



# pork industry handbook

MICHIGAN STATE UNIVERSITY EXTENSION

## Bird Management at Swine Facilities

Keywords: Bird damage, bird damage control, damage prevention, disease transmission, feed loss

### Authors

James F. Glahn, USDA/APHIS/ADC,  
Mississippi State University  
Ron J. Johnson, University of Nebraska-Lincoln  
Larry E. Germer, University of Nebraska-Lincoln

### Reviewers:

Palmer Holden, Iowa State University  
Duane Reese, University of Nebraska-Lincoln  
David E. Reeves, University of Georgia  
Charles M. Stanislaw, North Carolina State University

A number of bird species cause damage problems at swine production facilities in the United States. These include European starlings (*Sturnus vulgaris*), house sparrows (*Passer domesticus*), feral pigeons or rock doves (*Columba livia*), and several species of the blackbird family (*Icteridae*). The latter group includes common grackles (*Quiscalus quiscula*), red-winged blackbirds (*Agelaius phoeniceus*), and brown-headed cowbirds (*Molothrus ater*); but, within the blackbird group, cowbirds seem to be the most likely to frequent swine facilities.

### Bird Identification and Status

To assess bird damage and institute effective and safe prevention and control measures, identification of species present is essential. Although most are commonly recognized, bird identification field guides or bird control specialists can help, especially where there is uncertainty in identification. The following descriptions are provided to aid in identification:

**European Starlings.** The adult starling is a robin-sized bird that appears black at a distance but shows light speckles on

body feathers closer up. Juveniles are of similar size but are pale brown to grey in color. Starlings are chunky and humped-back in appearance with a short tail and wings that have a triangular shape when outstretched in flight (Figure 1). Starlings are only partially migratory with a portion of the population remaining as year-round residents. Outside the breeding season, starlings feed and roost in flocks and, each day, they may fly 15 to 30 or more miles from roosting to feeding sites.

**House Sparrows.** House sparrows are brownish birds about 5 3/4 inches long. The male has a distinctive black bib, white cheeks, and a gray crown. Female and juvenile birds, which are difficult to distinguish from some protected native sparrows, have a plain, dingy grey breast, dull buffy eye stripe, and streaked back (Figure 2). House sparrows are year-round residents and, except in dispersal, remain within a mile of their nesting areas.

**Pigeons.** Pigeons are distinctive 12 to 13 inch-long birds that are difficult to confuse with most other birds. Although typically blue-grey with a whitish rump and red feet, there also



Figure 1. Adult European Starling (*Sturnus vulgaris*).  
(Figure by Renee Lanik, University of Nebraska-Lincoln.)

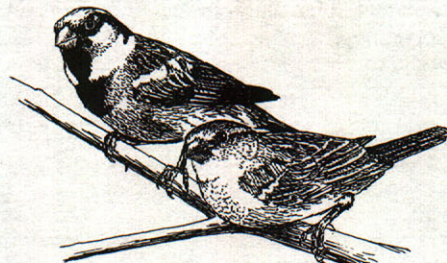


Figure 2. House sparrow, *Passer domesticus*. Male (left) and Female (right). (Figure by Emily Oseas Routman.)

are varieties with white, tan, red, and black, often multicolored. At take-off, pigeon wings often slap together and produce a clapping sound and, in flight, pigeons glide with wings raised at an angle (Figure 3). Like house sparrows, pigeons are year-round residents and, although they are strong fliers, pigeons normally range within 1 to 5 miles of their home site.



**Figure 3. Pigeons (Rock Doves), *Columba livia*.**  
(Figure by Emily Oseas Routman)

**Blackbirds.** Blackbirds as a group vary in size, but adult males are mostly black and females are smaller than males. Brown-headed cowbirds are sparrow-sized birds. Adult males are black with a dark brown head but females and juveniles are slate grey. Common grackles, the largest of the group, have a long wedge-shaped tail and, from a distance, all appear to be black. Adult males are black with an iridescent purplish or bronze appearance whereas females and juveniles are less shiny and more brown. Adult male red-winged blackbirds are all black with red shoulder patches, but the red is visible mostly during territorial displays. Female and juvenile redwings are somewhat sparrow-like in appearance but are streaked underneath, and their bills are longer than those of sparrows. Blackbirds are exclusively migratory in that they breed in northern latitudes during spring and summer and migrate in the fall to winter primarily in the southern United States. Like starlings, blackbirds are wide-ranging and daily movements may range up to 15 to 30 miles or more.

