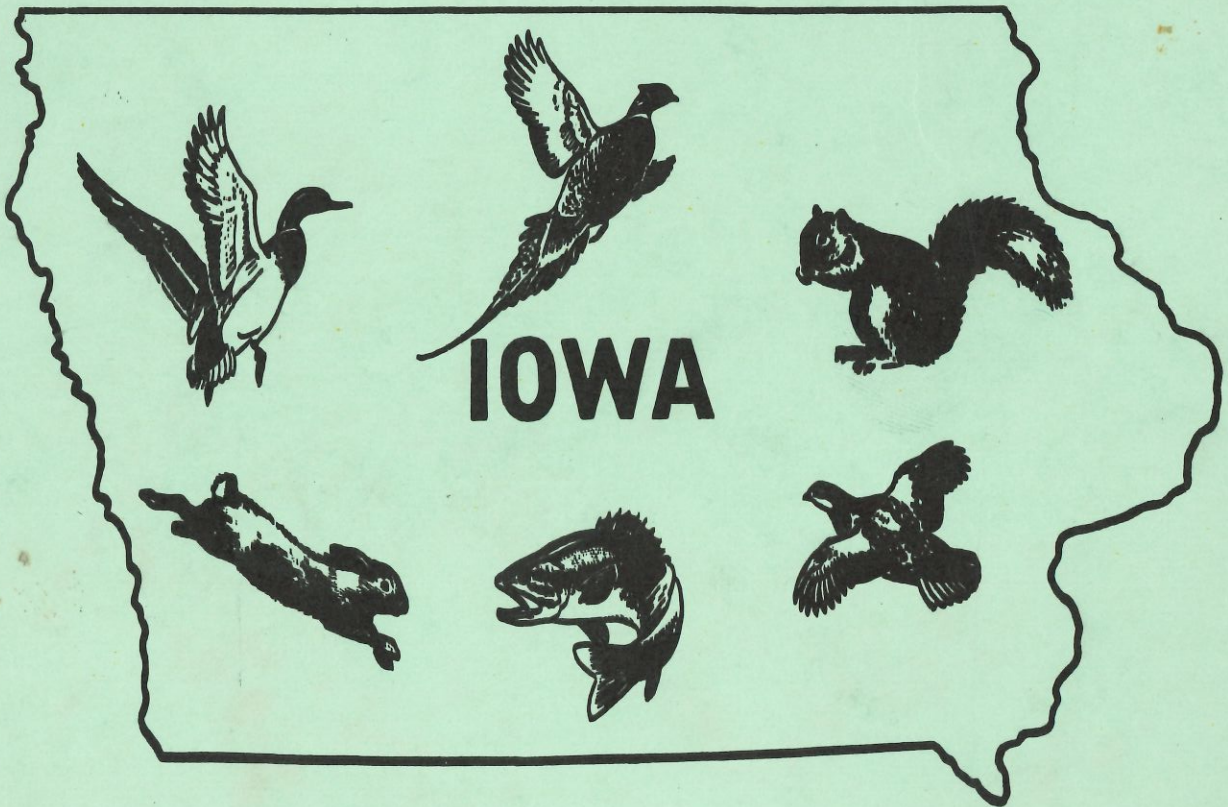


1964

QUARTERLY BIOLOGY REPORTS



FISH AND GAME DIVISION — BIOLOGY SECTION
STATE CONSERVATION COMMISSION

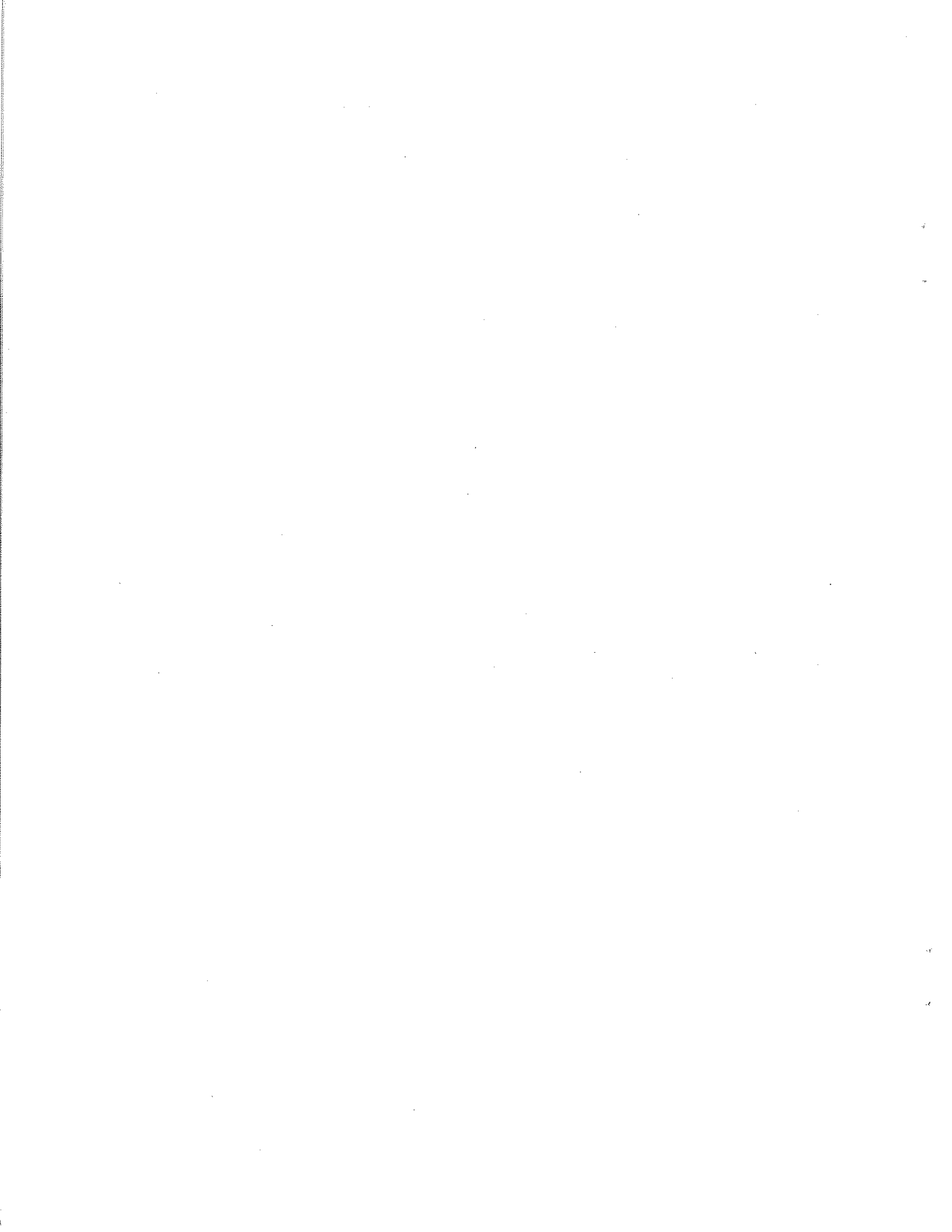


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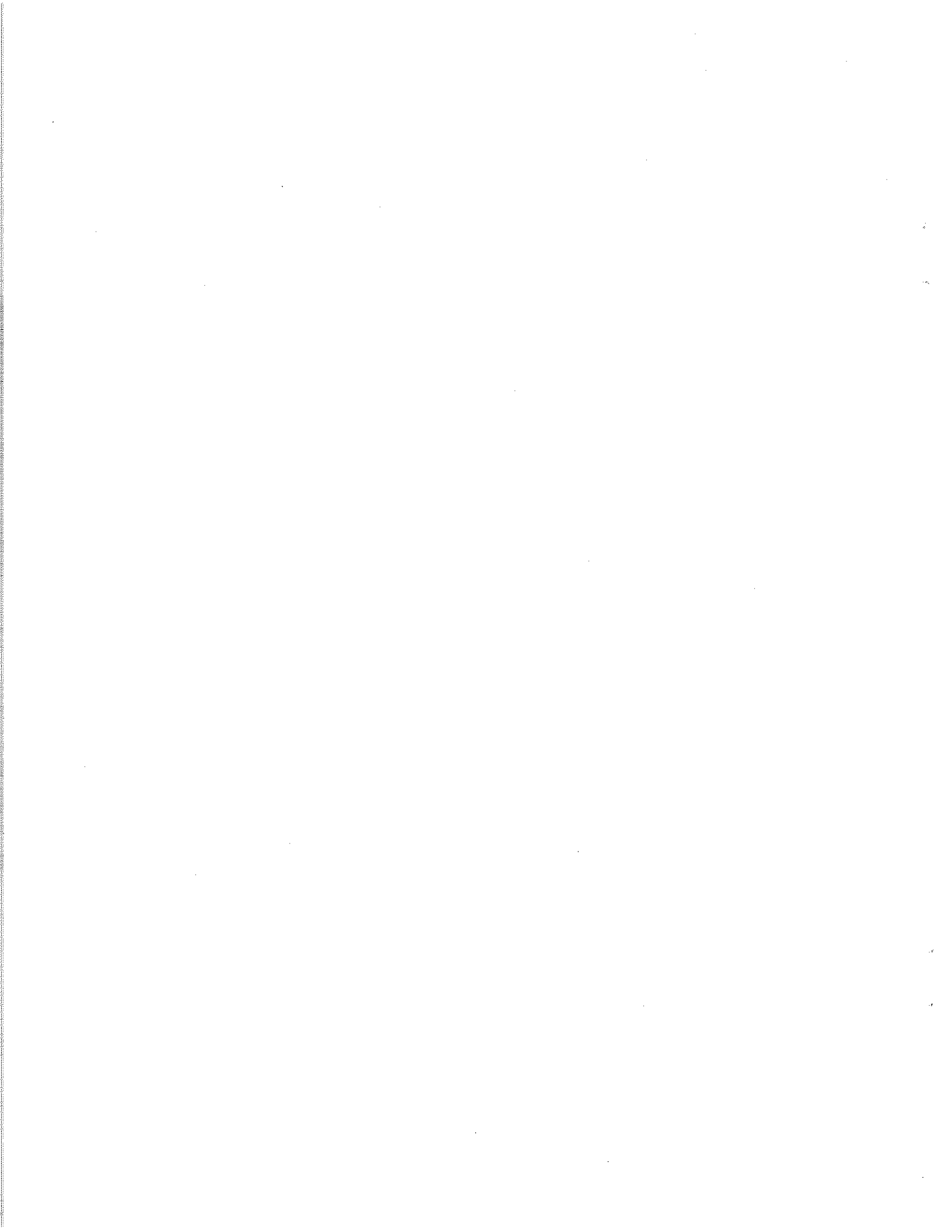
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ABSTRACTS

DEER POPULATION ESTIMATES - 1964

Keith D. Larson
Game Biologist

A winter deer population of 21,580 was reported by Conservation Officers for 1964. This represents a 10.2% increase over 1963. A fall population of 36,694 is indicated based on the average annual reproductive rate of 70 fawns:100 adults. A lack of snow cover during the survey period hampered sight records, which made it more difficult for Officers to estimate the deer population in their respective counties.

POSTAL CARD SURVEYS OF SQUIRREL, RABBIT, FOX, AND RACCOON HUNTERS FOR THE 1963-64 SEASON

Paul D. Kline
Game Biologist

Approximately one-third of both resident and non-resident hunters contacted by mail responded to a postal card survey of hunting pressure and success. Of those reporting, 55% hunted cottontails, 49% hunted squirrels, 18% hunted foxes, 9% hunted raccoon, and 10% hunted jackrabbits. The expanded data reveals 2,066,472 cottontails, 1,440,576 squirrels, 121,124 foxes, 347,168 raccoon, and 75,015 jackrabbits were harvested by licensed hunters in Iowa during the 1963-64 season. Cottontail hunting was best rewarded in southern Iowa, least in eastern Iowa. Squirrel hunting was best in the Driftless Area of northeast Iowa and poorest in the Northern Glaciated Area. Only 8% of the rabbit hunters owned rabbit hunting dogs; 5% of the fox hunters owned fox hounds; and 30% of the raccoon hunters owned coon hounds. A discussion and presentation of indices of desirability and of availability are included. The "Indices of Desirability" disclosed deer and fox are highly desirable species as compared to rabbits and squirrels. Squirrels were more desirable than rabbits. The "Indices of Availability" on the other hand, indicated foxes, deer, and jackrabbits are much less available to the average hunter than cottontails, squirrels, and raccoon. The indications of desirability vs. availability should be considered in the practice of game management in Iowa.

IOWA'S WATERFOWL PRODUCTION AERIAL TRANSECT COUNT - 1964

Gene Goecke
Game Biologist

A 489 mile aerial waterfowl production survey transect was run in July of 1964. A total of 109 broods of waterfowl were seen while taking the transect. Sixty-four per cent of the privately owned potholes and marshes sighted on the transect were dry. The average brood size for mallard and blue-winged teal observed this summer was 7.2 and 7.4 birds per brood, respectively.

RESULTS OF THE 1963 PHEASANT HUNTER SURVEY

Richard C. Nomsen
Game Biologist

A hunter questionnaire survey was conducted following the 1963 pheasant season to determine the number of pheasant hunters, the total number of birds killed and the distribution of hunting pressure in Iowa. Results indicated that 88 per cent (270,512) of the licensees hunted pheasants in 1963. They bagged a total of 1,874,500 ringnecks during the 54 day season. Nearly 7,000 non-resident hunters bagged 60,500 pheasants in 1963. Pheasant hunters in north-west Iowa killed nearly 8,000 hungarian partridge during the fall season.

IOWA'S SPRING PHEASANT POPULATION - 1964

Richard C. Nomsen
Game Biologist

