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AN EVALUATION OF ROOST DISPERSAL FOR REDUCING CORMORANT ACTIVITY ON CATFISH PONDS

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Abstract: Pyrotechnics and helicopter flyovers were used to harass double-crested cormorants (Phalacrocorax auritus) at 4 roost sites in the Delta region of Mississippi. Roosting cormorants were easily dispersed from 3 of the 4 sites. Average numbers of cormorants observed at selected catfish (Ictaluridae) ponds and day roosts near foraging areas also declined after harassment began.

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The serious economic losses that can be caused by fisheating birds have been a concern at fish-rearing facilities (Mott 1978). Previously, attention had been directed at wading birds (i.e., herons and egrets, family Ardeidae) at hatcheries and rearing stations (Lagler 1939). Since 1970, coincidental with the increase in numbers of catfish ponds in Mississippi, doublecrested cormorant numbers increased due to reductions in pesticide residues and greater protection efforts (Vermeer and Rankin 1984, Craven and Lev 1987). Cormorants wintering in the lower Mississippi Valley have caused serious losses to the expanding catfish farming industry of the region. Stickley and Andrews (1989) estimated that the value of catfish lost annually to cormorants could be as high as $3.3 million at the 36,000 ha of commercial catfish ponds in Mississippi. Because of increased cormorant depredations, research was designed to test procedures for reducing losses. Dispersal of cormorants from night roosting locations was evaluated during the winter of 19881989, to determine if dispersal would reduce the number of cormorants on nearby commercial catfish ponds, and to evaluate the extentcormorants would move in response to disturbance.

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STUDY AREAS

Roosts

Roost dispersal was conducted in 2 separate study areas. The first roost was located at Lake Washington, Washington County, Mississippi (Fig. 1). Lake Washington is a Mississippi River oxbow about 13.3 km long. Cormorants roosted at the extreme northwest end of the lake in about 20 ha of bald cypress (Taxodium distichum). Cypress trees also dotted the west shoreline of this lake. Prior to this study, cormorants had roosted in 2 other cypress stands of about 4 and 10 ha each at the southwestern end of the lake.

The second cormorant dispersal was conducted at 2 roosts in Leflore County (Little Mossy Lake and Mathews Brake Lake) and 1 roost in Holmes County, Mississippi (Bee Lake) (Fig. 2). Little Mossy Lake and Mathews Brake Lake are about 16 km apart. Bee Lake is about 35 km south of Little Mossy and Mathews Brake.

Little Mossy has an oxbow shape and is 8.5 km long. Cormorants roosted in about 25 ha of cypress in the southwestern end of the lake. Cypress trees are also found along about 3.2 km of shoreline.

Mathews Brake is within Mathews Brake National Wildlife Refuge and is composed of about 725 ha of cypress swamp and open water. The primary roost site was about 50 ha in the northcentral area of the lake. Other sites used for roosting were located at the south end of the lake.

Bee Lake has an oxbow shape and is 19.3 km long. Cormorants roosted in cypress trees scattered throughout the lake.

Catfish Ponds and Day Roosts

To evaluate the effect of roost dispersal on foraging birds, catfish ponds along roost flightlines and loafing areas (day roosts) near the ponds were selected for aerial surveys. The number of ponds selected and counted in each study was determined by aircraft fuel consumption (3-hr flight time).

In theLake W ashington area, 27 separate catfish operations (3,240 ha of water) were selected and mapped for observations (Fig. 1). Ponds were located to the north and east within approximately 35 km of the roost. A total of 23 catfish operations (2,066 ha of water) within 16 km of Mathews Brake

