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State Natural History Survey Division

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Illinois Department of
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24 September 1986

Ms. Susan E. Lauzon
Endangered Species Coordinator
Illinois Department of Conservation
600 North Grand W
Springfield, Illinois 62706

Dear Sue:

Enclosed are three copies of the final draft of the report, "Protection of Native Endangered Prairie-chickens from ring-necked pheasants on Illinois Sanctuaries," by Ronald L. Westemeier. This project was partially funded by the Division of Natural Heritage, Illinois Department of Conservation.

I am also sending information copies to Becker, Moak, Simpson, and Cooper.

Thank you for your cooperation and assistance.

Sincerely,

Glen C. Sanderson, Head
Section of Wildlife Research

GCS:cj
Enclosures

cc: Carl Becker
Jim Moak
Dave Cooper
Scott Simpson
Ron Westemeier

Project #50

ILLINOIS NATURAL HISTORY SURVEY

Section of Wildlife Research

FINAL REPORT SUBMITTED TO

ILLINOIS DEPARTMENT OF CONSERVATION

DIVISION OF NATURAL HERITAGE

PROTECTION OF NATIVE ENDANGERED PRAIRIE-CHICKENS FROM RING-NECKED PHEASANTS ON ILLINOIS SANCTUARIES

1 April - 31 August 1986

by

Ronald L. Westemeier

9 September 1986

PROTECTION OF NATIVE ENDANGERED PRAIRIE-CHICKENS FROM RING-NECKED PHEASANTS ON ILLINOIS SANCTUARIES

The purpose of this report is to provide the Illinois Department of Conservation with an evaluation of various methods of acceptably controlling pheasant numbers on prairie-chicken sanctuaries. The study was made possible in part by a grant from the Illinois Nongame Wildlife Conservation Fund.

Status of Prairie-Chickens and Pheasants

The 24th consecutive spring census of greater prairie-chickens in Illinois showed a total of 116 cocks. The 1986 counts included 42 cocks on the main study area at Bogota in Jasper County (Fig. 1) and 70 cocks near Kinmundy in Marion County (Fig. 2); respective declines for the 2 areas were 31% and 20% since spring 1985. (Counts of hens are not used for annual comparisons because of the greater variation--than is the case for cocks--in their presence on booming grounds.) We checked several reports of prairie-chickens in areas with no sanctuaries and located a small flock with at least 4 cocks and 5 hens in the Oskaloosa "prairie" area of Clay County. Chickens were last known in this area in 1965, but local residents indicated that the birds reappeared about 4 years ago. This surprise flock evidently resulted from a dispersal of colonizers from the population near Kinmundy prompted by the cyclic high in 1982. The distance between the 2 areas is about 8 miles.

In contrast to the 31% decline of prairie-chickens at Bogota, pheasants on that area about doubled from 38 crowing cocks in 1985 to at least 70 cocks in 1986 (Table 1). As in the past few years, booming grounds were limited to the 3 central sanctuary units, but pheasants were concentrated on all sanctuaries at Bogota. Numbers, densities, and distribution of prairie-chickens at Kinmundy were good compared with those at Bogota. No crowing pheasant cocks were heard in Marion County during our standard pheasant census, but single cocks were seen on the Lacey-Loy and Loy-Soldner units. Broods of pheasants were also seen by project personnel and reported by farmers in this area later this summer.

Reduced populations of prairie-chickens at both Bogota and Kinmundy in spring 1986 were likely related to cyclic factors (lows typically occur in years ending in 5, 6, 7, or 8) and to later-than-normal farming activities (tillage, seeding, and spraying) in 1985, which coincided with brooding efforts by prairie-chickens. However, pheasant interactions with chickens greatly exacerbated the situation at Bogota. Pheasants continue to present probably the greatest threat to the survival of remnant flocks of prairie-chickens in Illinois (Vance and Westemeier 1979, Westemeier 1984, Buhnerkempe and Westemeier 1985, Westemeier, Buhnerkempe, and Edwards, ms under external review).

The help of J.E. Buhnerkempe and S.A. Simpson is acknowledged in all phases of this project. R. Montgomery of the Max McGraw Wildlife Foundation kindly provided about 1,100 fresh surplus pheasant eggs for the artificial nest study. R. Bauer and B. Warren of the IDOC Propagation Section kindly provided 10 game-farm pheasants for the livetrapping study. I thank field assistants T. Strole, R. Heuerman, and C. Hawker for long arduous hours in the field.

METHODS

Approaches taken to protect prairie-chickens from pheasants in 1986 included livetrapping, use of artificial nests, use of a cable-chain drag, on-foot searches for nests, and discreet shooting as follows:

Livetrapping

Livetrapping with funnel traps using game farm pheasants as bait was tried on 26 days between 20 March and 26 June 1986. Trap-hours totaled 852, including 555 trap-hours with cocks as bait and 297 trap-hours with hens as bait. Trapping periods usually extended between 0800 and 1700 hours.

Wire poultry netting (2.5-cm mesh) and 2.5- x 7.6-cm lumber was used for framing funnel traps that measured 259 cm long, 122 cm wide, and 61 cm high. Cages for pheasants used as bait were constructed of welded wire (2.5-cm x 5.1-cm mesh) and measured 91 cm long by 46 cm in width and height. Nylon netting of 2.5-cm mesh was stretched tight and suspended as a buffer 5 cm from the top of each cage to minimize scalping of bait pheasants. Bait birds were provided food and water ad libitum and held continually in their cages in order to avoid handling the birds. Each cage containing a bait bird was centrally placed perpendicular to the long axis of each trap. Funnels--also of poultry netting measuring approximately 30 cm long, with the width tapering from 27 cm to 20 cm and the height tapering from 30 cm to 20 cm--were placed in the center of each end of the traps.

Caged bait birds were also tried in conjunction with monofilament snares as described by Berger and Hamerstrom (1962). Up to 25-30 snares

were tied to strips of welded wire and staked to the ground on 2 sides of a caged bait bird. The cage/snare approach was tried on 7 days between 20 March and 22 April for a total of 141 trap days.

Criteria for selecting a trapsite included (1) frequent observation of a cock pheasant on a fairly specific site, (2) good visibility such as field lanes, firelanes, or bare ground, (3) access by project vehicles, and (4) concealment from the general public. Traps were checked about noon and at pick-up time. Windy or rainy days were avoided.

Artificial Nests

In an attempt to decoy egg deposition by pheasants, artificial nests were created on the 3 central sanctuaries using fresh pheasant eggs donated by the Max McGraw Wildlife Foundation. Beginning 1 April 1986, with 29 artificial nests, the number of "dummy" nests was increased to 79 by 18 April. Clutch size was generally increased by adding an egg twice weekly whether or not parasitism occurred. Destroyed or missing clutches were replaced with the number of eggs that would have been present had no predation occurred.

Densities of artificial nests ranged from highs of 29.7 and 19.3 per 10 ha in several fields in which parasitism was documented during 1970-85, to 4.4 nests per 10 ha in other areas. Fields on the 24-ha (60-acre) West Donnelley Sanctuary were used as a control (no artificial nests) because (1) that area also had a history of parasitic nesting, (2) its location was central to the 3 areas with artificial nests, and (3) because of the inaccessibility of the West Donnelley unit.

Artificial nests were placed on field edges near ($\leq$0.5 m) sharp breaks in cover such as field lanes, firelanes, and bare fields in order to

be visible to hen pheasants from travelways. A depression (scrape) was made in grassy vegetation, a mat of grassy duff was added, and each "nest" entry was oriented east, northeast, or north to protect eggs from rapid spoilage and bleaching by the sun. Bows of blaze-orange flagging ribbon were tied in vegetation 10 m north of each artificial nest to facilitate rapid relocation.

Nest Searching

Nest searches in 1986 were conducted on foot and with a cable-chain drag. Systematic searching on foot as described by Westemeier (1973) and Westemeier and Buhnerkempe (1983) involved 445 man-hours to cover 144 ha (356 acres). On-foot nest searches were begun earlier in 1986 (29 April) than in past years in an effort to remove pheasant eggs from more of the active prairie-chicken nests and to collect more pheasant eggs and hens from pheasant nests than has been possible in previous years.

The cable-chain dragging technique described by Higgins et al. (1977) for finding active nests was tried on 20-21 May 1986 in 16 fields totaling 42 ha (103 acres).

Discreet Shooting

An effort was made between 17 March and 23 April 1986 on 20 occasions (41 man hours) to reduce the number of pheasant cocks primarily on the Yeatter-Field-McGraw (YFM) Sanctuary Unit by the use of shooting from small portable blinds. The YFM unit contained the largest booming ground (29 cocks, 69% of the total cocks), as has been the case over the past 23 years at Bogota. Blinds were placed near prairie-chicken booming grounds or near pheasant cock territories. Shooting was done mainly with the use of .22

rifles with short hollow point ammunition. Pheasant calls were generally used while occupying blinds and on occasion, caged game-farm pheasants were placed on top of the blinds as live decoys.

RESULTS AND DISCUSSION

Livetrapping

A pilot study with funnel traps in 1985 between 5 and 26 June that resulted in the capture of 4 cock pheasants in 152 trap-hours (2.6 captures/100 trap-hours) suggested the possibility that pheasants might be removed from the sanctuaries throughout the breeding season in 1986. However, in 852 trap-hours this year from late March through late June only 9 cock pheasants (1.1 captures/100 trap-hours) were taken despite a doubling in the population between 1985 and 1986 (Tables 1, 2). Dates of captures in 1986 were 21 and 22 May and 13, 16, 19, 23, and 25 June. One of the 4 captures in 1985 and 4 of the 9 captures in 1986 were made with game-farm hen pheasants as bait. Half of the 4 cocks in 1985 and 8 of the 9 cocks this year were captured in funnel traps by noon of each trap-day.

Use of the cage/snare set-ups resulted in 1 temporary capture of a wild cock pheasant (feathers were present) on 31 March. This short-term capture resulted in the death of the bait cock. Also, 1 red-tailed hawk was captured by this approach on 22 April with no harm to the bait hen or hawk.

Although the livetrapping technique proved disappointing from the standpoint of captures, the data suggest 3 ways of increasing livetrapping efficiency. First, the trapping period should perhaps be limited to the period of mid May through June. Secondly, hen pheasants appear as likely (perhaps more so) as cock pheasants (rivals) to attract wild cocks into

funnel traps. Thirdly, the daily period of from about 0800 to 1200 hours appears to be the most promising time span for captures. Funnel traps baited with game-farm pheasants may not be an efficient long-term solution to suppressing pheasant numbers on prairie-chicken sanctuaries. However, the technique may offer innovations for further studies of pheasant biology, behavior, and management during the breeding season. Buffer netting should be added to the inside top of funnel traps to minimize scalping of captured wild pheasants in future studies.