There were 140 crowing cock and roadside pheasant counts taken in the spring of 1964. An average of 11.9 calls per stop was heard in 1964 which was 8 per cent less than the 12.9 calls per stop heard in 1963. The statewide hen index indicated that the 1964 population of hens was 11 per cent higher than in 1963. An average of 2.76 pheasants per mile was sighted on the roadside counts which was 20 per cent higher than in 1963. There were fewer roosters recorded but the number of hens sighted per mile increased 44 per cent. Population trends were similar when analyzed by the crowing count and roadside count. In general, the 1964 spring pheasant population was up substantially from 1963; fewer males were seen and heard, but a considerable increase in hens was recorded.

SPRING 1964 RUFFED GROUSE AND WOODCOCK SURVEYS

Eugene D. Klonglan
Ass't. Supt. of Biology

and

Gene Hlavka
Game Biologist

Nine ruffed grouse roadside drumming counts made in the spring of 1964 in Allamakee, Clayton and Winneshiek Counties averaged 1.5 drums per stop. This indicates a relatively stable population, when compared with counts of the preceding 3 years, and further indicates that a harvestable surplus of this species is present in this part of northeastern Iowa. Twelve woodcock singing ground counts were made in the eastern half of the state in late April and early May of 1964. On 108 stops made, 17 woodcock were heard. Over the 4-year period such counts have been made in Iowa (1961-64), 68 birds have been heard on 295 stops - a mean of 0.23 per stop. These surveys indicate that woodcock are more common in the state than generally believed.

QUAIL HUNTING RESULTS FOR 1963-64 SEASON

M. E. Stempel
Game Biologist

A postcard survey of small game hunters was made following the 1963 season. The names of about 2 of each 100 hunting license holders and 2 of each 100 combination license holders were selected from the files in the Des Moines Office. Each of the chosen numbers received a letter of instruction and the postcard which was to be filled in and returned. Quail shooting was reported on 391 cards from 64 of 69 counties open for quail hunting. This represents 46,090 quail gunners who took 322,630 quail at a rate of 1.8 hunter-hours per bird. Eighty-seven per cent also had shot pheasants at some time during the season, and 65 per cent had shot squirrels. In the quail range 73 per cent of shooters did their hunting in their home county or an adjoining county. Some Iowa hunters drove as far as 250 miles to a quail hunting spot. Sixty-seven per cent of the shooting was in the 3 southern tiers of counties. Best of this was 1.4 hours per quail. The greatest number of reports (31) were from Lee County. Of the total number of hunters who returned cards, 15 per cent had hunted quail. Other surveys have indicated that 12 to 28 per cent of average hunters prefer quail, while in one portion of the southern Iowa quail range 55 per cent indicated they went out after quail.

THE 1963 ANGLER SUCCESS AND HARVEST IN IOWA MAN-MADE LAKES

Jim Mayhew
Fisheries Biologist

Information on angler catch statistics was obtained by a Conservation Officer field contact census. The lakes were divided into separate groups based on primary use and purpose. Officers contacted 4,824 fishermen during the census. These people caught 12,017 fish after fishing 9,338 hours. Bluegill comprised 41 per cent of the anglers catch. They were followed in importance by bullhead, crappie, largemouth bass, and channel catfish. The most contacts were made on recreation lakes, followed by municipal reservoirs, strip mine-gravel pits, and farm ponds. The catch rate varied with individual types of lakes from 1.4 to 0.9 fish per hour. Mean catch rate for all lakes was 1.3 fish per hour.