**Status.** European starlings, house sparrows, and pigeons are not protected by federal laws, nor, in most cases, by state laws. These three species were introduced as exotics into the United States and eventually became well established and widely distributed. In contrast, blackbirds are all native to the United States and are protected under the federal Migratory Bird Treaty Act, an international treaty with Canada, Mexico, and certain other countries. Because of their known conflicts with agriculture and people, however, this Act provides that blackbirds may be controlled without a federal permit when found "committing or about to commit depredations upon ornamental or shade trees, agricultural crops, livestock, or wildlife, or when concentrated in such numbers and manner as to constitute a health hazard or other nuisance." State laws may

provide additional protection for blackbirds and may require permits to control them.

## Bird Conflicts With Swine Production

The most common areas of complaint about bird damage at swine production units include bird consumption of livestock feed, contamination of feed or facilities with droppings, and transmission of diseases (Table 1). Economic assessment of bird damage is difficult because the impacts vary not only with the species involved and numbers present, but also with where they are feeding and roosting, as well as how these activities compete or interact with the swine herd and production system.

Starlings and to a lesser extent pigeons provide the greatest potential for problems through feed consumption, contamination with droppings, and disease transmission. In contrast, blackbirds wintering in the southern United States can appear in fields or around farms periodically in enormous numbers (tens of thousands); but, because their foraging is primarily in fields, they may not conflict with livestock and may in fact provide benefits through their consumption of insect larvae, weed seeds, and waste grain.

**Feed Consumption.** Feed losses vary with the number of birds present as well as with their feed consumption capabilities, feeding preferences, and behavior of each species. Blackbirds and starlings eat mostly insects during warm-weather months; but in winter, a large portion of their diet is grain. Pigeons and house sparrows eat grain, seeds, and other vegetable matter year-round. Feed grains, such as corn, are a preferred food of pigeons, house sparrows, and blackbirds. Starlings, although also consuming corn and other feed grains, prefer high-protein foods, such as white grubs and foods associated with feeder pig diets. Bakery products, which are sometimes used as hog feed, also are relished by starlings. The protein and fat content in these products are dietary components important to wintering starlings.

When at livestock facilities, some bird species eat more than others. For example, starlings are only about one-third the size of pigeons but eat about the same amount, in part because starlings are adapted to other food types (Table 2). The inefficiency of starling digestion of feed grains appears to be why they consume much more feed and consequently produce more bird droppings than most birds their size. Since most of these consumption rates are based on data gathered in cage tests, the actual consumption by free ranging birds, particularly in winter, may be slightly higher.

Economically important feed losses usually occur only when large bird populations are present at a farm for several months. Limited information is available for swine operations, but studies in England indicated that a small population of approximately 50 starlings removed 8% of a pelleted pig starter ration exposed in creep feeders at a cost of approximately \$5 per week. At other livestock feeding operations, estimated or measured feed losses have never been reported to exceed 12%.

Although feed losses may be dependent on the number of birds present at the farm, the economic loss is largely dependent on whether the birds consume feed in direct competition with livestock. Spillage around flip-top feeders at swine facilities may attract large numbers of birds, but may not

**Table 1. Potential for conflict when flocks of various pest bird species are at swine facilities.**

Conflict	European starling	House sparrow	Rock dove (Pigeon)	Blackbirds
Feed consumption	High	Low-moderate	Moderate-high	Moderate
Contamination with droppings	High	Moderate	Moderate-high	Low
Disease transmission	Moderate	Low-moderate	Low-moderate	Low
Roosting/nesting	High	Moderate-high	Moderate-high	Low-none

**Table 2. Bird weight and expected feed consumption for birds that commonly use livestock feeds, based on cage tests with adult birds; consumption rates for free-ranging birds may be higher.**

Species	Bird weight grams (ounces)	Daily feed consumption grams (ounces)
European starling	85 (3)	28 (1)
Rock dove (pigeon)	285 (10)	28 (1)
Common grackle	120 (4.3)	22 (0.8)
Red-winged blackbird	63 (2.3)	11 (0.4)
Brown-headed cowbird	45 (1.6)	11 (0.4)
House sparrow	27 (1)	8.3 (0.3)

constitute a large economic loss. Feeding swine on the ground has been shown to attract large numbers of birds, particularly blackbirds. However, if the diet is fed in the late afternoon when few birds are present and is limited so that swine consume it in a single feeding, negligible economic loss might be expected.

