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Seasonal Effects on Control Methods for the Great-Tailed Grackle

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Efficiency of methods used to control damage to citrus fruit by great-tailed grackles was found to vary considerably from season to season. From April - July, the birds congregated in small breeding colonies where they were susceptible to baiting and poisoning. From August - October, the birds could be baited in to and poisoned at watering sites. Intensive shooting and use of pyrotechnics were also used successfully at this time of year to control damage at groves with high grackle concentrations. From late October - March, birds moved over wide areas each day, and were easily frightened from groves by pyrotechnics and shooting. No single method is available at present to control the entire population or to protect a given grove through all seasons.

INTRODUCTION

The great-tailed grackle Quiscalus mexicanus) is an abundant permanent resident of the lower Rio Grande Valley of Texas. Though numbers of the birds change from season to season, there is no time when this species is not present. As a result, grackle damage to citrus and other fruit and vegetable crops is a yearround phenomenon.

During the course of our work in the Valley, 8 methods were considered to determine their effectiveness in limiting grackle damage to citrus: 1) monofilament line 2) reflective tape, 3) **eyespot balloons 4) pyrotechnics** (propane cannons and shotgun scare shells), 5) poisoning of birds, 6) shooting birds, 7) grackle nest destruction, and 8) spraying birds with the wetting agent, PA14. Details of the methods and results of the research on the effectiveness in reducing grackle damage to fruit of monofilament line, reflective tape, eyespot balloons, pyrotechnics, and poisoning with PA-14 and DRC-1339 are presented elsewhere in this volume (Tipton et al. 1989x, Tipton et al. 1989b).

In this paper, we present the results of control efforts using some

STUDY AREA

The lower Rio Grande Valley of Texas (fig. 1) is the fertile delta region of the Rio Grande River (referred to hereafter as the Valley). The rich soils of the delta cover approximately 1,194-kmZ in Texas. We travelled and worked throughout the Valley, but most of our radio-tracking and damage assessments were done in Hidalgo and Cameron counties. Ninety-eight percent of the Valley land is in agriculture of one form or another (George 1985), including 11,760-ha of citrus (Waggerman 1988). Prior to the freeze of December 1983, citrus covered more than 30,000-ha (R.. Prewitt, pers. comm.). Natural habitat (thorn forest, savanna, riparian forest) occupies an estimated 4,700-ha in the Valley (Waggerman 1988), and these areas are in various successional stages; none is in pristine condition.

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METHODS

Shooting was used in conjunction with pyrotechnics as a control device in selected groves where grackles occurred during the day at densities > 10 birds/ha. Control efforts were performed in 1 of the groves (Fox) during the breeding season, 2 groves in the summer post-breeding period (Fox and Moorefield), and 5 groves during the winter period.

Fruit Damage Reduction Using Shooting and Pyrotechnics

Breeding season procedures involved making counts in the grove on 3 non-successive days using a shotgun scare shell ("Shot Tell" scare shells, Reed Joseph International Co., Greenville, Mississippi). These shells are fired from a 12-ga shotgun. They explode about 50-m downrange with a loud (100-db) noise. Damage to fruit in the grove was assessed monthly from July until harvest, which usually occurs in November, though some groves are not harvested completely until February. Fifteen trees were randomly selected in each grove and the total number of fruit damaged by grackles and the undamaged fruit were counted on each tree. Four technicians entered the grove on the first Monday after pre-treatment damage assessment was completed, and shot as many grackles as possible from 0800-1000-h each day, MondayFriday, for 2 weeks. At 1000-h, they placed 2 propane cannons in the grove. Propane cannons (Margo Supplies Ltd., Calgary, Canada) are metal tubes roughly 1-m in length that stand about 1m off the ground on a tripod. They are connected to a 10-kg propane tank. A timed, electronic spark ignites a small amount of propane at pre-set intervals producing a loud, "thunderclap" sound of 80-120 db. Two, multi-detonation cannons were placed in the grove, 1 in the center of the north half, the other in the center of the south half. These cannons automatically fired at 2-5-min intervals and were run from 1000-h until dark during the 2 week treatment period. On Monday, Wednesday and Friday of the third week, the grove was entered and a single scare shell was fired over the northern half and the southern half of the grove, and the number of grackles taking flight was counted. On each Monday thereafter, scare shells were fired and grackle counts made. When counts reached 25% of treatment pre-counts, a 1-week treatment of shotgun and propane cannons was repeated.