MISSISSIPPI RIVER CATFISH INVESTIGATIONS IN 1963

PART II: SMALL CHANNEL CATFISH AND FLATHEAD CATFISH STUDIES

Roger Schoumacher
Fisheries Biologist

Three thousand one hundred twenty-eight small channel catfish from the Mississippi River were measured and a sample aged during 1963. Ninety per cent were from 6 to 12 inches long, and 69 per cent belonged to age group II and 19 per cent to age group III. Age II fish were about 7.5 inches long in May and 9 inches by August. One hundred ninety-six commercially taken flathead catfish were examined ranging in size from 11 to 38 inches. Forty-eight per cent were under 17 inches, 70 per cent under 20 inches, and 10 per cent 25 inches or longer. Seventy-seven per cent were from age groups III, IV, and V. Average sizes of fish aged II through VII, respectively, were: 13.1, 15.4, 17.2, 20.0, 22.3, and 26.4.

EFFECTS OF CHANNELIZATION ON THE FISH POPULATION OF THE LITTLE SIOUX RIVER

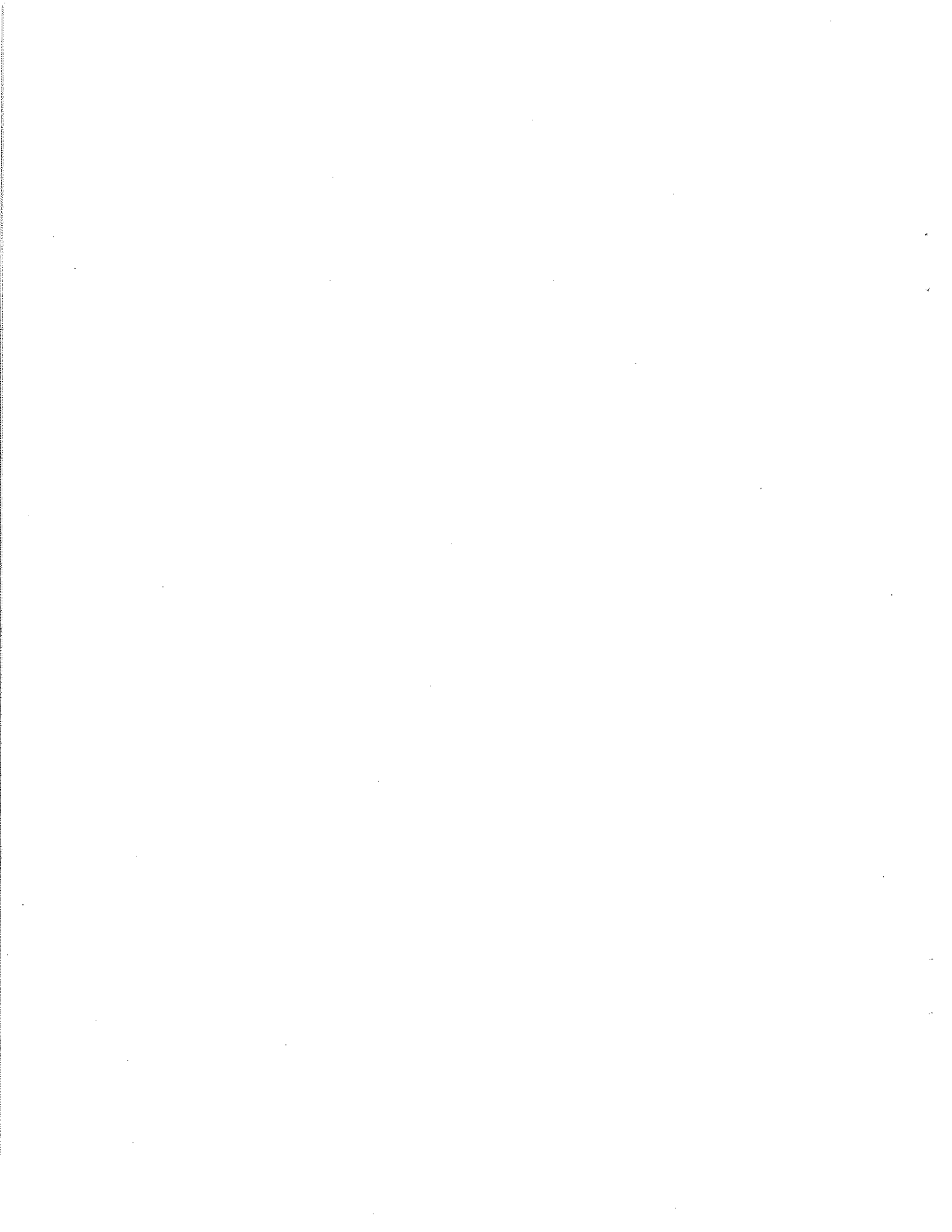
Bill Welker
Fisheries Biologist

A study was initiated last May to study the effects of channelization on the fish population of the Little Sioux River with special emphasis on the migration patterns of the channel catfish. Cheese-baited hoop nets and wooden box traps are used to collect the fish and are set in both the channeled and unchanneled parts of the river. To date, 6,853 channel catfish have been caught and 3,483 have been tagged with metal body cavity tags. The general migration trend of the few tagged channel catfish recaptured (50) indicates a downstream movement. This study is continuing and the full report will appear in a later issue.

AQUATIC WEED AND ALGAE CONTROL

Tom Moen
Fisheries Biologist

The Iowa State Conservation Commission receives numerous requests from farmers, sportsmen's organizations, and others for literature on how to control aquatic plant growth in farm ponds, small lakes, and similar water areas. This paper outlined simple methods of identification of the various aquatic plants and procedures for control by mechanical and chemical methods. A mimeographed pamphlet, entitled as above, will be ready for general distribution in the near future.



DEER POPULATION ESTIMATES - 1964

Keith D. Larson
Game Biologist

INTRODUCTION

Deer population estimates in Iowa are based on a county by county survey conducted by each Conservation Officer during the winter. This survey has been conducted since 1947. Results are intended to reflect the late winter population of white-tailed deer in Iowa.

METHODS

Various means of making these estimates are employed. Ordinarily the location of a winter herd is known by the officer. He may estimate its numbers by keeping daytime sight records, by spotlighting at night, by counting tracks crossing roads, or by a combination of these methods. Sportsmen contribute information as well. A new system was employed in one territory this year. Small maps of nine sections with appropriate section numbers were sent to landowners. One landowner or tenant received a request to estimate the size of the deer herd in each of the nine section areas. The cooperation was good and the herd estimate based on this system was 229% higher than the previous year. No doubt some deer were counted twice, but others may have been missed. The officer believes it to be more nearly correct than his previous estimates.

RESULTS

A winter deer population of 21,580 was reported for 1964. This estimate is another record high and continues the upward trend begun in 1957 (Table I). Estimates ranged from 5 for Grundy County to 1,440 for Pottawattamie County. The numerical increase statewide was 2,015. This represents a 10% increase over 1963.

The average winter deer population for the preceding five years was 14,892, with a range of 11,705 to 19,565. The mean percentage annual increase for this period was 13.4%.

Iowa white-tails have an annual average reproductive rate of 70 fawns:100 adults (Mustard, 1962). A 1964 fall population of 36,694 is indicated based on this reproductive rate and the winter population estimates.

DISCUSSION

The late winter period of 1963-64 was marked by a lack of snow cover. In most districts there was no snow cover at all during the period when deer surveys were to be made. This situation is reflected in the estimates submitted. Thirty-eight county estimates indicated herd reductions. In follow-up conferences regarding major decreases in herd estimates, no real reduction has been acknowledged to exist in many of these counties. Lack of snow cover and resulting inability to see deer was mentioned primarily as the major factor in these lower estimates. The 1963 estimates included only 17 herd reductions.