**Contamination And Destruction of Property.** Contamination of feed or property with droppings is primarily associated with starlings, pigeons, and house sparrows. Although some droppings may accumulate at daytime perching sites, worse problems occur at large night roosts such as in barns, silos, and other structures. After repeated occupation of roost sites, large deposits of bird droppings can accumulate on or under the areas where they perch. These deposits are not only foul smelling, but also corrosive to metal surfaces, and may pose a human health risk from the fungal disease histoplasmosis. In some situations, feed can be contaminated where it is exposed in feeders or in storage.

Contamination of feed with bird droppings appears not to affect feed consumption or weight gain in pigs. Western Kentucky University compared groups of pigs fed either clean feed or feed contaminated with various levels of bird droppings. Results showed that although the pigs generally preferred the clean feed when offered a choice, bird droppings, even at high levels, did not result in significant differences in weight gains or feed efficiency. Contamination of large quantities of stored feed, however, may over time result in spoilage and more significant losses.

Although house sparrows are smaller in size and produce fewer droppings, they can be a nuisance by building nests in almost any crevice in buildings or equipment around the farm, in some cases posing a fire hazard. House sparrows nesting in insulated buildings also have caused damage by pecking at and removing insulation materials.

**Disease Transmission.** Probably the biggest concern about bird dropping contamination is the potential for animal disease transmission. For example, European starlings may contribute to the spread of transmissible gastroenteritis (TGE) among swine facilities. Pork producers in Tippecanoe County, Indiana, and Gage County, Nebraska reported decreases in the prevalence of TGE following coordinated starling control programs carried out during the winters of 1975-76 and 1979-80, respectively.

Although it is difficult to verify that birds act as vectors of livestock disease, a number of factors provide evidence that disease vectoring occurs. Studies at Iowa State University of starlings as a potential vector for TGE in pigs showed, under

experimental conditions, that the virus could be transmitted back and forth between pigs and starlings. TGE was identified in the intestinal tract of starlings where it appeared to remain sufficiently virulent to be infectious to pigs through starling feces. In Iowa, starlings foraged on average at three farms per day and certain individuals visited as many as 14 farms. At these farms, the TGE virus was isolated from the intestinal tract in 14% of the starlings examined. However, infected starlings were identified from as many healthy, virus-free farms as from those where the virus was present. Thus, it appeared that the extent of close interaction between the birds and pigs was possibly the most important factor in controlling the potential for disease vectoring. This Iowa study also examined house sparrows and found the TGE virus in 18% of the house sparrows at TGE-positive farms and in 10% from TGE-negative farms. However, the limited movements of house sparrows makes them less likely to be a disease vector between farms, although they might be a source of reinfection. It is important to realize that TGE also may be transmitted by people, stray animals, or infected swine added to the herd and that birds are only one factor in disease prevention plans.

In contrast to TGE, studies have shown that the virus responsible for pseudorabies does not survive within starlings long enough to be passed in their droppings. The potential for disease vectoring to pigs may involve other pest bird species and a number of disease organisms, but this remains poorly documented. For example, strains of Salmonella organisms have been isolated from starlings, pigeons, house sparrows, and blackbirds, and the bacterium responsible for avian tuberculosis was isolated from starlings at a farm where pigs had contracted this disease. Typically, disease organisms are isolated from only a very small percentage of birds sampled. Although infected birds may excrete these organisms in their feces, it has not been demonstrated that they remain infectious to pigs. Overall, the importance of birds as disease vectors is unclear, but there is enough evidence to warrant limiting the close association of certain birds with swine herds.

## Conflict Prevention and Damage Control

**Exclusion.** Exclusion can be a permanent solution by physically separating birds from stored feed, roosting sites, and interactions with the swine herd (Table 3). To prevent access, close all openings larger than 3/4-inch using plastic or nylon netting, hardware cloth, or other building materials. An alternative to netting is to hang heavy plastic or rubber strips over the opening to keep birds out while allowing tractor or animal access (Figure 4). Rubber strips hung from a pig shelter at the Mississippi State University Farm have excluded birds but allowed pigs to go through; these strips have been in place and effective for over five years. Where birds are causing problems by roosting on beams, ledges, or similar sites, place a wooden, plastic, or plexiglass covering over the ledge at a 45° angle, or install commercially available wire protectors (porcupine wires) (Figure 5), or attach netting to the underside of beams to exclude access to roosting sites (Figure 6). Soft, sticky substances like Roost-No-More®, Bird Tanglefoot®, and others, can temporarily exclude birds from roof beams and ledges. These are best placed on wide masking tape strips to facilitate removal and must be replaced periodically because dust and dirt coat the sticky surfaces. These substances may not work in cold temperatures, because they harden and lose their sticky consistency.

