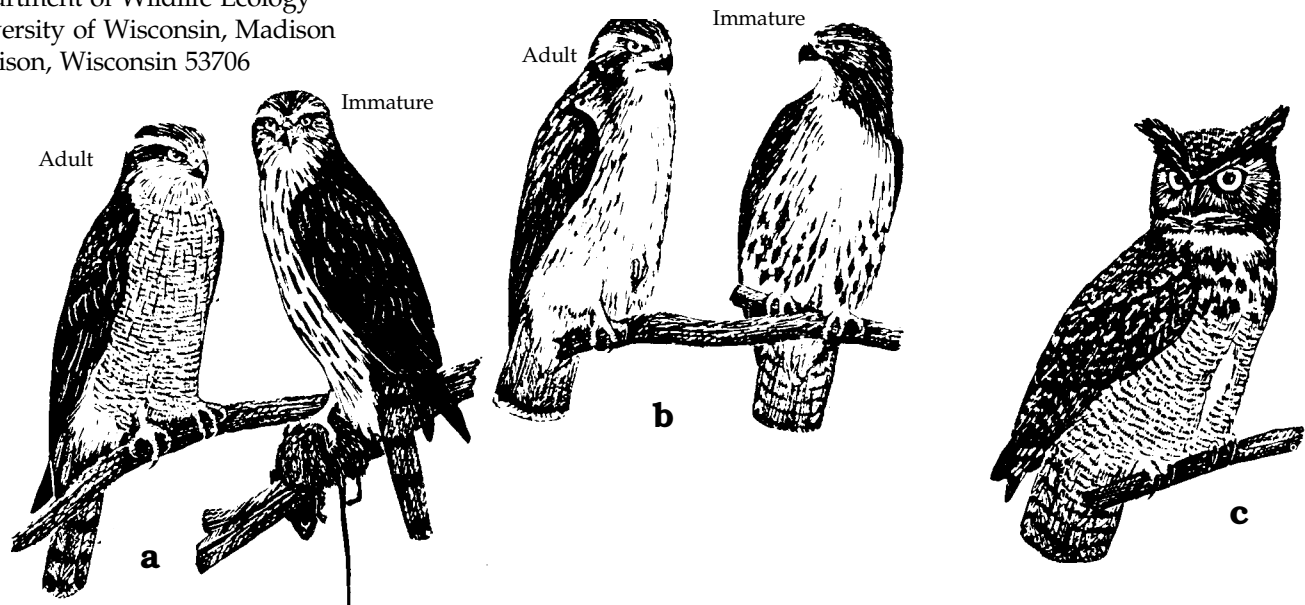


**Scott E. Hygnstrom**  
 Extension Wildlife Damage Specialist  
 Department of Forestry, Fisheries  
 and Wildlife  
 University of Nebraska  
 Lincoln, Nebraska 68583-0819

**Scott R. Craven**  
 Extension Wildlife Specialist  
 Department of Wildlife Ecology  
 University of Wisconsin, Madison  
 Madison, Wisconsin 53706

# HAWKS AND OWLS

Fig. 1. Raptors, representative of those that may cause damage by preying on poultry and other birds, pets, and other animals: (a) the goshawk (*Accipiter gentilis*), (b) red-tailed hawk (*Buteo jamaicensis*), and (c) great horned owl (*Bubo virginianus*).



## Damage Prevention and Control Methods

### Exclusion

Livestock confinement is the most effective control method, but it must be practical and economical.

Confine free-roaming fowl in enclosures covered with netting or woven wire.

Condition poultry and fowl to move into coops or houses by feeding and watering them indoors at dusk.

House them at night to protect them from owls.

### Habitat Modification

Eliminate perch sites near areas of potential damage by removing large, isolated trees and snags.

Install utility lines underground and remove telephone poles near poultry-rearing sites.

Cap poles with sheet metal cones, Nixalite®, Cat Claws®, or inverted spikes.

### Frightening

Use scarecrows and pyrotechnics.

Erect electric pole shockers when hawks or owls are observed around areas of potential damage.

### Repellents

None are registered.

### Toxicants

None are registered.

## Trapping and Relocating

State and federal permits are required to trap and relocate hawks and owls. If possible, experienced bird banders or trappers should do the trapping.

Landowners, however, can safely trap hawks and owls if they follow instructions and are careful when handling the birds.

## Shooting

State and federal permits are required to shoot hawks and owls. They may be issued only when there is a serious public health or depredation problem and when nonlethal control methods fail or are impractical.



## PREVENTION AND CONTROL OF WILDLIFE DAMAGE — 1994

Cooperative Extension Division  
 Institute of Agriculture and Natural Resources  
 University of Nebraska - Lincoln

United States Department of Agriculture  
 Animal and Plant Health Inspection Service  
 Animal Damage Control

Great Plains Agricultural Council  
 Wildlife Committee

## Introduction

Hawks and owls are birds of prey and are frequently referred to as raptors—a term that includes the falcons, eagles, vultures, kites, ospreys, northern harriers, and crested caracaras. Food habits vary greatly among the raptors. Hawks and owls are highly specialized predators that take their place at the top of the food chain. Some are responsible for the loss of poultry or small game. In the past, raptors were persecuted through indiscriminate shooting, poisoning, and pole trapping. The derogatory term *chicken hawk* was used generically to identify raptors, especially hawks, but has fallen out of usage during the past two decades. Recently, many people have developed a more enlightened attitude toward raptors and their place in the environment.