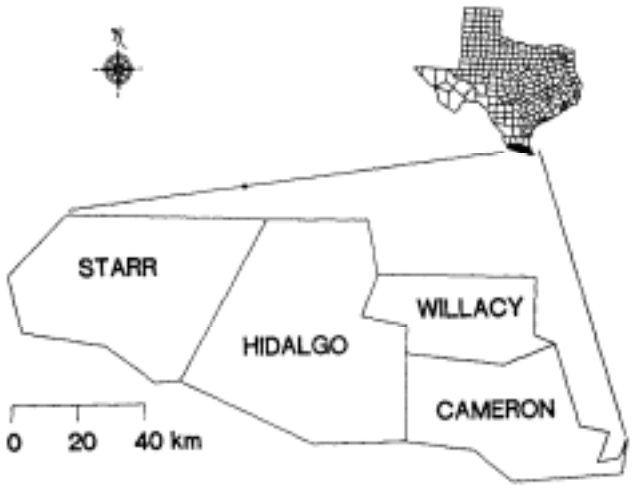

Figure 1: -Map of Texas showing location of the lower Rio Grande Valley.

During the 1988 post-breeding and winter seasons (Aug-Dee), we searched for groves having > 10 birds/ha on which to try our shotgun-scareshell-propane cannon technique. The method was used on 2 groves during the summer post-breeding period (Aug 1988), and on 5 groves during the winter season (Nov 1988). The method was drastically alterred during the winter season due to dramatic changes in the behavior of the birds. During the winter, when a grove was located that contained birds, several scare shells and shotgun shells were fired in a short period (10-20 min), and the number of birds leaving the grove vicinity was counted. The grove was then re-visited at 2-h intervals the rest of the day, and the number of birds in the gave was counted either by using scare shells or by driving up and down the rows and counting numbers of grackles flushed. The grove was then checked once/day for the next 5 days in the same manner.

Fruit Damage Reduction Using Nest Removal

To prevent establishment of breeding colonies in citrus groves, a grackle nest removal procedure was performed in 2 groves with a history of high grackle nesting densities (> 10 nests/ha), and high damage rates as recorded during the 1987 season: Nonmacher (0.8-ha) and Signez (.3-ha). On 23 March 1988 all grackle nests, old and new were removed from both groves. New grackle nests were counted and removed at biweekly intervals thereafter until no new nests were found in either grove (17 June 1988). Fifteen trees were randomly selected in each gove for assessment of damage to fruit. The assessment was performed monthly on the same fifteen trees from July - October 1988. These results were compared with damage assessments performed on the same groves in 1987.

Damage to citrus fruit by grackles was assessed throughout the project, from January, 1987 - January, 1989. Initially (Jan Oct 1987), a study was done to determine the extent of damage to the citrus industry done annually by the birds, and to identify the major factors correlated with grackle damage to citrus (e.g. proximity to roosting sites, grove isolation) (Johnson et al. 1989). Subsequently, damage assessments were performed on treatment and control groves for each of the different treatment experiments. Damage was assessed monthly in treatment and control groves from July until harvest (Nov - Feb depending on grove).

Grackle Movements

We made daily observations on the movements and behavior of great-tailed grackles throughout 2 complete annual cycles. In addition to these observations, we placed radio transmitters on selected individuals during the different seasons of the year. Birds were captured using a variety of methods including: Australian crow traps, cannon nets, light traps, and mist nets. The most commonly used method involved placing mist nets (12-m x 2-6-m, 61-mm and 121-mm mesh) on 5-m, telescoping poles in areas of high activity, e.g. feed lots (winter), roost sites (winter), nesting sites, and watering sites (summer).

Each captive was banded with a U.S. Fish and Wildlife Service numbered, aluminum band, and given a unique color band and patagial tag sequence for individual identification in the field. A 6-gm radio transmitter (at frequencies between 150.850-151.450 MHz) was attached using a figure 8 harness (Rappole et al., MS). Each transmitter (Custom Telemetry, Athens, Georgia) was 2.5-cm x 1.5-cm x 1-cm with a 23-cm whip antenna, powered by a lithium battery. Average battery life was 6 weeks. Reception distances were highly variable depending on the amount of interference by other radio traffic and power lines. However, normally we were

able to pick up signals at distances of 1.5-2.0-km on the ground, and 3.0-5.0-km from the air using an LA 12, 12-channel receiver, 4element Yagi antenna with 3-m extension pole, and Dave Clark headphones. Birds were located 2-3 times daily as other duties allowed.

