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ABSTRACT—From 2 to 16 April 1993, we conducted road-side surveys of birds using harvested fields of small grains, soybeans, and corn within 8 km of two blackbird roosts in east central South Dakota. Blackbirds, waterfowl, killdeer, horned larks, ring-necked pheasants, and western meadowlarks were the most common birds recorded. The frequencies of blackbirds, nongame birds, terrestrial game birds, and waterfowl was not equally distributed within the three habitats ($P = 0.023$).

Key words: Avicides, birds, blackbirds, spring migration, sunflower

Red-winged blackbirds (*Agelaius phoeniceus*), yellow-headed blackbirds (*Xanthocephalus xanthocephalus*), and common grackles (*Quiscalus quiscula*) causing damage to ripening sunflower is a particularly vexing production problem for growers (Kleingartner 1989). Dispersal studies indicate that migrating red-winged blackbirds moving through east central South Dakota in the spring are likely to breed in the sunflower-growing areas of the northern Great Plains and subsequently damage ripening sunflower (Knittle et al. 1987). Thus, sunflower growers are seeking the development of DRC-1339 (3-Chloro-4-methylbenzenamine), a slow-acting (1-3 days) avian toxicant, for reducing these spring migratory blackbird populations (L. Kleingartner, National Sunflower Association, Bismarck, ND, pers. commun.). This toxicant, which is used in Louisiana, North Dakota, and Texas, is applied to grain baits and broadcast on the ground near blackbird roosts (Huffman 1989, Tipton et al. 1989, Glahn and Wilson 1992).

Although nontarget animals (non-blackbird) are seldom found dead during field studies (Glahn and Wilson 1992), laboratory studies indicate that any bird that eats DRC-1339 treated baits could be negatively affected (U. S. Department of Agriculture 1994). Therefore, an evaluation of potential non-target bird hazards associated with blackbird feeding sites is a critical first step before DRC-1339 is tested on a broad-scale basis in South Dakota. In this paper, we report preliminary data on (1) feeding sites used by spring migratory blackbird populations in South Dakota and (2) potential nontarget bird (non-blackbird) hazards associated with these sites.

STUDY AREA AND METHODS

Our study was conducted in Kingsbury and Miner counties, which are located in the Coteau Des Prairies physiographic region of east central South Dakota (South Dakota Ornithologists' Union 1991). Farmers in Kingsbury and Miner counties planted an average of 47,957 ha (47%) of small grains (wheat, barley, oats), 38,851 ha (38%) of corn, 10,670 ha (10%) of soybeans, and 4,937 ha (5%) of sunflower in 1992 (South Dakota Agricultural Statistical Service 1993).

We selected two blackbird roosts in the study area and established a 24-km route along all-weather roads (navigable by four-wheel-drive) within 8 km of each roost. Observers, equipped with binoculars and spotting scope, stopped every 0.8 km and recorded the species, number, and habitat of all birds observed within 0.4 km of the road for three min. Surveys were conducted between 30 min and 3.5 hr post-sunrise on 13 days between 2 and 16 April 1993.

One or two observers estimated the number of blackbirds leaving the roosts in the morning using the block-count methodology (Meanley 1965). Data from the two survey routes were combined to provide sufficient data for meaningful descriptive statistics. We used a 3 x 4 chi-square contingency table (Conover 1980) to test the null hypothesis that the frequency of occurrence of blackbirds, nongame birds (excluding blackbirds), terrestrial game birds (mourning doves, ring-necked pheasants), and waterfowl was the same for harvested corn, soybean, and small grain fields.

RESULTS

The two blackbird roosts contained an average of 119,000 blackbirds during 2-5 April 1993 and 73,000 birds during 12-16 April. Of 60 survey stops, harvested fields of corn, soybean, and small grains occurred 26, 14, and 15 times, respectively. Sunflower fields were not present on either of the survey routes. Birds were seen in harvested corn fields 71 times, harvested soybeans 41 times, and small grain fields 39 times (Table 1). Thus, the overall frequency of occurrence of birds was proportional to the availability of each grain habitat. Overall, 20 species were observed in harvested grain fields.

