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Pheasant Nesting and Production in Winnebago County, Iowa, 1954¹

By EUGENE D. KLOGLAN²

Since 1935 the Iowa Cooperative Wildlife Research Unit has conducted life history and management studies of the ring-necked pheasant (*Phasianus colchicus*) on the Winnebago Research Area in north-central Iowa. From 1939 to 1941, intensive investigations were centered on nesting and production on a 1520-acre plot lying within sections 13, 14, 15, 23 and 24 of Eden Township, Winnebago County (Baskett, 1947). Field activities were curtailed during World War II, and further research on this plot was not begun until 1949 (Kozicky and Hendrickson, 1951).

Changes in farming techniques, cropping practices and types of machinery used by farmers can exert a profound effect upon natural pheasant production. The necessity for high food production during the war, and the many scientific advances in the agricultural field have resulted in rapid changes in farming methods during recent years. Consequently, wildlife biologists must maintain close contact with the pheasant population to determine the effect of these changes upon this important game bird species.

From April 22 to September 7, an intensive study of pheasant nesting and production was conducted on the same 1520-acre area used in previous investigations. The primary objective of the study was to ascertain the relationship between present agricultural practices and other environmental conditions, with a view toward further determining the factor, or factors, that are limiting pheasant populations to their present levels in Iowa's primary pheasant range.

The Winnebago Area lies within the Wisconsin drift soil area. The topography is level to gently rolling with a few rounded hills and ridges. The several sloughs formally present on the area have been gradually removed by tile drainage until only two remain. During 1954, 92.4 percent of the total acreage was put to

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direct agricultural use, i.e., mowed for hay, pastured or cropped. A detailed account of crops and land use acreages is included in Table 2.

TECHNIQUES OF INVESTIGATION

The spring population on the area was determined by field counts with the aid of binoculars in the early morning and evening, by a morning roadside (Kozicky, 1952) and cock crowing count (Kimball, 1949) and by the enumeration of crowing cocks and their "harems". The fall population estimate was based on flushing counts with the aid of bird dogs and by a morning roadside count (Bennett and Hendrickson, 1938).

Throughout the nesting season the area was searched for nests systematically. Fencerows, road ditches, farm groves, sloughs and pastures were checked at weekly intervals until mid-June and again during early July and early August. A limited amount of time was spent in hay and oat fields during May and early June. During hay mowing, the observer rode on the tractor in most fields to determine the effectiveness of flushing bars in saving hens. The fields were checked soon after mowing and again after raking for further sign. The oat fields were searched for nests immediately after windrowing.

In the recording of data, two or more eggs in a nest form were considered a nest. If one or more eggs hatched, the nest was considered a successful one. The approximate date of nest establishment, date and cause of nest destruction, and date of hatching were recorded, or estimated if not known. Estimates were based on number of eggs present, general appearance of eggs or shells in relation to previous weather conditions, age of embryos, age of brood observed in vicinity, or other available indicators. Brood counts were made by repeated field observations and by early morning and evening roadside counts.

Table 1.
Mean temperature and precipitation at Forest City, Iowa,
from March to August, 1954

Month	Mean Temperature	Dev. from Normal	Mean Precipitation	Dev. from Normal
March	28.9°	-2.9°	1.15"	-0.34"
April	49.5°	+3.2°	4.71"	+2.53
May	53.9°	-4.5°	2.84"	-1.29"
June	71.0°	+3.4°	8.85"	+4.33"
July	74.5°	+1.4°	4.72"	+1.41"
August	70.0°	-0.5°	5.50"	+1.70"

Table 2.
Land use acreages, nesting densities and nesting success, Winnebago Pheasant Research Area, 1954.

Cover Type	No. of Acres	No. of Nests	Percent of all Nests	Acres per Nest	No. of Nest Succ.	% of Nests Succ.
I. Hayfields	189.2	89	54.9	2.1	13	6.8
A. Alfalfa	20.7	20	12.3	1.0	0	0.0
B. Alfalfa-red clover	21.7	7	4.3	3.1	1	14.3
C. Red clover	21.9	3	1.9	7.3	1	33.3
D. Red clover-timothy	49.7	11	6.8	4.5	0	0.0
E. Sweet clover-red clover	21.0	15	9.3	1.4	0	0.0
F. Native grasses	27.7	6	3.7	4.6	3	50.0
G. Road ditches (alfalfa)	3.3	13	8.0	0.3	1	7.7
H. Road ditches (native)	23.2	14	8.6	1.7	7	50.0
II. Small grains	402.8	48	29.6	8.4	9	18.8
A. Oats	402.1	47	29.0	8.6	9	19.1
B. Rye	0.7	1	0.6	0.7	0	0.0

Table 2 (Con't.)

