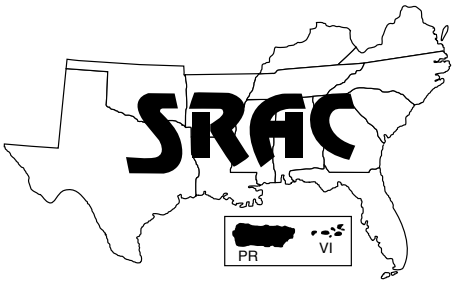
SRAC Publication No. 402

Southern
Regional
Aquaculture
Center



October 1997
Revision

Control of Bird Predation at Aquaculture Facilities:

Strategies and Cost Estimates

Gary A. Littauer[1], James F. Glahn[1], David S. Reinhold[1] and Martin W. Brunson[2]

Bird predators cause significant losses of commercially produced aquaculture products in the southeastern United States. A wide variety of species are implicated, depending on the location and type of farm. Cormorants, wading birds, pelicans, and even ducks and blackbirds forage at commercial catfish, crawfish, baitfish, ornamental fish, and trout farms. Most birds are protected by state and federal laws, so most fish farmers must rely primarily on nonlethal techniques to accomplish control objectives. Although much is yet to be learned about controlling bird damage at aquaculture facilities, producers can optimize current control efforts by understanding and considering the logic, costs, and limitations of different techniques and by developing integrated strategies for their use.

Factors in deciding on control

Producers should first determine whether birds are causing economic losses in order to decide whether control is **economically justified**. It is important to identify the species of bird predators using the facility and to determine the size and species of fish available in ponds. Herons, egrets, and other wading birds cause significant losses at some trout, baitfish, and ornamental fish farms. For instance, at trout-rearing facilities, foraging by great blue herons can result in production losses up to 39 percent. However, at some catfish farms great blue herons and great egrets may have a negligible impact on catfish production because they forage primarily on wild noncommercial fish or sick catfish. Likewise, although cormorants and pelicans cause significant losses at many catfish and other large pond culture farms, when shad are abundant in ponds, cormorants prefer and, appear to feed almost exclusively on, these species.

Potential damage is greater for some species of birds than for others. For example, a double-crested cormorant requires approximately 1 pound of food per day; a great blue heron requires 2/3 to 3/4 pound; a great egret about 1/3 pound, and a white pelican 1 to 3 pounds per day. Additionally, potential losses may be higher than one would estimate by consumption alone because birds often wound fish that they do not eat. The importance of birds as vectors of fish diseases has yet to be determined.

Where only a few birds are present, aggressive scaring programs may not be economically justified unless there is a risk that more birds will be attracted to the facility by the ones already present, or there is a limited, but particularly high value, crop that must be protected. SRAC Publication No. 400, *Avian Predators on Southern Aquaculture*, contains information on potential losses producers can expect from a number of bird species.

Physical characteristics of farms or production facilities must also be considered when determining appropriate control strategies. Size of ponds or production units is an important factor in determining whether exclusion or frightening techniques would be more cost effective. For example, birds can be economically excluded or deterred from most concrete raceways or small ponds by using netting or barrier wires, but such measures will generally be too expensive on larger ponds and facilities. In such situations, frightening programs usually must be used to control bird damage.

Frightening programs

On facilities with large ponds and heavy bird predation, an effective frightening program can require continuous harassment of bird predators by one or more employees driving pond levees. Pyrotechnics and/or live ammunition are fired from vehicles to scare birds away. Recorded distress calls

[1]USDA/APHIS/Wildlife Services
[2]Cooperative Extension Service, Mississippi State University

and/or electronic noises can be broadcast from vehicle-mounted speaker systems to supplement scaring efforts. One person can usually cover up to 500 acres if ponds are located in one contiguous complex and levee roads are in sufficient condition to allow continuous traffic. An all-terrain vehicle may be necessary if levees are easily damaged or wet weather hampers access.

A scaring program must be consistent and aggressive to be successful. When the potential for bird predation is at its worst, bird patrols should be conducted seven days a week from morning to evening. When birds come to the farm only during certain periods of the day such as morning and evening, employing scaring efforts only during those periods may be adequate. Scaring programs to deter pelicans, night herons, and to a lesser degree, great blue herons may have to be conducted at night as well as during the day because these species feed at night.

Scaring programs should be started when birds first arrive, before they establish feeding habits at aquaculture ponds. On facilities that suffer chronic cormorant depredation in winter, a scaring program should be started in the fall when the first birds arrive. Cormorants have reportedly stopped coming to some farms for a month or more after initial aggressive scaring efforts.

