Spring Migration Phenology and Habitat Use of Red-Winged Blackbirds in Eastern South Dakota

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Abstract: We conducted studies from 1994 to 1999 in eastern South Dakota to determine the best strategy for baiting spring-migrating blackbirds. From 26 March to 14 April, male and female red-winged blackbirds made-up 61% and 17% of the roost population, respectively. After the 14th of April, the population consisted of 32% male and 49% female red-winged blackbirds. Blackbird migration in eastern South Dakota generally ended by late April. Habitat use studies conducted in March and April 1994, 1995, and 1998 showed that blackbirds used corn stubble for foraging and woodlots/shelterbelts for loafing. We concluded that bait plots located in corn stubble adjacent to wooded areas could attract large numbers of red-winged blackbirds during spring migration.

Key Words: avicides, birds, blackbirds, DRC-1339, habitat use, South Dakota, red-winged blackbirds, *Agelaius phoeniceus*, spring migration, sunflower

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In the northern Great Plains, commercial sunflower producers are annually plagued by an estimated 75 million blackbirds that feed on ripening sunflower (Peer et al. *In Press*). In 2001, producers in the southern Drift Plains of North Dakota, a 26,350 km^2 area where about one-third of the crop is produced (NDASS 2001), lost 5.6% or $2.5 million to blackbirds (Wimberly et al. 2002). This damage occurred despite intensive use of several dispersal and harassment techniques, including aerially applied repellents, propane cannons, shotguns, rifles, and applications of glyphosate herbicide to wetland roosts (Linz and Hanzel 1997). In response to the inadequacy of current damage abatement techniques, some sunflower producers have avoided planting near traditional blackbird roosts or have planted alternative crops. Although down from historical levels, sunflower plantings in the Dakotas exceeded 405,000 ha in 2001 (NDASS 2001).

Because their numbers exceed 35 million by late summer (Peer et al. *In Press*) and they have a propensity for eating sunflower (Homan et al. 1994), red-winged blackbirds (*Agelaius phoeniceus*) might cause 50% of the damage. Common grackles (*Quiscalus quiscula*) and yellow-headed blackbirds (*Xanthocephalus xanthocephalus*) cause the remainder of the damage (Homan et al. 1994). Spring-migrating red-winged blackbirds stage in eastern South Dakota and disperse northwest to nesting areas in sunflower growing regions of the Dakotas and Canadian Prairie Provinces (Knittle et al. 1996). These birds and their offspring feed on ripening sunflower during molt and while undergoing pre-migratory fattening. Reducing the size of this regional population during spring migration, prior to the breeding effort, is being deliberated during the preparation of an Environmental Impact Statement (Federal Register 2001).

The U.S. Department of Agriculture's National Wildlife Research Center continues to evaluate the costs and benefits of using DRC-1339-treated (3-chloro-*p*-toluidine hydrochloride) rice baits, to manage the blackbird population in the northern Great Plains (Federal Register 2001). Effective population management is contingent upon developing an efficient baiting strategy that can be quickly implemented with minimal costs. The objectives for our studies were to (1) describe the phenology of blackbird migration in eastern South Dakota, and (2) document the preferred foraging and loafing habitats of spring-migrating blackbirds.

STUDY AREA AND METHODS

Study Area

Our studies were conducted in the Coteau Des Prairies physiographic region (South Dakota Ornithologists' Union

1991) of South Dakota between 1994 and 1999 (Figure 1). These counties encompassed 13,102 km^2 and included 5,043 farms and 173,958 ha of wetlands, ponds, and linear waterways (Johnson and Higgins 1997). Over the 6-year period our studies were conducted, 40% of the land was planted in soybeans, 30% corn, 15% hay, 14% small grains (wheat, barley, oats), and 1% other crops (SDASS 2001).

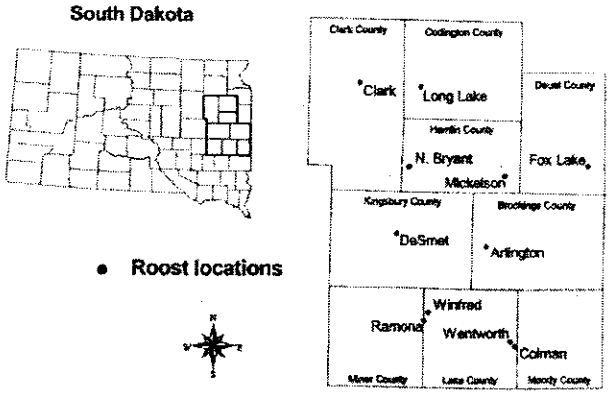

Figure 1. Location of study area and spring-migratory blackbird roosts in eastern South Dakota.

