the morning between 07:00 and 11:00 and one in the evening between 17:00 and 20:30. As the time-of-day is more critical for censusing males when driving roads than when walking non-roadside habitat (Besser and Brady 1984), we usually censused non-roadside habitat immediately after making morning roadside counts and immediately before making evening roadside counts. Each year of the survey, we counted birds in 6622.3 ha of roadside habitat and 1280.5 ha of non-roadside habitat.

Probabilities of statistical differences in numbers of birds observed in 1965 and 1981 were determined by two-tailed Wilcoxon signed rank tests. The association between precipitation and numbers of male red-wings in roadsides and non-roadsides during the 17-year period were ascertained by linear regressions. The decline in red-wing numbers from 1966–1981 was also analyzed by linear regression.

RESULTS AND DISCUSSION

During the 16-year period, the mean number of breeding male Red-winged Blackbirds, on the 12 routes declined by 18.4% ($P = .11$) in roadside habitats (Table 1) and by 47.4% ($P = .002$) in non-roadside habitats (Table 2). As non-roadside habitats make up about 84% of the total habitat sampled in a section (216.7 ha non-roadside vs. 42.3 ha roadside), the weighted number of males holding territories per 259-ha area per route declined 41.8% ($P = .003$) (Table 3). Almost half (20.2%) of the total decline occurred the second year of the census (1966). However in the next 16 years, the decline continued to average about 1.3% per year, accounting for the remaining 21.6% of the total decline (Fig. 2). In calculating the total number of birds per 259-ha area in roadside habitats, we assumed we observed the same percentage (77.2%) as Besser and Brady (1984) observed during morning and eve-

ning breeding red-wing censuses in North Dakota in 1980. To obtain the estimates of the total number present per 259-ha area, we multiplied the number observed in roadside habitat by 1.295. The data in Table 3 enabled us to estimate that the number of breeding male red-wings in the 77,700 km² area sampled during the 16 years declined by 861,000 birds; from 2,061,000 in 1965 to 1,200,000 in 1981.

The density of red-wing males found on the 10 routes censused in North Dakota in 1967 agree closely with the North Dakota statewide breeding bird census made by Stewart and Kantrud (1972) the same year, which covered most of the same area that we censused. Surveying greater portions of non-roadside habitat than roadside habitat in 130 randomly drawn 64.8-ha areas, Stewart and Kantrud estimated a density of 11.4 breeding red-wing males per km² in North Dakota. However, they found 17.6 (SE ± 2.4) breeding males per km² in the 39 sample areas that they censused in 1967 within that area of North Dakota (29.2% of the state) also covered by our 1967 census (H. A. Kantrud, pers. comm.), compared to the 19.7 (SE ± 2.4) males per km² on the 10 routes surveyed in North Dakota in 1967. This is approximately the same density of males for the two different censuses made in the same area the same year. Field notes from the Stewart and Kantrud study indicate that the area of North Dakota that we surveyed contained 45.3% of the total number of breeding males in North Dakota in 1967, or about twice the density of males per km² (17.6 vs. 8.7) as the remainder of the state.

The decline in numbers of breeding red-wing males from 1965 to 1981 was correlated with biennial precipitation and also appeared related to the amount of land under tillage. Annual precipitation at 12 weather stations nearest the 12 census routes (at Conde and Onaka, South Dakota and at Forman, Forbes, Litchville, Gackle, Cooperstown, Carrington, Devils Lake, Balta, Bottineau, and Mohall, North Dakota) varied from 29 to 60 cm during the 17-year period. The mean of 46 cm for the census period was close to the 40-year average of 43 cm for the 12 stations (C. M. Prindiville and C. Stohl, pers. comm.). Numbers of breeding red-wing males were only slightly associated with annual precipitation ($r = .33, P > .10$), but were highly correlated with biennial precipitation ($r = .76, P < .03$). The latter association suggests a positive response by nesting red-wings to flooded tall emergent dead vegetation such as cattail (*Typha* sp.), often the product of increased precipitation the previous year. Biennial precipitation varied from 108.5 cm in 1964–1965 to 83.0 cm in 1978–1979. Biennial precipitation was not associated with the number of male red-wings in roadside habitats ($r = .06, P > .10$), but had a significant correlation with numbers in non-roadside areas ($r = .81, P < .01$). Periodic decreases in biennial precipitation accounted for much of the decline.

Increased tillage of former breeding habitat was probably responsible for a portion of the decline in red-wing numbers. Areas planted to the 12 major agricultural crops requiring tillage increased 32.9% from 1965

to 1981, from 6.2 million ha to 8.3 million ha. If newly tilled areas were converted from favored red-wing breeding habitat, such as small wetlands, in equal proportion to their existence, it might account for a major portion of the decline. However, we believe that a larger proportion of the newly tilled areas was converted from uplands, rather than small wetlands.

Alfalfa and other haylands decreased by about 19% from 1.6 million ha in 1965 to 1.3 million ha in 1981 (Statistical Reporting Service, 1966 and 1982). However, a re-census in 1981–1982 of the 130 64.8 ha areas in North Dakota censused by Stewart and Kantrud (1972), found only 4.0% of the male red-wings holding territories in alfalfa and other haylands (J. F. Besser, unpubl. data), suggesting that haylands are a minor breeding habitat for red-wings in this latitude.

The differential rate of decline in numbers of breeding males in roadside and non-roadside habitats, 18.4% and 47.4% respectively, during the 17 years, causes doubt about the use of roadside censuses to detect sizable changes in breeding red-wing populations. We believe that increased tillage, especially during dry periods, in the prairie-pothole region of the Dakotas, affects breeding conditions for red-wings in non-roadside habitat more adversely than habitat along roadsides. Dry periods enable farmers to till some wet areas containing nesting cover in non-roadside habitats, whereas such areas are left undisturbed along roadsides.

SUMMARY

Breeding male Red-winged Blackbirds were censused in a 77,700 km² area of North Dakota and South Dakota, chiefly in the Drift Plains physiographic region, during 9 of 17 years between 1965 and 1981. The number of breeding males in surveyed areas declined by 41.8% ($P = .003$) from 1965 to 1981, with much of the decline occurring from 1965–1966. We attribute a portion of the decline to lower biennial precipitation and to loss of breeding habitat through increased tillage of small wetland areas. In 1965 and 1981, we estimated the area censused contained 2,061,000 and 1,200,000 breeding male red-wings, respectively, or 861,000 fewer in 1981. Our estimate of 19.7 (SE ± 2.4) breeding male red-wings per km² for the area censused in North Dakota in 1967 closely agrees with the estimate of 17.6 (SE ± 2.4) breeding male red-wings made by Stewart and Kantrud (1972) in the same area of North Dakota that year.

The number of breeding male red-wings declined only 18.4% ($P = .11$) in roadside habitats, but 47.4% ($P = .002$) in non-roadside habitats. This differential decline in red-wing numbers in non-roadside and roadside habitats causes doubt about the use of censuses conducted from roads to detect substantial changes in non-roadside red-wing breeding habitats. Non-roadside habitats predominate in the Dakotas and many other regions in which red-wings are the chief species involved in perennial problems of bird damage to ripening agricultural crops.

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