RESULTS

Fruit Damage Reduction Using Shooting and Pyrotechnics

The breeding period for the great-tailed grackle in the lower Rio Grand Valley is early April to mid-July, during which time grackles show considerable site tenacity to breeding colony sites. This fact is illustrated by the results of the shooting and pyrotechnic treatments applied to Fox Grove (table 1). This grove had a density of 16.3 grackle nests/ha in June, 1988 when this control procedure was initiated. Furthermore, there was a history of early season (Jun-Aug) grackle damage to fruit from 1987 (table 2), presumably due to the high grackle populations present in the grove during the summer breeding period. Scare shell counts performed on 3 non-consecutive days prior to the initiation of the intensive shooting and propane cannon work showed mean densities of only 2.9 birds/ha. However, 425 birds were shot in the grove during the 14 day period of morning shooting and cannon work, including 22 on the last control day. Post-treatment counts performed in the grove using scareshells on 3 consecutive days showed mean densities of 0.8 grackles/ha.

Table 1 . --Shotgun-pyrotechnic control efforts.

Grove(ha)	Date initiated	Estimated Birds/hat	Control period	Cost/ hectare($)
Fox (18.0)	6 Jun 1988		27	14 days
Fox (16 . 0)	1 Aug 1988		9	14 days
Moorefield (40.0)	2 Asp 1988		10	14 days
Taylor (2 . 8)	18 Nov 1988			
Trenton (8. 0)	3 Nov 1988			

1Based on number of birds Idled for Fox and Moorefield and number of birds counted in the air for the remaining groves.

Grackles also showed a great deal of tenacity to colony sites during the period immediately following breeding (Aug-Sep) as well, particularly those where drinking water, usually in the form of irrigation ditches, was available. In August, when the treatment had to be repeated in Fox Grove, 146 birds were killed in an 8-day period. Table 3 shows the estimated cost of the shotgun-cannon treatment at Fox Grove during June. Total cost/ha of the treatment was $25.69/ha.

Effectiveness of the shotgun-pyrotechnic treatment increased sharply in the winter months (Nov-Mar) when only a few scare shells were sufficient to cause all of the grackles in a 500-m radius to leave the area within minutes (table 1).

Fruit Damage Reduction Using Nest Removal

The basic conjecture underlying the nest removal treatment was the same as that for the shotgun-pyrotechnic treatment, i.e. that disruption of breeding colonies in citrus groves would cause desertion of the colony and subsequent reduction of early season (Jun-Aug) damage to fruit. However, the birds did not readily abandon colonies in either case. Despite weekly removal of nests from 23 March - 17 June 1988, birds continued to build nests in the colony until the final week of the treatment (fig. 2). Nor did the treatments appear to have a significant positive effect on fruit damage (table 4).

Table 2 . -Effects of Shooting, Pyrotechnics, and Cannons In breeding colonies on damage rates to citrus fruit.

Treatment	Mean damage % by month Al Asp	Sep	Oct	Year
Moorefield - 31				1988
	21.7	22 .1		21. 6
Moorefield - NS2				1988
	17.33			
Fox - S				1988
	3.19 . 3			9. 5
	3 . 9			
Fox - S				19874
	5.38.8			18.2
	21.4			

13 . Intensive shooting as described In MOW*.

2NS . No shooting. We had no damage assessment from Moorefield Grove for 1987. We performed a damage assessment In July before beginning procedure 3pre-treatment damage levels. Damage levels from previous yeaa.

Table 3 . -Estimated cost of pyrotechnic and nest removal treatments.

Treatment	Type	ROM	Coat/ units($)	Total COSt($)
14 days	pyrotechnic	shells	0.13	173.71
14 days		labor	3 , 3,5	279.74
14 days		cannon, 1	2.00	4.00
removal		labor		
40 10 min				

1 Cost/cannon was $450. 00 in 1988 and was amortized over the estimated 20-yr lifespan of the cannon.

Table 4.--Effects of nest removal on damage rates to citrus fruit.