Roost Counts and Species Composition

From mid March to late April 1994-1999, we estimated roost size using block-count methodology (Meanley 1965). The birds were counted as they left the roosts at dawn. The number of roosts varied across years and was as follows: 1994 and 1995 (n=4), 1996 and 1997 (n=2), 1998 (n=5), and 1999 (n=6). In 1994 and 1995, we estimated species composition at least weekly by randomly selecting and identifying birds as they entered the roost during late afternoon. In 1998 and 1999, species composition was determined from observations of feeding and loafing flocks at fixed points. In both 1994 and 1998, we found roosts remaining active past April. We estimated the size and species composition of these roosts at least once in early May.

Habitat Preference

In 1994 and 1995, we conducted 0.4-km fixed-radius point counts at specified road intersections ($\bar{x}$=22) within a 93-km^2 area surrounding 4 roosts (Hutto et al. 1986, Barras 1996). Each roost was surveyed an average of 10 times from late March through April. Two of the roosts were used during both years. We recorded the number of blackbirds by habitat category during a 3-min counting period between 1 and 4 hr after sunrise. Observations were made at least once per week. Hectares of each habitat class in a 0.4-km radius of each observation point were estimated from aerial photographs using geospatial analysis software (Map and Image Processing System, MicroImages Inc., Lincoln, Nebraska).

In 1998, counts were conducted in an 8-km radius (259-km^2) centered on each of 4 active roosts. We counted all blackbird flocks seen inside 0.8-km × 0.8-km quadrats centered on road intersections (n=81). The observations occurred between 1 and 4 hr after local sunrise and between 4 and 1 hr before local sunset. Habitat use was surveyed at each roost once each week throughout the 4-week study period.

We calculated habitat availability using a nonmapping technique (Marcum and Loftsgaarden 1980). We randomly allocated 16 points to each of the 0.8-km × 0.8-km quadrats used for the surveys. The proportion of each habitat class available in the quadrats was estimated by dividing by 16 the number of points falling in each habitat. We summarized the data using the following habitats: corn, small grains/soybeans, grass/pasture, shelterbelts/woodlots, and wetlands. Lakes, ponds, and roadside ditches with emergent vegetation were placed in the wetland category. In all 3 years (1994, 1995, 1998), surveys were not conducted during periods of measurable precipitation, when visibility was <1 km, or when winds were >32 km/hr.

RESULTS

Roost Counts

Between 26 March and 4 April 1994 and 1995, the 4 roosts combined averaged 319,000 and 500,000 blackbirds, respectively; by the 4th week of April in both years, numbers had declined to <24,000 (Table 1). In 1996, we had 2 active roosts and found comparatively fewer blackbirds, with numbers peaking at 183,000 in early April. In 1997, these same 2 roosts peaked at more than 600,000 birds during the 2nd week in April. From 26 March to 14 April 1998 and 1999, the study counties contained 496,000 (n=5 roosts) and 866,000 (n=6 roosts) blackbirds, respectively (Sawin 1999). These numbers dwindled after mid April, but >100,000 birds were still present in late April during both years.

Species Composition

From 26 March to 14 April, male and female red-winged blackbirds made up 61% and 17% of the roost population, respectively. Common grackles made up 18% of the population, while few yellow-headed blackbirds (2%) were present during this time. After the 14th of April, the population consisted of 32% male and 49% female red-winged blackbirds, 13% common grackles, and 4% yellow-headed blackbirds (Table 2).

Overall, the blackbird migration in eastern South Dakota was completed by the end of April, but exceptions were noted. In 1994, we encountered a roost that harbored 16,000 and 6,000 blackbirds on 3 May and 12 May, respectively. On 11 May 1994, this roost consisted of 46% yellow-headed blackbirds, 32% red-winged blackbirds, and 20% common grackles. In early May 1998, we found a roost of about 10,000 female red-winged blackbirds and few of the other 2 blackbird species.

Habitat Preference

With years pooled, the availability of habitat types in the defined survey areas was as follows: 31% grass/pasture, 25%

Table 1. Numbers of blackbirds using spring roosts in eastern South Dakota during 1994 to 1999.