**Table 3. Likelihood of various controls effectively solving problems associated with pest bird flocks at swine facilities.**

Control techniques	European starling	House sparrow	Rock dove (Pigeon)	Blackbirds
Exclusion	High	High	High	High
Production practices	High	Moderate-high	Moderate-high	High
Frightening <sup>a</sup>				
Sight, sound	Moderate	Low-moderate	Low-moderate	Moderate
Chemical (Avitrol®) <sup>b</sup>	Moderate	Moderate	Moderate	Moderate
Toxic Baits (Starlicide®) <sup>c</sup>	High	Not effective	Moderate-high <sup>e</sup>	Moderate-high
Toxic perches (Rid-A-Bird) <sup>d</sup>	Moderate	Moderate	Moderate	Not registered
Trapping	Low	Moderate	Moderate	Low
Shooting	Low <sup>e</sup>	Moderate	Moderate	Low <sup>e</sup>

<sup>a</sup> Frightening effectiveness varies with north-south climate differences and with other factors that affect availability of alternative food or shelter resources.

<sup>b</sup> Effectiveness of Avitrol®, a chemical frightening agent, may result in part from bird mortality.

<sup>c</sup> Starlicide Technical® is registered in some states for control of pigeons but must be used in those states under supervision of USDA/APHIS/Animal Damage Control personnel.

<sup>d</sup> Toxic perches (Rid-A-Bird) are registered for use only by persons trained in bird control and, on farms, are recommended for use only inside buildings.

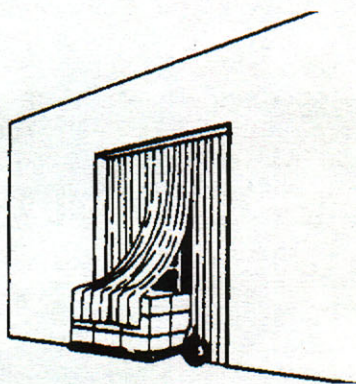
<sup>e</sup> Shooting has little effect on highly mobile starling or blackbird populations but may be of use as a frightening/dispersal technique.

Excluding access to stored feed is an important preventative measure in reducing bird problems. All feed should be stored in bird-proofed facilities. Flip-top feeders, commonly used to feed pigs outside, are effective in limiting feed access to birds, but lids and adjustments must be regularly maintained.

**Production Practices.** Swine production practices that create a less suitable environment for birds can prevent much of the associated problems. Swine feeds are a particularly attractive food source in the winter, when snow cover and frozen ground impedes feeding in other areas. Birds require a steady food supply to sustain their high metabolic demands. Typically, large bird flocks at swine units are associated with large quantities of palatable feed accessible to birds throughout the day. An important bird control approach is to avoid constant daily exposure of feed to birds during the daylight hours.

The following practices used singly, or preferably in combination, will reduce feed loss, contamination, and the chances of disease transmission, as well as the cost and labor of direct control measures.

1. Clean up spilled grain and adjust equipment to prevent spillage.
2. Properly adjust feeders so that feed is not wasted, and repair or replace worn-out feeders that have holes that spill feed.



**Figure 4. Hanging plastic or rubber strips such as these exclude birds, but allow equipment and animal access.**

3. Where feed may be accessible to birds, use feed formulations that the birds cannot easily or rapidly swallow (>3/8 inch diameter pellet or ground meal). Avoid bird-preferred feed formulations such as small (3/16-inch or 1/4-inch) pellets, especially attractive to starlings, and cracked corn, which attracts blackbirds and sparrows.

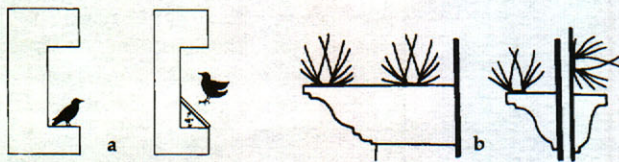
4. Where sows and boars on limited-energy feeding programs are fed on the ground or on concrete pads, adjust feeding schedules to late afternoon when few birds are present. This timing limits bird access because most birds are gone to roost and because the swine normally consume all the feed in a short time.