Artificial Nests

A cumulative total of ≥61 parasitic pheasant eggs were deposited in ≥19 of the 79 artificial nests gradually placed in sanctuary meadows (Tables 1, 2). The first egg deposition by wild pheasants occurred between 7 April and 11 April and rose rapidly thereafter until 18 April (Fig. 3). By mid April, predation, primarily by crows during intervals of only 3 days had increased to 87-93% of the pheasant eggs in artificial nests on the C. McCormick and East Donnelley sanctuaries. Essentially all nests pilfered by crows were empty with no egg shells in the vicinity of the nest site, indicating that crows had carried off the eggs, a finding consistent with that of Montevecchi (1976). The flagging 10 m from each artificial nest evidently provided a visual cue to crows that aided them in finding nest sites, as was the case in studies by Picozzi (1975) and Yahner and Wright (1985). On 21 April, 2 crows were observed carrying pheasant eggs from artificial nests within 10 minutes after fresh eggs had been placed in the emptied nests. Because of the excessive predation by crows and risk to nearby prairie-chicken nests, this study had to be essentially terminated by 22 April. Six artificial nests that were still intact and well

concealed from crows were checked until 15 May; 5 of these 6 nests were parasitized by pheasants. Thus, it can be assumed that the number of eggs deposited by pheasants in artificial nests was considerably above the known minimum of 61 eggs, and that considerably more "nests" would have attracted greater numbers of wild pheasant eggs had the study continued.

Was there evidence that the artificial nests helped curtail the incidence of parasitism by pheasants of prairie-chicken nests? Twelve (39%) of 31 prairie-chicken nests were parasitized by pheasants in 1986 (Table 3). The parasitism rate was 38% in 1985 (9 of 24 nests) and 43% in 1983 (9 of 21 nests) when the pheasant population was only 54% and 41%, respectively, of that in 1986. Numbers of parasitized prairie-chicken nests from 1969 through 1985 correlated with abundance of pheasants ($P < 0.05$), and with numbers and densities of pheasant nests ($P < 0.01$), so overall, the artificial nests may have helped reduce the incidence of parasitism of chicken nests. The correlations established from the previous 15 years of data suggest that parasitism might have been about 78% instead of the actual 39% had there been no artificial nests to attract parasitic hen pheasants. However, the incidence of parasitism of prairie-chicken nests did not correlate with the density of pheasant eggs deposited in artificial nests ($P > 0.10$) or with the density of artificial nests placed in fields ($P > 0.10$) (Table 3). For example, on the YFM unit where 19.3 artificial nests/10 ha were placed and 12.9 parasitic eggs/10 ha were deposited in these "nests", the parasitism rate among prairie-chicken nests was 67% (6 of 9 nests), whereas on the control area the parasitism rate was 17% (1 of 6 nests).

It took approximately 1 man-hour to collect each of the 61 (minimum count) parasitic eggs in 1986 (Table 2). Viewed from the perspective that

a single, early-hatching parasitic egg can result in the death of an entire clutch of prairie-chicken embryos, as actually happened in 1985, the use of artificial nests may be worthy of further investigation. Artificial eggs, made of plastic or glass, or perhaps old golf balls, may suffice for this purpose and have the advantage of no food reward for predators.

On-foot Nest Searches

The intensive on-foot search of 144 ha (356 acres) of sanctuary grasslands at Bogota in 1986 resulted in 31 prairie-chicken nests, 54 pheasant nests, 13 bobwhite nests, 9 mallard nests, 3 upland sandpiper nests, plus an assortment of other nesters. Twelve of the 31 chicken nests and 1 of the 9 mallard nests had been parasitized by pheasants.

Managed Prairie-Chicken Nests.--Five of the 12 parasitized prairie-chicken nests were found early enough so that the pheasant eggs could be removed, thus facilitating the success of each of the 5 nests. However, the percentage of egg success was substandard in 2 (15%, 47%) of these 5 nests. The pheasant eggs in these 2 prairie-chicken nests had live embryos with 9-11 days of incubation; however, it was later determined (after hatching of only 9 of the 28 prairie-chicken eggs) that $\geq$15 of the prairie-chicken embryos died at ages of 4-8 days. This finding brought 2 possibilities to light. First, it ruled out the possibility that the embryo mortality might have been due to researchers flushing the incubating hens off their nests. Secondly, the finding supported the earlier discovery (Westemeier et al. ms in external review) that pheasant interactions with incubating prairie-chickens may somehow cause mortality of chicken embryos whether or not the parasitic eggs hatch--and possibly whether or not chicken nests are parasitized. Insufficient attentiveness

by prairie-chicken hens of their clutches owing to harassment by pheasants is a clear possible cause of the embryonic mortality.

The 2 poor hatches in cleaned-up nests have been the exception so far. Among 8 prairie-chicken nests which had pheasant eggs removed since 1983, 5 showed "normal" egg (92%) success, the 2 nests above averaged 32% egg success, and 1 nest was destroyed by a predator.

Unmanaged Prairie-Chicken Nests.--How well did unmanaged prairie-chicken nests fare in 1986? Only 3 (43%) prairie-chicken nests with pheasant eggs were successful among 7 nests not found early enough to remove parasitic pheasant eggs; predators destroyed 4 of these nests. Surprisingly, egg success was 100% for 2 of the 3 successful nests for which counts were judged complete, despite the hatching of 6 of 7 pheasant eggs in those 2 nests.

Among the 19 unparasitized prairie-chicken nests at Bogota this summer, 8 (42%) were successful, 10 were destroyed by predators, and 1 was abandoned. Success for 62 eggs from 6 nests, for which counts were judged complete, was 81%--somewhat low compared with the long-term average of 87% for 1,093 eggs over the "pheasant era" of 1970-85 at Bogota.

Overall, 16 (52%) of the prairie-chicken nests were successful among the 31 nests found in 1986 at Bogota. Overall egg success, however, was still below average with 121 (80%) hatched among 152 eggs in nests for which counts were judged complete. It is clear that pheasants are responsible for much of the suppression of egg success of prairie-chickens at Bogota.

Pheasant Nests.--Like abundance of pheasants at Bogota, the density of pheasant nests found during the intensive on-foot search in 1986 (3.9 nests/10 ha) about doubled over that of 1985 (2.0 nests/10 ha). Clearly,

the collection of 5 incubating pheasant hens and 88 eggs from 8 nests in 1985 did not control the subsequent abundance of pheasants. We knew of 9 hatches among 28 pheasant nests in 1985. In 1986, we were able to collect 17 incubating hens and 322 eggs from 24 (44%) of the 54 pheasant nests found on sanctuaries (Table 2); predation and abandonment accounted for 25 (46%) nests and 5 (9%) nests were successful. Thus, more incubating pheasant hens and eggs were collected in 1986 than in past years but the degree that these efforts constitute "control" presents an array of questions. How many hens were present at Bogota in spring 1986? How many hen pheasants were successful in rearing young this year? How many young were reared? How many pheasants will immigrate to the sanctuaries this fall and winter? There are no good answers to these questions.

Nest Searching with a Cable-Chain Drag

The search on 20-21 May of 16 fields totaling 42 ha (103 acres) resulted in finding nests of 1 woodcock and 1 bobwhite. Because the cover searched was high-use pheasant habitat, we felt confident that the drag merely slid on the vegetation over incubating pheasant hens without flushing them. Prairie-chicken nesting areas were not searched with the cable-chain drag because of cool rainy weather that began 13 May, thus constituting a danger to young broods and developing embryos. Separation of incubating or brooding hens from developing or very young chicks was considered too much of a risk. Time constraints and unavailability of help prior to mid May during relatively warm-dry conditions precluded earlier searches with the drag. Although the cable-chain drag technique seems clearly ineffective for finding incubating pheasant hens, its use by researchers/managers in Minnesota (Dr. W. Daniel Svedarsky, 1985, pers.

commun.) and Wisconsin (Mr. Jim Kier, 1985, pers. commun.) was highly successful in safely locating prairie-chicken nests. If proper conditions and manpower prevail in the future, the cable-chain drag merits further testing in our situation to find prairie-chicken nests so that parasitic pheasant eggs can be removed from those nests.

Discreet Shooting

From Blinds.--Aggressive harassment of prairie-chickens by cock pheasants on booming grounds was reported by Vance and Westemeier (1979). Similar interactions have been observed since that report. This spring (12 April) Dr. David Osborne, zoology professor, and 7 faculty members from Miami University, Oxford, Ohio, witnessed 1.5 hrs of aggressive interactions by 1 cock pheasant among the 28 prairie-chicken cocks regularly present on the Marshall Field booming ground. Dr. Osborne's group summarized their observations for the morning (in a large blind) as follows: "Effect of encroaching cock ringneck appears to result in a total, but slow displacement and movement of the chickens, thus shifting the lek."

Use of small portable blinds near prairie-chicken booming grounds and on pheasant crowing territories resulted in the collected of 9 cock pheasants in 41 man-hours (0.22 bird/man-hr). All 9 cocks were taken on the YFM unit and most of these were near ($\leq$0.4 km) the main booming ground. In 1 instance, a commercial pheasant call (Mallardtone) appeared effective in coaxing a wild cock pheasant to within 45 m of a blind for easy collection. Seven of the 9 cock pheasants subsequently taken by livetrapping were also collected on the YFM--also mostly within 0.4 km of the booming ground. Numbers like this indicate a high density of

pheasants, thus presenting a high probability for conflict with the subordinate prairie-chickens at Bogota. One is led to wonder how the chickens "hang on" as well as they do.

Other Efforts Using Shooting.--Twelve pheasants were discreetly collected by shooting during various other activities, or by intention, on the sanctuaries. Because these 12 specimens were taken largely opportunistically, little time (about 4 man hours) was involved, thus such an approach was relatively efficient (3 birds/man-hr). Fog, snowy conditions, and sometimes high winds, were used to advantage in order to be discreet in this approach. During such conditions, instead of being dispersed and inaccessible by feeding in corn stubble on private land, pheasants seemed more likely to seek the shelter of heavy cover on sanctuaries. Patches of tall, dense cover left unmanaged on the sanctuaries adjacent to corn stubble on private land were highly effective in concentrating pheasants during the winter of 1985-86. The patches of heavy cover were designed for that purpose on the basis of earlier findings (Westemeier 1984).

RECOMMENDATIONS

This report is not intended to be a detailed plan for implementing control of pheasants on prairie-chicken sanctuaries this fall or winter because of the needed discussions and meetings yet to transpire, and the approvals that must be obtained. Rather, some recommendations and considerations are discussed for whatever help they may be.