TABLE I. Winter deer population estimates, Iowa, 1947-1964

Year	Population Estimate	Percentage Increase or Decrease
1947	1,650	-
1948	2,024	12
1949	No estimate	-
1950	4,530	-
1951	6,553	14
1952	10,721	16
1953	12,982	12
1954	11,892	- 8
1955	10,674	- 10
1956	10,811	1
1957	10,284	- 5
1958	10,643	3
1959	11,705	11
1960	13,101	12
1961	14,155	8
1962	15,938	13
1963	19,565	23
1964	21,580	10

TABLE 2. Comparison of 1963 and 1964 Iowa winter deer population estimates, and anticipated fall 1964 projections, by county

County	Winter Pop. Est.		Pct. Change	Numerical Change	Fall 1964 Pop. Est.
	1964	1963			
1. Adair	231	189	12	42	393
2. Adams	39	25	56	14	66
3. Allamakee	750	750	0	0	1,275
4. Appanoose	105	84	25	21	179
5. Audubon	110	87	26	23	187
6. Benton	56	39	43	17	95
7. Black Hawk	150	117	28	33	255
8. Boone	143	106	35	37	243
9. Bremer	150	117	28	33	255
10. Buchanan	100	138	-28	-38	170
11. Buena Vista*	44	51	-14	-7	75
12. Butler	130	220	-41	-90	221
13. Calhoun*	25	30	-17	-5	43
14. Carroll*	35	35	0	0	60
15. Cass	250	220	14	30	425
16. Cedar	155	77	101	78	264
17. Cerro Gordo*	25	25	0	0	43
18. Cherokee	149	111	34	38	253
19. Chickasaw	155	120	29	35	264
20. Clark	305	450	-32	-145	519
21. Clay*	109	112	-3	-3	185
22. Clayton	730	1,150	-37	-420	1,241
23. Clinton	193	160	21	33	328
24. Crawford	675	375	80	300	1,148
25. Dallas	250	242	3	8	425
26. Davis	108	89	21	19	184

* Short-zone counties

County	Winter Pop. Est.		Pct. Change	Numerical Change	Fall 1964 Pop. Est.
	1964	1963			
27. Decatur	600	590	2	10	1,020
28. Delaware	190	283	-33	-93	323
29. Des Moines	679	410	66	269	1,154
30. Dickinson*	66	75	-12	-9	112
31. Dubuque	180	200	-10	-20	306
32. Emmet*	103	80	29	23	175
33. Fayette	120	80	50	40	204
34. Floyd	125	155	-20	-30	213
35. Franklin*	75	135	-45	-35	128
36. Fremont	131	224	-42	-93	223
37. Greene*	80	88	-9	-8	136
38. Grundy*	5	5	0	0	9
39. Guthrie	589	527	12	62	1,001
40. Hamilton*	111	111	0	0	189
41. Hancock*	28	33	-15	-5	48
42. Hardin*	110	115	-4	-5	187
43. Harrison	600	260	131	340	1,020
44. Henry	208	153	36	55	354
45. Howard	173	165	5	8	294
46. Humboldt*	149	80	86	69	253
47. Ida*	29	57	-49	-28	49
48. Iowa	120	127	-6	-7	204
49. Jackson	530	595	-11	-65	901
50. Jasper	200	106	89	94	340
51. Jefferson	236	192	23	44	401
52. Johnson	110	130	-15	-20	187
53. Jones	350	160	119	190	595
54. Keokuk	100	146	-32	-46	170
55. Kossuth*	89	73	22	16	151

County	Winter		Pct. Change	Numerical Change	Fall 1964 Pop. Est.
	1964	1963			
56. Lee	257	237	8	20	437
57. Linn	175	220	-21	-45	298
58. Louisa	110	85	29	25	187
59. Lucas	585	530	10	55	995
60. Lyon	360	155	132	205	612
61. Madison	350	300	17	50	595
62. Mahaska	126	139	-9	-13	214
63. Marion	128	129	-1	-1	217
64. Marshall	62	133	-53	-71	105
65. Mills	333	264	26	69	566
66. Mitchell	120	135	-11	-15	204
67. Monona	1,260	775	63	485	2,142
68. Monroe	350	285	23	65	595
69. Montgomery	209	194	8	15	355
70. Muscatine	120	80	50	40	204
71. O'Brien*	32	35	-9	-3	54
72. Osceola*	56	21	167	35	95
73. Page	131	188	-30	-57	223
74. Palo Alto*	50	44	14	6	85
75. Plymouth	192	315	-30	-123	326
76. Pocahontas*	74	45	64	34	126
77. Polk	130	120	8	10	221
78. Pottawattomie	440	1,385	4	55	2,448
79. Poweshiek	100	65	54	35	170
80. Ringgold	78	85	-8	-7	133
81. Sac*	57	87	-35	-20	97
82. Scott	40	58	-31	-18	68
83. Shelby	490	215	128	275	833
84. Sioux	112	205	-45	-93	190

County	Winter		Pct. Change	Numerical Change	Fall 1964 Pop. Est.
	1964	Pop. Est. 1963			
85. Story*	51	72	-29	-21	87
86. Tama	74	63	17	11	126
87. Taylor	50	38	32	12	85
88. Union	88	85	4	3	150
89. Van Buren	115	109	6	6	196
90. Wapello	221	162	36	59	376
91. Warren	141	144	- 2	- 3	240
92. Washington	303	240	26	63	515
93. Wayne	135	120	13	15	230
94. Webster	125	160	-22	-35	213
95. Winnebago*	65	60	8	5	111
96. Winneshiek	702	775	- 9	-73	1,193
97. Woodbury	585	370	58	215	995
98. Worth*	85	70	21	15	145
99. Wright*	55	72	-24	-17	94
TOTALS	21,580	19,565	10.2%	2,015	36,694

Fifty-six counties reported increases averaging 39.8%. I believe this figure reflects two things, primarily: A continuing adjustment of previously low estimates as dramatized by kill figures and, secondly, a growing awareness of the high reproductive rate of white-tails in Iowa. Herd increases were reported in 78 counties in 1963 with an average increase of 39.3%. This might be interpreted as indicating a similar statewide percentage of increase for the two years. Officers reporting increases no doubt utilized more of the existing overall knowledge, whereas those reporting herd reductions relied heavily on sight records.

Estimates for the 25 counties in the two-day hunting zone of 1963 totaled 1,608 for 1964. The 1963 estimates for these counties total 1,611. This apparently stable situation suggests again that the short zone regulation accomplished its purpose.

SUMMARY

1. The 1964 winter deer population was estimated at 21,580.
2. This represents a 10.2% increase in winter population over 1963.
3. Projecting the average reproductive rate on the winter herd would indicate a fall population of 36,694.
4. A lack of snow cover during the survey hampered deer counts.
5. Estimates for the 25 counties in the two-day hunting zone of 1963 indicated no real change in population size.

LITERATURE CITED

- Mustard, E. W. 1962. Iowa Deer Population Estimates - 1962. Iowa Conserv. Comm., Quart. Biol. Repts. 14(2): 44-49.

POSTAL CARD SURVEYS OF SQUIRREL, RABBIT, FOX, AND RACCOON HUNTERS FOR THE 1963-64 SEASON

Paul D. Kline
Game Biologist

INTRODUCTION

One of the tools of the game manager is his knowledge of hunting pressure and distribution, seasonal kill, and relative importance of huntable species. One method by which this knowledge can be gained is by mail contact of a sample of hunters. This paper constitutes a report on one phase of a postal card survey of a 2 per cent sample of licensed Iowa hunters for the 1963-64 season.

METHODS

In obtaining the 2 per cent sample, approximately 6,000 of an estimated 300,000 hunters were contacted. Sampling was stratified by estimated sales of hunting and combination hunting-fishing resident licenses sold in each county. Names and addresses of potential hunters were copied from the State Conservation Commission license files. In effect, less than 2 per cent sampling was obtained because of improper addresses, persons moved, etc.. Non-resident hunters were contacted in similar fashion.

Each potential cooperator was mailed a letter of instruction and a card at the end of February following the close of the rabbit season. He was asked to record on the card for each of cottontails, jackrabbits, foxes, and raccoon the number of times he hunted, how many hours he spent hunting, total bag for the season, and county in which he hunted most. Also, he was asked to record the number of times he hunted and his bag of cottontails during February, and numbers and varieties of hunting dogs he may have owned. Squirrel data was obtained from a companion survey which was mailed in January following the close of the pheasant and quail seasons. It will suffice to record that the squirrel data was obtained in a similar manner.

RESULTS

Response: Sales of resident hunting and combination licenses for 1963 totaled 307,400. Of these, 5,850 (1.9%) were contacted in this survey. Non-resident licenses totaled 7,500, 207 (2.8%) of whom were contacted. Resident hunters returned 1,975 cards for a response of 33.8%. Seventy-one non-residents returned cards (34.3%).

Cottontails: Of those reporting, 1,080 (54.65%) hunted cottontails. Complete tabulation of the hunting success and effort for five species appears in Tables 1 and 2. For cottontails licensed hunters expended 2,618,393 hours and bagged 2,066,472 (0.79 cottontails per gun hour). Success varied some in various portions of Iowa (Table 3). Highest success per hour appeared in the Southern Loess, poorest in the Eastern Area. Success was correlated with known abundance of cottontails in the various regions.