III. Pastures	125.9	5	3.1	25.2	2	40.0
A. Alfalfa-timothy	15.6	4	2.5	3.9	1	25.0
B. Timothy	33.4	-	-	-	-	-
C. Red clover-timothy	41.7	-	-	-	-	-
D. Red clover-sweet clover	15.0	1	0.6	15.1	1	100.0
E. Bluegrass	8.6	-	-	-	-	-
F. Bromegrass	4.7	-	-	-	-	-
G. Canary grass	6.9	-	-	-	-	-
IV. Corn	587.0	-	-	-	-	-
V. Soybeans	124.6	-	-	-	-	-
VI. Non-agricultural use	90.5	20	12.4	4.5	4	20.0
A. Fencerows	6.0	-	-	-	-	-
B. Sloughs	9.6	17	10.5	0.4	3	17.6
C. Roads and lanes	16.6	-	-	-	-	-
D. Farm groves and lots	58.3	3	1.9	19.4	1	33.3
Totals	1520.0	162		9.4	28	17.3

WEATHER CONDITIONS

Climatological data were obtained from the U. S. Weather Bureau Station at Forest City, Iowa, which is about 16 air miles from the research area. Temperature and precipitation data for March to August are given in Table 1. The preceding winter was one of the mildest on record with no severe snow or ice storms. The pheasant population apparently suffered little mortality between the close of the 1953 hunting season and the beginning of the study.

Since April was warmer than usual, the farmers' field work progressed rapidly and earlier than usual. However, severe frosts on May 5, 6, and 7 gave the oats and red clover a noticeable setback, alfalfa being less affected. A cooler than normal May slowed the recovery of the injured crops. Also, temperatures below normal in May are not considered to be conducive to an increase in the fall pheasant population (Kozicky, *et al.*, 1952). Though the nesting season was delayed by the slow development of oats and red clover, the peak of the first mowing of hay and the windrowing of oats occurred between June 14-30 and July 14-26, respectively. Both are about normal dates for these activities on the research area.

RESULTS OF INVESTIGATION

A total of 162 pheasant nests were found, of which 28 (about 17 percent) were successful (Table 2). Data on complete clutch size were obtained from 81 nests. The mean number of eggs was 9.9 ± 1.4 , with range of 5 to 16. This does not include 10 dump nests which had an average of 17.4 ± 3.1 eggs and a range of 14 to 25. Of the 653 eggs examined in 67 nests, 619 (94.8 percent) were fertile. A total of 1500 eggs (11.5 per hen in spring population) was found, 232 (15 percent) of which eventually hatched. The mean number of hatched eggs in successful nests was 8.3 ± 2.4 , with a range of 4 to 15. Of the 1.1 eggs per nest which failed to hatch, half were infertile and half partially to completely developed. There was no definite period of peak hatch, probably because nests were hatching in many cover types, each with different periods of peak nesting, as compared to previous years when most of the nests hatched in oat fields (Table 3).

The appearance of a new type of road ditch cover—alfalfa—occurred in 1954 on the 1520-acre area. The large number of nests found in this limited cover type suggests the possibilities of attracting many hens away from hay fields where nearly all nests are destroyed. The mile of alfalfa road ditch on the study area was mowed for hay early in the haying season, explaining the low success of the nests.

Table 3.

Hatching date distribution of successful nests and observed broods on the Winnebago Area, 1954

Date	Nests	Percent	Broods	Percent
May 16-31	1	3.6	1	2.4
June 1-15	6	21.4	8	19.0
June 16-30	9	32.1	15	35.7
July 1-15	9	32.1	13	31.0
July 16-31	2	7.2	3	7.1
Aug. 1-15	1	3.6	2	4.8

No nests were found in the second cutting of alfalfa and very few birds were flushed. One hatched nest was found in a field of second-cutting red clover which was allowed to mature for seed before mowing.

Nest Establishment

The height of nest establishment was during the period, June 1-15 (Table 4). The peak of establishment for both successful and unsuccessful nests occurred during this interval. However, a higher percentage of early as compared to late nests was successful. Closely related to the later than usual nesting season were the large number of dump nests (10) and single dropped eggs (127). Differences in the time of nest establishment in the major cover types are shown in Table 5. Fencerows, road ditches and farm groves were used almost exclusively early in the season when the oat and hay fields had not achieved sufficient growth to attract many nesting hens.

Table 4.