People who experience raptor damage problems should immediately seek information and/or assistance. “Frustration killings” occur far too often because landowners are unfamiliar with or unable to control damage with nonlethal control techniques. These killings result in the needless loss of raptors, and they may lead to undesirable legal actions. If trapping or shooting is necessary, permits should be requested and processed as quickly as possible. Always consider the benefits that raptors provide before removing them from an area; their ecological importance, aesthetic value, and contributions as indicators of environmental health may outweigh the economic damage they cause.

## Identification and General Biology

There are two main groups of hawks: accipiters and buteos. Accipiters are the forest-dwelling hawks. North American species include the northern goshawk (*Accipiter gentilis*), Cooper’s hawk (*Accipiter cooperii*), and sharp-shinned hawk (*Accipiter striatus*). They are characterized by distinctive flight silhouettes—relatively short, rounded wings and a long rudderlike tail. Their

flight pattern consists of several rapid wing beats, then a short period of gliding flight, followed by more rapid wing beats. Accipiters are rarely seen except during migration because they inhabit forested areas and are more secretive than many of the buteos.

The largest and least common, but most troublesome, accipiter is the goshawk (Fig. 1). It is a bold predator that feeds primarily on forest-dwelling rodents, rabbits, and birds. Occasionally, it is attracted by free-ranging poultry or large concentrations of game birds and can cause depredation problems. Its breeding range is limited to Canada, the northern United States, and the montane forests of the western United States. Spectacular autumn invasions of goshawks occur at irregular intervals in the northern states. These are probably the result of widespread declines in prey populations throughout the goshawk’s breeding range. Cooper’s hawks will occasionally cause problems with poultry; sharp-shinned hawks are rarely a problem because of their small size.

The buteos are known as the broad-winged or soaring hawks. They are the most commonly observed raptors in North America. Typical species include the red-tailed hawk (*Buteo jamaicensis*), red-shouldered hawk (*Buteo lineatus*), broad-winged hawk (*Buteo platypterus*), Swainson’s hawk (*Buteo swainsoni*), rough-legged hawk (*Buteo lagopus*), and ferruginous hawk (*Buteo regalis*). All buteos have long, broad wings and relatively short, fan-like tails. These features enable them to soar over open country during their daily travels and seasonal migrations.

The red-tailed hawk (Fig. 1) is one of our most common and widely distributed raptors. Redtails can be found over the entire North American continent south of the treeless tundra and in much of Central America. They demonstrate a remarkably wide ecological tolerance for nesting and hunting sites throughout their extensive range. Typical eastern redtails nest in mature forests and woodlots, while in the Southwest they often nest on cliffs or in trees and cacti. Their diet, although

extremely varied, usually contains large numbers of rodents and other small mammals. Redtails occasionally take poultry and other livestock, but the benefits they provide in aesthetics, as well as in the killing of rodents may outweigh depredation costs. Other species of buteos rarely cause problems.

Owls, unlike hawks, are almost entirely nocturnal. Thus, they are far more difficult to observe, and much less is known about them. They have large heads and large, forward-facing eyes. Their flight is described as noiseless and mothlike. There are 19 species of owls in the continental United States. They range in size from the tiny, 5- to 6-inch (12- to 15-cm) elf owl (*Micrathene whitneyi*) that resides in the arid Southwest, to the large, 24- to 33-inch (60- to 84-cm) great gray owl (*Strix nebulosa*) that inhabits the dense boreal forests of Alaska, Canada, and the northern United States.

The great horned owl (*Bubo virginianus*, Fig. 1) is probably the most widely distributed raptor in North America. Its range extends over almost all the continent except for the extreme northern regions of the Arctic. These large and powerful birds are considered to be the nocturnal complement of the red-tailed hawk. Great horned owls generally prey on small- to medium-sized birds and mammals and will take poultry and other livestock when the opportunity presents itself. They are responsible for most raptor depredation problems.

## Damage and Damage Identification

The most troublesome raptors are the larger, more aggressive species, such as the goshawk, red-tailed hawk, and great horned owl. The majority of depredation problems occur with free-ranging farmyard poultry and game farm fowl. Chickens, turkeys, ducks, geese, and pigeons are vulnerable because they are very conspicuous, unwary, and usually concentrated in areas that lack escape cover. Confined

fowl that are chased by raptors will often pile up in a corner, resulting in the suffocation of some birds. Reproduction may also be impaired in some fowl if harassment persists.

For years, game farms have dealt with raptor depredation problems. Large concentrations of game farm animals are strong attractants to predators. Operators should consider the prevention of predation as part of their cost of operation. Other depredation problems include the loss of rabbits at beagle clubs, the loss of homing and racing pigeons, and occasionally the loss of farm or household pets. Cooper's and sharp-shinned hawks occasionally prey on songbirds that are attracted to feeding stations. This should be viewed as a natural event, however, and control of the raptors is not advisable.

There are occasions when raptors cause human safety and health hazards. For example, concentrations of raptors at airports increase the risk of bird-aircraft collisions and loss of human life. The vast majority of aircraft strikes involve gulls, starlings, and blackbirds, but a few raptor strikes have been documented. It is interesting to note that falconers with trained hawks have been used to clear airport runways of other birds so that airplanes can land. Although raptors are usually secretive and choose to avoid human contact, they occasionally nest or roost in close association with humans. At such times, noise, property damage, and aggressive behavior at nest sites can cause problems.