In summary, reproduction by pheasants, numbers of pheasants, and interference by pheasants with prairie-chickens may have been temporarily suppressed by control efforts implemented in 1986 on the sanctuaries at

Bogota. Such a supposition must be considered guardedly optimistic and highly temporary at best. There can be little confidence that any single method alone will provide a satisfactory long-term solution to controlling numbers of pheasants on the prairie-chicken sanctuaries. An ongoing integreated approach to control seems essential. I recommend an annual integration of habitat manipulation in late summer and fall, followed by a drastic reduction via shooting in fall and winter, then followed by a combination of "mop-up" methods in spring and summer as discussed in this report.

Habitat Manipulation

General.--Because of the similar rates of utilization of all cover types by nesting prairie-chickens and ring-necked pheasants, altering habitat management practices will not reduce parasitism of prairire-chicken nests or competition for nest sites between the 2 species. However, much different patterns of cover use by pheasants and prairie-chickens are evident for roosting (nocturnal and diurnal), escape cover, and possibly crowing/booming territories (Westemeier 1984). Thus, a general habitat management approach to pheasant control on the sanctuaries includes (1) combining for seed, or otherwise mowing fields to a height of approximately 30 cm in late summer or fall, (2) conducting prescribed burning of prairie grass in late fall, instead of late winter or early spring, and (3) completing routine plowing of old sods in fall, to reduce preferred winter loafing and roosting cover for pheasants.

Perimeter Hotspot Development.--Pheasants have shown a high degree of selection for stands of prairie grass, particularly switchgrass, left undisturbed on the prairie-chicken sanctuaries. In order to facilitate

legal hunting on private land near sanctuaries and not cause too many problems, such stands should be (1) held to 1-4 ha in size, (2) be on sanctuary perimeters adjacent to corn stubble on private land, and (3) be away from booming grounds and occupied farmsteads or homesites. As a form of biological control, a perch suitable for great horned owls and other raptors, might be installed near each hotspot in order to facilitate hunting by raptors. Perches should be designed to be taken down if concentrations of pheasants do not occur nearby in order to lessen the possibility of raptors killing prairie hichkens.

Shooting

Passive System.--Perimeter fields from which pheasants walk, run, or fly each morning to adjacent corn stubble fields on private land and return each evening provide local sportsmen with opportunities to legally harvest cocks near "hotspots". However, pheasants are difficult to bag when dispersed in large fields of relatively open corn stubble. One technique would be to ambush pheasants, perhaps from blinds, on private land near managed hotspots as the birds move to or from feeding sites. Under certain conditions, however, pheasants seem reluctant to leave the shelter of heavy cover and thus spend much of the daytime on sanctuaries legally unavailable to hunters. Illegal hunting on sanctuaries might be inadvertantly encouraged by a passive system of managed hotspots.

Low-Key Approach by Experts/(Locals?).--Local participation in harvesting pheasants on prairie-chicken sanctuaries seems desirable from the standpoint of public relations and political implications; however, such participation generates more problems than benefits. The perimeter-hotspot approach provides opportunities for sanctuary managers and biologists to

emphasize removal of hen pheasants with some discretion. Limited shooting of pheasants in sanctuary hotspots would likely go relatively unnoticed during regular hunting seasons. Even after the waterfowl and upland game seasons, shooting associated with coyote hunting is common at Bogota. There are frequent opportunities to remove significant numbers of hen pheasants by shooting during the half-hour after sunset (after legal shooting time) when birds are going to roost in sanctuary hotspots. Such opportunities, however, are just that--they are opportunities that do not afford advance planning for a "swat-team" approach in daylight. Unfortunately, shooting by local managers/biologists has the disadvantage of being viewed by local citizens as the local "prairie-chicken guys" out having a good time shooting "their" pheasants.

The Drastic Approach.--As discussed and agreed to by most all concerned during the fall/winter of 1985-86, the drastic approach was to involve shooting at night by personnel of the INHS and IDOC, when the ground was sufficiently frozen to support nightlighting vehicles. Nightlighting and shooting should again be seriously considered, approved, and implemented if other approaches via shooting are not feasible or sufficiently effective. Nightlighting and shooting would be difficult for participants, hard on equipment, and probably not supported by local sentiment. It is also untried. Nightlighting and shooting, however, may be our only viable option to effectively reduce pheasant abundance on the sanctuaries. If so, the risks may need to be taken. It may be prudent to try nightlighting and shooting with 1 rig and few personnel in safe terrain remote from human habitation, prior to a full-fledged effort.

Nest Studies

The nest study continues to be the heart of the prairie-chicken project. Among the short-term, stop-gap approaches to control of pheasants that have been tried on the sanctuaries, the intensive on-foot nest search should be continued each year starting in late April. The nest study should be continued in conjunction with habitat manipulations and shooting in order to evaluate the effects of more drastic efforts to control pheasants. The value of continuing the long-term data base on nesting by communities of grassland wildlife is paramount in its own right.

Finally, a marked recovery of the prairie-chicken population at Bogota following a substantial reduction of pheasants, would provide valuable management information as well as data on the population dynamics of prairie-chickens.

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Table 1. Numbers of crowing cock pheasants and pheasant nests found on the Bogota Study Area, and numbers of pheasants, pheasant nests, and pheasant eggs removed from prairie-chicken sanctuaries by project personnel, 1969 through August 1986.

Year	Spring count of crowing cocks	Pheasant nests found	Pheasants removed from sanctuaries			
			Cocks	Hens	Nests	Eggs
1969	4	1	0	0	0	0
1970	6	7	0	0	0	0
1971	8	10	0	0	0	0
1972	6	4	0	0	0	0
1973	8	9	0	0	0	0
1974	14	4	2	1	0	0
1975	22	6	6	4	0	0
1976	18	5	3	3	0	0
1977	23	5	2	2	0	0
1978	26	13	6	13	7	84
1979	22	10	3	3	2	20
1980	25	12	1	2	0	0
1981	48	21	3	1	1	14
1982	46	19	0	1	1	10
1983	29	11	6	3	4	62
1984	24	29	0	5	6	74
1985	38	28	3	5	8	95
1986	70	54	23	27	24	402

Table 2. Summary of efforts to control pheasants on prairie-chicken sanctuaries, Bogota Study Area, 1986.

Control Method	Period tried	Trap hours	Man hours	Pheasants & eggs collected				
							Per man-hour	
				Cocks	Hens	Eggs	Birds	Eggs
Livetrapping:								
Funnel traps								
Males as bait	20 Mar.-26 Jun.	555	51	5	0		0.10	
Females as bait	31 Mar.-26 Jun.	297	27	4	0		0.15	
Snares	20 Mar.-22 Apr.	141	9	0	0		0.00	
Nest studies:								
Artificial nests	1 Apr.-15 May		56	0	3	≥ 61	0.05	1.09
On-foot searches	29 Apr.-30 Jun.		445					
Pheas. nest termin.				0	17	322	0.04	0.72
P-c nest "clean-up"				0	0	19		0.04
Cable-chain drag	20-21 May		64	0	0	0	0.00	0.00
Discreet shooting:								
From blinds	17 Mar.-23 Apr.		41	9	0		0.22	
Using chick calls	May-July		3	0	0		0.00	
Opportunistically	Jan.-May		4	5	7		3.00	
Total or Mean		993	698	23	27	402	0.08	0.71

Table 3. Results of artificial nest placement to decoy parasitic egg laying by pheasants on prairie-chicken sanctuaries in 1986, Bogota Study Area.

Sanctuary	Artificial nests placed & results: N	Nests/ 10 ha	Nests parasitized	Parasitic eggs deposited: N	N/10 ha	Grassland searched for nests (ha)	Prairie-chicken nests found: Total	Para-sitized	% Para-sitized
YFM [a]	18	19.3	4	12	12.9	9.3	9	6	67
YFM	26	4.4	6	24	4.0	60.0	6	3	50
E. Don [b]	6	29.7	3	11	54.4	2.0	0	--	--
E. Don	9	5.9	2	4	2.7	15.0	1	0	0
C. McC [c]	20	4.9	4	10	2.4	41.3	9	2	22
W. Don [d]	0	--	--	--	--	16.6	6	1	17
Total or Mean	79	5.4	19	61	4.2	144.1	31	12	39

[a] Yeatter-Field-McGraw unit

[b] East Donnelley unit

[c] C. McCormick unit

[d] West Donnelley unit (control)

FIG. 1. PRAIRIE CHICKEN SANCTUARIES, JASPER COUNTY

1. Ralph E. Yeatter, 77 acres
2. Max McGraw, 20 acres
3. Donnelley Brothers, West 60 acres
4. Cyrus H. Mark, 17 acres
5. Jamerson McCormack, 80 acres
6. Mr. and Mrs. Chauncey McCormick, 140 acres

* = Grassland Wildlife Research Lab.

7. Cyrus H. Mark, 40 acres
8. Stuart H. Otis, 58 acres
9. Donnelley Brothers, East 60 acres
10. Marshall Field III, 135 acres
11. Fuson Farm, 164 acres
12. Joseph W. Galbreath, 110 acres
13. Walters, 40 acres
14. CIPS, 200 acres

Ownership or Lease By:

= Illinois Department of Conservation	612 acres
= The Nature Conservancy	589 acres
TOTAL	1,201 acres