Dates of pheasant nest establishment, Winnebago Area, 1954

Date	All Nests	Unsuccessful Nests	Successful Nests	Successful Percent
April 1-15	0	0	0	—
April 16-30	6	4	2	33.3
May 1-15	18	12	6	33.3
May 16-31	28	21	7	25.0
June 1-15	59	48	11	18.6
June 16-30	30	29	1	3.3
July 1-15	16	15	1	6.2
July 16-31	5	5	0	0.0
August 1-15	0	0	0	—
Totals	162	134	28	17.3

Table 5.
Dates of pheasant nest establishment in relation to cover
types, Winnebago Area, 1954

Date	No. in Oats*	No. in Hayfields	No. in Pastures	No. in Road Ditch	No. in Fencerows	No. in Farm Grov
April 16-30	0	0	0	2	2	2
May 1-15	0	5	1	5	6	1
May 16-31	2	9	0	9	8	0
June 1-15	15	33	1	9	1	0
June 16-30	16	11	2	0	0	0
July 1-15	10	4	1	2	0	0
July 16-31	5	0	0	0	0	0
Totals	48	62	5	27	17	3

*Includes one in rye.

Peripheral Location

The distance to the nearest cover type edge was recorded for 153 nests. Of these, 103 (67 percent) might be termed "field" nests. The remaining 50 were found in narrow strips of cover, such as fencerows, road ditches, farm groves and slough edges. Over half of the "field" nests were more than 100 feet from the nearest cover edge. The often recommended practice of leaving a strip of unmown hay around the outside of the field would have been to little avail on the study area. Only 6 of 64 hayfield nests were less than 25 feet (about four mower swaths) from the field edge. Only 4 of 39 oat field nests were less than 25 feet from the field edge.

The fields were divided into an inner and outer half, and also into thirds in a similar manner, and comparisons made of the number of nests found in each portion. Statistical (chi-square) tests showed no significant differences existed. The general tendency appeared to be away from the peripheral nesting habit often ascribed to pheasants. Qualitative observations indicated that the varying density of cover in most fields was more responsible for nest placement than the distance to the nearest cover type edge.

Nesting Losses

Nearly 83 percent of the 162 nests established were destroyed before they could hatch (Table 6). Agricultural activities, primarily hay mowing and oat windrowing, were responsible for 63 percent of all destroyed nests. All known instances of predation occurred during the early part of the nesting season while cover was still rather poor. Ten of the 18 nests broken up by predators were located in fencerows. Fencerows suffered much heavier predation loss than any other cover type, probably due to the predators' well known habit of using fencerows for travel lanes. Nearly all known

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Table 6
Causes of pheasant nest destruction, Winnebago Area, 1954

Causes of Loss	No. of Nests	Percent
I. Desertion because of:	25	18.7
a. Dump nests	7	5.2
b. Hen flushed by observer	12	9.0
c. Unknown reason	4	3.0
d. Disturbance by farmer	2	1.5
II. Predation by:	18	13.4
a. Crows	4	3.0
b. Skunk	2	1.5
c. Spotted skunk	1	0.7
d. Franklin ground squirrel	1	0.7
e. Raccoon	1	0.7
f. Badger	1	0.7
g. Housecat	1	0.7
h. Farm dog	1	0.7
i. Observer	1	0.7
j. Unknown predator	5	3.7
III. Destroyed by mower in:	57	42.5
a. Hayfields	49	36.6
b. Pastures	3	2.2
c. Road ditches	5	3.7
IV. Destroyed by binder or windrower in oats	21	15.7
V. Destroyed by combine in oats	4	3.0
VI. Destroyed by flooding in oats	9	6.7
Total	134	100.0

instances of nest desertion also took place during the early part of the nesting season. The flood resulted when about 8 inches of rain fell during a four-day period in mid-June, leaving about 10 percent of the study area under water.

Pheasant Mortality

The records of all known adult and juvenile pheasant mortality included hens that were severely injured by hay mowing or oat windrowing (Table 7). This group was removed from further production in 1954 and few, if any, would be likely to survive until the 1955 nesting season. The 40 hens killed or injured represented 31 percent of the spring hen population. Thirty of these losses, or 23 percent of the total population, could be attributed directly to agricultural activities. Flushing bars were used on about 85 percent of the first mowing of hay; otherwise, the hen mortality would have been higher.

Lack of sufficient data precluded making any conclusions as to the primary causes of juvenile mortality. Very little cock mortality was observed during the study. Cocks were seldom seen in hay or oat fields during harvest operations, and thus were not subjected to the dangers confronting the hens.