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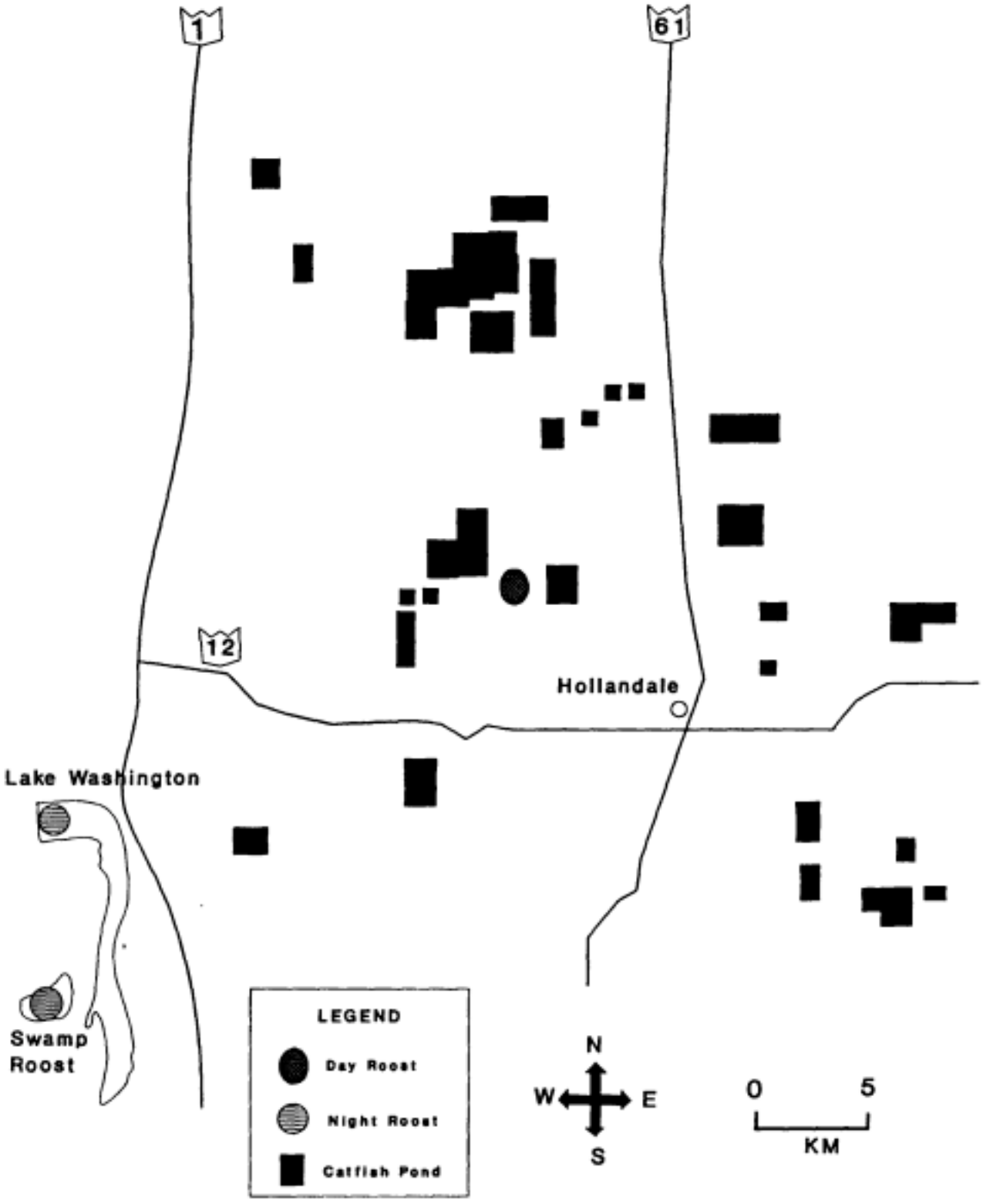

Fig. 1. Locations of roost sites and catfish ponds in the Lake Washington study area, 1988-89.