Poultry and other livestock are vulnerable to a wide range of predators. Frequent sightings of hawks and owls near the depredation site may be a clue to the predator involved, but these sightings could be misleading. When a partially eaten carcass is found, it is often difficult to determine the cause of death. In all cases, the remains must be carefully examined. Raptors usually kill only one bird per day. Raptor kills usually have bloody puncture wounds in the back and breast from the bird's talons. Owls often remove and eat the head and sometimes the neck of their

prey. In contrast, mammalian predators such as skunks or raccoons often kill several animals during a night. They will usually tear skin and muscle tissue from the carcass and cut through the feathers of birds with their sharp teeth.

Hawks pluck birds, leaving piles of feathers on the ground. Beak marks can sometimes be seen on the shafts of these plucked feathers. Owls also pluck their prey, but at times they will swallow small animals whole. Many raptors (especially red-tailed hawks and other *buteos*) feed on carrion. The plucked feathers can often determine whether a raptor actually killed an animal or was simply "caught in the act" of feeding on a bird that had died of other causes. If the feathers have small amounts of tissue clinging to their bases, they were plucked from a cold bird that died of another cause. If the base of a feather is smooth and clean, the bird was plucked shortly after it was killed.

Raptors often defecate at a kill site. Accipiters such as the goshawk leave a splash or streak of whitewash that radiates out from the feather pile, whereas owls leave small heaps of chalky whitewash on the ground.

Hawks and owls regurgitate pellets that are accumulations of bones, teeth, hair, and other undigested materials. These are not usually found at the kill site, but instead accumulate along with whitewash beneath a nearby perch or nest site. Fresh pellets, especially of owls, are covered with a moist iridescent sheen. They can be carefully teased apart and examined to learn what the hawk or owl had been eating. Owls gulp their food and swallow many bones along with the flesh. These bones are only slightly digested and persist in the pellets. A pellet that contains large bones, such as those from the leg of a rabbit, is undoubtedly from a great horned owl. Hawks feed more daintily and have stronger digestive juices than owls. Thus, hawk pellets contain fewer bones.

## Legal Status

All hawks and owls are federally protected under the Migratory Bird Treaty Act (16 USC, 703-711). These laws strictly prohibit the capture, killing, or possession of hawks or owls without special permit. No permits are required to scare depredating migratory birds except for endangered or threatened species (see Table 1), including bald and golden eagles.

In addition, most states have regulations regarding hawks and owls. Some species may be common in one state but may be on a state endangered species list in another. Consult your local USDA-APHIS-Animal Damage Control, US Fish and Wildlife Service (USFWS), and/or state wildlife department representatives for permit requirements and information.

## Damage Prevention and Control Methods

### Exclusion

The ultimate solution to raptor depredation is prevention. Free-roaming farmyard chickens, ducks, and pigeons attract hawks and owls and are highly susceptible to predation. Many problems can be eliminated by simply housing poultry at night. They can be conditioned to move into coops or houses by feeding or watering them indoors at dusk. If depredation persists, durable fenced enclosures can be constructed by securing poultry wire to a wooden framework and covering the enclosure with poultry wire, nylon netting, or overhead wires (Fig. 2). A double layer of overhead netting separated by a 5- to 6-inch (12- to 15-cm) space may be necessary to keep owls away from penned birds. Large poultry operations rarely have depredation problems because most practice confinement.

### Habitat Modification

Habitat modification can make an area less attractive to raptors. Hawks and owls often survey an area from a perch prior to making an attack. Eliminate

**Table 1. Federally endangered or threatened raptors.**

Name:	California condor ( <i>Gymnogyps californianus</i> )
Status:	Endangered
Where	Endangered: US (California and Oregon), Mexico (Baja California).
Name:	Bald eagle ( <i>Haliaeetus leucocephalus</i> )
Status:	Endangered and Threatened
Where	Endangered: US (Conterminous states except Michigan, Minnesota, Oregon, Washington, and Wisconsin)
Where	Threatened: US (Michigan, Minnesota, Oregon, Washington, and Wisconsin)
Name:	American peregrine falcon ( <i>Falco peregrinus anatum</i> )
Status:	Endangered
Where	Endangered: Nests from central Alaska across northcentral Canada to central Mexico. Winters south to South America.
Name:	American peregrine falcon ( <i>Falco peregrinus tundrius</i> )
Status:	Threatened
Where	Threatened: Nests from northern Alaska to Greenland. Winters south to Central and South America.
Name:	Peregrine falcon ( <i>Falco peregrinis</i> )
Status:	Endangered
Where	Endangered: Wherever found in wild in the conterminous 48 states.
Name:	Hawaiian (lo) hawk ( <i>Buteo solitarius</i> )
Status:	Endangered
Where	Endangered: US (Hawaii)
Name:	Everglade (snail kite) kite ( <i>Rostrhamus sociabilis plumbeus</i> )
Status:	Endangered
Where	Endangered: US (Florida)
Name:	Palau owl ( <i>Pyroglaux [=Otus] podargina</i> )
Status:	Endangered
Where	Endangered: West Pacific Ocean: US (Palau Islands)

perch sites within 100 yards (90 m) of the threatened area by removing large, isolated trees and other perching surfaces. Install utility lines underground and remove telephone poles near poultry-rearing sites. Cap poles with sheet metal cones, Nixalite®, Cat Claws®, or inverted spikes. Improve rabbit escape cover at beagle clubs by constructing brush piles and cutting large trees to increase the density of shrub and ground cover. An abundance of rabbits will often attract raptors. Clubs should release only as many rabbits as are needed for an outing.