Treatment	Mean Damage % by Month All A
Nonmacher - T 1	1.1
	2 . 8
	2 . 7
Nonmacher - C2	1. 2
	1. 4
	1. 5
	2 .1
(physical pair)	
Siflnez - T	23.0
	32.2
	37.5
	30.1
Sipnez - C	15.0
	17.3
	40.5
	37. 4
(temporal pair)	

1 T - Treatment (nest removal). 2 C - Control (no nest removal).

Annual Cycle of Behavior and Movements of

Males begin leaving the large winter roosts in late March and early April, dispersing to breeding sites. These sites are widely dispersed throughout the Valley. In central Hidalgo County alone we located 56 nesting colonies in May, 1987. The colonies vary in size from 2-3 males with 5-10 females and nests in a single hackberry tree at a residence to thousands of nests in extensive thorn forest and citrus groves. Nests are deep, bag-like structures usually placed in the crown of a tree, 4 to 5-m above the ground. Preferred trees for nest placement include ebony (Pithecellobium flexicaule), brazil on condalia obovata hackberry (Celtic ***laevigata*** granjeno l6 pallid a), mature citrus, and giant reed Arundo donax Nest building begins in early April and reaches a peak in late April and early May (fig. 2). Females perform all of the brood-rearing duties: nest-building, incubation, brooding, feeding of hatchlings, and feeding of fledglings. Males defend perch sites in the colony and normally take no part in brood-rearing activities, although on one occasion we observed a male grackle defending a nest from an intruding female grackle. The nest had been left vacant by a radio-tagged female who had left to locate food for her newly hatched young. Female grackles readily **canibalize the nests of their neighbors.**

Radio-tracking data show that adult males during the breeding period (Apr - Jul) seldom move more than 1-km from their perch site, day or night, and spend more than 90% of their time at the site, as illustrated by the movements of male GP 104 (fig. 3). This bird was tracked from 22 April - 7 May and was never found more than 100-m from his perch site, which was located in the top of a mesquite Prosopis i l andulosa at Garza Brush. Some males, presumably mostly second year birds, tend to show little or no fidelity to a colony or perch site, and spend much of their time at watering or feeding sites. This was the case with GP 109 who was captured at a temporary pond formed by irrigation water across the road from Garza Brush, a chaparral nesting colony. He spent most of his time in a barnyard and pasture 2-km W of his capture point (fig. 3). He was tracked from 22 April - 26 May.

Nearly all females are involved with nesting and rearing of young from April - July, with a few birds continuing to nest into August. During this period, they seldom move more than 1-2-km from the nest site. The movements of female GP 110 are illustrative. She was captured at a pond in Garza Brush on 2 June and followed until 30 July (fig. 3). For most of this time, she made increasingly frequent trips between her nest near the road and the pond 1-km N of her nest, bringing food and water to her nestlings. However, on 28 July, she flew 6-km N to Wallace Marsh to roost and never returned to Garza Brush, presumably because her offspring were independent. Thereafter until her transmitter failed she was found in agricultural fields feeding with other grackles and roosting at night in the marsh with about 10,000 other grackles.

When the young hatch, they are fed primarily Lepidoptera larvae, which the females procure from nearby fallow fields. Seventeen females shot while returning to the nesting colony in the thorn forest of Garza Brush on Monte Cristo Road all had Lepidoptera larvae in their beaks. Females nearly always stop at a watering site on their return with food for their young, and dip the food into the water before flying on with it to the nest. Normal daytime temperatures exceed 37 C in the Valley from June September, so that water in the vicinity of a nesting colony is a critical factor.

Incubation lasts an average of 14 days, after which the young spend an average of 12 days as nestlings. After fledging, they accompany the mother for several days. They then join flocks of other newly independent young that congregate in hedgerows, brush patches, and cane stands in the immediate vicinity of water. During the post-breeding period from mid-July to September, grackles seldom move far from a watering site during the day. Both the adults and the young perform the pre-Basic molt during this time. In the evening, however, they collect in numerous small roost sites, generally located at marshes, cane fields, residential areas, native thorn forest; anywhere that provides a combination of tall, dense vegetation fairly close (1-2-km) to good feeding and watering sites. The movements of GP 166, a hatching year female followed from 10 August - 29 September, illustrate characteristic movement during this period (fig. 4).

