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ABSTRACT

Observations of blackbird and starling reactions to helicopter flyovers were made at 12 winter roosts. Extensive bird flushing was observed during 6 flights that were conducted on clear (cloudless) nights. No appreciable bird movement took place during the 6 flights on overcast nights. Helicopter type, time of flight, roost habitat type, bird species composition, and external lighting appeared to have little influence on the amount of flushing observed. The data suggest that the best conditions to apply an avian toxicant by helicopter would be on an overcast night while flying at the highest permissible elevation.

INTRODUCTION

Large concentrations of winter roosting blackbirds (Icteridae) and starlings *(Sturnus vulgaris)* have been a concern in the southeastern United States because of related economic, health, and nuisance problems (Meanley, 1975; Dolbeer et al., 1978; Garner, 1978). Various methods have been employed for reducing the conflicts associated with these birds including the aerial application of a wetting agent, Compound PA-14 Avian Stressing Agent, to reduce local populations (Garner, 1978). Successful use of PA-14, however, has been limited because of the stringent weather conditions (temperatures below 45°F with at least 0.5 inches of rain) required for its effective use. As a result, the U.S. Fish and Wildlife Service (USFWS) intensified their search for a roost toxicant chemical less dependent on weather factors.

Field evaluations of a candidate toxicant (CAT, DRC-2698, [N-3-chloro-4-methylphenyl] acetamide) were conducted in 1979 and 1980 (Lefebvre et al., 1979; 1980). The low mortality resulting during these tests was largely attributed to extensive flushing of the roosting birds during the helicopter applications. This flushing prompted a study to examine the influence of low-flying helicopters on the behavior of winter roosting blackbirds and starlings and to relate this behavior to factors such as weather conditions, vegetation types, flight times, and bird species composition.

Helicopters are preferred over fixed-wing aircraft for nighttime applications because of greater pilot safety, control of spray distribution, and logistics considerations. The goal of the present investigation was to determine the conditions under which roosting populations of blackbirds and starlings could be effectively sprayed by helicopter with a minimum of disturbance.

METHODS

This study was conducted in Tennessee and eastern Arkansas during the winter months from January 1981 to February 1983. Seven flights over five different roosts were conducted with turbine-powered helicopters (either a Bell 206 Jet Ranger or Hughes 500D). Turbine-powered helicopters were used to comply with the regulations of the Department of the Interior's Office of Aircraft Services. In addition, observations were made during four PA-14 roost treatments by Tennessee Department of Agriculture personnel and one spray of an experimental roost repellent (USFWS) with a Bell 47 or Hiller 12-J helicopter (reciprocating engines).

The flights were conducted at elevations between 9 and 40 m above the roost vegetation at speeds between 40-56 km/hr. A minimum of two and a maximum of 30 passes (during a PA-14 application) were made over each roost during a flight. Flights not involving the application of a chemical were made over the center of the roost vegetation. External helicopter landing lights were used during one PA-14 application and during six passes on three other flights. Helicopter takeoffs and landings were usually not in the area of the roost. At Estill Springs, Tennessee (PA-14 application), however, the helicopter took off and landed from a field about 150 m from the roost without noticeably disturbing the birds.

Roost population counts were usually made on the evening or morning before the helicopter flight occurred. The predominant bird species comprising a roost was also determined by identifying individual birds on incoming roost flightlines with the aid of binoculars. The total area and average tree height of test roosts were determined. During each helicopter flight, data on time of flight, weather conditions, speed and height of each pass, and number of passes were recorded. Usually two or three observers equipped with light-amplifying night vision devices (Goggles, ITT Electro-optical Products Division Model No. 4907, or a Scope, Javelin Division Model 226) were positioned within or on the perimeter of the roost and observed the reaction of the birds to the helicopter flyover and estimated the number of birds leaving the roost boundaries during the flight.