Hawks and owls that roost in buildings can be frightened away, or live trapped and removed. Close off all entryways after the birds are out of the building. Common barn owls are endangered in some states and rarely, if ever, cause damage to poultry. Their use of farm buildings, where sanitation problems associated with droppings pose no threat, should be encouraged. Consult your local wildlife agency for information on barn owls in your area.

### Frightening

There are many techniques that can be used to scare hawks and owls from an area where they are causing damage. Some are inexpensive and easy to use, while others are not. The effectiveness of frightening devices depends greatly on the bird, area, season, and method of application. Generally, if birds are hungry, they quickly get used to and ignore frightening devices. Frightening devices are usually a means of reducing losses rather than totally eliminating them. Landowners who use them must be willing to tolerate occasional losses.

Increasing human activity in the threatened area will keep most raptors at a distance. The most common and easily implemented frightening device is a shotgun fired into the air in the direction of (not at) the raptor. Scarecrows are effective at repelling raptors when they are moved regularly and used in conjunction with shotgun fire or pyrotechnics.

Pyrotechnics include a variety of exploding or noise-making devices. The most commonly used are shell crackers, which are 12-gauge shotgun shells containing a firecracker that is projected 50 to 100 yards (45 to 90 m) before it explodes. Fire shell crackers in the direction of hawks or owls that are found within the threatened area. An inexpensive open-choke shotgun is recommended. Check the gun barrel after each shot and remove any wadding from the shells that may become lodged in the barrel. Noise, whistle, and bird bombs are also commercially available. They are fired from pistols and are less expensive to use than shell crackers, but their range is limited to 25 to 75 yards (23 to 68 m). Your local fire warden can provide information on local or state permits that are required to possess and use pyrotechnics.

The electric pole shocker is a device developed by R.W. Schmitt of Sheboygan, Wisconsin, to protect game farms and poultry operations (Fig. 3). It has proven very effective in several different settings in Wisconsin. Each unit consists of a ground wire running 1 inch (2.5 cm) from and parallel to a wire that is connected to an electric fence charger. Install electrical shocking units on top of 14- to 16-foot (4- to 5-m) poles and erect the poles around the threatened area at 50- to 100-foot (15- to 30-m) intervals. When a raptor lands on a pole, it receives an electric shock and is repelled from the immediate area. Other perching sites in the area should be removed or made unattractive. Energize the shocking unit only from dusk until dawn for owls and during daylight hours for hawks.

The electric pole shocker keeps raptors from perching within a threatened area but does not exclude them from nesting in or using a nearby area. Most hawks and owls are highly territorial. A pair that is allowed to remain will aggressively defend the area and usually exclude other hawks and owls. Thus, farmers may actually find it beneficial to coexist with a pair of hawks or owls that have learned to avoid an area protected by pole shockers.

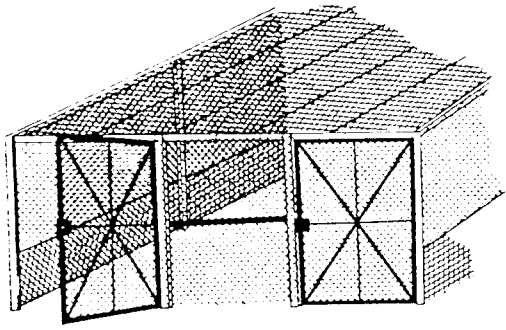


Fig. 2. A complete enclosure can protect fowl and livestock from hawk and owl predation.

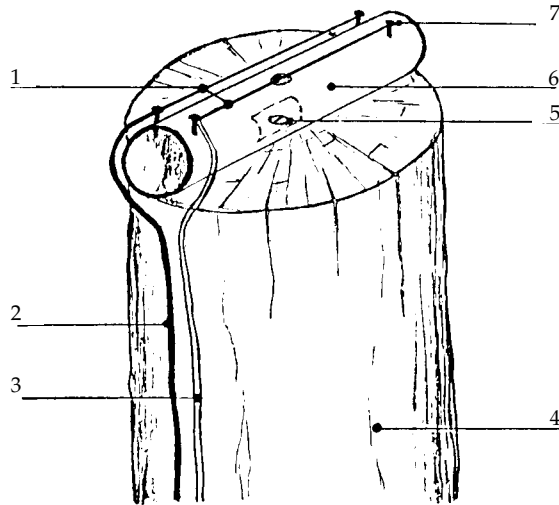


Fig. 3. The electric pole shocker.

- (1) uninsulated (exposed) 12-gauge (0.28-cm) copper, ground, and hot wires (no connection from ground to hot wire)
- (2) insulated wire to ground
- (3) insulated wire to fence charger
- (4) 14- to 16-foot (4- to 5-m) post
- (5) mounting screw
- (6) 1-inch x 6-inch (2.5- x 15-cm) self-insulating plastic pipe
- (7) 3/4-inch (0.2-cm) sheet metal screws with plastic expansion sleeve or tubing between head of screw and plastic pipe

### Repellents and Toxicants

No repellents or toxicants are registered or recommended for controlling hawk or owl damage. In years past, raptors were killed by putting out carcasses laced with poison. This practice led to the indiscriminate killing of many nontarget animals. Concerns for human safety also prompted the banning of toxicants for raptor control.