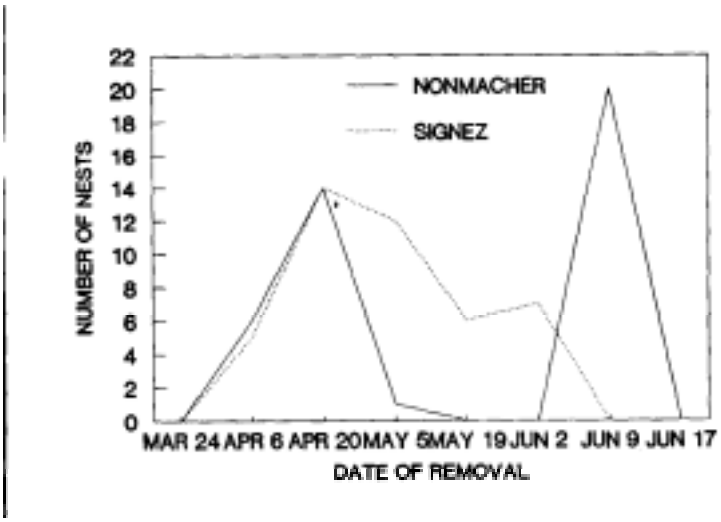

Figure 2: -Graph of bi-weekly counts of nests removed in 2 groves

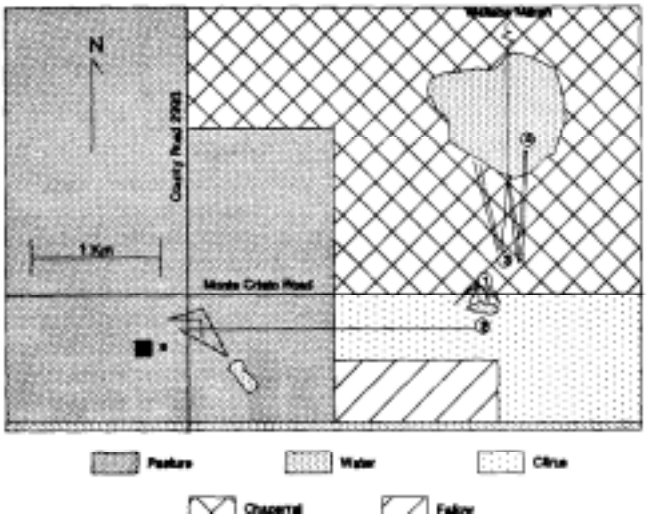

Figure 3. Movements of adult males GP 108 (1) and 109 (2) and adult female GP 110 (3) radio tracked the **June–July** peak of bra .

When the weather begins to cool in October, the birds range over much larger distances, and they begin to coallesce into larger roost sites, abandoning many of the smaller roosts.. Instead of restricting their activities to a 1-2-km circle around a dependable water supply, they fly several km in search of food At this time, and throughout the winter period (Oct-Mar), flying birds readily respond to the presence of other grackles feeding, so that a small flock following a tractor turning up grubs in an agricutural field can become a flock of several hundred individuals in a matter of minutes. Radio-tracking data on female GP 178 illustrate this moment (fig. 5). She was captured on 29 September at a roost in sugar cane. For the next week she moved from the roost to weed fields in the vicinity, but made a 20-km flight to the west on 14 October.