Date	1994 n = 4	1995 n = 4	1996 n = 2	1997 n = 2	1998 n = 5	1999 n = 6
21 - 25 March	190,000	457,000	73,000	-	-	72,000
26 - 30 March	371,000	480,000	41,000	40,000	35,000	494,000
31 March - 4 April	267,000	520,000	88,000	542,000	496,000	774,000
5 - 9 April	319,000	290,000	183,000	610,000	866,000	751,000
10 - 14 April	209,000	56,000	113,000	566,000	459,000	469,000
15 - 19 April	137,000	348,000	5,000	370,000	226,000	186,000
20 - 24 April	24,000	24,000	-	-	181,000	106,000

Table 2. Percent species composition of blackbirds using spring roosts in eastern South Dakota during 1994, 1995, and 1998.

Date	Male red-winged blackbirds	Female red-winged blackbirds	Yellow-headed blackbirds	Common grackles	Other blackbirds[a]
21 - 25 March	56	22	2	16	4
26 - 30 March	71	15	1	10	3
31 March - 4 April	63	17	<1	19	<1
5 - 9 April	56	17	4	22	1
10 - 14 April	54	20	3	22	1
15 - 19 April	37	38	6	17	1
20 - 24 April	28	60	2	9	1

[a]Brewer's blackbirds (*Euphagus cyanocephalus*), European starlings (*Sturnus vulgaris*), brown-headed cowbirds (*Molothrus ater*), rusty blackbirds (*Euphagus carolinus*), and unidentified blackbirds.

Table 3. Percentage of various land uses in the vicinity of spring blackbird roosts in eastern South Dakota and percentage of blackbirds found in each class.

Habitat	Mean percent coverage (95% Confidence Limits)	Percent blackbirds (95% Confidence Limits)
Grass/pasture	31 (±7.4)	16 (±14.7)
Small grains/soybeans	25 (±5.6)	10 (±13.4)
Corn	21 (±4.5)	12 (±7.4)
Wetlands	19 (±2.2)	11 (±3.8)
Woodlots	4 (±0.7)	51 (±13.8)

Table 4. Percentage of potential foraging habitats in the vicinity of spring blackbird roosts in eastern South Dakota and percentage of blackbirds found in each class.

Habitat	Mean percent coverage (95% Confidence Limits)	Percent blackbirds (95% Confidence Limits)
Grass/pasture	40 (±10.0)	43 (±20.7)
Small grains/soybeans	34 (±6.7)	21 (±17.8)
Corn	26 (±4.9)	36 (±18.1)

small grains/soybeans, 21% corn, 19% wetlands, and 4% woodlots/shelterbelts (Table 3). Blackbirds used woodlots/ shelter belts ($\bar{x}$ = 51%), more often than grass/ pasture ($\bar{x}$ = 16%), corn ($\bar{x}$ = 12%), wetlands ($\bar{x}$ = 11%), and small grains/soybeans ($\bar{x}$ = 10%). Looking only at the availability of foraging habitats, grass/pasture comprised 40%, small grains/soybeans 34%, and corn 26%; usage of these habitats was 43%, 21%, and 36%, respectively (Table 4).

Habitat Preference

With years pooled, the availability of habitat types in the defined survey areas was as follows: 31% grass/pasture, 25% small grains/soybeans, 21% corn, 19% wetlands, and 4% woodlots/shelterbelts (Table 3). Blackbirds used woodlots/ shelterbelts ($\bar{x}$ = 51%) more often than grass/pasture ($\bar{x}$ = 16%), corn ($\bar{x}$ = 12%), wetlands ($\bar{x}$ = 11%), and small grains/ soybeans ($\bar{x}$ = 10%). Looking only at the availability of foraging habitats, grass/ pasture comprised 40%, small grains/soybeans 34%, and corn 26%; usage of these habitats was 43%, 21%, and 36%, respectively (Table 4).

DISCUSSION

Roost Counts and Species Composition

The arrival and departure dates of migrating blackbirds were consistent with dates reported by the South Dakota Ornithologists' Union (Figure 2). Temporal changes in roost size and species composition occurred at all roosts throughout the migratory period within and among years; however, migrational peaks were fairly consistent across years, occurring sometime during the first 2 weeks of April.

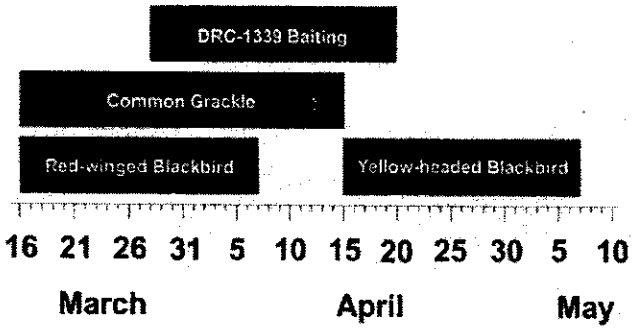

Figure 2. Migration dates for blackbirds as reported by the South Dakota Ornithologists' Union and projected dates for baiting with DRC-1339.