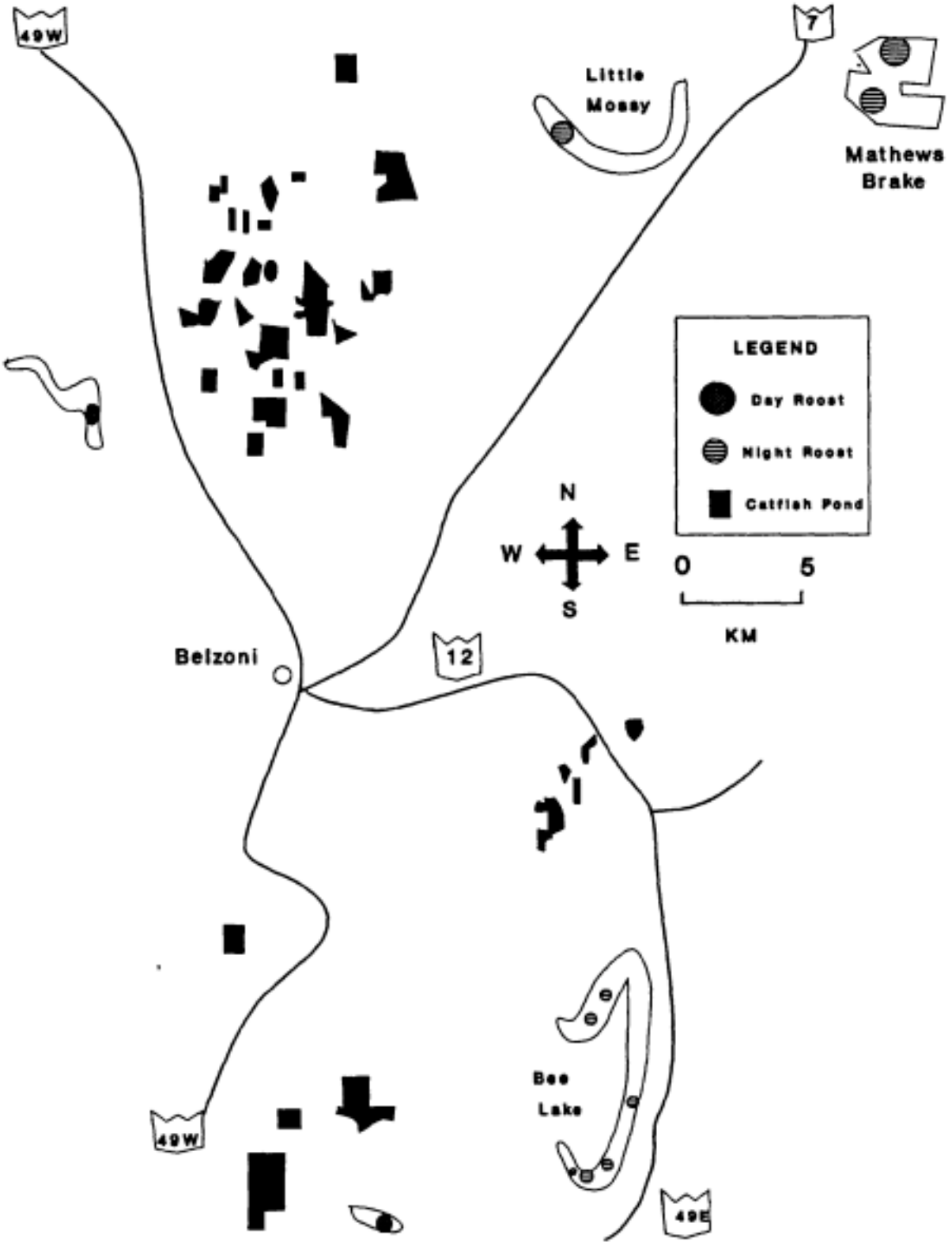

Fig. 2. Locations of roost sites and catfish ponds in the Mathews Brake, Little Mossy, and Bee Lake Study areas, 1988-89.

and Little Mossy and 9 operations (1,296 ha of water) within 18 km of Bee Lake were selected for aerial surveys. Catfish operations in this study varied from a single 4-ha pond to more than 60 ponds covering greater than 500 ha.

METHODS

Night Roost Counts

Estimates of the number of cormorants using study area roosts were made by ground-based observers, aerial counts in a Cessna 150 fixed-wing aircraft, or a Bell 47 helicopter. Ground estimates were made by 1 or 2 observers counting birds on flightlines as they left the roost site in the morning, or returned to the roost site in the evening. Aerial counts involved estimating numbers of cormorants seen from the air within the roost boundary after 1600 hours.

At Lake Washington, 2 pretreatment ground counts were made of birds arriving at the roost in the evening on 23 November and 25 November. Evening ground counts were also made on the second and fourth day of harassment (29 November, 1 December), and posttreatment on 3 and 5 December.

At Mathews Brake, aerial roost counts were made on 11 and 15 February (pretreatment), 22 February (treatment), and 9 March (posureatment).