RESULTS AND DISCUSSION

Extensive flushing of birds involving more than half of the roosting population leaving the roost was noted during six of the 12 helicopter flights. This extensive flushing occurred only on clear nights with or without a moon. In contrast, little (0.5% or less of the roosting population departing the roost) or no bird movement was recorded on the other six nights with 95% or more cloud cover. The data suggest that helicopter type (turbine vs reciprocal engine), time of flight, temperature, and type of roost habitat did not influence flushing (Table 1). Although the roosts where flushing occurred were late in the season (19 February or later), I believe that sky cover was the primary factor influencing flushing and not the lateness of the winter roosting season. The extensive flushing during the CAT evaluations on January 15, 1979 and January 14, 1980 would support this contention (Lefebvre, et al., 1979; 1980).

TABLE 1. Factors examined to determine the influence of helicopter flights on the behavior of winter roosting blackbirds and starlings, Arkansas and Tennessee, 1981-1983.

Roost	Date	Habitat (ha)	Ave. Tree Height (m)	Bird Numbers	Predominant Species	Helicopter	Time	Temp (°C)	Visibility	Flushing[a]
Knoxville, Tenn.	1/08/81	Pines-Hardwoods (2)	12.2	100,000	Starling	Bell 206[b]	1805	−1	Overcast (95%)	No
Jefferson City, Tenn.	1/22/81	Pines (1.2)	12.2	700,000	Grackle	Bell 206	1835	5	Overcast (100%)	No
Jefferson City, Tenn.	2/10/81	Pines (1.2)	12.2	170,000	Grackle	Bell 47[c]	2200	10	Overcast (100%)	No
Clarendon, Ark.	2/19/81	Hardwoods (3.2)	15.2	2,000,000	Redwing	Hughes 500D[b]	1910	18	Clear-Full Moon	Yes
Wynne, Ark.	2/19/81	Pines (6.1)	15.2	2,000,000	Redwing	Hughes 500D	2040	17	Clear-Full Moon	Yes
Fair Oaks, Ark.	2/19/81	Hardwoods Cattail Marsh (ND)[d]	ND	2,000,000	Redwing	Hughes 500D	2230	16	Clear-Full Moon	Yes
Wynne, Ark.	3/06/81	Pines (6.1)	15.2	1,800,000	Redwing	Hughes 500D	0030	2	Clear-No Moon	Yes
Fair Oaks, Ark.	3/06/81	Hardwoods Cattail Marsh (ND)	ND	200,000	Redwing	Hughes 500D	0130	1	Clear-No Moon	Yes
Lewisburg, Tenn.	2/02/82	Cedars (2.4)	6.1	3,900,000	Grackle	Hiller 12-J[c]	1940	8	Overcast (100%)	No
Manchester, Tenn.	2/19/82	Pines (1.2)	4.6	730,000	Grackle	Bell 47[e]	1930	6	Clear-No Moon	Yes
Estill Springs, Tenn.	1/21/83	Pines (4.1)	9.1	3,800,000	Grackle	Hiller 12-J	2000	2	Overcast (100%)	No
Memphis, Tenn.	2/04/83	Hardwoods (2.3)	12.2	1,900,000	Grackle	Bell 47[c]	2330	0	Overcast (100%)	No

[a]No - 0.5% or less of roost population left the roost boundary during a helicopter flight.
Yes - More than 50% of the roosting population left the roost boundary during a helicopter flight.

[b]Turbine engine.

[c]Reciprocating engine — PA-14 application.

[d]Not determined (ND).

[e]Experimental repellent application.

Red-winged blackbirds *(Agelaius phoeniceus)* predominated in five of the six roosts where extensive flushing occurred. I would have suspected that species composition of the roost played a more important role had it not been for the massive flushing at Manchester, Tennessee, where grackles *(Quiscalus quiscula)* predominated (Table 1). Also, if redwings were more prone to flush than other species, there should have been more flushing at Memphis and Estill Springs, Tennessee, where 15% and 25%, respectively, of these roosts were composed of redwings.

Ambient light from the moon or nearby streets and industrial sites did not appear to influence the amount of flushing observed. At Wynne and Fair Oaks, Arkansas, birds flushed equally as much during full moon as they did during no-moon conditions. Further, at Memphis, nearby industrial and street lighting illuminated the area surrounding the roost site, yet no appreciable bird movement was recorded.