It was estimated that 42 broods were observed on the study area. Visual estimates of the age of each brood were made. The approximate hatching dates were then calculated and compared with the known or estimated hatching dates of the 28 successful nests (Table 3). The similarity between the two was apparent. Most of the 42 broods were seen several times during the study, though on many occasions an accurate count could not be obtained with any certainty. Of these observations, 92 were tabulated to show brood mortality (Table 8). All chicks were believed counted in each instance and, though some broods were seen almost daily, none was included more than once in any weekly age group. A loss of 2.3 chicks per brood from hatching to 9-12 weeks of age was found, about the same loss as reported by Kozicky (1951).

Table 7
Causes of Pheasant Mortality, Winnebago Area, 1954

Cause of Death	No. Hens	No. Juveniles	No. Cocks
Killed by mower	7	3	
Killed by binder-windrower	2		
Injured by mower, killed by observer	3	1	
Injured by mower, killed by predator	2		
Injured severely by mower*	13	4	
Injured severely by binder-windrower*	3		
Road kill	4	2	1
Red-tailed hawk	1		
Raccoon	1		
Remains found, cause of death unknown	4		3
Killed by hen in nest		2	
Crow		1	
Total	40	13	4

*Loss of one or both legs/or wings, and/or considerable blood, flesh and feathers.

Production

The spring population on the 1520-acre study plot was estimated at 47 cocks and 130 hens, or about 75 birds (20 cocks and 55 hens) per section. The observed sex ratio was one male to 2.75 females, or 36 males per 100 females.

It has been estimated that about 2/3 of all hatched nests on the area are found during intensive nesting surveys. Assuming that 42 broods is an accurate count, the finding of the 28 hatched nests would seem to substantiate the 2/3 estimate. The total production of young produced can then be computed from the available nesting and brood data. On this basis, about 145 chicks per section were brought off from successful nests. Brood mortal-

ity of 2.3 chicks per brood, or nearly 30 percent, lowered this figure to about 100 chicks per section by September 7. Known adult mortality during the reproductive season reduced this segment of the population to about 50 birds per section. Combining these two figures gives a fall population estimate on September 7 of roughly 150 birds per section, a 100 percent increase over the spring population.

Flushing counts made with the aid of bird dogs on November 9-11 on the 1520-acre segment plus 960 adjacent acres gave an estimate of 100 birds per section, a 33 percent increase over the spring population. This figure is used as an index, and its relationship to the true population is not known. The difference from the September 7 population may be due to several factors. Mortality of young and adults during the two month interval between estimates is unknown and undoubtedly important. Errors through seasonal movements of birds on an area of the size used in the study could easily affect the validity of the estimates. The assumption that 2/3 of the hatched nests are found is still open to question, as are the estimates of adult and juvenile mortality during the summer.

The fall roadside count of 3.62 birds per mile (mean of 23 counts) indicated no significant population differences between 1954 and the preceding two years (3.73 in 1952, 3.46 in 1953). The counts were taken in August and early September and corrected for dewfall (Klonglan, in press). All but 10 miles of the 30-mile route were within, adjacent to, or less than a mile from the 2480-acre area covered during the flushing counts. The 1954 flushing count of 100 pheasants per section compared to counts of 118 and 90 per section in 1952 and 1953, respectively. With due allowance for sampling variation, it could hardly be said that there was a significant increase in the 1954 pheasant population.

SUMMARY

1. An intensive pheasant nesting and production study was conducted in 1954 on the Winnebago Research Area in north-central Iowa.
2. About 17 percent of the 162 nests were successful.
3. Agricultural activities accounted for 63 percent of the nest losses. Desertion, predation and flooding accounted for the rest.
4. Agricultural activities killed or severely injured 23 percent of the spring hen population. Other causes accounted for 8 percent.

Table 8

Summary of observed pheasant broods, Winnebago Area, 1954

Brood Size (No. of chicks)	Number of Observations				
	At Hatching	1-3 Weeks	4-5 Weeks	6-8 Weeks	9-12 Weeks
1	—	1	—	—	—
2	—	1	—	—	—
3	—	—	1	1	5
4	1	1	6	5	3
5	2	—	3	2	2
6	3	2	4	7	4
7	5	5	5	6	3
8	5	3	3	3	3
9	5	1	1	—	1
10	3	1	—	1	1
11	1	—	1	1	—
12	2	2	—	—	1
13	—	—	1	—	—
14	—	—	—	—	—
15	1	1	—	—	—
<hr/>					
Total number of chicks	232	136	158	162	137
No. of brood observations	28	18	25	26	23
Mean number of chicks	8.3	7.6	6.3	6.2	6.0
Standard deviation	±2.40	±3.40	±2.36	±1.88	±2.48

5. A loss of 2.3 chicks per brood, or about 30 percent, from hatching to 9-12 weeks of age was found.

6. The fall pheasant population did not differ significantly from those of the preceding two years. A cold May apparently prevented any great increase, though a large brood stock was present.

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