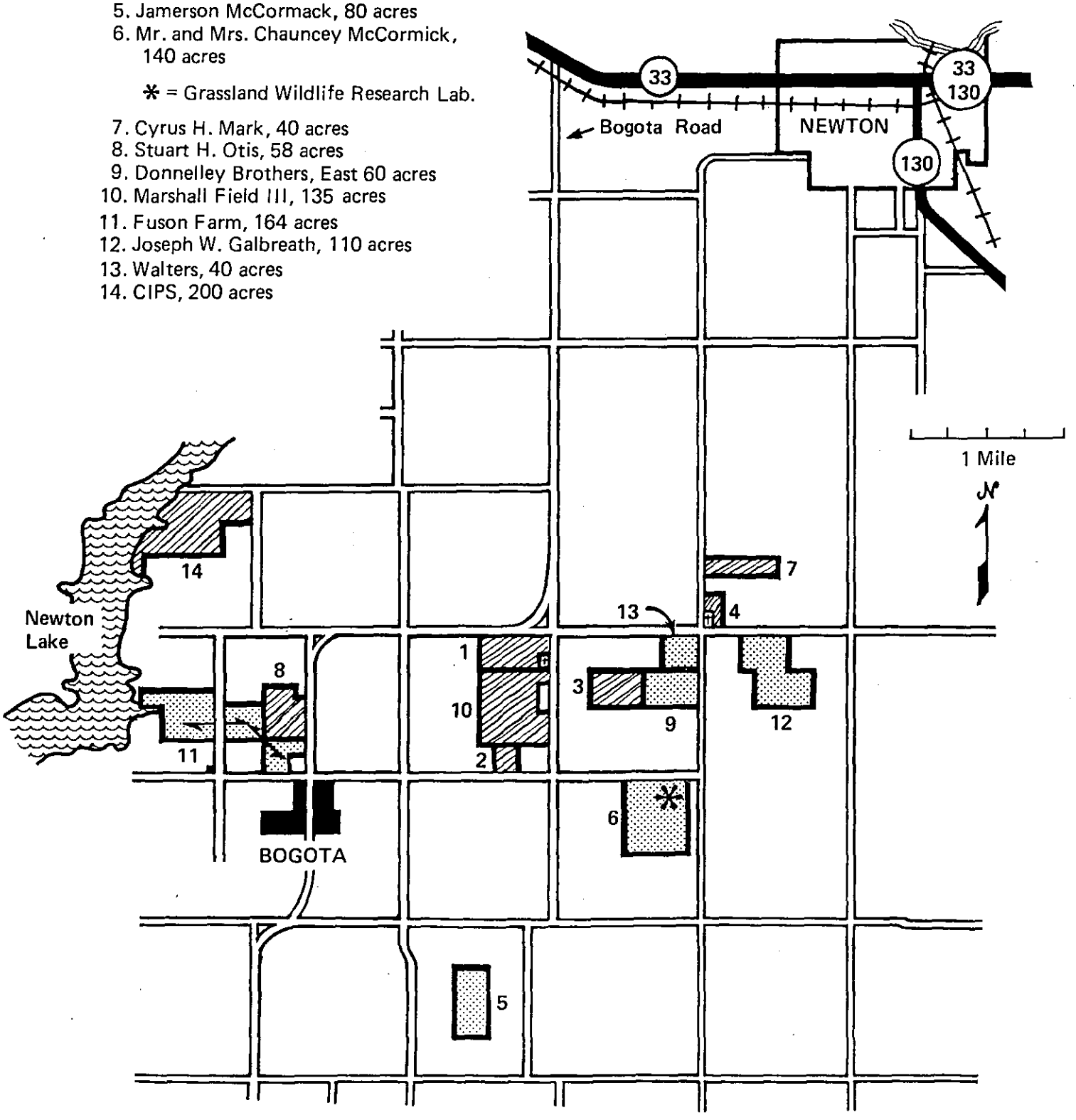
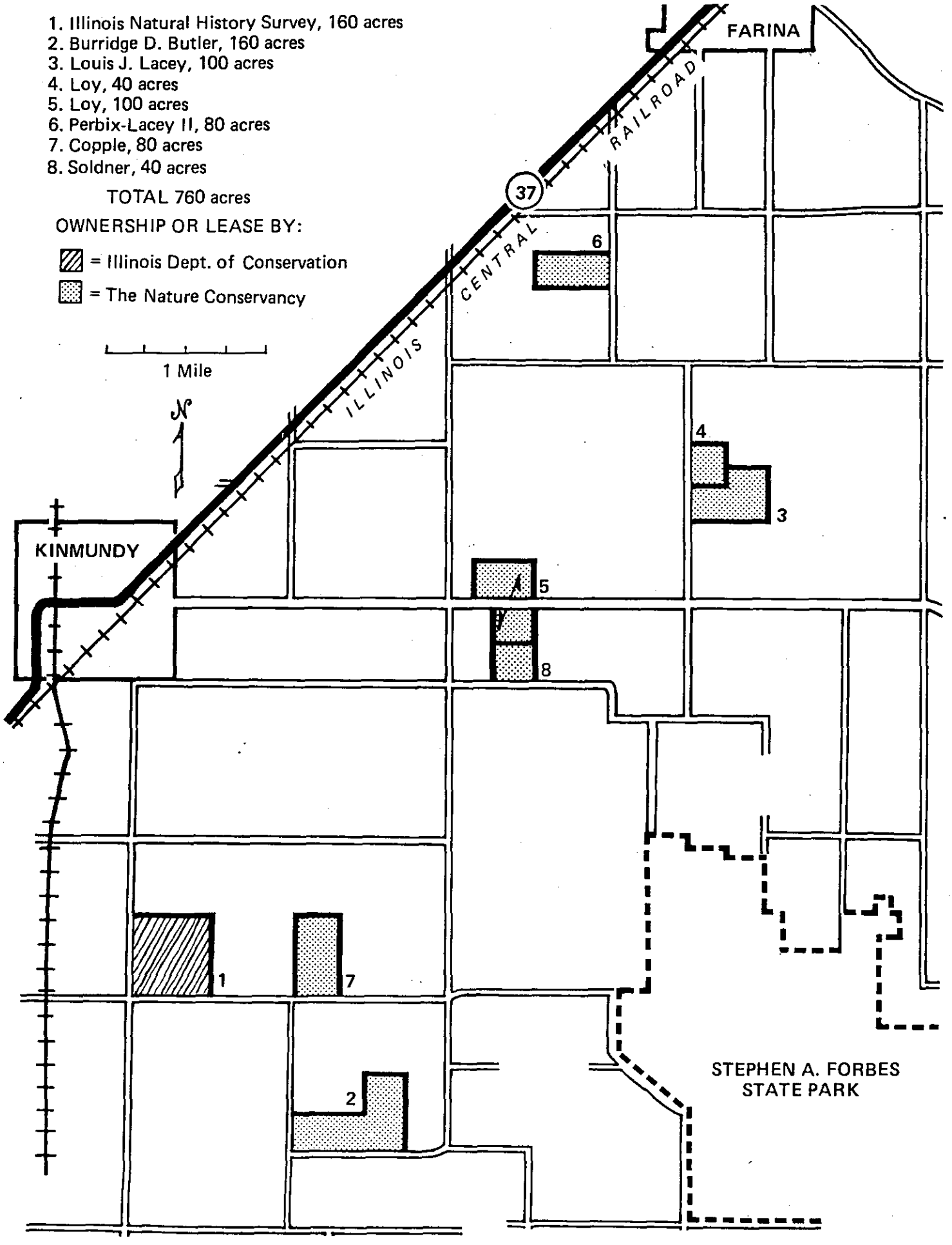


FIG. 2. PRAIRIE CHICKEN SANCTUARIES, MARION COUNTY



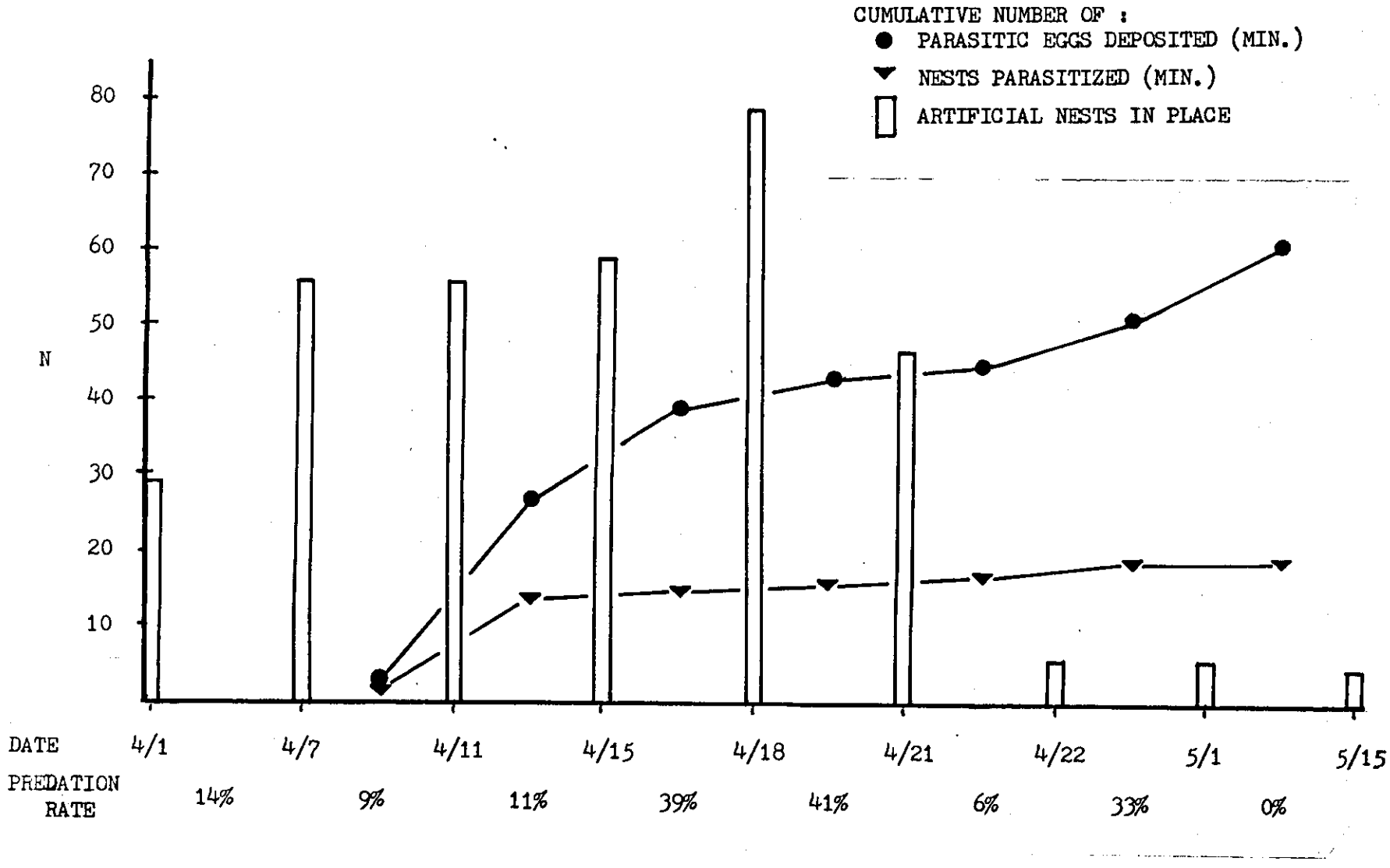


Fig. 3. Egg deposition by pheasants in artificial nests on prairie-chicken sanctuaries, Bogota Study Area, 1 April - 15 May, 1986.