The use of helicopter landing lights while making passes over the roosts did not appreciably contribute to flushing. Landing lights were used during the entire PA-14 application at Estill Springs (30 passes). Some flushing was observed on the first pass when the pilot became disoriented and flew within 9 m of the roost vegetation. On succeeding passes, however, an elevation of 30 m above the roost was maintained; the birds did not flush from the roost. No effect was observed at Knoxville, Tennessee, when the lights were used on two of three passes. At Jefferson City, Tennessee (1/22/81), lights were used on three of five passes and an increase in bird movement was noted; nevertheless, less than 0.5% of the roost population left the roost area during these three passes. At Fair Oaks, massive flushing was observed before, during, and after the one time the lights were used with no apparent differences in numbers flushing.

Height of the helicopter passes on cloudless nights did not appreciably influence bird flushing. Birds flushed as much at Manchester during passes at 30 m above the roost vegetation as they did in Arkansas at 15 m above the vegetation. In fact, at Manchester the birds began flushing as the helicopter approached the roost. On overcast nights, however, lower altitudes (9 m above vegetation), especially with landing lights on, did elicit more bird movement than passes at higher elevations (30 m) as witnessed at Estill Springs. Also, at Jefferson City (1/22/81) lateral bird movement increased, although not extensively, when the landing lights were used at an elevation of 9-11 m above the roost.

The birds appeared to become conditioned to repeated passes over roosts treated with PA-14 (overcast conditions). Although insignificant, some bird movement within the roost usually occurred on the first few passes. Succeeding passes, however, did not elicit the same degree of excitement among the birds. This was especially evident at Estill Springs and Memphis, where 30 passes were made over the roosts. Conditioning, therefore, could have influenced the amount of flushing observed at Memphis, as this roost was 0.5 km from the end of the airport runway and under the flight path of arriving and departing aircraft. On clear nights when flushing was extensive, birds repeatedly rose *en masse* into the air as the helicopter flew over. Although a maximum of five passes were made over these roosts, conditioning did not appear to occur. After flushing, the birds would usually begin to return to the roost soon after the helicopter passed over or when the flight was completed. Numerous bird strikes on the helicopter's rotor blades and fuselage were evident when massive flushing occurred.

This phenomenon of massive flushing of birds during the helicopter flights on cloudless nights could conceivably be related to the birds using the stars to orient themselves. Sauer (1957, as cited in Welty, 1962), Emlen (1970), and Wiltschko and Wiltschko (1974) have demonstrated that some avian species navigate by the stars. Although blackbirds and starlings are not generally considered nocturnal migrants (Stickley and Steffen, 1974), it is reasonable to assume they could orient by the stars and therefore be hesitant to take flight on overcast nights. In support of this thinking, Mitchell (1963) noted that the floodlight trap was more successful in trapping roosting blackbirds and starlings on cloudy nights. This may have been because birds were reluctant to flush away from the roost as they were herded towards the light source of the trap.

Results of this study suggest that the extensive flushing recorded during the 1979 and 1980 roost toxicant trials (Lefebvre et al., 1980) was due to the sky conditions at application. During both trials the chemical was applied under high cirrus cloud formations through which celestial cues should have been visible. (Information on cloud cover during these applications was obtained from the U.S. Weather Bureau, Little Rock, Arkansas, and Memphis, Tennessee.)

SUMMARY

Observations of bird behavior to helicopter flights were made at 12 winter blackbird-starling roosts. Extensive bird flushing was observed during six flights that were conducted on cloudless nights. No appreciable flushing took place during the six flights on overcast nights. The data suggest that helicopter type, time of flight, roost habitat type, bird species composition, and external lights had little influence on the amount of flushing observed. Results indicate the best conditions to apply a chemical by helicopter would be on an overcast night, at the highest permissible elevation (and still avoid spray drift), without using helicopter landing lights.

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