Only 7.32% of the season's bag was taken during February. The writer believes lack of snow curtailed cottontail hunting during February. Only 81 of 1,041 cottontail hunters (7.78%) owned beagles or bassets, normally considered rabbit dogs. The index of success per hour, 0.79, varied somewhat from the 0.71 index compiled from Conservation Officer contacts.

TABLE 1. Statewide results of 1963-64 postal card surveys of hunting success reported by residents

Species	Per Cent of Returns Reporting Hunting	Ave. No. Trips per Hunter	Ave. No. Gun Hours/Hunter	Ave. Number Hours/Trip	Total Resident Hunters
Cottontail	54.65	6.17	15.45	2.50	167,994
Squirrel	48.89	5.11	14.60	2.86	150,288
Raccoon	8.70	9.23	27.28	2.96	26,744
Fox	17.61	4.79	17.15	3.58	54,133
Jackrabbit	9.92	3.03	7.00	2.31	30,494

Species	Ave. No. Bagged/Hunter/Season	Avg. Bag/Trip	Ave. Bag/Gun Hour	Total Hunting Trips	Total Hunting Hours	Statewide Bag
Cottontail	12.20	1.98	0.79	1,036,523	2,595,507	2,049,527
Squirrel	9.55	1.87	0.65	767,972	2,194,205	1,435,250
Raccoon	12.89	1.40	0.47	246,847	729,576	344,730
Fox	2.22	0.46	0.13	259,297	928,381	120,175
Jackrabbit	2.46	0.81	0.35	92,397	213,458	75,015

TABLE 2. Statewide results of 1963-64 postal card surveys of hunting success reported by non-residents

Species	Per Cent of Returns Reporting Hunting	Ave. No. Trips per Hunter	Ave. No. Gun Hours/Hunter	Ave. Number Hours/Trip	Total Non-resident Hunters
Cottontail	23.94	3.09	12.75	4.13	1,795
Squirrel	8.59	3.55	8.36	2.35	644
Raccoon*	1.41	6.00	30.00	5.00	106
Fox*	2.82	15.00	55.00	3.67	211
Jackrabbit	0.00	None detected by this survey!			

Species	Ave. No. Bagged/Hunter/Season	Ave. Bag/Trip	Ave. Bag/Gun Hour	Total Hunting Trips	Total Hunting Hours	Statewide Bag
Cottontail	9.44	3.06	0.74	5,547	22,886	16,945
Squirrels	8.27	2.33	0.99	2,286	5,384	5,326
Raccoon*	23.00	3.83	0.77	636	3,180	2,438
Fox*	4.50	0.30	0.08	3,165	11,605	949

* Data on fox and raccoon hunting success by non-residents questionable because only one raccoon and two fox hunters responded to the survey.

TABLE 3. Average cottontail hunting by areas for 1963-64: Resident hunters only

Area	No. Trips/ Hunter Season	No. Hours/ Hunter Season	No. Hours/ Trip	No. Bagged/ Hunter Season	No. Bagged/ Hunter/Trip	No. Bagged/ Gun Hour
Western Loess	5.99	14.64	2.44	12.44	2.08	0.85
Northern Glaciated	6.07	14.31	2.36	11.35	1.87	0.79
Southern Loess	6.38	16.07	2.52	14.70	2.30	0.91
Eastern	6.43	18.33	2.86	10.46	1.93	0.68

Squirrels: Of the reporting resident hunters, 48.89% hunted squirrels. The expanded data indicates 2,199,589 hours were expended to bag 1,440,576 squirrels, or 0.65 squirrels per gun hour. This index of success agrees closely with the 0.67 index of squirrels per gun hour compiled from Conservation Officer contacts. Success over Iowa varied from 0.62 per hour from the Northern Glaciated region to 0.72 from the Driftless region of northeast Iowa (Table 4).

Foxes, Raccoons, and Jackrabbits: Fox hunters comprised 17.61% of the licensed resident hunters. The expanded data discloses 939,986 hours were spent in bagging 121,124 red and gray foxes, or 0.13 foxes per gun hour. Only 4.75% of the fox hunters owned fox hunting dogs.

Raccoon hunters totaled 8.7% of the licensed resident hunters. The expanded data reveals 732,756 hours were expended in bagging 347,168 raccoons, or 0.47 raccoons per hour. Coon hounds were owned by 30.13% of the raccoon hunters.

Jackrabbit hunters totaled 9.92% of the licensed resident hunters. The expanded data reveals 75,015 jacks were taken during 213,458 hours of hunting, or 0.35 jacks per gun hour.

DISCUSSION

The total hunting hours expended can be an accurate indication of popularity of the various game species in Iowa. In this respect, of the five species considered in this report cottontails can be considered most important, with squirrels, foxes, raccoon, and jackrabbits following in descending order.

In any area the relative popularity of multiple game species will depend on several factors. Perhaps the most important of these factors will be availability and desirability. For the purposes of this paper availability is defined as the relative attainability of the various game species. It will depend on distribution, abundance, ease of access, relative willingness of the species, hunting regulations, etc.. Desirability is defined as the tendency of hunters to prefer any one species as compared to other species.

A measure of desirability appears in the data at hand. The average number of hours per trip for each species is used here and designated "Index of Desirability". Other data such as the average number of trips per hunter would in the writer's opinion measure availability as well, and, therefore, could not be used for desirability.

In the calculation of an "Index of Availability" the total statewide bag by resident licensed hunters is used. Total bag should reflect both availability and desirability. Therefore, the influence of desirability must be suppressed to give an indication of availability. The "Index of Availability" for any one species following this line of reasoning, becomes statewide bag divided by 10,000 times the "Index of Desirability". These indices appear in Table 5.

The indices should not be construed as true measures of either of the factors being considered. They do, however, give indications of the reasons for varying popularity of the six Iowa game species considered here. Indices for deer were taken from unpublished data furnished by Keith Larson. The "Index of Desirability" for deer, for example, shows high preference in Iowa for that species, while the "Index of Availability" shows that to the

TABLE 4. Average squirrel hunting by areas for 1963-64: Resident hunters only

Area	No. Trips/ Hunter Season	No. Hours/ Hunter Season	No. Hours/ Trip	No. Bagged/ Hunter Season	No. Bagged/ Hunter/Trip	No. Bagged/ Gun Hour
Western Loess	4.75	14.15	2.98	9.47	1.99	0.67
Northern Glaciated	4.94	13.04	2.64	8.07	1.63	0.62
Southern Loess	4.99	15.00	3.00	9.83	1.97	0.66
Driftless	6.59	18.95	2.88	13.60	2.06	0.72

TABLE 5. Indices of desirability and of availability based on postal card surveys of hunters*

Species	Index of Desirability	Index of Availability
Cottontail	2.50	81.98
Squirrel	2.86	50.18
Raccoon	2.96	11.65
Fox	3.58	3.36
Jackrabbit	2.31	3.25
Deer	5.78	0.10

* The Index of Desirability equals average number of hours per hunting trip. The Index of Availability equals the statewide bag divided by 10,000 times the index of desirability.

average hunter deer are relatively unattainable as compared to rabbits and squirrels.

These indices should be of interest to the game manager because they can serve as guides to corrective management which would consider public desire for hunting as well as provide relative indications of availability. For example, they indicate that both fox and deer should receive more attention in management than either statewide kill data or total hunting hours would denote.

IOWA WATERFOWL PRODUCTION AERIAL TRANSECT COUNT - 1964

Gene Goecke
Game Biologist

INTRODUCTION

In the summer of 1964, the Conservation Commission designed an aerial transect route across the northern part of Iowa to count young waterfowl. (Figure 1) The transect route was established to provide a method of evaluating the production of waterfowl in that section of the state which is of primary importance in this respect. It is anticipated that this project can be carried on in coming years so that the year to year production trends of waterfowl in Iowa can be measured and evaluated.

Marsh and pothole numbers and conditions were also noted while taking the transect.

METHODS

The transect was flown using the Conservation Commission's own airplane. The broad count transect covered a 1/8-mile wide strip on each side of the airplane. The airplane was flown at an altitude of 150 to 160 feet and at speeds of 85 to 90 miles per hour. Only mornings with sunny skies and very little breeze were used to take the transect. The pilot and three observers flew the transect. One observer routed the course, and the other two observers made the counts.

While taking the transect, observations were taken 1 mile on each side of the airplane to count the number of potholes and marsh areas sighted along the transect route.

A typical marsh was checked several weeks prior to the transect to ascertain when the peak of the young duck hatch was reached. The 1st and 2nd of July were then selected as the dates for the transect in 1964.

