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Evaluation of an Electric Fence System for Excluding Wading Birds at Catfish Ponds

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Abstract.—We evaluated a two-strand electric fence barrier to determine its utility in excluding great blue herons (*Ardea herodias*) and great egrets (*Casmerodius albus*) from ponds containing channel catfish (*Ictalurus punctatus*). Fencing at five ponds resulted in at least a 91% reduction in pond use by herons and egrets. Labor to install the fences ranged from 2 to 6 person-hours per pond. Equipment costs, including US$260 for the fence energizer and battery, ranged from $309 (0.3-ha pond) to $404 (2.2-ha pond).

Production of channel catfish (*Ictalurus punctatus*) has grown tremendously in the last 20 years in the delta region of Mississippi (Wellborn 1987; Brunson 1991). A concern of catfish farmers has been bird predation on their fish stocks. Federally protected double-crested cormorants (*Phalacrocorax auritus*), great blue herons (*Ardea herodias*), and great egrets (*Casmerodius albus*) are the primary species causing losses (Stickley 1990). Harassment of these birds with shooting, pyrotechnics, and propane cannons has been the method most frequently used in attempts to reduce damage (Salmon and Conte 1981; Littauer 1990). Although harassment strategies initially are effective, the birds often become desensitized over time. Covering large ponds with overhead netting or wire grids is impractical because of difficulties spanning long distances and the interference with harvesting and feeding operations (Littauer 1990). Although overhead wire grids have been shown by Moerbeek et al. (1987) to deter cormorants (*Phalacrocorax* spp.), other species, primarily wading birds, may land on levees and walk into ponds (Naggiar 1974).

Use of electric fence barriers in wildlife management is increasing because they are, in most cases, nonlethal, cheaper, and easier to erect than conventional fences (McKillop and Sibly 1988). Ramsey et al. (1989) described a five-strand electric bird barrier system used to prevent predation, primarily by great egrets and snowy egrets (*Egretta thula*), on western mosquitofish (*Gambusia affinis*) in California. In this paper, we describe the design and evaluation of a simpler two-strand electric fence barrier for preventing wading bird damage at catfish ponds in Mississippi.

This evaluation was conducted during late summer and fall in 1991 and 1992 at a catfish farm 8 km southeast of Brooksville, Noxubee County, Mississippi. This area is characterized by flat farmland used for row crops, pasture, and channel catfish ponds. The test facility contained 13 adjacent earthen ponds with surface areas of 0.1–4.0 ha and depths of 1.2–1.5 m. Great blue herons and great egrets were the primary avian fish predators at this site.

Ponds selected for this evaluation were those with the highest observed levels of great blue heron and great egret activity. In 1991, ponds D (1.4 ha) and G (0.3 ha) were used in the experiment. Pond D contained channel catfish (25–40 cm long) stocked at 8,500 fish/ha. Pond G contained 8–15-cm-long fingerlings stocked as fry at 200,000/ha. Ponds F, G, H, and I were used in the 1992 experiment. Adjacent ponds F, G, and H, all 0.3 ha, had similar fish populations (8–15-cm-long fingerlings stocked at 200,000 fry/ha). Pond I (2.2 ha) contained 25–40-cm-long fish stocked at 8,500/ha. Fish stocking densities were obtained from the farm owner, but could not be verified.

The electric fence consisted of fiberglass posts (1.2 m long, 0.95 cm in diameter), plastic fence post insulators, 17-gauge smooth wire (used in 1991) or six-strand polywire (used in 1992), a steel grounding rod (1.2 m long, 1.5 cm in diameter), a 12-V deep-cycle battery, and a Gallagher model E 12 electronic fence energizer (4,800 V, 65 pulses/min; Gallagher Electronics Ltd., Hamilton, New Zealand) (use of trade names for identification of materials does not constitute endorsement by the federal government).

The two-strand electric fence was set up on each pond after a pretreatment period. Fence posts were positioned around the perimeter of the sloping pond edge at intervals of 9–15 m. Posts were set in the water 30 cm from the edge of the pond; all vegetation that would touch the lower wire was

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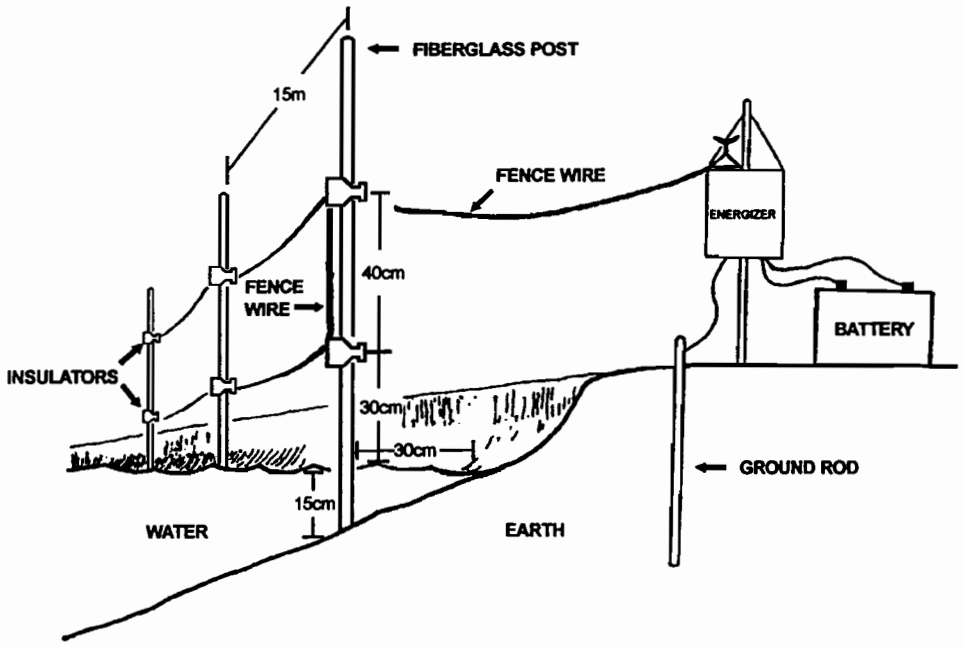