At Little Mossy, an aerial count was made on 25 January and ground counts were made on 10, 13, and 15 February (pretreatment). Counts during treatment were made on 16 February (ground) and on 25 February (aerial). Posttreatment aerial census was made on 9 March.

At Bee Lake, counts during pretreatment were made on 25 January (aerial), 1 and 8 February (ground) and 11 and 25 February (aerial). Aerial estimates of thepopulation were made on 28 February and 1, 2, 3, and 4 March (treatment), and on 9 March (posttreatment).

Night Roost Dispersal

Cormorants were harassed at Lake Washington between 1500-1730 hours on f evenings (28 November - 1 December 1988) by 2-S people firing pyrotechnic devices (Reed-Joseph International Co., Box 894, Greenville, MS 38702) in the direction of birds attempting to land. Two people in each of 2 motorboats fired bird-bangers and screamer-sirens from singleshot pistol launchers during the first 2 evenings of harassment. During the last 2 evenings only 1 motorboat with 2 people was used. On the second and third night of harassment, an additional person firing shot-tell scare shells from a 12-gauge shotgun was positioned on the lakeshore at the edge of the roost area. Because harassed birds attempted to relocate at former sites along the west edge of the lake it was necessary to patrol most of the lake. Totals of 111, 214,102, and 25 pyrotechnics, respectively, were fired on each of the 4 evenings of harassment.

Roost harassments at Mathews Brake and Little Mossy were conducted simultaneously. At these roosts, cormorants were harassed by helicopter (Bell 47) between 1500-1800 hours on 7 days of an 11-day treatment period (15,19, 21-25 February). When harassing by helicopter, the craft was flown between 30 and 150 m above the roost vegetation and pyrotechnics were fined in the direction of birds being harassed. In addition, ground harassment was conducted in the evening at Little Mosy by 1-3 persons on 3 occasions (16, 17, and 19 February). On average, 75 pyrotechnics were used daily during the aerial harassment at both roosts. An accurate record of the number of pyrotechnics used each evening during the ground harassment was not kept, but averaged fewer than 100 per night.

Helicopter harassment at Bee Lake began 3 days after harassment at Mathews Brake and Little Mossy terminated. Harassment was conducted for 5 evenings (28 February - 4 March) between 1500-1800 hours. On average, 80 pyrotechnics were fired from the helicopter during each of the last 4 evenings. No ground harassment was conducted at this site.

Pond and Day Roost Counts

Estimates of the number of cormorants using catfish ponds and day roosts near these ponds were made to evaluate the effect of the night roost dispersal program. Estimates of cormorant numbers on ponds were made by the same observer from a Cessna 150 aircraft during pretreatment, treatment, and posttreatment periods. Flights over the ponds were conducted at approximately 150 m above ground level between 0800-1200 hours. Weather conditions prevented all ponds from being observed at the same time each count day. In the Lake Washington area, 5 pretreatment, 3 treatment, and 5 posttreatment counts were made. The Mathews Brake/Little Mossy area received 4 pretreatment, 4 treatment, and 4 posttreatment counts. In the Bee Lake area, 5 pretreatment, 2 treatment, and 1 posttreatment counts were made. Inclement weather prevented some aerial surveys.

Total number of cormorants observed per day at ponds and day roosts during pretreatment and posttreatment periods were ranked, and differences between periods were analyzed using the Mann-Whitney U test. Because cormorants routinely moved between ponds and day roosts, we combined numbers at these sites for this analysis.

RESULTS

Roost Dispersal

Cormorants roosting at Lake Washington were easily dispersed. Over 8,000 birds present during pretreatment were reduced to less than 500 following 2 evenings of harassment. By the end of the 4-day treatment period, only 6 cormorants were observed attempting to roost (Table 1). On the third evening of harassment, a new roost was located in a cypress swamp (Swamp Roost) 7.2 km south of the Lake Washington roost (Fig. l). About 5,800 cormorants were counted at this site on the third evening after harassment ceased at Lake Washing

ton and over 7,000 cormorants roosted there 2 weeks later. Periodic checks of Lake Washington during the posttreatment period showed no cormorants moved back. About 8,000 cormorants, however, were seen roosting at the southwestern end of this lake 1 month posttreatment.