### Trapping and Relocating

A landowner must obtain a permit from the US Fish and Wildlife Service and usually the local state wildlife

agency to trap any hawk or owl that is causing damage. Trapping is usually permitted only after other nonlethal techniques have failed. Set traps in the threatened area where they can be checked at least twice a day. If possible, experienced individuals or agency personnel should conduct the trapping and handling of captured birds.

The Swedish goshawk trap is a relatively large, semipermanent trap that can be used to capture all species of hawks and owls (Fig. 4). It consists of two parts: a 3 x 3 x 1-foot (90 x 90 x 30-cm) bait cage made of 1-inch (2.5-cm) mesh welded wire. A trap mechanism consisting of a wooden "A" frame, nylon netting, and a trigger mechanism is mounted on the bait cage. A hawk or owl dropping into the trap will trip the trigger mechanism and be safely trapped inside. Pigeons make very good lures because they are

hardy, easily obtained, and move enough to attract hawks and owls. Other good lures include starlings, rats, and mice. For detailed information on the construction and use of Swedish goshawk traps, see Meng (1971) and Kenward and Marcstrom (1983).

The bal-chatri trap is a relatively small, versatile trap that can be modified to trap specific raptor species (Fig. 5). Live mice are used to lure raptors into landing on the traps. Nylon nooses entangle their feet and hold the birds until they are released. The quonset-hut type bal-chatri was designed for trapping large hawks and owls (Berger and Hamerstrom 1962). The trap is made of 1-inch (2.5-cm) chicken wire, formed into a cage that is 18 inches long, 10 inches wide, and 7 inches high at the middle (46 x 25 x 18 cm). The floor consists of 1-inch (2.5-cm) mesh welded wire with a lure entrance door and steel rod edging for ballast. The top is covered with about 80 nooses of 40-pound (18-kg) test monofilament fishing line (Fig. 5). Pigeons, starlings, house mice, and other small rodents can be used as lures. The trap should be tied to a flexible branch or bush to keep a trapped bird from dragging the trap too far and breaking the nylon nooses.

Spring-net traps are ideal for catching particular hawks or owls that are creating a damage problem (Fig. 6). Square spring nets, hoop nets, and the German "butterfly trap" have all been used successfully. A trap is baited by attaching the partially eaten carcass of a fresh kill or a stuffed bird to the trigger bar. The trap should be camouflaged by covering the frame and folded net with leaves and feathers from the kill. For detailed information on spring-net traps see Kenward and Marcstrom (1983).

Problem hawks and owls can be trapped safely using the sliding padded pole trap because of their tendency to perch prior to making an attack (Fig. 7). Erect 5- to 10-foot (1.5- to 3-m) poles around the threatened area where they can be seen easily and place one padded steel leghold