FIGURE 1.—Placement of the electric fence system components around catfish ponds, Mississippi, 1991–1992.

removed. Water depth at post location was about 15 cm. Two fence post insulators were placed on each post and the lower wire was set 30 cm above the water. The top wire was spaced 40 cm above the lower wire (Figure 1).

Counts of great blue herons and great egrets at test ponds were made during pretreatment, treatment, and posttreatment periods. Time that each bird spent at the pond (in water) during an observation period was recorded. Most observations were made between 0700 and 0900 hours with binoculars and a variable-power spotting scope from a vehicle at a distance that presumably would not disturb the birds (>75 m). An effort was made to observe each pond at about the same time each observation morning. Counts at each pond usually were made three times per week. Length of observation periods varied between 30 and 170 min in 1991 and lasted 60 min in 1992. Pretreatment periods lasted from 4 to 21 d at each pond followed by a treatment period (pond fenced) of 14–62 d and a posttreatment (fence removed) period of 4–35 d.

Because data on numbers of fish removed by birds from the test ponds could not be obtained, the efficacy of the electric fence at each pond was assessed by comparing between test periods the minutes per hour of observation that birds were in the water. During 1992, pond F served as an unfenced "control" for the period that pond G was fenced.

The electric fence system reduced wading bird use of catfish ponds based on a comparison of bird-minutes of activity during pretreatment and treatment periods. Overall, a 91% reduction in great blue heron time was observed on the five test ponds after they were fenced: pond D—130.8 min/h during pretreatment versus 0 min/h during treatment; pond G (1991)—37.2 min/h during pretreatment versus 0 min/h during treatment; pond G (1992)—411.7 min/h during pretreatment versus 3.5 min/h during treatment; pond H—78.6 min/h during pretreatment versus 22.3 min/h during treatment; pond I—78.0 min/h during pretreatment versus 10.7 min/h during treatment. During the treatment period at pond G (1992), 247.1 min/h were recorded on unfenced pond F.

Great egret numbers on ponds were reduced by more than 99% after the ponds were fenced: pond D—349.2 min/h during pretreatment versus 0 min/h during treatment; pond G (1991)—264.0 min/h during pretreatment versus 1.2 min/h during treatment; pond G (1992)—1,415.4 min/h during pretreatment versus 0 min/h during treatment; pond H—645.8 min/h during pretreatment versus 0 min/h during treatment; pond I—34.0 min/h during pretreatment versus 0.6 min/h during treatment. Dur-

ing the treatment period at pond G (1992), 170.8 min/h were recorded on unfenced pond F.

With the exception of pond I, heron and egret activity did not return to pretreatment levels once the fence was removed (posttreatment). We speculate that the birds had become conditioned to avoid the test ponds because of previous exposure to the fence. Also, fewer great egrets were noted on the entire catfish farm during late October and early November, when many posttreatment counts were conducted.

Both herons and egrets were observed being shocked when they came in contact with the fence wire. When this occurred, shocked birds typically took flight and left the pond area. Once the ponds were fenced, most birds were reluctant to approach the edge of the water. No birds were found to be injured or killed after coming in contact with the electric fence.

The electric fence system, for the most part, reduced wading bird foraging at the pond except for the limited shallow area between the fence and the pond edge. Placement of the fence posts 30 cm out from the edge of the pond caused the birds to stand in water when they contacted the fence. This most likely increased the potential for receiving an effective shock. A few birds (primarily great blue herons on pond I) foraged on the pond side of the fence. These birds landed in the shallow water adjacent to the fence where the pond did not slope as rapidly.

The electric fence took relatively little time to set up (mean, 4 person-hours/pond; range, 2.0–6.0 h/pond) and remove (mean, 2.3 h/pond; range, 0.7–4.0 h/pond). The amount of vegetation to be removed from the edge of the pond was the primary factor affecting the setup time required.

The cost for equipment to erect the electric fence system with smooth electric fence wire ranged from US$309.00 for the 0.3-ha pond to $404.00 for the 2.2-ha pond. Polywire was slightly more expensive. Although no difference in effectiveness was apparent, the polywire was easier to use than the smooth wire because of its greater flexibility. The highest-priced item was the fence energizer. One energizer ($200.00) and battery ($60.00) could be used to charge several ponds at the same time.

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