5. Use automatic waterers or adjust the water level in troughs so that birds cannot reach it when perching on the edge (about 4 inches below edge). At the same time, keep the water level deep enough so that they cannot stand in it (about 4 inches deep).

**Frightening Methods.** Frightening strategies may be useful in southern states when large wintering concentrations of blackbirds and starlings congregate at swine facilities to feed. In such situations, other natural food sources are available and frightening lowers the attractiveness of the livestock area. In the colder mid to northern states, winter frightening from livestock facilities is often ineffective because natural foods become covered with snow, frozen, or otherwise less available. At these times, control such as cultural methods, exclusion, and baiting generally are more effective. Attempts to frighten pigeons and sparrows usually are ineffective as are attempts to frighten all species in northern climates during winter. If disease transmission is a concern, frightening birds may be counterproductive because these actions may only temporarily disperse birds to other livestock facilities.

Conventional frightening devices, including distress calls, gas-operated exploders, pyrotechnics, and other noise-making devices usually are not recommended at swine facilities because of the possible disturbance to animals. Ultra-high frequency control devices, above the range of human hearing, are not effective because birds cannot hear them either. In contrast, visual scare devices, such as helium balloons, may be compatible with swine production and these have been shown to deter starlings. Balloons with eye spots and with some reflective surfaces appear to have greater effectiveness.

Avitrol® (active ingredient: 4-aminopyridine) is a Restricted Use Pesticide available in several bait formulations as a chemical frightening agent. Avitrol® baits contain a small number of treated grains or pellets. Birds that eat the treated portion of the bait react quickly (within about 10 to 20 minutes), behave erratically, and/or give warning cries that frighten other birds from the area. Generally, birds that eat the treated particles die. At low dilution rates (ratio of treated to untreated particles) many birds may be killed and, in these situations, it is unclear whether the effects of Avitrol® baiting is the result of frightening or bird mortality. Because there is a potential hazard to nontarget hawks and owls that might eat birds killed



**Figure 5. A board or metal covering over a ledge at a 45° angle (a) or porcupine wires (b) can be used to prevent roosting and nesting.** (Figure by Renee Lanik, University of Nebraska-Lincoln.)

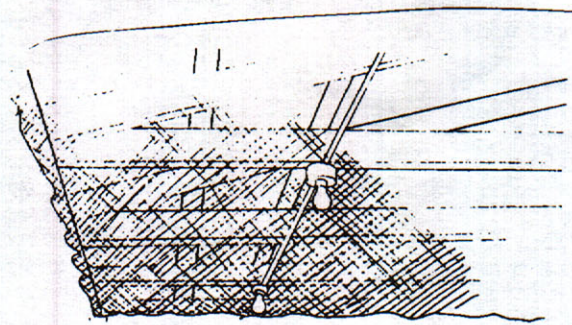
with Avitrol®, it is important to pick up and bury or incinerate any dead birds found. After baiting, it is also important to completely remove any unconsumed bait to reduce potential hazards to desirable species.

Although Avitrol® is registered and potentially useful for control of several pest bird species, the bait formulation and dilution needed varies with the species to be controlled. Avitrol® is designed as a frightening agent and its use in bird control requires some expertise. If Avitrol® baits are to be used, contact a qualified person trained in bird control for technical assistance (e.g., contact USDA/APHIS/Animal Damage Control or Cooperative Extension).

**Toxic Baits.** Starlicide® (3-chloro p-toluidine hydrochloride) is a toxicant originally developed for starling control and is commercially available as a pelletized bait (Starlicide Complete®) for controlling blackbirds and starlings at livestock feeding operations. Starlicide Technical® is registered in some states for formulation on other baits for control of starlings, pigeons, and blackbirds, but can only be used in those states under supervision of USDA/APHIS/Animal Damage Control personnel. Starlicide® is toxic to other birds in varying degrees, but house sparrows and mammals generally are resistant to its toxic effects. Birds die 24 to 36 hours after feeding, often at their roost, from a slow, non-violent death and there are no frightening effects. Because most of the toxicant is excreted before death, poisoned birds do not present a significant hazard to scavengers or predators. However, for good sanitation and to prevent the possible spread of disease that birds might carry, pick up and bury or incinerate any dead starlings found.