Birds arriving later in the season often follow those that are already present to feeding areas. Conditioning the early birds to avoid production ponds may thus reduce damage by later arrivals. Control measures may have to be applied throughout the season at farms located in major daily flight paths of fish-eating birds or near large roosting areas.

Cormorant roost dispersal programs

Dispersing cormorants from night roosts can reduce depredation at nearby aquaculture farms. The number of cormorants visiting fish farms near roosts can be reduced by 70 to 90 percent when roost dispersal programs are implemented. Dispersing birds from night roosts can be logistically difficult because it requires from one to eight people firing pyrotechnics for approximately 2 hours as birds arrive in the evening. Cormorants usually abandon roost sites, at least temporarily, after 2 or 3 consecutive nights of harassment with pyrotechnics. For best results, night roosts should be patrolled weekly to prevent birds from returning, and all roost sites within a 15-mile radius of fish production areas should be harassed simultaneously. Roost dispersal will not eliminate the need to harass birds on ponds, but it will substantially reduce the amount of harassment needed on farms where birds are causing severe problems.

Augmenting frightening programs

Supplemental frightening devices can enhance the effectiveness of harassment patrols at both farms and roost sites. SRAC Publication No. 401, *Avian Predators – Frightening Techniques for Reducing Bird Damage at Aquaculture Facilities*, describes several devices that can be used to frighten avian predators. Automatic exploders have been used effectively to supplement cormorant harassment in more remote night roost sites. Exploders at production sites should be turned off after sunset to prevent habituation and to avoid harassment of other wildlife. Where birds are scared easily by the presence of humans or vehicles, a few strategically placed exploders and scarecrows (human-shaped and/or old vehicles) can increase the effectiveness of frightening programs on farms.

Automatic pop-up scarecrows may be more effective than conventional types since they have the added factor of motion. In field trials, such passive frightening devices (i.e., ones that do not require a constant human presence to function) have deterred cormorants for a few days to several weeks. Passive frightening devices are less effective against herons and egrets than cormorants.

Since effectiveness of frightening techniques varies, producers should not rely solely upon them. Rather, they should employ exploders and scarecrows as some of many tools in an aggressive, integrated bird management program. Scarecrows, exploders, or pop-up scarecrows usually are effective for only short periods, but they can be especially useful at isolated ponds or where access is difficult. Passive frightening devices may also make a subtle but significant difference by preventing birds from landing on a section of the facility between the times when it is monitored by harassment patrols.

The effectiveness of scarecrows and cannons should be monitored closely and these devices should be moved to new locations every few days to reduce habituation by birds. Scarecrows should be replaced periodically with human shooters. Where birds have become habituated, exploders and scarecrows should be removed for several days or weeks while aggressive harassment is continued. The devices can be tried again later if the birds once again are frightened easily by humans and vehicles.

Even the most aggressive harassment program rarely eliminates all bird predation. Herons, egrets, and gulls can be exceedingly difficult to disperse. Frightening devices can scare away large flocks of cormorants, but groups of less than 10 birds may remain on the farm and move from pond to pond despite continued harassment. In general, producers should expect scaring programs to reduce but not totally eliminate bird predation.

When non-lethal scaring programs are ineffective, producers may have to resort to limited killing of birds to reinforce fear in the remaining birds. Depredation permits are required from the U.S. Fish and Wildlife Service and, in some states, from the state wildlife agency, to kill almost any species of birds. Contact your nearest USDA Wildlife Services Control office about procedures for obtaining a permit. New federal regulations proposed in 1997 would

allow persons engaged in aquaculture production to kill double-crested cormorants at their farms without a permit. At the time of printing for this publication, however, these proposed regulations were still undergoing review. For currently applicable laws, contact your nearest USDA Wildlife Services office, aquaculture specialist, or the U.S. Fish and Wildlife Service.