We found the frequencies of blackbirds, nongame birds, terrestrial game birds (mourning doves, pheasants), and waterfowl were not equally distributed within the three habitats (X^2=14.66, df=6, P=0.023). Individual chi-square cells showed that 26% of the total chi-square value was contributed by more sightings of blackbirds in harvested corn fields than expected. We observed terrestrial game birds, nongame birds, and waterfowl with statistically equal frequency within each habitat. Blackbirds, waterfowl, killdeers, horned larks, ring-necked pheasants, and meadowlarks (see Table 1 for scientific names of bird species) were the most common birds recorded. Blackbirds were observed in harvested cornfields 28 times (median=9.5, range=1 -1000), soybeans 9 times (median=5, range=1 - 300), and small grains 5 times (median=2, range=1 - 1075).

Table 1. Frequency of occurrence and median number of birds observed in harvested corn, soybean, and small grain fields in east central South Dakota during 2-16 April 1993.

	Habitat					
	Corn		Soybeans		Small Grains	
Taxon	Frequency	Median	Frequency	Median	Frequency	Median
Canada goose (*Branta canadensis*) and Snow goose (*Chen caerulescens*)	3	200	1	2	2	100
Northern pintail (*Anas acuta*) and Mallard (*Anas platyrhynchos*)	6	2	1	2	5	2
Northern harrier (*Circus cyaneus*)	3	1				
Raptors (uznidentified) (*Accipitridae/Falconidae*)	1	1			1	1
Ring-necked pheasant (*Phasianus colchicus*)	2	1	4	1	3	5
Killdeer (*Charadrius vociferus*)	8	1	9	1	12	1
Franklin's gull (*Larus pipixcan*) and Bonaparte's gull (*Larus philadelphia*)	1	1	2	3.5	2	3
Mourning dove (*Zenaida macroura*)	1	2				
Rock dove (*Columba livia*)	3	3	3	1		
Northern flicker (*Colaptes auratus*)	1	1				
Horned lark (*Eremophila alpestris*)	5	1	4	1	6	1
American crow (*Corvus brachyrhynchos*)	1	1				
American robin (*Turdus migratorius*)	2	1	2	1.5		
European starling (*Sturnus vulgaris*)			4	18.5		
Sparrows (unidentified) (*Emberizinae*)	1	2	1	12		
Red-winged blackbird (*Agelaius phoeniceus*) and Common grackle (Quiscalus quiscula)	28	9.5	9	5	5	2
Western meadowlark (*Sturnella neglecta*)	4	1	1	2	3	1
House sparrow (*Passer domesticus*)	1	3				

DISCUSSION

Peak numbers of blackbirds migrate through east central South Dakota between mid-March and mid-April (Knittle et al. 1987). Although it appears that blackbirds use harvested corn fields more than small grain and soybean fields, this may be due to the greater availability of corn fields along the survey routes. During early spring, migrating and nonmigrating birds are feeding and resting in and near blackbird feeding areas (i.e., harvested grain fields). Thus, potential hazards exist for any bird that eats DRC-1339 treated grain baits (U. S. Department of Agriculture 1994). However, the likelihood of a bird ingesting a treated bait is related to the bird's habitat and diet. Obviously, hazards are highest for granivorous birds likely to forage in areas where DRC-1339 has been broadcast.

Of the birds commonly seen in harvested grain fields, blackbirds (Icterinae) are 2 - 7 times more susceptible to negative effects from DRC-1339 (LD_{50} 1.8 - 3.2 mg/kg) than pheasants (Phasianidae), ducks and geese (Anatidae), and doves and pigeons (Columbidae) (Decino et al. 1966, Schafer et al. 1977, Knittle 1989, U. S. Department of Agriculture 1994). Although our data are preliminary, it would be prudent to carefully examine the DRC-1339 bird toxicity data-base for possible gaps and errors. Any data deficiencies should be rectified by conducting rigorous nontarget risk analysis on the appropriate nontarget species following Good Laboratory Practice Standards (40 CFR Part 160, Federal Insecticide, Fungicide, and Rodenticide Act). Additionally, intensive field studies designed to document the feeding ecology of nontarget birds in relation to potential bait sites should be considered.

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