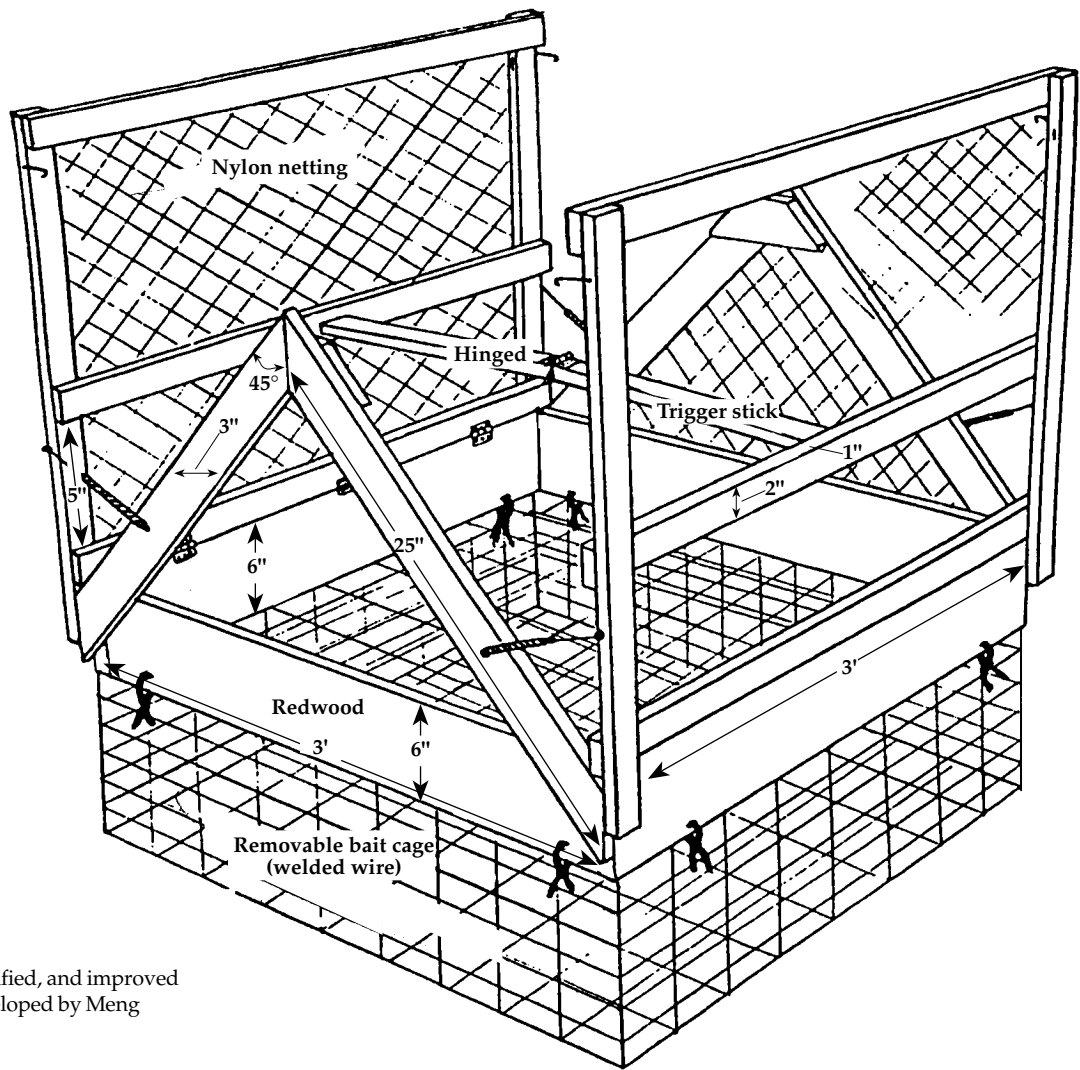


Fig. 4. The redesigned, modified, and improved Swedish goshawk trap developed by Meng (1971).

trap (No. 1 1/2) on top of each pole. The jaws must be well padded with surgical tubing or foam rubber and wrapped with electrician's tape. Run a 12-gauge steel wire through the trap chain ring and staple it to the top and bottom of the post. This allows the trap to slide to the ground where the bird can rest. Some states prohibit the use of pole traps.

**Handling and Transportation.** If necessary, landowners can safely handle and transport hawks and owls. The key to successful raptor handling is to control the bird's feet. The talons can easily grasp a careless hand and inflict a painful injury. There is significantly less chance of injury from the wings and beak. The safest approach, regardless of the type of trap, is to toss an old blanket or coat over both the bird and trap. The darkness will calm

most birds and make them less able to defend themselves. Reach in carefully with your bare hands and grasp the bird's lower legs. Control the feet to avoid getting "footed." Pull the bird out of the trap so that it is clear of any object on which it could injure itself. Fold the wings down against the body and hold them securely. Check the bird for any signs of external injury, such as cut feet or legs, excessively battered feathers, or scalping (the splitting of the skin over the forehead). If the bird is injured, have a local veterinarian examine it, or in extreme cases, transport it to the nearest raptor rehabilitation center.

Raptors should be restrained before they are transported to reduce the chances of injury to both the bird and handler. The best transport container is a stout, covered cardboard box.

Select a box that is large enough for the bird to stand upright in. Holes should be punched near the bottom of the box to supply fresh air and keep the raptor from struggling toward any cracks of light coming from the top of the box. Carry only one bird per box. Tape an old rag or towel to the floor to provide a good gripping surface to keep the bird from slipping. If a burlap bag must be used to transport the bird, tie the bird's legs together with a nylon stocking to keep it from footing someone during transport or release. If possible, ask a local bird bander to attach a leg band. Banding information can be very useful to the research and management of raptors.

Transport the bird as quickly and comfortably as possible. Minimize excess handling, and above all, keep the bird calm and cool. More birds die

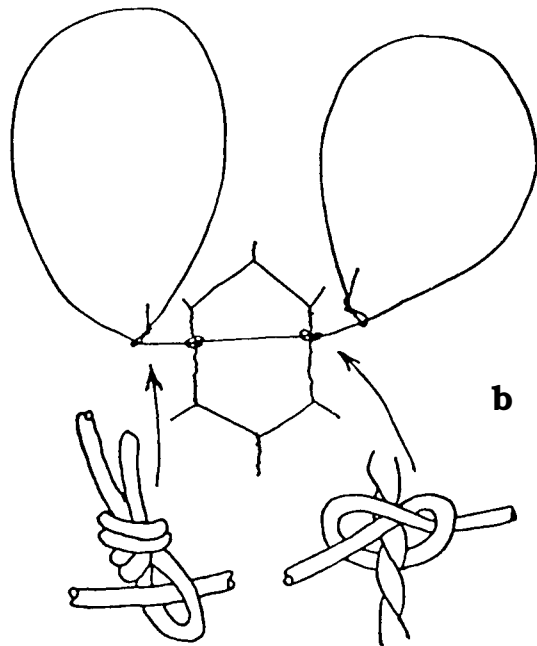
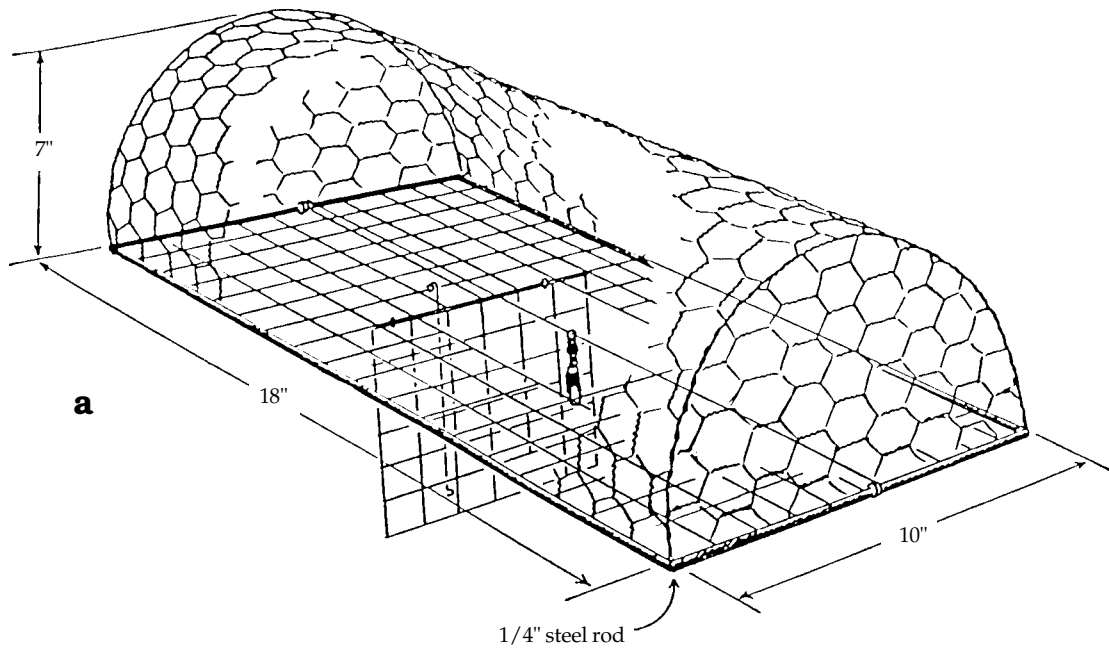
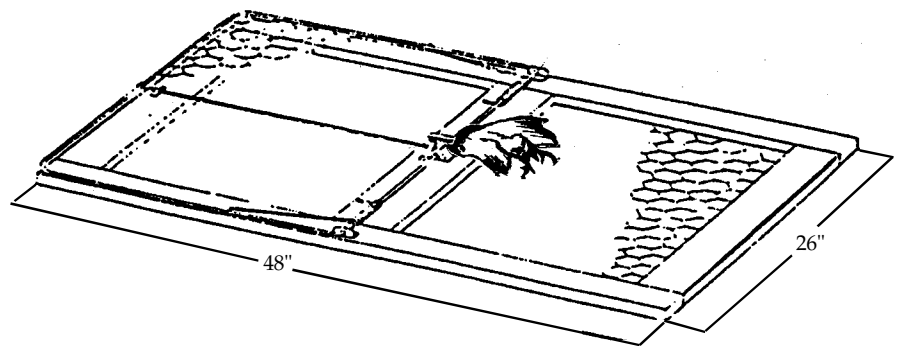