The following steps are recommended when using Starlicide Complete® in a starling control program at swine facilities:

1. Observe when and where starlings prefer to feed around the facility. The best time to observe is usually during the first few hours after sunrise.
2. Determine the kinds of birds that may be feeding with starlings. If protected birds such as doves or songbirds are present, contact your local Cooperative Extension office, USDA/APHIS/Animal Damage Control, or state wildlife agency for advice or help in identification. **Do not apply toxic bait if protected bird species are present.**
3. Time the bait application for cold days, particularly when snow covers the ground. Starlings become stressed for food during these periods and are more likely to consume the bait.
4. Prebaiting for one to four days is recommended. Use a non-poisonous prebait such as pig starter pellets that closely resembles the toxic bait in color, size and texture. Place this prebait near areas where starlings have been observed feeding but not accessible to livestock. If starlings do not consume prebait, try moving it to another location.
5. Elevated bait containers are recommended because they

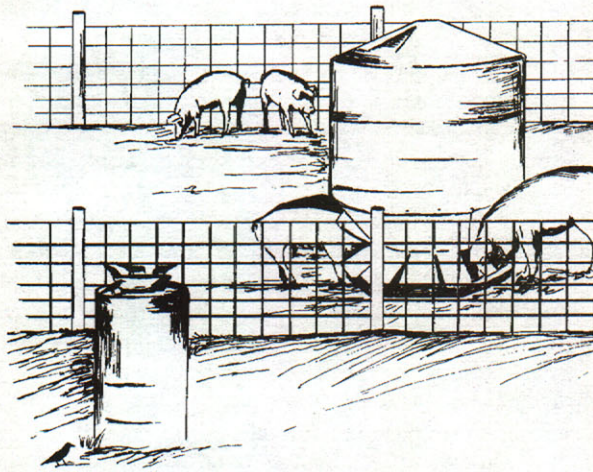


**Figure 6. Netting can be useful for excluding birds from building rafters.** (Figure by Jill Sack Johnson.)

allow efficient removal and less waste of bait (Figure 7). Black rubber feed pans work well for this; they are shallow, do not tip easily, and their dark color will not frighten birds. Other similar containers may also work, and large flat surfaces such as farm wagons could be effective. The advantage of bait containers is that they can be covered or moved into shelter during rain or snow storms. The bait must be exposed, however, before starlings arrive in the morning.

6. After starlings have consumed prebait, remove and replace it with Starlicide Complete®. Use only fresh bait (stored for less than 1 year). A large amount of bait usually is not needed (between 100 and 200 birds will be killed for every pound of bait consumed). Since the total number of starlings using a farm over time may greatly exceed the number seen on a given day, continue to bait for at least two or three days until bait consumption diminishes.
7. After bait consumption diminishes, remove all remaining bait. Evaluate the success of the control program by observing the numbers of birds at the farm over the next two or three mornings. Reduced numbers indicate success, because few birds will be found dead around the farm. If starling numbers are still unacceptably high or gradually return to unacceptable levels, then apply prebait and toxic bait as before (Steps 4 to 6). **Do not leave Starlicide Complete® exposed for prolonged periods because this may cause starlings to reject the bait and may increase hazards to protected bird species.**
8. For most effective control, consider coordinating control efforts with your neighbors. This is particularly important if there is concern about the potential of disease vectoring by starlings. Several farms baiting at the same time most likely will achieve better control in the least amount of time. Before initiating baiting efforts of this magnitude, notify local wildlife officials of your plans, so they are able to explain the potentially large starling die-off.
9. Remember that Starlicide Complete® is poisonous to chickens, turkeys, ducks, and some other birds. Never expose bait where poultry, livestock, or nontarget wildlife can feed on it. Do not re-package Starlicide Complete® into anything other than its original container; this would be unsafe and a violation of federal label law. Read and follow all label directions.

**Toxic perches.** Toxic perches are perforated metal tubes about two feet long that contain a wick saturated with contact poison that enters the birds' feet as they perch on the tube. Fenthion® (Rid-A-Bird 1100) is registered as a Restricted Use



**Figure 7. Well positioned bait containers, excluded from livestock, provide better safety and control in baiting programs.** (Figure by Renee Lanik, University of Nebraska-Lincoln.)