RESULTS

The transect route was divided into four segments for recording the numbers of waterfowl, potholes, and marsh areas (Figure 1). There were 489 miles flown to cover the entire transect route. The potholes and marsh areas sighted along the route were all on privately owned land. These potholes and marsh areas were divided into 0-1 acre, 1-2 acres, 2-4 acres, and 4 or more acres for recording (Table 1). Sixty-four per cent of the potholes and marsh areas were dry at the time of the transect. No waterfowl production was seen on any of the small potholes or marsh areas.

FIGURE 1. Aerial transect routes used in counting waterfowl broods and observing pothole and marsh conditions, July 1964

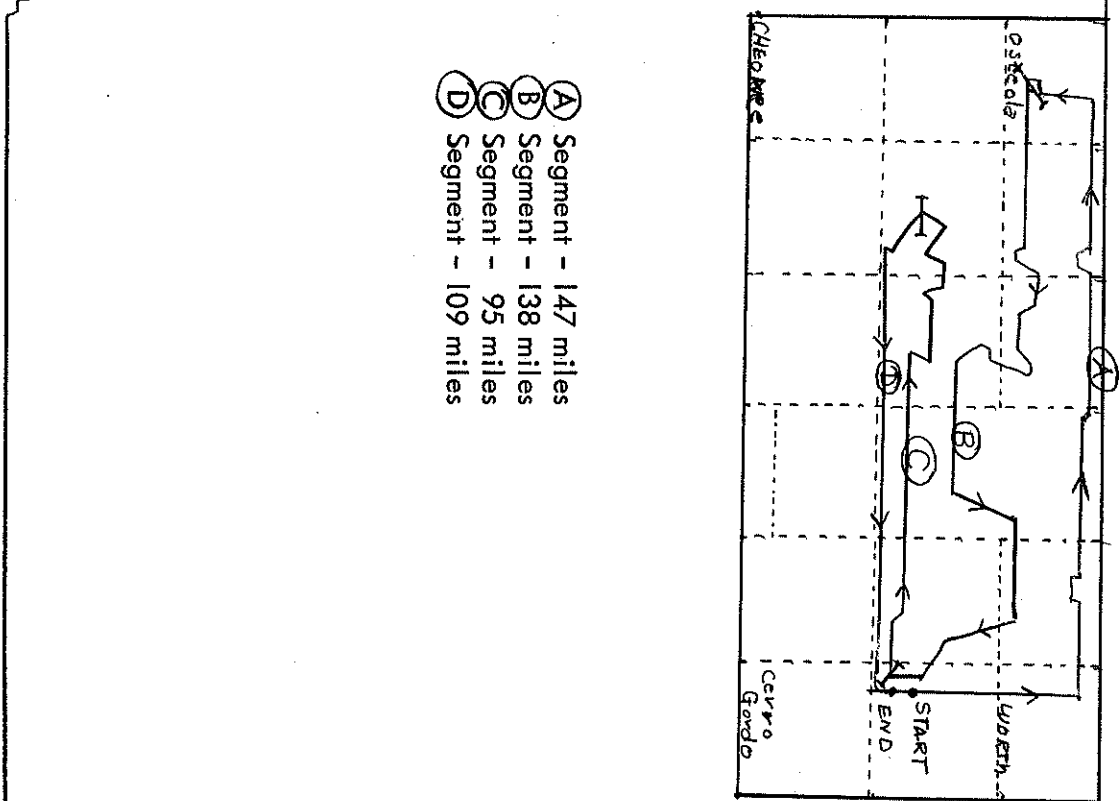


TABLE 1. Numbers and condition of potholes and marshes sighted on July 1964 waterfowl production aerial transects in northern Iowa

Segment (see Fig. 1)	0-1 acres		1-2 acres		2-4 acres		4+ acres		Totals	
	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
A	38	2	10	4	8	3	8	7	64	16
B	15	2	11	1	0	1	0	3	26	7
C	16	2	1	3	2	4	6	9	25	15
D	5	2	1	0	0	1	6	5	12	8
TOTALS	74	8	23	10	10	6	20	24	127	46

There were 109 broods sighted and counted while flying the transect (Table 2). In future counts, there will be more effort placed on recording species and numbers in broods and adult fliers sighted on the areas.

During the production period this summer, Unit Managers and the Waterfowl Biologist recorded all broods seen on various areas and the number of young in each brood (Table 3).

TABLE 3. Brood counts of young waterfowl, 1964

Species	No. Broods	No. Young	Average Brood Size
Blue-winged teal	48	357	7.4
Mallard	24	173	7.2
Wood duck	14	161	11.5
Redhead	3	26	8.7
Ruddy duck	1	7	7

Emergent vegetation as a whole was fair to good on the marshes in the transect route this year.

DISCUSSION

The aerial transect route established this summer in Iowa is a good start toward a system by which the production of young waterfowl in the state can be evaluated, and trends in production of waterfowl in the state can be measured. The production survey transect will have to be carried on for several years before the real benefits of this type of survey can be realized. More emphasis will have to be placed on recording the species and numbers in broods and adult birds sighted on the transect route. Vegetative and water conditions of the areas will have to be recorded more exactly before this phase of the survey can be of great value.

TABLE 2. Results of aerial transect flown July 1964 to measure waterfowl production in northern Iowa

Area	County	Broods	Adults	Coot
<u>Segment A</u>				
Elk Creek Marsh (A)	Worth	1	0	0
Silver Lake	Worth	0	3	0
Harman Lake	Winnebago	8	10	many
Little Goose Lake	Kossuth	0	0	0
Iowa Lake Marsh	Kossuth	0	0	0
Tuttle Lake	Emmet	0	2	0
Eagle Lake	Emmet	1	6	0
Christopherson Slough	Dickinson	7	5	0
Swan Lake	Dickinson	0	0	0
Marble Lake	Dickinson	1	0	many
Hottes Lake	Dickinson	0	0	0
Grovers Lake	Dickinson	2	4	1
Iowa Lake Marsh	Osceola	2	many	0
Rush Lake	Osceola	5	many	0
Total		27	many	many
<u>Segment B</u>				
Stony Lake	Dickinson	2	0	0
Garlock Slough	Dickinson	0	0	0
Lower Gar Lake	Dickinson	0	0	0
Prairie Lake	Dickinson	1	1	
Spring Run Area	Dickinson	1	0	1
Lily Lake	Dickinson	2	1	0
4 Mile Lake	Emmet	2	3	0
Cheever Lake	Emmet	5	many	0
West Swan Lake	Emmet	9	many	many
East Slough	Emmet	7	many	0
Cunningham Slough	Emmet	3	many	0
High Lake	Emmet	0	0	0
Bur Oak	Emmet	0	0	0
Buffalo Creek	Kossuth	0	0	0
Union Slough (Federal Area)	Kossuth	11	many	many
Pothole east of Union Slough	Kossuth	0	many	0
Total		43	many	many

Area	County	Broods	Adults	Coot
<u>Segment C</u>				
Ventura Marsh	Cerro Gordo	3	many	many
Eagle Lake (drained to revegetate)	Hancock	0	"	0
Five Island Lake	Palo Alto	0	0	0
Palo Alto Meadow Area	Palo Alto	3	0	0
Blue Wing Marsh	Palo Alto	3	0	0
Oppedahl Tract	Palo Alto	6	many	many
Smith's Slough	Clay	2	many	0
Trumble Lake	Clay	0	0	0
Dan Green Slough	Clay	9	many	many
Total		26	many	many
<u>Segment D</u>				
Round Lake	Clay	1	many	0
Barringer Slough	Clay	2	many	many
Virgin Lake	Palo Alto	1	0	many
Silver Lake	Palo Alto	0	0	0
Rush Lake (drained to revegetate)	Palo Alto	0	many	0
West Twin Lake	Hancock	4	"	0
East Twin Lake	Hancock	5	"	0
Total		13	many	many
<hr/>				
Total for entire transect		109	many	many

SUMMARY

1. A 489 mile aerial waterfowl production survey transect was run in July of 1964.
2. A total of 109 broods of waterfowl were seen while taking the transect.
3. Sixty-four per cent of the privately owned potholes and marshes sighted on this transect were dry.
4. The average brood size for mallard and blue-winged teal observed this summer was 7.2 and 7.4 birds per brood, respectively.

RESULTS OF THE 1963 PHEASANT HUNTER SURVEY

Richard C. Nomsen
Game Biologist

A two per cent random sample was drawn from the duplicate files of license sales following the 1963 pheasant season. Names were selected from each county according to the number of hunting and combination licenses sold. A record card and letter of instructions were mailed to each person selected requesting information about the previous hunting season. They were asked to report the number of times hunted, total hours hunted, number of birds bagged and in which county they hunted most. In addition, they were requested to give information concerning opening day hunting and hunting success during the holiday period (last 12 days).