Table 1. Numbers of double-crested cormorants observed roosting at Lake Washington, Mathews Brake, Little Mossy, and Bee lake, Mississippi, November 1988 - March 1989.

Roost	Period	Date	Number
Lk. Washington	Pretreatment	1183/88	8,150
		11/25/88	6,650
	Treatment	11/29/88	< 500
		12/01/88	6
	Posttreatment	12/n3/88	0
		12/05/88	0
Little Mossy	Pretreatment	01/25/89	< 100
		02/10/89	24,300
		02/13/89	6,975
		02/15/89	5,500
	Treatment	02/16/89	75
		02/25/89	< 50
	Posttreatment	03/0989	0
Mathews Brake	Pretreatment	02/11/89	45
		02/15/89	5,000
	Treatment	02/22/89	5,000
	Posttreatment	03/09/89	6,000
Bee Lake	Pretreatment	01/25/89	6,000
		02/01/89	9,025
		02/08/89	125
		02/11/89	65
		02/25/89	7,000
	Treatment	02/28/89	10,000
		03/01/89	10,000
		03/02/89	3,000
		03/0389	1,500
		03/n4/89	50
	Posttreatment	03/0989	< 50

Numbers of roosting,cornorants at Little Mossy fluctuated considerably during pretreatment counts (Table 1). A peak of about24,000 birds roosted at this site 5 days before harassment began. A total of 5,500 cormorants were counted coming into this site the evening treatment began (15 February). Counts after treatment indicated bird numbers were quickly reduced. After harassment was initiated, the highest number observed at this site was only 75 birds on 16 February. No birds were seen at Little Mossy when the study ended on 9 March.

At Mathews Brake, pretreatment counts varied between 45 and 5000 cormorants during the 5-day pretreatment period (Table 1). In spite of helicopter harassment, over 5,000 cormorants continued to use this most during the treatment period. A total of 6,000 birds were still using this site at the completion of the study (9 March).

Numbers of roosting cormorants using Bee Lake also varied during pretreatment and probably were influencedby the harassment taking place at Little Mossy and Mathews Brake. Cormorants were observed going south towards Bee Lake during harassment at these sites. Roosting numbers at Bee Lake were reduced from about 10,000 to SO by the fifth consecutive evening of harassment (Table 1). A check of this site 5 days posttreatment (9 March) indicated no buildup of numbers.

Pond and Day Roost Observations

In the Lake Washington study area, an average of about 3,000 cormorants were counted at ponds and day roosts during the pretreatment period. However, significantly fewer (X = 806, P = 0.02) were counted posttreatment (Table 2). Cormorants that continued to forage at these ponds probably roosted at the Swamp Roost (7.2 km south of Lake Washington). Although roosting numbers at this site were similar to those at Lake Washington, the foraging pattern of the birds obviously changed. A 75% reduction in bird numbers was recorded posttreatment in the foraging area compared with pretreatment counts.

Average numbers of cormorants seen on ponds and day roosts near Mathews Brake and Little Mossy were also reduced substantially (P = 0.06) during the posttreatment periods (Table 3). Although the roosting population at Mathews Brake and Little Mossy was reduced by at least SO% during the treatment period, the number of birds counted in the foraging area posttreatment was reduced more than 90%. This reduction on ponds likely is a result of cormorants changing their foraging pattern and a reduction of birds in the area.

An insufficient number of foraging counts were made in the Bee Lake area posttreatment to allow a statistical analysis. Fewer cormorants, however, were counted from pretreatment through the treatment and posttreatment periods (Table 4). Although the counts of roosting cormorants varied substantially during the long pretreatment period, fewer birds were seen roosting at Bee Lake after harassment began. This lack of birds in the foraging area is reflected in the number of birds seen on the posttreatment survey on 10 March.