Pesticide for use in these perches by persons trained in bird control. Some areas may require local, state, or federal permits before use. Be aware that Fenthion® is absorbed through skin, so it is important to avoid contact with skin, eyes, and clothing. Use proper protective clothing as specified on the label and follow all safety and precautionary statements on the label.

At swine farms, toxic perches are used most often for removal of birds from inside machine sheds or equipment storage buildings where other control methods may not be feasible. Birds die within 24 to 72 hours after landing on a treated perch. Dead birds are likely to be found near treated sites but some may travel farther. Because birds killed by toxic perches may be harmful to animals that eat them, all dead birds should be picked up with protective gloves and either burned or buried. Outside use on farms is not recommended because of hazards to non-target birds that might land on the perches and to hawks and other predators or scavengers that might feed on affected birds. Avoid using toxic perches adjacent to open livestock feed to prevent possible contamination of feed with the chemical. Because proper perch placement is needed for effective control and because there are potential safety and non-target hazards, only persons trained in bird control are likely to safely and effectively control pest birds with this method.

**Trapping.** Trapping is usually an inefficient method for removing large populations of wide-ranging birds such as blackbirds and starlings. Traps have been used effectively, however, to remove small to moderate numbers of the less-mobile species, house sparrows and pigeons, especially in isolated situations where re-invasion is limited. Although some time is required to maintain and service traps, they do not present any significant non-target hazards if they are checked regularly. To achieve effective trapping success, prebait traps or trapping areas for one to two weeks before setting traps.

The most widely used pigeon trap is the "bob" trap, so called because of the swinging rods or bobs used at the entrance. Many styles of house sparrow traps are commercially available and effective in capturing house sparrows. Generally, the more effective house sparrow traps are automatic multi-catch traps that use counterbalanced perches or compartments to drop house sparrows into a holding compartment before resetting. Traps should be checked at least daily.

If any nontarget birds are captured, they should be released immediately. Except where laws or other legal restrictions apply, pest birds captured can be killed humanely using either carbon dioxide exposure or cervical dislocation (quickly breaking the neck).

Other more efficient capturing procedures used by professionals in bird control include mist nets for house sparrows and cannon nets or the immobilizing drug alpha-chloralose for pigeons. Consult USDA/APHIS/Animal Damage Control officials for possible use of these methods.

**Shooting.** Shooting is probably the most widely used method of bird control, but in many cases the least effective. Shooting highly mobile bird species such as blackbirds and starlings has little effect on population numbers, but may have some benefits for frightening and dispersing them temporarily. Shooting can be effective, however, in reducing small pigeon and house sparrow flocks in isolated situations where re-invasion is limited. Shooting house sparrows or pigeons at night while they are roosting (using a spotlight) is one approach that has been successful. Pellet guns or low-powered rifle ammunition such as .22 caliber shot shells (rimfire cartridge filled with fine shot) or .22 caliber rimfire CB cartridges (a reduced-power load with a small bullet) are available.

## Summary

Several species of birds can cause economic losses at swine production facilities through feed consumption; contamination of feed, water, equipment, and facilities with bird droppings; and potential disease transmission. Losses vary with the species and numbers of birds present; and, more importantly, with ways in which bird activities compete or interact with the swine herd. When large numbers of birds are present with swine, controlling them is often desirable even though an accurate assessment of the economic benefits may not be feasible. Prevention is generally the best strategy in bird management, using measures that either physically exclude birds or make facilities less optimal for their survival. Direct control measures to manage birds vary in effectiveness with the species, their numbers, and the nature of the problem situation. No one control measure is likely to resolve all problems caused by birds and several methods may be needed. Consult bird control specialists with USDA/APHIS/Animal Damage Control or Cooperative Extension where a bird problem is perceived. They can help assess the need for control and recommend the most cost-effective means of resolving the problem.

## Additional Information and Sources of Supply

Prevention and Control of Wildlife Damage. 1994. S. E. Hygnstrom, R. M. Timm and G. E. Larson, eds. University of Nebraska-Cooperative Extension. Lincoln, NE 683 pp.

Reference to products in this publication is not intended to be an endorsement nor a criticism of similar products not mentioned. Persons using such products assume responsibility for their proper use. Before using any pesticide, read the label and follow all recommendations. Following label instructions is important for safe and proper pesticide use and for helping to ensure continued registration and availability.