Fig. 5. (a) Big bal-chatri trap ready for nooses (door is open). (b) Method of attaching nooses.

Fig. 6. Automatic spring-net trap in set position; inset with bait.



of overheating during shipment than of any other cause. Transport the bird as far away from the trapping site as possible. Some biologists believe that 20 miles (32 km) is sufficient, but raptors have been known to travel up to 200 miles (320 ) km after release. If a bird is trapped in the fall, help it along its way by transporting it southward.

### Shooting

All hawks and owls are protected by federal and state laws. There are cases, however, in which they can create public health and safety hazards or seriously affect a person's livelihood. Contact your local USDA-APHIS-ADC office first if you are interested in obtaining a shooting permit. The USFWS and state wildlife agencies may issue shooting permits for problem hawks and owls if nonlethal methods of controlling damage have failed or are impractical and if it is determined that killing the offending birds will alleviate the problem.

Permittees may kill hawks or owls only with a shotgun not larger than 10-gauge, fired from the shoulder and only within the area described by the permit. Permittees may not use blinds or other means of concealment, or decoys or calls that are used to lure birds within gun range. Exceptions to the above must be specifically authorized by USFWS. All hawks or owls that are killed must be turned over to USFWS personnel or their representatives for disposal.

### Economics of Damage and Control

In 1985, we conducted a national survey of US Fish and Wildlife Service and Cooperative Extension personnel. Nearly all noted that the economic damage caused by raptors is minimal on a national scale, but can be locally severe if depredation occurs on fowl or livestock that are relatively valuable and vulnerable.

Cost estimates of damage ranged from \$10 to \$5,000 per report and from \$70 to \$94,000 per year. The severity of