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Date: 9 September 1986

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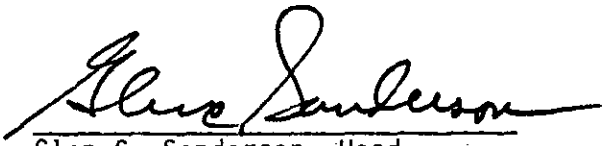

Glen C. Sanderson, Head
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ILLINOIS NATURAL HISTORY SURVEY

Section of Wildlife Research

FINAL REPORT SUBMITTED TO

ILLINOIS DEPARTMENT OF CONSERVATION

DIVISION OF NATURAL HERITAGE

PROTECTION OF NATIVE ENDANGERED PRAIRIE-CHICKENS FROM RING-NECKED PHEASANTS ON ILLINOIS SANCTUARIES

1 April - 31 August 1986

by

Ronald L. Westemeier

9 September 1986

PROTECTION OF NATIVE ENDANGERED PRAIRIE-CHICKENS FROM RING-NECKED PHEASANTS ON ILLINOIS SANCTUARIES

We have concluded, on the basis of an intensive nesting and population study continuous since 1963, that pheasants currently pose the single greatest threat to preservation of Illinois prairie-chickens (Vance and Westemeier 1979, Westemeier 1984, Westemeier and Edwards in Press, Westemeier, Buhnerkempe, and Edwards, ms under external review). Extirpation in the near future is highly probable unless pheasant numbers on the prairie-chicken sanctuaries are controlled.

The purpose of this report is to provide the Illinois Department of Conservation with an evaluation of various methods of acceptably controlling pheasant numbers on prairie-chicken sanctuaries. The study was made possible in part by a grant from the Illinois Nongame Wildlife Conservation Fund.

Status of Prairie-Chickens and Pheasants

The 24th consecutive spring census of greater prairie-chickens in Illinois showed a total of 116 cocks. The 1986 counts included 42 cocks on the main study area at Bogota in Jasper County (Fig. 1) and 70 cocks near Kinmundy in Marion County (Fig. 2); respective declines for the 2 areas were 31% and 20% since spring 1985. (Counts of hens are not used for annual comparisons because of the greater variability--than is the case for cocks--in their presence on booming grounds.) We checked several reports of prairie-chickens in areas with no sanctuaries and located a small flock

with at least 4 cocks and 5 hens in the Oskaloosa "prairie" area of Clay County. Chickens were last known in this area in 1965, but local residents indicated that the birds reappeared about 4 years ago. This surprise flock evidently resulted from a dispersal of colonizers from the population near Kinmundy prompted by the cyclic high in 1982. The distance between the 2 areas is about 8 miles.

In contrast to the 31% decline of prairie-chickens at Bogota, pheasants on that area about doubled from 38 crowing cocks in 1985 to at least 70 cocks in 1986 (Table 1). As in the past few years, prairie-chicken booming grounds were limited to the 3 central sanctuary units, but pheasants were concentrated on all sanctuaries at Bogota. Numbers, densities, and distribution of prairie-chickens at Kinmundy were good compared with those at Bogota. In spring 1986, no crowing pheasant cocks were heard in Marion County during our standard pheasant census. However, single cocks were seen on the Lacey-Loy and Loy-Soldner units. Broods of pheasants were also seen by project personnel and reported by farmers in this area later this summer. These observations suggest possible establishment and future problems in Marion County such as we now experience in Jasper County.

Reduced populations of prairie-chickens at both Bogota and Kinmundy in spring 1986 were likely in part related to cyclic factors (lows typically occur in years ending in 5, 6, 7, or 8) and to later-than-normal farming activities (tillage, seeding, and spraying) in 1985, which coincided with brooding efforts by prairie-chickens. However, research findings leave little doubt that pheasant interactions with chickens greatly exacerbated the situation at Bogota (Buhnerkempe and Westemeier 1985). Pheasants continue to present probably the greatest single threat to the survival of

the last remnant flocks of prairie-chickens on native range east of the Mississippi River (Westemeier 1984, Westemeier et al. ms under external review). Those remnant flocks, basically two, occur in Illinois. Greater detail on the status of Illinois prairie-chickens, historic and current, are given by Westemeier (1985a,b) and Simpson et al. (1986).

METHODS

Approaches evaluated as possible methods for reducing negative impacts of pheasants on prairie-chickens on sanctuaries at Bogota in 1986 included livetrapping, use of artificial nests, use of a cable-chain drag, on-foot searches for nests, and discreet shooting as follows:

Livetrapping

Livetrapping with funnel traps using game-farm pheasants to attract wild pheasants was tried on 26 days between 20 March and 26 June 1986. Trap-hours totaled 852, including 555 trap-hours with cocks as bait and 297 trap-hours with hens as bait. Trapping periods usually extended between 0800 and 1700 hours.

Wire poultry netting (2.5-cm mesh) and 2.5- x 7.6-cm lumber was used for framing funnel traps that measured 259 cm long, 122 cm wide, and 61 cm high. Cages for pheasants used as bait were constructed of welded wire (2.5-cm x 5.1-cm mesh) and measured 91 cm long by 46 cm in width and height. Nylon netting of 2.5-cm mesh was stretched tight and suspended as a buffer 5 cm from the top of each cage to minimize scalping of "bait" pheasants. Bait birds were provided food and water ad libitum and held continually in their cages in order to minimize handling. Each cage containing a bait bird was centrally placed perpendicular to the long axis

of each trap. Funnels--also of poultry netting measuring approximately 30 cm long, with the width tapering from 27 cm to 20 cm and the height tapering from 30 cm to 20 cm--were placed in the center of each end of the traps.

Caged bait birds were also tried in conjunction with monofilament snares as described by Berger and Hamerstrom (1962). Up to 25-30 snares were tied to strips of welded wire and staked to the ground on 2 sides of a caged bait bird. The cage/snare approach was tried on 7 days between 20 March and 22 April for a total of 141 trap hours.

Criteria for selecting a trapsite included (1) frequent observation of a cock pheasant on a fairly specific site, (2) good visibility such as field lanes, firelanes, or bare ground, (3) access by project vehicles, and (4) concealment from the general public. Traps were checked about noon and at pick-up time. Windy or rainy days were avoided.

Artificial Nests

In an attempt to decoy egg deposition by pheasants, artificial nests were created on the 3 central sanctuaries using fresh pheasant eggs donated by the Max McGraw Wildlife Foundation. Beginning 1 April 1986, with the placement of 29 artificial nests, the number of "dummy" nests was increased to 79 by 18 April. Clutch size was generally increased by adding an egg twice weekly whether or not parasitism had occurred. Destroyed or missing clutches were replaced with the number of eggs that would have been present had predation not occurred.

Densities of artificial nests ranged from highs of about 30 and 20 per 10 ha in several of the fields where parasitism had been documented during 1970-85, to about 4 nests per 10 ha in other areas. Fields on the 24-ha

(60-acre) West Donnelley Sanctuary were used as controls (no artificial nests) because (1) that area also had a history of parasitic nesting, (2) its location was central to the 3 areas with artificial nests, and (3) because of the relative inaccessibility of the West Donnelley unit.

Artificial nests were placed on field edges near (≤0.5 m) sharp breaks in cover such as field lanes, firelanes, and bare fields in order to be visible to hen pheasants from travelways. A depression (scrape) was made in grassy vegetation, a mat of grassy duff was added, and each "nest" entry was oriented east, northeast, or north to protect eggs from rapid spoilage and bleaching by the sun. Blaze-orange flagging ribbon was tied in vegetation 10 m north of each artificial nest to facilitate rapid relocation.

Nest Searching

Nest searches in 1986 were conducted on foot and with a cable-chain drag. Systematic searching on foot as described by Westemeier (1973) and Westemeier and Buhnerkempe (1983) involved 445 man-hours to cover 144 ha (356 acres). On-foot nest searches were begun earlier in 1986 (29 April) than in past years in an effort to remove pheasant eggs from more of the active prairie-chicken nests and to collect more pheasant eggs and hens from pheasant nests than has been possible in previous years.

The cable-chain dragging technique described by Higgins et al. (1977) was tried on 20-21 May 1986 in 16 fields totaling 42 ha (103 acres) in an effort to find active pheasant nests.

Discreet Shooting

Efforts were made on 20 occasions between 17 March and 23 April 1986 (41 man hours) to reduce the number of pheasant cocks primarily on the

Yeatter-Field-McGraw (YFM) Sanctuary Unit, by the use of discreet shooting from small portable blinds. The YFM unit contained the largest booming ground (29 cocks, 69% of the total cocks) in spring 1986, as had been the case annually over the past 23 years at Bogota. Blinds were placed near prairie-chicken booming grounds or near pheasant cock territories. Shooting was done mainly with the use of .22 rifles with short hollow point ammunition. Pheasant calls were generally used while occupying blinds and on occasion, caged game-farm pheasants were placed on top of the blinds as live decoys.

RESULTS AND DISCUSSION

Livetrapping

The use of funnel traps between 5 and 26 June 1985 resulted in the capture of 4 cock pheasants in 152 trap-hours (2.6 captures/100 trap-hours). This capture rate suggested the possibility that pheasant numbers might be effectively reduced from the sanctuaries if done throughout the breeding season. However, in 852 trap-hours from late March through late June 1986 only 9 cock pheasants (1.1 captures/100 trap-hours) were taken despite a doubling in the area cock population between 1985 and 1986 (Tables 1, 2). Dates of captures in 1986 were 21 and 22 May and 13, 16, 19, 23, and 25 June. One of the 4 captures in 1985 and 4 of the 9 captures in 1986 were made with game-farm hen pheasants as bait. Half of the 4 cocks in 1985 and 8 of the 9 cocks this year were captured by noon of each trap-day.

Use of the cage/snare set-ups resulted in 1 only temporary capture of a wild cock pheasant (feathers were present) on 31 March. This short-term capture resulted in the death of the bait cock. Also, a red-tailed hawk

was inadvertantly snared on 22 April with no harm to either the bait hen or hawk.

Although livetrapping proved disappointing from the standpoint of pheasants captured, the field work suggested 3 ways of increasing livetrapping efficiency. First, trapping should probably be limited to the period of mid May through June. Second, caged hen pheasants appear as likely (perhaps more so) as cocks (rivals) to attract wild pheasant cocks into funnel traps. Third, the daily period of from about 0800 to 1200 hours appears to be the most promising time span for captures.

Funnel traps baited with game-farm pheasants may not be an efficient long-term solution to suppressing pheasant numbers on prairie-chicken sanctuaries. However, the technique may offer innovations for further studies of pheasant biology, behavior, and management during the breeding season. Buffer netting should be added to the inside top of funnel traps to minimize scalping.