Costs and benefits of frightening programs

The costs of employing frightening programs on farms can vary substantially, depending on the mix of techniques used, the species of birds involved, the size and configuration of the farm, and road and levee conditions. Below is an example of daily costs (1997 estimates) for a typical scaring program on a farm of 500 acres or less of contiguous ponds:

Labor (10 hr @ $8/hr) $80.00
FICA on Labor @ 7.65% 6.12
Vehicle expenses (100 mi @ $.30/mi) 30.00
Pyrotechnics (average 20 rounds @ $36.50/100 rounds) 7.30

Live ammunition for harassment of birds:

(300 rounds .22 shells @ $1.25/100 rounds) 3.75
(25 rounds 12 gauge small game loads @ $5.25/ 25 rounds) 5.25
TOTAL.....$132.42

For example, if cormorants were a problem for five months of the year, then scaring costs under this scenario would be almost $20,000 annually. Supplementing the program with exploders and scarecrows would require initial start-up costs of an additional $1,000 to $2,000. Many farmers spend considerably less, while others spend substantially more than these amounts. Employing bird scaring programs on facilities of more than 500 acres or on those facilities with widely separated pond complexes would require additional personnel, vehicles, and ammunition. These costs usually are justified on facilities with serious cormorant depredation. For instance, constant feeding activity by 100 cormorants (but not necessarily the same individuals) throughout the day would result in fingerling losses of $400 per day, which would easily offset and justify the costs of an aggressive scaring program.

During the winter in the southeastern U.S., several hundred or even thousands of cormorants sometimes visit farms that are close to night roosts. Harassing cormorants at these night roosts can help alleviate this problem, but the costs of roost dispersal programs to individual farms vary with the number of roost sites involved and the number of farms participating in the dispersal program. The total cost of dispersing birds from 30 to 40 roost sites over the course of two winters in the Mississippi Delta ranged from $16,757 to $32,302. The average cost per farm of the 40 to 50 participating farms ranged from $400 to $640 per year. Producers also reported average savings of $1,400 to $3,200 per year due to reduced costs of harassing cormorants on their farms.

Exclusion and barrier techniques

Where feasible, exclusion and barrier techniques are highly effective for controlling fish predation by birds. Netting exclosures generally are feasible only on small ponds or raceways (Figure 1). Relatively inexpensive polypropylene netting is commercially available for this use, and simple supported netting systems have been constructed on trout raceways for only $ 0.14 per square foot. However, these simple netting systems often interfere with routine fish maintenance and harvesting operations and are susceptible to ice and wind damage. For these reasons, they should be constructed for easy set-up and removal. Total exclusion with netting is the only completely effective strategy for controlling all bird predation, but it is not cost-effective or practical in many situations.

Overhead lines or wires generally deter most species of fish-eating birds if spacings are narrow enough. Polypropylene line with spacings of 10 inches are used on a number of trout farms and are purported to exclude virtually all fish-eating birds. Parallel lines are usually strung across ponds from steel cables that encircle the pond and are supported from 15-foot-high poles or treated wood posts. Additional lines or netting can be suspended on the sides to form a complete exclosure and prevent predators from walking in from pond levees. If properly designed, such systems can provide a durable, all-weather exclosure that accommodates maintenance and harvesting operations for smaller scale operations such as trout-rearing facilities. Logistics have yet to be worked out to accommodate harvesting and feeding operations at catfish farms that typically utilize ponds of 12 to 15 surface acres. Existing levees on many catfish farms are not wide enough to accommodate poles while still allowing vehicle access. The cost of constructing such systems at large catfish farms also reduces the feasibility of this strategy. Based on 1997 costs of $0.22 per square foot for materials alone, plus the cost of labor, it would cost approximately $1 million to enclose a 100-acre farm.

Other barrier systems using wire, string or floating rope on or near pond surfaces have been partially

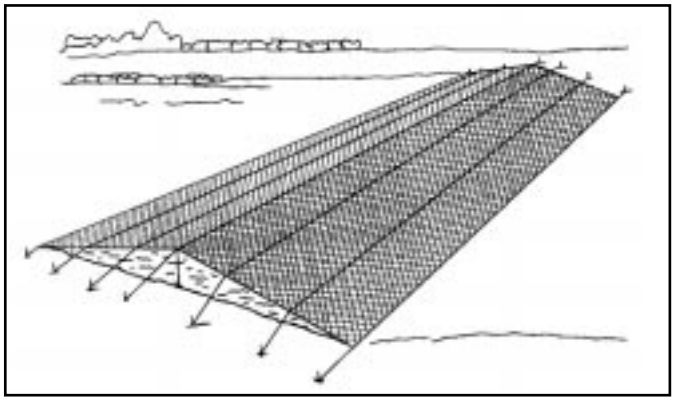


Figure 1. A modified pup tent of netting requires a larger initial investment than scare devices, but can be amortized over several years.