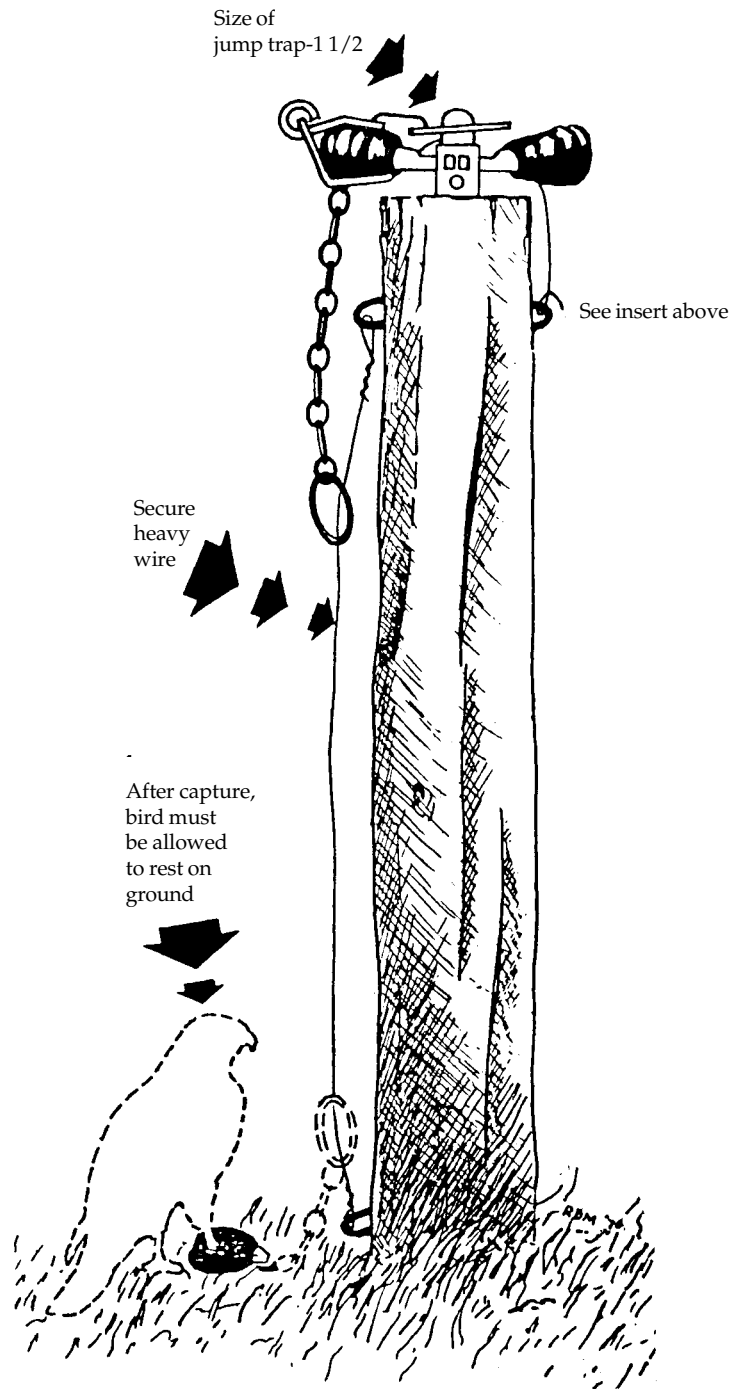
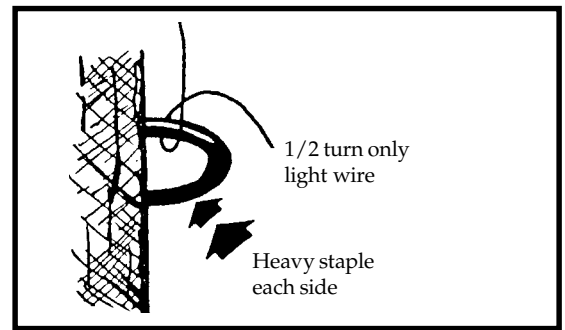


Fig. 7. Sliding padded pole trap.



raptor problems is influenced by several factors, including prey and carrion abundance, weather, time of year, husbandry methods, vegetative cover, and topography as well as density and local distribution of raptors.

## Acknowledgments

We wish to thank Fran and Frederick N. Hamerstrom for their comments on early manuscripts and information regarding the handling of raptors. Reviewers included Richard H. Behm, James L. Ruos, Leroy W. Sowl, V. Dan Stiles, and Richard Winters. Eldon L. McLaury reviewed the manuscript and provided legal information.

Figure 1 by Elva Hamerstrom Paulson, from Hamerstrom (1972).

Figure 2 from Salmon and Conte (1981).

Figure 3 by the authors.

Figure 4 from Meng (1971).

Figure 5 from Berger and Hamerstrom (1962).

Figure 6 from Kenward and Marcstrom (1983).

Figure 7 from US Department of Interior, Bulletin 211-1-77.

## For Additional Information

- Berger, D. D., and F. Hamerstrom. 1962. Protecting a trapping station from raptor predation. *J. Wildl. Manage.* 26:203-206.
- Hamerstrom, F. 1972. Birds of prey of Wisconsin. Wisconsin Dep. Nat. Resour. 64 pp.
- Hamerstrom, F. 1984. Birding with a purpose. Iowa State Univ. Press, Ames. 130 pp.
- Heintzelman, D. S. 1979. Hawks and owls of North America. Universe Books, New York. 197 pp.
- Karlbom, M. 1981. Techniques for trapping goshawks. Pages 138-144 in R. E. Kenward and I. Lindsay, eds. *Understanding the goshawk*, Internat. Assoc. Falconry Conserv. Birds of Prey.
- Kenward, R. E., and V. Marcstrom. 1981. Goshawk predation in game and poultry: some problems and solutions. Pages 152-162 in R. E. Keward and I. Lindsay, eds. *Understanding the goshawk*. Internat. Assoc. Falconry Conserv. Birds of Prey.
- Kenward, R. E., and V. Marcstrom. 1983. The price of success in goshawk trapping. *Raptor Res.* 17:84-91.

- Meng, H. 1971. The Swedish goshawk trap. *J. Wildl. Manage.* 35:832-835.
- Newton, I. 1979. Population ecology of raptors. Buteo Books, Vermillion, South Dakota. 399 pp.
- Peterson, L. 1979. Ecology of great horned owls and red-tailed hawks in southeastern Wisconsin. Wisconsin Dep. Nat. Resour. Tech. Bull. 111. Madison. 63 pp.
- Salmon, T. P., and F. S. Conte. 1981. Control of bird damage at aquaculture facilities. WML No. 475. US Dep. Inter. Fish Wildl. Serv., Washington, D.C. 11 pp.
- US Fish and Wildlife Service. (no date). Raptor control-protecting livestock from hawk and owl predation. US Dep. Inter. An. Damage Control Bull. 211-1-77.

## Editors

Scott E. Hygnstrom  
Robert M. Timm  
Gary E. Larson