Artificial Nests

A cumulative total of at least 61 parasitic pheasant eggs were deposited in at least 19 of the 79 artificial nests gradually placed in sanctuary meadows (Tables 1, 2). The first deposition of eggs by wild pheasants in the artificial nests occurred between 7 April and 11 April. Parasitism rose rapidly thereafter until 18 April (Fig. 3). By mid April, predation, primarily by crows during intervals of only 3 days had increased to about 90% of the eggs in artificial nests on the C. McCormick and East Donnelley sanctuaries. Essentially all nests pilfered by crows were empty with no egg shells to be found in the vicinity of the nest site, indicating that crows had carried off the eggs, a finding consistent with that of

Montevecchi (1976). The flagging 10 m from each artificial nest evidently provided a visual cue to crows that aided them in finding nest sites, as was the case in studies by Picozzi (1975) and Yahner and Wright (1985).

On 21 April, 2 crows were observed carrying pheasant eggs from artificial nests within 10 minutes after the eggs had been replaced in emptied (previously depredated) nests. Because of the very high rate of predation by crows and the probable increased risk to nearby prairie-chicken nests, this study was essentially terminated by 22 April. Six artificial nests that were still intact and well concealed from crows were checked until 15 May with 5 of the 6 nests being parasitized by pheasants. Thus, it is reasonable to assume that the number of parasitic eggs deposited by pheasants in artificial nests was considerably above the known minimum of 61 eggs, and that considerably more "nests" would have attracted greater numbers of wild pheasant eggs had the study continued.

Was there evidence that the artificial nests helped curtail the incidence of parasitism by pheasants of prairie-chicken nests? Twelve (39%) of 31 prairie-chicken nests were parasitized by pheasants in 1986 (Table 3). The parasitism rate was 38% in 1985 (9 of 24 nests) and 43% in 1983 (9 of 21 nests) when the pheasant population was only 54% and 41%, respectively, of that in 1986. Numbers of parasitized prairie-chicken nests from 1969 through 1985 correlated with abundance of pheasants ($P < 0.05$), and with numbers and densities of pheasant nests ($P < 0.01$), so overall, the artificial nests may have helped reduce the incidence of parasitism of chicken nests. The correlations established from the previous 15 years of data suggest that parasitism would have been about 78% instead of the observed 39% had there been no artificial nests to attract parasitic hen pheasants. However, the incidence of parasitism of prairie-

chicken nests did not correlate with the density of pheasant eggs deposited in artificial nests ($P > 0.10$) or with the density of artificial nests placed in fields ($P > 0.10$) (Table 3). For example, on the YFM unit where 19.3 artificial nests/10 ha were placed and 12.9 parasitic eggs/10 ha were deposited in these "nests", the parasitism rate among prairie-chicken nests was 6 of 9 nests (69%), whereas on the control area the parasitism rate was 1 of 6 nests (17%).

It took approximately 1 man-hour of effort per parasitic egg dropped in an artificial nest (Table 2). Viewed from the perspective that a single, early-hatching parasitic egg can result in the death of an entire clutch of prairie-chicken embryos, as actually happened in 1985, the use of artificial nests may be worthy of further investigation as part of an overall control program. Artificial eggs, made of plastic or glass, or perhaps old golf balls, might suffice and have the advantage of no food reward for predators. As a single means of pheasant control, however, artificial nests cannot be expected to control parasitism.

On-foot Nest Searches

The intensive on-foot search of 144 ha (356 acres) of sanctuary grasslands at Bogota in 1986 resulted in 31 prairie-chicken nests, 54 pheasant nests, 13 bobwhite nests, 9 mallard nests, 3 upland sandpiper nests, plus nests of an assortment of other species. Twelve of the 31 chicken nests and 1 of the 9 mallard nests had been parasitized by pheasants.

Managed Prairie-Chicken Nests.--In 1986, five of the 12 parasitized prairie-chicken nests were found early enough so that the pheasant eggs could be removed, thus facilitating the success of each of the 5 nests.

However, the percentage of egg success was substandard in 2 (15%, 47%) of those 5 nests. The pheasant eggs in those 2 prairie-chicken nests had live embryos with 9-11 days of incubation; however, it was later determined (after hatching of only 9 of the 28 prairie-chicken eggs) that at least 15 of the prairie-chicken embryos had died at ages of 4-8 days. This finding shed light on 2 important possibilities. First, it ruled out the possibility that the embryo mortality might have been due to researchers flushing the incubating hens off their nests because the deaths occurred before the nests were found. Second, the finding supported previous evidence (Westemeier et al. ms in external review) that pheasant interactions with incubating prairie-chickens at times cause mortality of prairie-chicken embryos even if the parasitic eggs do not hatch and possibly whether or not chicken nests are parasitized. Insufficient attentiveness by prairie-chicken hens of their clutches owing to harassment by pheasants is a clear possible cause of the embryonic mortality.

The 2 poor hatches among managed nests have been the exception so far. Since 1983, among 8 prairie-chicken nests found early enough to facilitate removal of pheasant, 5 showed "normal" egg (92%) success, the 2 nests above averaged 32% egg success, and 1 nest was destroyed by a predator.

Unmanaged Prairie-Chicken Nests.--How well did unmanaged prairie-chicken nests fare in 1986? Only 3 (43%) prairie-chicken nests with pheasant eggs were successful among 7 nests not found early enough to remove parasitic pheasant eggs; predators destroyed 4 of these 7 nests. Surprisingly, egg success was 100% for 2 of the 3 successful nests for which counts were judged complete, despite the hatching of 6 of 7 pheasant eggs in those 2 nests.

Among the 19 unparasitized prairie-chicken nests at Bogota in 1986, 8 (42%) were successful, 10 were destroyed by predators, and 1 was abandoned. Success among 62 eggs from 6 nests, for which counts were judged complete, was 81%--somewhat low, but not significantly lower ($P > 0.05$) than the long-term average of 87% for 1,093 eggs over the "pheasant era" of 1970-85 at Bogota.

Overall, 16 (52%) of the prairie-chicken nests were successful among the 31 nests found in 1986 at Bogota. Overall egg success, however, was still below average with 121 (80%) hatched among 152 eggs in nests for which counts were judged complete. It is clear that pheasants are responsible for much of the suppression of egg success of prairie-chickens at Bogota.

Pheasant Nests.--Like abundance of pheasants at Bogota, the density of pheasant nests found during the intensive on-foot search in 1986 (3.9 nests/10 ha) was about double that found in 1985 (2.0 nests/10 ha). Clearly, the collection of 5 incubating pheasant hens and 88 eggs from 8 nests in 1985 did not control the subsequent abundance of pheasants. We knew of 9 hatches among 28 pheasant nests in 1985.

In 1986, we were able to collect 17 incubating hens and 322 eggs from 24 (44%) of the 54 pheasant nests found on sanctuaries (Table 2); predation and abandonment accounted for 25 (46%) nests and 5 (9%) nests were successful. Thus, more incubating pheasant hens and eggs were collected in 1986 than in past years but the degree that these efforts constitute "control" presents an array of questions. How many hens were present at Bogota in spring 1986? How many hen pheasants were successful in rearing young this year? How many young were reared and will survive the coming winter? How many pheasants will immigrate to the sanctuaries this fall and winter? There are no good answers to these questions.

Nest Searching with a Cable-Chain Drag

The search on 20-21 May of 16 fields totaling 42 ha (103 acres) resulted in finding nests of 1 woodcock and 1 bobwhite. Because the cover searched was high-use pheasant habitat, we believed that nests and nesting hens were present and that the drag merely slid on the vegetation over the incubating pheasant hens without flushing them. Prairie-chicken nesting areas were not searched with the cable-chain drag because of the possible danger to young broods and developing embryos. Separation of incubating or brooding hens from developing or very young chicks during the cool rainy weather that began 13 May was considered too much of a risk. Time constraints and unavailability of help prior to mid May during relatively warm-dry conditions precluded earlier searches with the drag. Although the cable-chain drag technique seems clearly ineffective for finding incubating pheasant hens, its use by researchers/managers in Minnesota (Dr. W. Daniel Svedarsky, 1985, pers. commun.) and Wisconsin (Mr. Jim Kier, 1985, pers. commun.) was highly successful in safely locating prairie-chicken nests. If proper conditions and manpower prevail in the future, the cable-chain drag merits further testing in attempts to find active prairie-chicken nests so that parasitic pheasant eggs can be removed from those nests.

Discreet Shooting

From Blinds.--Aggressive harassment of prairie-chickens by cock pheasants on booming grounds was reported by Vance and Westemeier (1979). Similar interactions have been observed since that report. This spring (12 April) Dr. David Osborne, zoology professor, and 7 faculty members from Miami University, Oxford, Ohio, witnessed 1.5 hrs of aggressive

interactions by 1 cock pheasant among the 28 prairie-chicken cocks regularly present on the Marshall Field booming ground. Dr. Osborne's group summarized their observations for the morning (in a large blind) as follows: "Effect of encroaching cock ringneck appears to result in a total, but slow displacement and movement of the chickens, thus shifting the lek."

Use of small portable blinds near prairie-chicken booming grounds and on pheasant crowing territories resulted in the collected of 9 cock pheasants in 41 man-hours (0.22 bird/man-hr). All 9 cocks were taken on the YFM unit and most of these were near ($\leq$0.4 km) the main booming ground. In 1 instance, a commercial pheasant call (Mallardtone) appeared effective in coaxing a wild cock pheasant to within 45 m of a blind for collection. Subsequently, 7 of the 9 cock pheasants taken by livetrapping were also collected on the YFM--also mostly within 0.4 km of the same booming ground. Numbers like this indicate a high density of pheasants and thus a high probability for conflict with the subordinate prairie-chickens at Bogota. One is led to wonder how the chickens "hang on" as well as they do.

Other Efforts Using Shooting.--Twelve pheasants were discreetly collected by shooting largely incidental to other activities on the sanctuaries. Because most of these 12 specimens were taken opportunistically, little time (about 4 man hours) was involved and such an approach was relatively efficient (3 birds/man-hr). Fog, snowy conditions, and sometimes high winds, were used to advantage in order to be discreet in this approach. During such conditions, instead of being dispersed and relatively inaccessible by feeding in corn stubble on private land, pheasants seemed more likely to seek the shelter of heavy cover on sanctuaries. Patches of tall, dense cover left unmanaged on the

sanctuaries adjacent to corn stubble on private land were highly effective in concentrating pheasants during the winter of 1985-86. Such patches were created for the purpose of concentrating pheasants on the basis of earlier findings (Westemeier 1984).

