

November 1979

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Besser, Jerome F.; Berg, William J.; and Knittle, C. Edward, "LATE-SUMMER FEEDING PATTERNS OF RED-WINGED BLACKBIRDS IN A SUNFLOWER-GROWING AREA OF NORTH DAKOTA" (1979). *Bird Control Seminars Proceedings*. 27.
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LATE-SUMMER FEEDING PATTERNS OF RED-WINGED BLACKBIRDS IN A SUNFLOWER-GROWING AREA OF NORTH DAKOTA

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During August and September in 1977 and 1978, we monitored the feeding patterns of radio-equipped, male red-winged blackbirds (*Agelaius phoeniceus*) and associated blackbird flocks in the vicinity of Fuller's Lake Waterfowl Production Area in Steele County in east-central North Dakota. Fuller's Lake, a cattail marsh of about 1,000 acres (405 ha), serves as the main roosting area for a blackbird assemblage that, for the past seven years in late summer, has numbered from 100,000 in wet years to more than 750,000 in dry years. Sunflower is an important crop in the Fuller's Lake area, being grown on about 20 percent of cropland. Wheat and barley are other major crops, grown on about 40 percent of the cropland. Corn is grown on less than 1 percent of the cropland, but the number of quarter-section (160-acre, 65 ha), irrigated cornfields increased in the area from two in 1977 to eight in 1978. The Fuller's Lake area lies on the eastern edge of the North Dakota Drift Plains and is poorly drained, with as many as a dozen water basins per square mile. This combination of a large roosting marsh and numerous satellite roosting and loafing marshes, intermingled with sunflower fields, has created optimum conditions for blackbirds to damage some sunflower fields. Damage was estimated at 23.6 percent of the sunflower crop in a 28-section area surrounding Fuller's Lake in 1972 (Besser and Guarino 1977), when little control effort was expended.

Experiments were conducted with 4-aminopyridine baits as a frightening agent to protect sunflowers from blackbird damage in a 7-township (3-county) study area in the Fuller's Lake area in 1977 and 1978. In 1977, 31 of the most heavily damaged fields were baited with Avitrol® FC-Corn Chops 99S (Henne 1978), but in 1978 only five were baited (Henne et al. 1979). These experiments afforded us an excellent opportunity to monitor the feeding patterns of blackbirds frightened from ripening sunflower fields as well as undisturbed birds. In some instances, when a feeding pattern had been established by a flock in an untreated ripening sunflower field, we frightened the flock from the field by mechanical means. This paper presents the major findings of this 2-year study.

METHODS

We attached radios to 45 adult male redwings between August 6 and September 18 (21 in 1977 and 24 in 1978). Redwings were mist-netted as they entered the marsh in the evening. The instrumented birds were part of a roosting assemblage of as many as 546,000 blackbirds during the study. To maximize the capability of radio-equipped birds to have near-normal movements, only those males in the most advanced stages of feather replacement were instrumented. Each bird was tagged with a 2½ inch orange leg streamer and instrumented with a 164 MHz transmitter. Transmitters were glued to clipped dorsal body feathers as described by Hegdal and Gatz (1977). Instrumented birds averaged 74.7 g body weight, and transmitter and attachment weighed

2.8 g. We monitored the movements of instrumented birds by using three-element yagi antennae mounted on vehicles carrying LA 12-S (AVM Instrument Company, Champaign, Illinois) receivers. Special efforts were made to determine where and how long instrumented birds fed.

RESULTS AND DISCUSSION

Twenty-eight of the 45 instrumented redwings supplied information on the movements of feeding blackbird flocks during 191 bird-days (number of birds x days) of monitoring. These birds were monitored an average of 6.8 days (range 1 to 21 days) before radios were lost, batteries were depleted of power, the bird was lost, or the bird moved far enough from the marking site that it was no longer feasible to gather information on its feeding activities. The other 17 instrumented birds lost transmitters or were killed by predators before meaningful feeding activities with flocks were recorded.