DISCUSSION

The number of cormorants estimated during roost surveys was reduced following harassment at 3 of the 4 study sites. With the exception of Mathews Brake, cormorants attempting to roost were obviously frightened by the harassment efforts. Cormorant numbers at Mathews Brake were not reduced by helicopter harassment for 7 evenings. Inclement weather prevented flying on 4 evenings during the harassment period, and this may have contributed to the lack of success in moving birds out of this site. In addition, the large expanse of the roosting area and the lack of ground- or water-based harassment probably contributed to the difficulty of dispersing this roost. Some cormorants also appeared to adapt to the helicopter flyovers by alighting on the water and diving rather than taking flight. On the last day of treatment at Mathews Brake, flocks of

Table 2. Number of double-crested cormorants observed at ponds and day roosts during morning aerial surveys in bake Washington study area, Mississippi, November - December 1988.

	Pretreatment			Treatment			Posttreatment				
	Nov 23 24 6	25	27	28	29	30	Dec 1	2	3	4	5
Ponds	223	538	786	29	241	777	540	265	397	478	385	1,182 283
Day$QQ 3.1 DD *2S?$ M2 GO*						1.960	3.291	3.725	*2~~*		*142*	*_K*	*UQ*
Roosts												
Total	1,023			3,638		2,746	3,320	3,966	1,727	865	407	492	588 593 1,434 923
Treatment means					2,939				1,000				806'

Table 3. Number of double-crested cormorants observed at ponds and day roosts during morning aerial surveys in Mathews BrakeLittle Mossy study area, Mississippi, February - March 1989.

	Pretreatment			Treatment			Posttreatment				
	Feb 11 10	12	13	15	22	23	24	25	28	Marl	2
Ponds	1,244	378	1,676		271		1,721	1,058	367	350	109	163 94 448
Day Roosts	$,441	*_M*	4.020				101	*_M 32M*	2.300	],$Q		
Total	9,685	1,363	5,696				372	2,021	4,258	2,667	539	124 163 154 773
Treatment means	4,279			2,371				304'				

'Less than pretreatment (P = 0.06)

Table 4. Number of double-crested cormorants observed at ponds and day roosts during morning aerial surveys in Bee Lake study area, Mississippi, February - March 1989.

	Pretreatment					Treatment	Posttreatment
	Feb 22 10	23	24	25	28	Mar 1	2
Ponds	757	872	147	1,152	784	342	1,083 35
Day Roosts	170	*$3Q*	*~Q*	622	-Q 0		- 12
Total	927	1,702	377	1,774	784	347	1,095 36

cormorants were observed flying south toward Bee Lake. Observations at Bee Lakeshowed increases in roosting populations that coincided with the harassment at Mathews Brake and Little Mossy. Subsequent harassment at Bee Lake probably moved some cormorants back into Mathews Brake.

Harassment by personnel on the ground or in boats appeared very effective in dispersing cormorants. Cormorants did nol seem to adapt to the ground- or water-based harassment. Because of the dependence on clear weather for flying, ground or water harassment would be the **preferred** method of dispersal in situations where access is possible, and the roost area is not too large or spread out. Use of ground- or water-based dispersal would also insure consecutive nights of harassment.

Populations of cormorants in the study areas were not stable even during pretreatment (Table 1). At Little Mossy, roosting populations varied from < 100 on 25 January to more than 24,000 2 weeks later. A similar situation was observed at Mathews Brake where the population increased from a few

birds to 5,000 birds in a few days. Weather seemed to play apart in the shifting of roosting populations. An ice storm in early February was likely responsible for the cormorant reduction at Bee Lake and subsequent buildup of numbers at Little Mossy. Interchange of birds between Little Mossy and Mathews Brake (16 km distant) was also evident especially after the harassment effort began at these 2 sites. Both sites had to be harassed simultaneously to prevent the birds from using the unprotected site.

Although numbers of cormorants at surveyed ponds and day roosts in the foraging areas were reduced after treatment, the overall damage to catfish growers may not have been reduced. As an example, at Lake Washington similar numbers of cormorants still roosted 7.2 km away, and these birds may have still foraged at catfish ponds other than at those being observed during the posttreatment period.

MANAGEMENT IMPLICATIONS

It appears from this study that local cormorant damage at catfish production areas can be reduced by harassing birds at nearby roosts. At mufti-roost areas, however, all active and potential roosts have to be harassed simultaneously in order to reduce overall damage in the area. This effort may be difficult or impossible logistically because of personnel and equipment needs required to harass all roost sites concurrently for extended periods. This technique for reducing cormorant damage may be more practical in areas where alternate roosting sites are limited.

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