In 1995 and 1997, nearly complete snow cover delayed migration and forced the birds to either remain at their northward staging sites or retreat southward to more open areas. During these times of near complete snow cover, foraging was mostly limited to livestock yards. After the ground had opened, the pace of migration quickened and roost turnover increased. Our observations illustrate the erratic nature of spring migration, and in turn the instability of spring blackbird roosts (Weatherhead and Bider 1979).

Daily turnover rates at roosts can be highly variable and driven by biotic and abiotic mechanisms, such as availability of roosting space, microclimate (Weatherhead and Hoysak 1984), and quantity of palatable foods nearby (Morrison and Caccamise 1985, Maccarone 1987). All these factors must be considered when establishing the timing of spring baiting and general location of the operational effort. Personnel need to have the logistical ability to quickly establish baiting sites and relocate to other areas when the dynamics of a targeted roost begin to change.

Although the peak of blackbird migration in eastern South Dakota occurred during the first 2 weeks of April, we discovered 2 roosts that remained active in May. Late migrations are not unusual, particularly for female red-winged blackbirds. For example, migratory aggregations consisting of 10,000 females were found as far south as Arkansas in late April (Meanley 1965); and Greenwood and Weatherhead (1982) reported that a blackbird roost in Quebec contained several thousand birds in late May. Linz et al. (1993) concluded that spring-migrating female red-winged blackbirds breeding in Canada are more likely to migrate later than females breeding in the United States. Late migrating blackbirds may linger at spring roost sites because of readily available food (Labisky and Brugger 1989). Therefore, it is possible that baiting operations may miss some birds from the Canadian population.

Habitat Preference

Employing different field techniques than ours, Linz et al. (1995) found that spring-migrating blackbirds fed in fields of harvested corn more often than either small grains or soybeans. However, their study occurred over a limited geographic area and (perhaps more importantly) did not consider habitat availability. Our results on habitat use were based on an expanded geographic area and considered habitat availability.

Similar to the results of Linz et al. (1995), blackbirds seemed to prefer fields of corn stubble over small grains/soybeans. Use of corn stubble was probably related to an abundance of waste corn and its higher palatability than alternate food sources available in other habitats (Dabbert and Martin 1994). Compared to male red-winged blackbirds, smaller-sized females often have greater difficulty handling corn kernels and may have fed more frequently on weed seeds while foraging in corn stubble (Linz et al. 1984). The lack of weed seeds or other waste grains may have caused blackbirds to avoid soybean fields and other crop types with depleted food sources (Beauchamp et al. 1987). In comparison to soybean and small grains, pastures and grasslands appeared to be important foraging habitats during spring migration. These habitats may have provided weed seeds (Mott et al. 1972) and waste grains in cattle manure (Johnson 1979).

The results on use of foraging habitats obtained by us concur with previous observational studies done on wintering red-winged blackbirds in Tennessee (White et al. 1985) and spring migrating red-winged blackbirds in Quebec (Daoust et al. 1985). Both described heavy use of cultivated fields often cornfields.

We observed that woodlots and shelters (linear arrays of planted trees) held the highest densities of non-foraging blackbirds. Our observations on blackbird use of trees were similar to those reported for wintering red-winged blackbirds in Tennessee. Similarly, Daoust et al. (1985) found that red-winged blackbirds in Quebec preferred feeding sites that were (1) surrounded by adjacent cultivated fields, (2) located near woodlots, and (3) lined by rows of trees at field edges. These observations indicate that most red-winged blackbirds do not return to their roost sites after morning feeding nor will they linger on the ground. Trees provide a relatively safe vantage point for red-winged blackbirds to loaf. Additionally, the panorama provided by tree perches may allow blackbirds to find other food resources through attentive viewing of the behavior of distant flocks (Dyer 1967, Martin 1977, Mason and Reidinger 1981).

The purpose of our paper was to synthesize existing data and present a science-based strategy for baiting blackbirds with DRC-1339 in eastern South Dakota. We conclude that (1) red-winged blackbird numbers generally peak during the first 2 weeks of April but migration can be delayed by adverse weather, especially late spring snow; (2) blackbirds spend a lot of time perched in trees; and (3) because of label restrictions that prevent applications near livestock, baiting in pastures would be limited, therefore, corn stubble fields located near trees would be the best sites for baiting.

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