Feeding Activities

The feeding activities of instrumented birds were monitored a total of 77,198 minutes during 86 days of tracking. They spent 73.1 % of their feeding time with flocks of 100 to 100,000 birds, which indicates much or most of their feeding was apparently normal. However, the instrumented birds fed alone 10% of the time and with flocks of less than 10 individuals 7% of the time. We believe this represents an above normal amount of feeding time spent alone or with small flocks. Therefore, we believe that the feeding time of flocks in areas where instrumented birds fed is more representative of feeding time of blackbirds in the study area. The feeding times of blackbirds with which instrumented birds fed were recorded for a total of 256,154,958 bird-minutes (number of birds x minutes).

Sunflower and cornfields were the favored feeding sites of blackbirds in the Fuller's Lake area. More than 75% of the feeding time of flocks was recorded in these crops each year (Table 1). However, the percentage of feeding time in sunflower and cornfields changed dramatically between years. In 1977, blackbird flocks spent 59% of their feeding time in sunflower fields and only 18% in cornfields, whereas in 1978, they spent only 7% of their feeding time in sunflower fields and an amazing 90% in irrigated cornfields. The switch in 1978 was apparently caused by an increase from two to eight in the number of irrigated cornfields and decreased canopy density in sunflower fields. In 1977, plentiful moisture, decreased row width, and heavy fertilization in sunflower fields combined to form dense canopies that rivaled marshes as bird loafing cover, whereas canopies were more open in 1978 as the result of a dry summer, and only the edges of fields were heavily damaged.

Weed patches, plowed fields, and stubble fields were other sites used more extensively by feeding flocks in 1977 than 1978. Swathed grain, pastures, and bean fields each accounted for less than one percent of feeding time either year.

Sunflower and cornfields were the most difficult feeding habitats for accurately determining feeding times, because instrumented birds also used these fields for loafing. In addition to feeding on sunflower seeds and corn ears, the birds fed on weed seeds and on insects on the ground, on the plants, and in the air. The height and density of plants and size of fields (average of 160 acres for irrigated corn and about 75 acres for sunflower) prevented accurate determination of feeding times even when birds were at close ranges (less than 100 yards). Undoubtedly, feeding times in sunflower and corn fields were overestimated and underestimated in open areas such as weed patches, stubbles, and swaths.

Movements of Frightened Birds

While monitoring, we recorded 56 instances when instrumented birds were frighten-

ed from a ripening sunflower field to another feeding site -- 34 in 1977 and 22 in 1978. The frightening responses were caused by 4-aminopyridine bait, shooting, shell crackers, exploders, auto horns, patrol, and hawks. In 17 of the 56 instances (30.4%), the flock with the instrumented bird next fed in another ripening sunflower field. Irrigated cornfields (15 instances), standing and tilled stubbles (11), blooming sunflower fields (6), and weed patches (5) were the other chief sites where frightened flocks next fed (Table 2). Flocks were far more difficult to frighten from the dense canopied ripening sunflower fields in 1977 than the more open canopied fields in 1978 and appeared more apt to feed in another ripening sunflower field -- 46 percent moved to another ripening sunflower field in 1977, but only 18 percent in 1978. In the latter year, flocks appeared to readily recognize the greater cover and safety of 9-foot-tall irrigated corn compared to 6-foot sunflower. It appeared that birds frightened from ripening sunflower were somewhat less likely to feed in another ripening sunflower field if frightened by chemical means than other means (33% vs. 46% in 1977).

Roosting Locations

The roosting locations of instrumented birds were recorded for 155 nights during the 2-year study. Although Fuller's Lake marsh held between 141,000 and 546,000 birds in 1977, and between 78,000 and 156,000 birds in 1978, instrumented birds roosted there only 52 nights (33.5%). They roosted in 25 other cattail marshes on 78 nights (50.3%), with as few as two and as many as 50,000 other birds. In 1977, they also roosted in six sunflower fields and a non-irrigated corn field with as many as 100 other birds. Roosting locations were as distant as 38 miles south and 18 miles northwest of Fuller's Lake. Several instrumented birds returned to Fuller's Lake after spending a week or more at roosts as far as 14 miles south of Fuller's Lake.