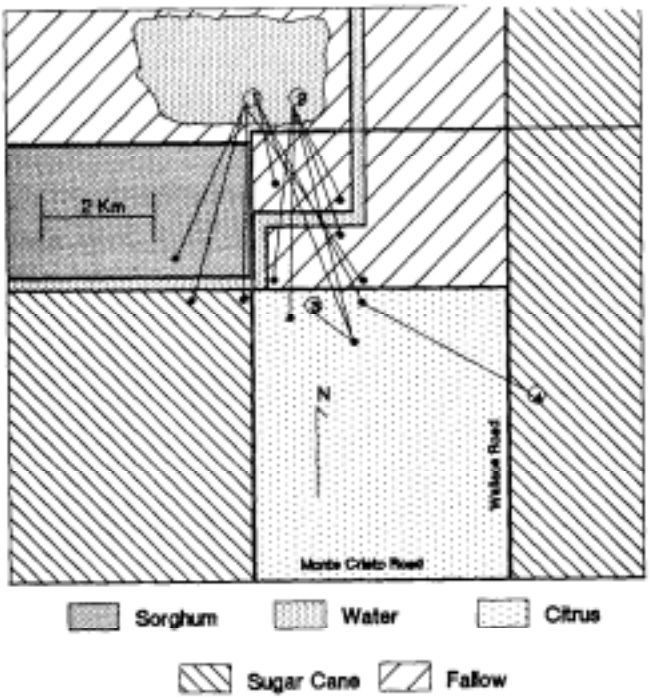

Figure 4. Movements of hatching year female GP 166, tracked from 10 August to 29 September. Circled numbers are roost sites.

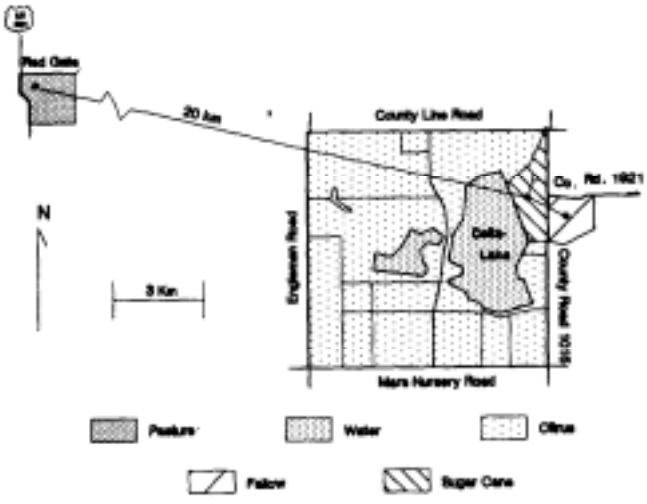

Figure 6.-AAwemerda of hatching year female GP 178 tracked from 29 September to 14 October.

There is an influx of birds from the north in November. Unfortunately, we were unable to document the amount of movement into the area, but migration clearly increases the number of birds wintering in the Valley from November until March when the winter roosts break up.

DISCUSSION

The annual cycle of the great-tailed grackle in the lower Rio Grande Valley of Texas has clear effects on the efficacy of damage reduction efforts in citrus. Nest removal had no measurable effect on reducing fruit damage because it did not cause the birds to abandon the grove. Males continued to display in the groves and were able to attract females right through the nesting season, despite the lack of success in rearing young. Grackle populations remained high in the groves until July so fruit damage continued until that time, at which point a large percentage of the fruit had already been damaged. We conclude that nest removal on is not a suitable method for controlling damage to citrus.

Disruption of the breeding colony by shooting does reduce the rate of damage to fruit. However, this method would be much more effective if instituted early in the season, i.e. late March or early April, before male territories and female nesting sites are established. By June, there were already 16.3 active nests/ha in Fox Grove, indicating that many individuals had their entire reproductive effort for the season committed to the grove. Given this circumstance, it is not surprising that they refused to abandon the grove despite heavy shooting pressure supplemented with scare techniques. Thus each breeding individual had to be shot to remove it from the grove.

Likewise, shooting in groves in the period immediately after breeding (Aug - Sep) required an intensive effort to reduce bird numbers, though damage was held in check by the procedure. We attribute this site tenacity during the post-breeding period to the fact that water is critical during this time, and any site that provides a combination of food, water, and cover in proximity to one another will be readily used by birds despite shooting and cannon pressure. Again, forcing birds out of the groves early in the season provides a good alternative. Failing that, poisoning with DRC-1339 at bait sites near water was successful during this period in some groves (Tipton et al. 1989, this volume).

In contrast to these equivocal results during the breeding and post-breeding periods, it appears that use of pyrotechnics (propane cannons and/or scare shells), offers an excellent deterrant during the winter period. At this time (Oct-Mar), birds forage over several km , and readily change their foraging site in response to relatively slight disturbances. A few noisemakers fired in the vicinity of flocks in groves, or even resting in trees near gros is normally sufficient to cause most of the grackles to leave the entire area.

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