Iowa's longest pheasant season of 54 days opened November 9 and closed January 1, 1964 with shooting permitted from 8:30 A.M. to 5:00 P.M.. The daily bag limit was 3 cocks and the possession limit was 9 roosters.

A total of 2,616 cards was received, which was 44 per cent of the sample mailed. Total license sales in 1963 was 307,400, which included 194,900 resident hunting and 112,500 resident combination. There were 7,500 non-resident hunting licenses sold in 1963, which was the highest total in recent years.

Results of the survey indicated that the 1963 pheasant season was the best in recent years. Complete statewide statistics are given in Table I for both resident and non-resident hunters, and for the two combined to give the picture for all hunting. No figures are available from those landowners and tenants who hunted only on their own land and did not buy a license. It is believed their omission would tend to balance any upward bias in the data obtained due to non-response of half those contacted and the possibility their hunting results were somewhat poorer than the half that did respond.

TABLE I. Statewide pheasant hunting statistics from 1963 postal card survey

	Resident	Non-Resident	Total
Statewide Bag - Pheasants	1,874,500	60,500	1,935,000
Total Hunting Hours	5,626,400	169,000	5,795,400
Total Hunting Trips	1,514,800	33,100	1,547,900
Number Hunting Pheasants	270,500	6,900	277,400
Per cent Hunting Pheasants	88%	92%	88%
Avg. No. Trips per Hunter	5.6	4.8	5.6

(CONTINUED)

TABLE 1. (CONTINUED)

	Resident	Non-Resident	Total
Avg. No. Gun Hours per Hunter	20.8	24.5	20.9
Avg. No. Hours per Trip	3.7	5.1	3.7
Avg. No. Bagged per Hunter per Season	6.9	8.7	7.0
Avg. No. Bagged per Trip	1.2	1.8	1.3
Avg. No. Bagged per Gun Hour	0.33	0.36	0.33
Avg. No. Hours per Bird	3.0	2.8	3.0

A comparison of the 1963 statistics for resident hunters was made with those from 1958, which was also an excellent season (Table 2). Statewide results showed that 88 per cent of the resident licensees hunted pheasants in 1963 compared to 75 per cent in 1958. Hunters averaged 1.7 more trips during 1963 which was no doubt due to the longer season. Nearly half of the cooperators replied that they hunted pheasants during the last 12 days of the season (holiday period). It was determined that 21 per cent of the hunting trips were made during the holiday period and 18 per cent of the total season kill occurred during this period. It appeared that many high school and college students took advantage of the extended season through the vacation period.

TABLE 2. Summary of statewide pheasant hunting success, Iowa residents, 1958 and 1963

	1958 Season	1963 Season
Per cent of Licensees Hunting Pheasants	75%	88%
Avg. No. Hunting Trips	3.9	5.6
Avg. Season Kill per Hunter	5.8	6.9
Hours per Pheasant Killed	2.1	3.0
Estimated Total Number of Hunters	267,450	270,500
Estimated Total Number of Pheasants Killed	1,548,565	1,874,400
Season Length	24 days	54 days

Several changes were noted in the number of pheasants killed by agricultural districts when compared to the 1958 season (Table 3). Although the statewide kill increased considerably, fewer birds were killed in North-central and Northeast Iowa. However, the kill in North-central remained high for the state. All other areas of the pheasant range registered increases. West-central and Southwest Iowa each showed a substantial increase of approximately 100,000 birds. Brood counts and population surveys had shown excellent production in Western Iowa last year. Hunting pressure has increased in the southwestern range in recent years.

TABLE 3. Distribution of hunting pressure and pheasant kill by agricultural districts, Iowa 1963, and comparison with 1958 season kill

	Percentage of Hunting Trips	Percentage of Birds Killed	Number of Birds Killed	
			1963	1958
1 Northwest	16.2%	15.5%	290,500	254,000
2 North-central	17.9	17.0	318,700	325,200
3 Northeast	14.5	14.6	273,700	291,100
4 West central	11.6	13.8	258,700	161,100
5 Central	12.3	13.3	249,300	229,200
6 East central	14.2	11.3	211,800	165,700
7 Southwest	9.0	10.0	187,500	86,700
8 South central	3.5	3.7	69,400	20,100
9 Southeast	0.8	0.8	15,000	15,500

Sex ratios obtained after the 1963 season indicated improvement in the harvest of roosters (see preceding Quarterly Biology Reports). Hours per bird bagged increased in 1963 compared to 1958, but the extra hunting trips provided by the extended season resulted in a better harvest of Iowa's most popular game species.

IOWA'S SPRING PHEASANT POPULATION - 1964

Richard C. Nomsen
Game Biologist

INTRODUCTION

The crowing cock count, started in 1950, is the primary method for obtaining information on the spring pheasant population in Iowa. A 10-mile roadside count was added in 1962 when routes were shortened to 10 stops. Routes were checked by Conservation Officers, Unit Game Managers and Biologists.

The winter of 1963-1964 was very mild with little snow. Pheasants wintered well under these favorable conditions, and should have been in excellent condition to begin nesting activity. Weather conditions in April were generally wet and stormy but with normal temperatures. May was warm with below normal rainfall but winds continued to blow. Persistent winds caused some difficulty in obtaining counts under desirable conditions.

METHODS

The technique for conducting the spring crowing and roadside counts remained the same as in 1962 and 1963 (see April-June 1963 Quarterly Biology Report, pp. 35-40). Results are given for the six major regions as well as statewide.

RESULTS AND DISCUSSION

Crowing Cock Counts

The 1964 crowing cock census showed a statewide decrease of 8 per cent, but all of this decrease occurred in the north central region (Table 1). Four regions showed increases and the count remained the same in northwest Iowa. Records from southwest Iowa indicated the greatest increase followed closely by central and southern Iowa.

Censusing conditions were generally favorable in 1964; however, some counts were delayed because of persistent wind. The 1964 average wind velocity reported on the counts was 3.4 mph., varying from 2.3 to 4.6 mph. within regions (Table 2). The average wind velocity in 1963 was 4.1 mph.. More wind was reported in northwest and north central Iowa but less in the other areas of the state.

It was quite difficult to determine the early peak of crowing activity this year due to stormy weather in April and early May. As a result, the instructions were mailed later than in 1963 and the average completion date of May 16 was almost 2 weeks later (Table 2). However, it is believed that nearly all counts were completed during the preferred time period.

Spring Hen Index

The statewide hen index indicated that the 1964 population of hens was 11 per cent higher than in 1963. The spring hen index of 42.8 was determined by multiplying the average number of calls per stop by the observed sex ratio from winter observations (11.9 calls

x 3.6 hens per cock). It should be noted, however, that considerable difficulty was encountered during the winter observations because lack of snow cover reduced the number of birds reported. This would, of course, affect the sex ratio figures and also the spring hen index. The 1963 spring hen index was 38.7.

TABLE 1. Results of 1964 spring crowing cock counts made by Conservation Officers, Unit Game Managers, and Game Biologists, and comparison with 1963 counts

Region of State	1964		1963		Change from 1963
	No. of Counts	Mean Calls per Stop	No. of Counts	Mean calls per Stop	
Northwest	20	20.4	22	20.4	Same
North Central	21	19.1	22	29.0	-34%
Central	25	15.0	25	13.7	+10%
Southwest	21	10.6	21	9.3	+14%
East	20	5.9	24	5.7	+ 3%
South	33	4.4	32	4.0	+10%
Statewide	140	11.9	146	12.9	- 8%

TABLE 2. Comparison of dates on which spring pheasant counts were taken and mean wind velocity during counts, 1964 vs. 1963

Region	Mean date of counts		Mean wind (mph.)	
	1964	1963	1964	1963
Northwest	May 18	May 8	4.4	3.5
North central	May 14	May 9	4.6	4.3
Central	May 15	May 1	3.7	4.2
Southwest	May 19	May 3	2.5	4.9
East	May 13	May 3	2.3	3.7
South	May 18	May 2	3.2	4.1
Statewide	May 16	May 4	3.4	4.1

Spring Roadside Counts

There were 3,867 pheasants sighted on the 140 10-mile roadside routes censused this spring, an average of 2.76 birds per mile (Table 3). This is a 20 per cent increase over the

TABLE 3. Results of 1963-1964 spring roadside counts made by Conservation Officers, Unit Game Managers, and Game Biologists