Distances to Sunflower Fields Visited

In 1977, we recorded 166 visits to sunflower fields by instrumented birds. Only 37 (22%) visits were to fields within 3 miles of Fuller's Lake, 98 (59%) to fields 3-6 miles distant, 26 (16%) to fields 6-12 miles distant, and only five (3%) to fields more than 12 miles away. These data indicate that sunflower growers who plant fields within six miles of major blackbird roosts should be prepared to combat damage, especially those growers whose fields have suitable satellite roosts or loafing cover nearby.

Flock Size, Sunflower Seed Maturity, and Damage Relationships

The size of flocks associated with instrumented birds was much larger in September than in August. In 1977, the largest flock in a cropfield in August was 20,000 birds, whereas a flock of 100,000 was recorded in September. In 1978, the largest flock in a cropfield in August was 4,000, whereas a flock of 50,000 was recorded in September. However, in 1978, when the sunflower crop matured early, the seeds of sunflower were more attractive and vulnerable to the smaller August flocks, and these flocks fed in rapidly maturing sunflower fields to a far greater extent in August than in September.

SUMMARY

Blackbirds, chiefly red-winged blackbirds, fed heavily on ripening sunflower in the early stages of maturity in North Dakota. Birds fed more heavily in dense canopied than open canopied sunflower fields. Irrigated cornfields appear to be capable of absorbing some of the damage pressure in areas with high blackbird numbers, and damage is comparatively slight in them. Smaller flocks occurred in August but may have caused more damage than the larger ones in September. Sunflower fields up to six miles from the main roost were regularly visited by blackbirds. Radio-equipped male redwings from the Fuller's Lake marsh also roosted in 25 other smaller cattail marshes within 38 miles of this roost. Only about 30% of flocks frightened from sunflower fields next fed in another ripening sunflower field.

ACKNOWLEDGMENT

We thank Daniel J. Twedt and Paul L. Hegdal for their assistance in monitoring radio-equipped birds.

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TABLE 1. Feeding activities of flocks of blackbirds with which 28 instrumented male redwings associated in Steele, Cass, and Traill counties, North Dakota during August and September, 1977 and 1978.

Feeding Site	% Flock-feeding Time		
	1977*	1978**	Avg.
Unbaited ripening sunflower fields	29.7	6.6	18.2
Baited ripening sunflower fields	22.7	0.4	11.6
Sunflower fields in bloom	6.3	0.2	3.3
All sunflower fields	58.7	7.2	33.0
Ripening irrigated cornfields	4.0	90.1	47.1
Ripening non-irrigated cornfields	14.2	T***	7.1
All cornfields	18.2	90.1	54.2
Plowed stubbles	6.3	1.1	3.7
Stubbles	3.6	0.7	2.2
Disked stubbles	3.4	T	1.7
All stubbles	13.3	1.8	7.6
Weed patches	8.7	0.8	4.8
Wheat swaths	0.7	T	0.4
Pastures	0.4	T	0.2
Beanfields	0.1	T	0.1
Spilled grain	T	T	T
ALL FIELDS	100.1	99.9	100.3

*N = 90,229,212 bird-minutes

**N = 165,925,746 bird minutes

***T = trace (<0.05%)

TABLE 2. Summary of movements of radio-equipped male red-winged blackbirds frightened from ripening sunflower fields in Steele, Cass, and Traill counties, North Dakota, August and September, 1977 and 1978.

Feeding Site Moved To	Method of Frightening		Total
	Chemical Agent 1977	Other Means 1977 1978	
Unbelted ripening sunflower fields	6	5 4	15
Treated ripening sunflower fields	1	1 0	2
Sunflower fields in bloom	2	3 1	5
Irrigated ripening cornfield	0	0 15	15
Non-irrigated ripening cornfield	1	0 0	1
Plowed stubbles	2	2 2	6
Standing stubbles	2	1 0	3
Disked stubbles	2	0 0	2
Weed patches	4	1 0	5
Swathed wheat	1	0 0	1
Sub-Total	21	13 22	56
Movements to other ripening sunflower fields			
When chemically frightened (1977)			7/21 = 33.3%
When frightened by other means (1977)			6/13 = 46.2%
When frightened by other means (1978)			4/22 = 18.2%
Total			17/56 = 30.4%