effective in deterring cormorants (Figure 2). Wire, line, and string have been placed in parallel or grid patterns with spacings of 25 to 50 feet at a height of 8 to 14 inches above the water, while polyethylene rope with foam floats (floating rope) have been evaluated at 50-foot spacings. The concept is meant to take advantage of the relatively long take-off distance that cormorants usually require to take flight from a pond. Parallel wires, lines, and floating ropes should be positioned perpendicular to the prevailing wind as cormorants generally take off and land into the wind. Colored streamers and Mylar balloons have been used to increase effectiveness of these systems. In field trials, these systems appeared to prevent large flocks from landing, but singles and pairs of cormorants learned to land among wires and floating ropes. Wire and string systems have been installed on small ponds up to 2.2 acres in size for as little as $15/acre and required about 3 working hours labor per acre. However, on a larger pond (9.1 acres), costs were $164/acre and required 15 working days to install. The physical constraints of spanning large distances and the extensive support systems needed for wire systems limit their usefulness and, in most cases, interfere with seining operations on large catfish ponds.

Most problems inherent to wire, line, or string grid systems are eliminated with floating ropes that do not require a support structure. However, ropes would probably have to be unfastened from at least one side of the pond to facilitate seining at harvest. Installing floating ropes is usually less expensive than constructing wire grids. In 1992 it cost only $39 per acre to cover a 14-acre pond with floating ropes.

Electric fencing around ponds and earthen raceways has prevented herons and egrets from preying on fish. Most recent trials have involved a two-strand system set approximately 1 foot from the water's edge. Wires were spaced about 15 inches apart and connected to insulators attached to fiberglass posts spaced at 50-foot intervals. Costs varied with the type of charger and fencing used. Solar-powered chargers and polyester coated wire were slightly more expensive but less time consuming to set up and maintain than battery-powered chargers and conventional wire fencing. Encircling a 5-acre pond with the former type of fence cost approximately $400. Protecting 0.5 miles of earthen raceways at a trout hatchery cost $875. Fencing may not be effective where pond and raceway bottoms slope gradually from the bank, because wading birds can forage on the water side of the fence. Even where the bottom drops off more steeply, herons have been observed flying over the fence and landing in deep water to take fish coming to the surface. Electric fencing will not deter cormorants, gulls, and other birds that forage in the central part of the pond.

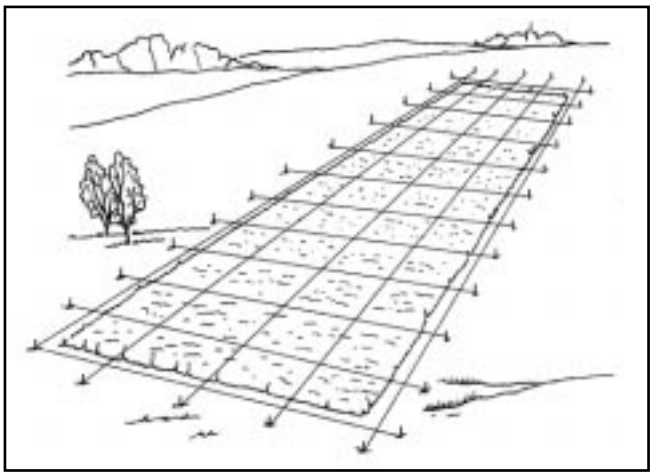


Figure 2. Grid systems with 30' x 30' openings have been successful with swimming birds such as cormorants and ducks.

Field tests of netting installed as a fence around the edges of catfish ponds to exclude herons and egrets have yielded mixed results. In general, wading birds prefer to land on solid ground such as pond levees before wading into ponds. Perimeter netting would likely discourage the birds from walking into the pond to fish. This system may also be useful for deterring various birds from foraging along spawning mats at minnow farms. However, in one field trial with horizontally-placed netting, great blue herons adapted by walking on and fishing from the net. Some birds even waded beneath the netting in bent-over body positions. For best success with perimeter netting, water depth just beyond the net should be more than 2 feet deep to prevent birds from wading beyond the netting. Placing the net at a 45º angle over the water will discourage birds from standing on the net. Material costs for perimeter netting systems vary between $100 to $150 per acre (1997 prices).

Technical assistance

For more information and technical assistance concerning bird predation control at aquaculture facilities, contact your nearest USDA/APHIS/Wildlife Service (formerly Animal Damage Control) office. To find the nearest Wildlife Service (WS) office in your state, contact your local county Extension agent or call the USDA/APHIS/WS Operational Support Staff Office in Riverdale, MD, at (301) 734-7921.

The work reported in this publication was supported in part by the Southern Regional Aquaculture Center through Grant No. 94-38500-0045 from the United States Department of Agriculture, Cooperative State Research, Education, and Extension Service.