RECOMMENDATIONS

This report is designed as a basis for development of a detailed plan for control of pheasants on prairie-chicken sanctuaries to be implemented by the IDOC in the winter of 1986-87.

In summary, reproduction by pheasants, numbers of pheasants, and interference by pheasants with prairie-chickens may have been partially and only temporarily suppressed by experimental control efforts implemented in 1986 on the sanctuaries at Bogota. There can be little confidence that any single method alone will provide a satisfactory, cost effective, long-term solution to controlling numbers of pheasants on the prairie-chicken sanctuaries. An ongoing integreated approach to control is appropriate. I recommend an integration of habitat manipulation in late summer and fall, followed by a drastic reduction via shooting in fall and winter, then followed by a combination of "mop-up" methods in spring and summer as discussed in this report, as the basic annual elements of pheasant control necessary for the long-term preservation of the remnant prairie-chicken flock at Bogota.

Habitat Manipulation

General.--Because of the similar utilization of cover types by nesting prairie-chickens and pheasants, altering habitat management practices will not significantly reduce parasitism of prairire-chicken nests or

competition for nest sites between the 2 species. However, much different patterns of cover use by pheasants than by prairie-chickens are evident for roosting (nocturnal and diurnal), escape cover, and possibly crowing/booming territories (Westemeier 1984). Thus, habitat management can be used in programs of pheasant control on the sanctuaries including (1) combining for seed, or otherwise mowing fields to a height of approximately 30 cm in late summer or fall, (2) conducting prescribed burning of prairie grass in late fall, instead of late winter or early spring, and (3) completing routine plowing of old sods in fall, to reduce preferred winter loafing and roosting cover for pheasants.

Perimeter Hotspot Development.--Pheasants have shown a high degree of selection for stands of prairie grass, particularly switchgrass, left undisturbed on the prairie-chicken sanctuaries. Stands of heavy cover are most attractive to roosting pheasants when located in close proximity to corn stubble suitable for feeding. Pheasant distribution can thus be managed by provision of such cover/food interfaces. In order to facilitate a passive system of legal hunting by local sportsmen on private land near sanctuaries and not cause too many problems, stands of tall, dense cover should be (1) held to 1-4 ha in size, (2) be on sanctuary perimeters adjacent to corn stubble on private land, and (3) be away from booming grounds and occupied farmsteads or homesites. Under certain conditions, pheasants seem reluctant to leave the shelter of heavy cover and thus spend much of the daytime on sanctuaries legally unavailable to hunters. Illegal hunting on sanctuaries might on occasion be inadvertantly encouraged by a passive system of managed hotspots.

Shooting by Experts

Low-Key Approach.--Local participation in harvesting pheasants on prairie-chicken sanctuaries may be desirable from the standpoint of public relations and political implications; however, such participation seems likely to generate more problems than benefits. The perimeter-hotspot approach provides opportunities for sanctuary managers and biologists to emphasize removal of hen pheasants with some discretion. With discretion, limited shooting of pheasants in sanctuary hotspots would likely go relatively unnoticed during regular hunting seasons. Even after the waterfowl and upland game seasons, shooting associated with coyote hunting is common at Bogota. There are frequent opportunities to remove significant numbers of hen pheasants by shooting during the half-hour after sunset (after legal shooting time) when birds are going to roost in sanctuary hotspots. Such opportunities, however, are just that--they are opportunities that do not afford advance planning options. Unfortunately, shooting by the local staff has the disadvantage of being viewed by local citizens as the "prairie-chicken guys" out having a good time shooting "their" pheasants.

The Nightlighting Approach.--As generally agreed to by most all concerned at several meetings held during the fall/winter of 1985-86, the most efficient approach would involve shooting at night by personnel of the INHS and IDOC, when the ground was sufficiently frozen to support nightlighting vehicles. Nightlighting and shooting should again be seriously considered, approved, and implemented if other approaches via shooting are not feasible or sufficiently effective. Nightlighting and shooting would be difficult for participants, hard on equipment, and probably not supported by local sentiment. It is also untried. However,

nightlighting and shooting appears our best, and may be our only viable option to effectively reduce pheasant abundance on the sanctuaries. If so, the risks may need to be taken. It may be prudent to try nightlighting and shooting with 1 rig and few personnel in safe terrain remote from human habitation, prior to a full-fledged effort.

Nest Studies

Although not generally well appreciated, the nest study continues to be the heart of the prairie-chicken management project. The intensive on-foot nest search should be continued each year starting in late April in conjunction with habitat manipulations and shooting in order to evaluate the effects of more serious efforts to control pheasants. The value of continuing the long-term data base on nesting by communities of grassland wildlife is paramount in its own right, as well as providing the essential basis for prairie-chicken management.

Finally, a marked recovery of the prairie-chicken population at Bogota following a substantial reduction of pheasants, would demonstrate a classic ecological phenomenon and significantly alter concepts of population ecology and wildlife management.

Acknowledgements

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Table 1. Numbers of crowing cock pheasants and pheasant nests found on the Bogota Study Area, and numbers of pheasants, pheasant nests, and pheasant eggs removed from prairie-chicken sanctuaries by project personnel, 1969 through August 1986.

Year	Spring count of crowing cocks	Pheasant nests found	Pheasants removed from sanctuaries			
			Cocks	Hens	Nests	Eggs
1969	4	1	0	0	0	0
1970	6	7	0	0	0	0
1971	8	10	0	0	0	0
1972	6	4	0	0	0	0
1973	8	9	0	0	0	0
1974	14	4	2	1	0	0
1975	22	6	6	4	0	0
1976	18	5	3	3	0	0
1977	23	5	2	2	0	0
1978	26	13	6	13	7	84
1979	22	10	3	3	2	20
1980	25	12	1	2	0	0
1981	48	21	3	1	1	14
1982	46	19	0	1	1	10
1983	29	11	6	3	4	62 [a]
1984	24	29	0	5	6	74
1985	38	28	3	5	8	95 [a]
1986	70	54	23	27	24	402 [a]

[a] Includes some pheasant eggs removed from prairie-chicken nests and those laid in artificial nests.

Table 2. Summary of efforts to control pheasants on prairie-chicken sanctuaries, Bogota Study Area, 1986.

Control Method	Period tried	Trap hours	Man hours	Pheasants & eggs collected				
							Per man-hour	
				Cocks	Hens	Eggs	Birds	Eggs
Livetrapping:								
Funnel traps								
Males as bait	20 Mar.-26 Jun.	555	51	5	0		0.10	
Females as bait	31 Mar.-26 Jun.	297	27	4	0		0.15	
Snares	20 Mar.-22 Apr.	141	9	0	0		0.00	
Nest studies:								
Artificial nests	1 Apr.-15 May		56	0	3	≥ 61	0.05	1.09
On-foot searches	29 Apr.-30 Jun.		445					
Pheas. nest termin.				0	17	322	0.04	0.72
P-c nest "clean-up"				0	0	19		0.04
Cable-chain drag	20-21 May		64	0	0	0	0.00	0.00
Discreet shooting:								
From blinds	17 Mar.-23 Apr.		41	9	0		0.22	
Using chick calls	May-July		3	0	0		0.00	
Opportunistically	Jan.-May		4	5	7		3.00	
Total or Mean		993	698	23	27	402	0.08	0.71

Table 3. Results of artificial nest placement to decoy parasitic egg laying by pheasants on prairie-chicken sanctuaries in 1986, Bogota Study Area.

Sanctuary	Artificial nests placed & results					Grassland searched for nests (ha)	Prairie-chicken nests found		
				Parasitic eggs deposited					
	N	Nests/ 10 ha	Nests parasitized	N	N/10 ha		Total	Para-sitized	% Para-sitized
YFM [a]	18	19.3	4	12	12.9	9.3	9	6	67
YFM	26	4.4	6	24	4.0	60.0	6	3	50
E. Don [b]	6	29.7	3	11	54.4	2.0	0	--	--
E. Don	9	5.9	2	4	2.7	15.0	1	0	0
C. McC [c]	20	4.9	4	10	2.4	41.3	9	2	22
W. Don [d]	0	--	--	--	--	16.6	6	1	17
Total or Mean	79	5.4	19	61	4.2	144.1	31	12	39

[a] Yeatter-Field-McGraw unit

[b] East Donnelley unit

[c] C. McCormick unit

[d] West Donnelley unit (control)

FIG. 1. PRAIRIE CHICKEN SANCTUARIES, JASPER COUNTY

1. Ralph E.Yeatter, 77 acres
2. Max McGraw, 20 acres
3. Donnelley Brothers, West 60 acres
4. Cyrus H. Mark, 17 acres
5. Jamerson McCormack, 80 acres
6. Mr. and Mrs. Chauncey McCormick, 140 acres

* = Grassland Wildlife Research Lab.

7. Cyrus H. Mark, 40 acres
8. Stuart H. Otis, 58 acres
9. Donnelley Brothers, East 60 acres
10. Marshall Field III, 135 acres
11. Fuson Farm, 164 acres
12. Joseph W. Galbreath, 110 acres
13. Walters, 40 acres
14. CIPS, 200 acres

Ownership or Lease By:

= Illinois Department of Conservation 612 acres

= The Nature Conservancy 589 acres

TOTAL 1,201 acres

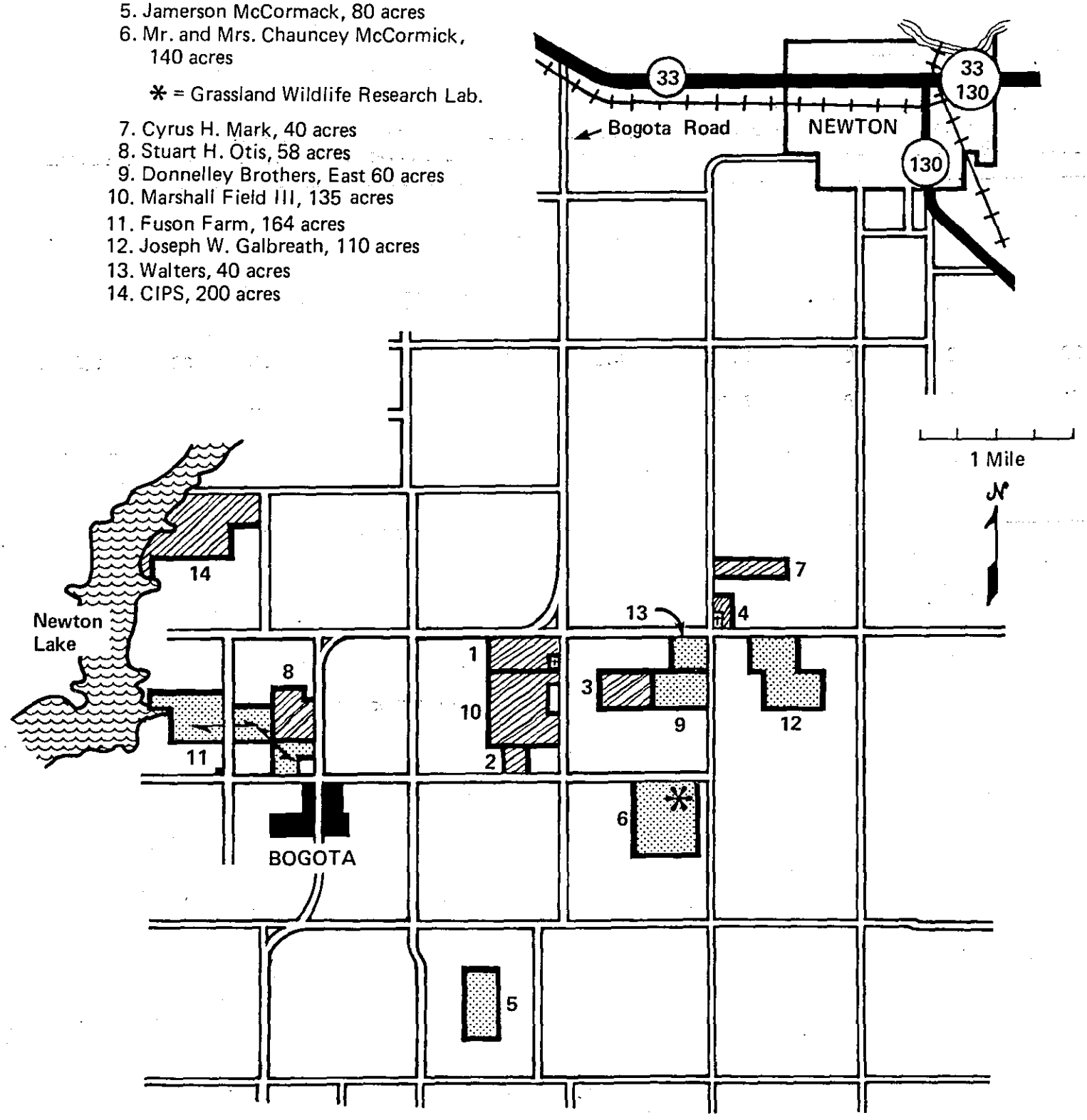
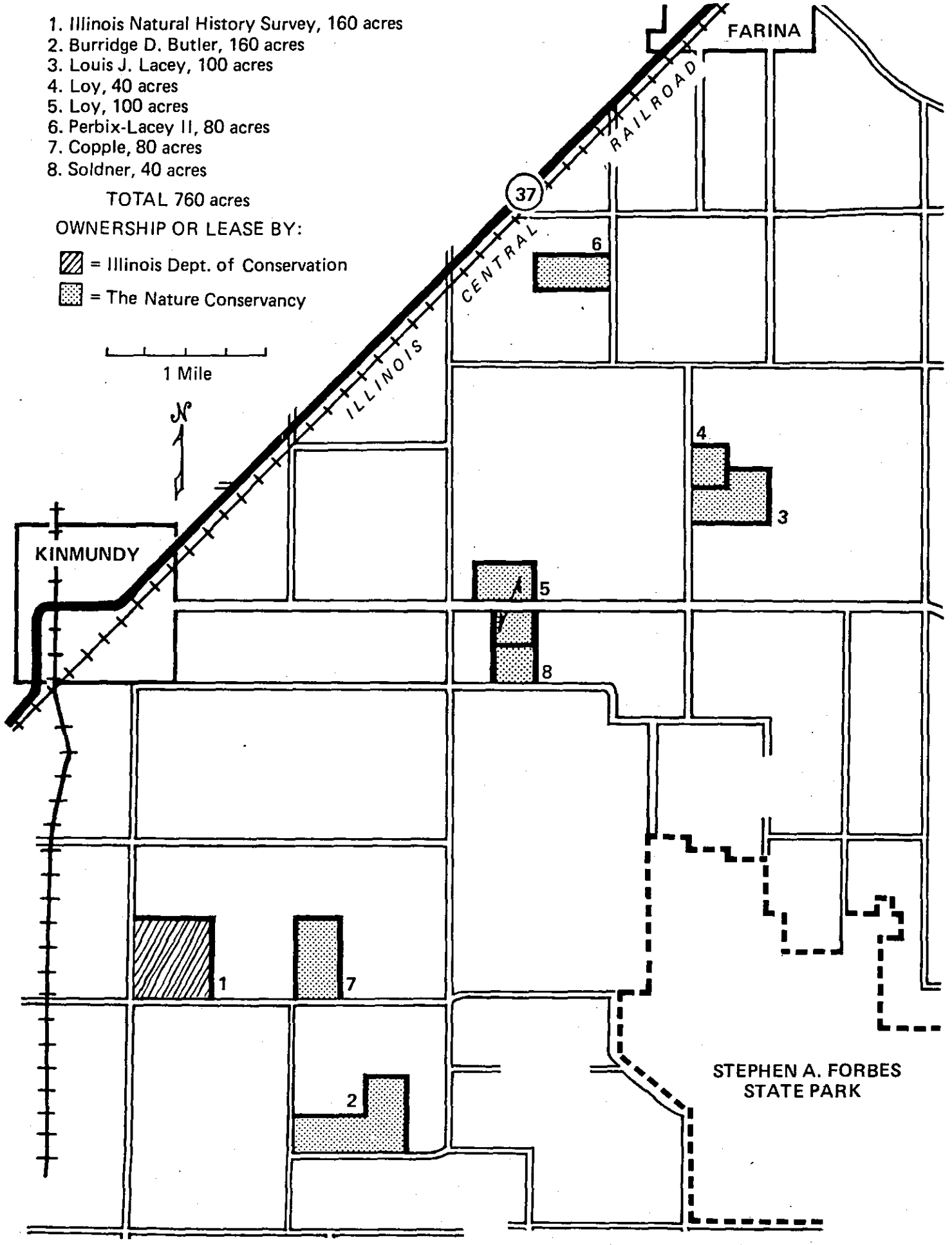


FIG. 2. PRAIRIE CHICKEN SANCTUARIES, MARION COUNTY



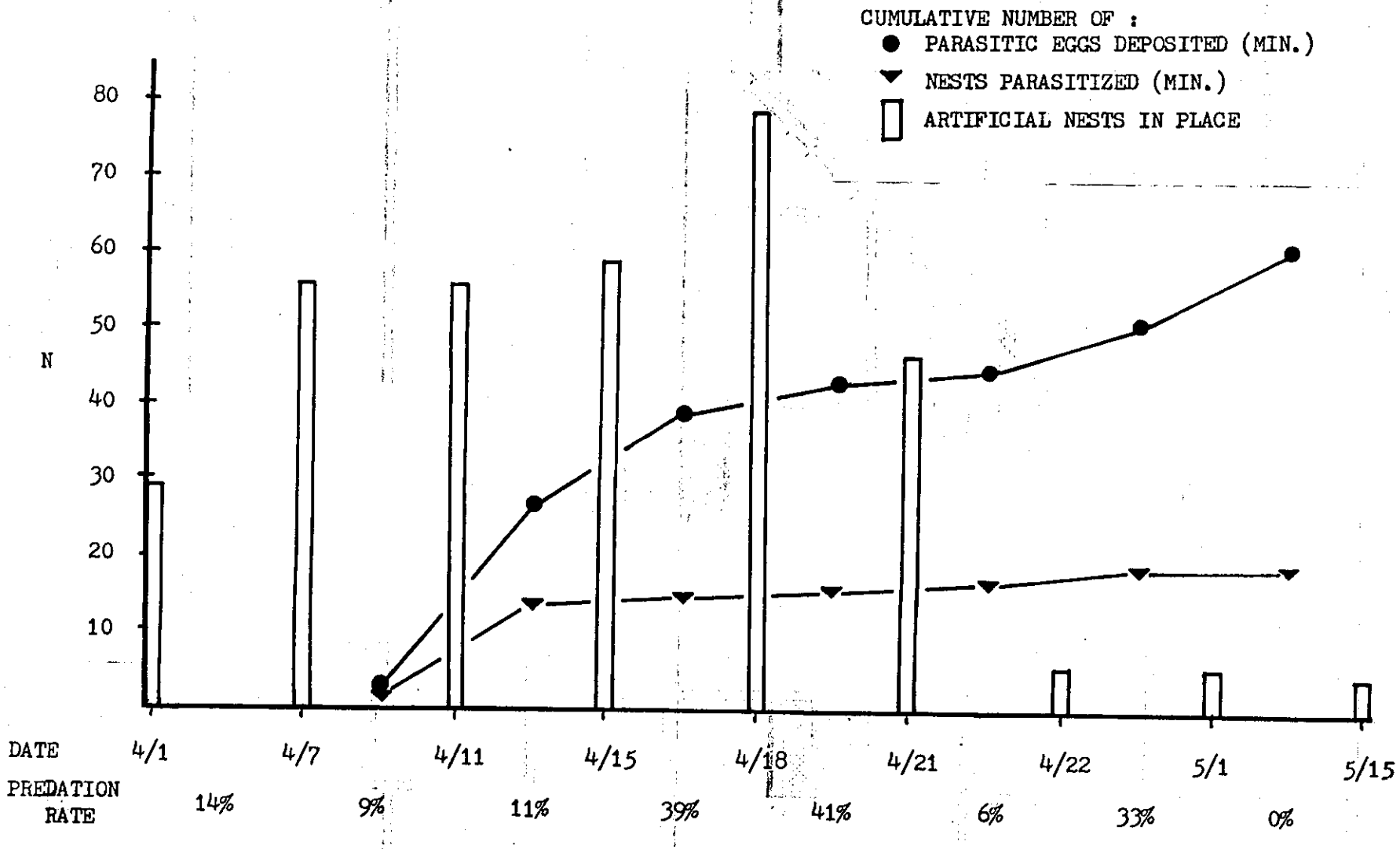


Fig. 3. Egg deposition by pheasants in artificial nests on prairie-chicken sanctuaries, Bogota Study Area, 1 April - 15 May, 1986.

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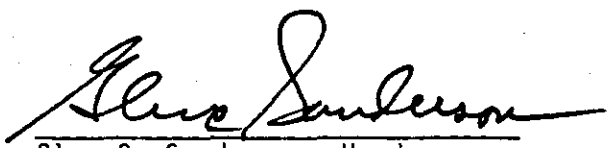

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