1964 Results								
Region of State	No. of Miles	No. of Cocks	No. of Hens	Total No. of Birds	Cocks per Mile	Hens per Mile	Total per Mile	Sex Ratio (M:F)
Northwest	200	257	557	814	1.28	2.79	4.07	1:2.2
North Central	210	239	651	890	1.14	3.10	4.24	1:2.7
Central	250	236	544	780	0.94	2.18	3.12	1:2.3
Southwest	210	215	591	806	1.02	2.81	3.83	1:2.7
East	200	84	258	342	0.42	1.29	1.71	1:3.1
South	330	91	144	235	0.28	0.44	0.72	1:1.6
Statewide	1,400	1,122	2,745	3,867	0.80	1.96	2.76	1:2.4
1963 Results								
Northwest	220	336	446	782	1.53	2.03	3.55	1:1.3
North Central	220	422	708	1,130	1.92	3.22	5.14	1:1.7
Central	250	224	288	512	0.90	1.15	2.05	1:1.3
Southwest	210	169	248	417	0.80	1.18	1.98	1:1.5
East	240	112	145	257	0.47	0.60	1.07	1:1.3
South	320	119	152	271	0.37	0.48	0.85	1:1.3
Statewide	1,460	1,382	1,987	3,369	0.95	1.36	2.31	1:1.4

2.31 birds per mile sighted in 1963; however, there was a considerable difference in numbers of cocks and hens observed. There was 1.96 hens sighted per mile, which was 44 per cent higher than in 1963. Counts in north central and southern Iowa indicated slight decreases but all other regions registered substantial increases in the number of hens. The average number of cocks observed per mile decreased 16 per cent from 0.95 to 0.80 cocks per mile. Only central and southwest Iowa recorded more males on the roadside segments.

The statewide observed sex ratio on the 1964 spring roadside counts was 2.4 hens per cock which was much higher than 1.4 hens per cock from previous counts in 1962 and 1963. This index would substantiate the results of the winter counts and indicate a higher and more desirable harvest of roosters during the extended 1963 season.

Thus, population trends were similar when analyzed by the crowing count and the roadside count. In general, the 1964 spring pheasant population was up substantially from 1963; fewer males were seen and heard but a considerable increase in hens was recorded.

SPRING 1964 RUFFED GROUSE AND WOODCOCK SURVEYS

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and

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RUFFED GROUSE

A project to learn more about the status of ruffed grouse in the state was begun in 1961. The first step in this investigation is to determine the present density and range of the species in Iowa (other phases involve restocking in suitable areas and evaluating hunting possibilities). The spring roadside drumming count technique was selected as the most suitable census method for our purposes. A few exploratory drumming counts had been made in northeastern Iowa, the only area in the state where ruffed grouse are found at present, in 1956 and 1960. More intensive surveys were initiated in 1961 and have been continued since that time. For background on the study and the methods employed and results obtained through 1963, see preceding issues of the Quarterly Biology Reports (particularly the April-June 1961, Oct.-Dec. 1962, and April-June 1963 volumes).

Nine drumming counts were made in the spring of 1964 in three northeastern Iowa counties. There were 203 drums heard on 133 stops - a mean of 1.5 drums per stop (Table I). This compares to a mean of 1.7 per stop in 1963 (217 drums in 130 stops) on the same nine routes. On the seven of these routes also run in 1961 and 1962, means of 1.4 and 1.8, respectively, were obtained in those years. Considering the small number of routes run, they apparently indicate a relatively stable ruffed grouse population during the past 4 years.

TABLE I. Results of spring, 1964, ruffed grouse drumming counts in northeast Iowa

Route	County	No. Stops	Drums Heard	Drums per Stop
Yellow River State Forest	Allamakee (SE)	15	44	2.9
Village Creek	" (C)	13	25	1.9
Harpers Ferry - Wexford	" (E)	15	27	1.8
Upper Iowa River	" (N)	15	16	1.1
Lower Yellow River	" (SE)	15	26	1.7
Highlandville - North Bear	Winnesheik (NE)	15	25	1.7
Frankville - Yellow River	" (SE)	15	11	0.7
Sny Magill - Bierbaum	Clayton (NE)	15	11	0.7
Bloody Run	" (NE)	15	18	1.2
TOTALS		133	203	1.5

WOODCOCK

Iowa is one of many states cooperating with the U. S. Fish and Wildlife Service in making woodcock singing ground surveys in the spring. The purpose of this survey is to obtain an index to woodcock breeding population size and thus determine annual trends in woodcock breeding densities. Such counts were made in Iowa for the first time in 1961. The techniques used and the results for 1961-62-63 will be found in the July-Sept. volume of the Quarterly Biology Reports.

Twelve singing ground counts were run in 1964 in the eastern half of the state. This number was expanded from ten run in 1963, five in 1962 and four in 1961. There were 17 woodcock heard on 108 stops, for a mean of 0.16 per stop (Table 2). This compares to means of 0.22 in 1961, 0.21 in 1962, and 0.35 in 1963. The 4-year average is 0.23 singing woodcock per stop (68 birds on 295 stops). Woodcock have been heard on 24 of the 31 routes scattered over the eastern part of Iowa, indicating that breeding woodcock may be more common in the state than generally believed.

TABLE 2. Results of spring 1964 woodcock singing ground counts in Iowa

Route	County	No. of Stops	No. Birds Heard	Birds Per Stop
Luster Heights	Allamakee	8	2	.25
Paint Creek	"	10	2	.20
Sand Cove	"	8	0	.00
Sny Magill	Clayton	9	2	.22
Rock Creek	Jasper	8	0	.00
Buck Creek	Clayton	10	3	.30
Canoe Creek	Winneshiek	10	0	.00
Wapsie Bottoms	Bremer	10	3	.30
Otter Creek	Tama	10	0	.00
Colyn Area	Lucas	10	2	.20
Klum Lake	Louisa	9	2	.22
Lick Creek	Lee	6	1	.17
TOTALS		108	17	.16

QUAIL HUNTING RESULTS FOR 1963-64 SEASON

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Game Biologist

INTRODUCTION

This report on quail hunting success for the past season is based on an Iowa postcard survey. This survey was more comprehensive than those made in the past. These included checking station questionnaires in 1933, when data indicated that gunners take only a small per cent of the quail in the fields in hunted areas; Conservation Officer field contact cards; and, more recently, Officer contact booklets. Both of the latter gave a general view of hunting by a few quail hunters. Through the 1964 postcard survey, about 6,000 hunters were contacted and data from those that replied are herein expanded to represent the 1963-64 success of all Iowa quail shooters.

Quail hunters in 1963-64 had the benefit of regulations based on high production due to an open winter and a favorable spring and summer. Hence there was a liberalization over 1962 when shooting was from November 3 to December 14; hours were 9 A.M. to 4:30 P.M.; with a daily bag limit of 5; possession limit of 10. The 1963 season was November 2 to January 1, 1964; hours 8:30 A.M. to 5 P.M.; bag 6; possession 12. Each year 69 counties were open for quail shooting, with north central and northwest Iowa being closed to quail hunting.

METHODS

The names of cooperators were obtained by drawing from the duplicate license files in Des Moines about 2 of each 100 resident combination licenses and 2 of each 100 resident and non-resident hunting licenses. Of these, each received a letter of instructions and the postcard which was to be filled in and returned. On the reverse side of the card were spaces for recording the county hunted, species of game, hours and related items.

RESULTS

Resident Licensees: Statewide

From the entire state, 2,616 cards were returned. On 391 there was useable data concerning quail shooting, indicating 15 per cent of resident hunters sought quail. This material came from 64 of the 69 counties where quail were legal game. Resident hunters bagged 322,630 quail last year (Table 1). The 46,090 such hunters made 165,924 quail hunting trips involving 585,343 hours.

The average hunter who shot quail made 3.6 trips during the 1963 season and 73 per cent of these gunners hunted in their home county or in an adjoining county. Some travelled round trips of 400 to 500 miles to shoot quail.

The average hunting trip for the individual was 3.6 hours, with 2 birds bagged per trip and a success rate of 1.8 hunting hours per quail (0.6 bird per hour). Of these quail shooters, 87 per cent also took pheasants and 65 per cent took squirrels at some time during the 1963-64 seasons.

The State Divided into 3 Regions

As a step in better utilizing the quail data, we can divide Iowa into 3 sections or regions. The best quail territory is within the 3 southern tiers of counties where the low-grade land is not heavily farmed, or cultivated, and here the good quail cover is most abundant. Eighty-five per cent of the quail reported shot were taken in this southern one-third of Iowa. Seventy-six per cent of trips were made in this territory. In this section, 32 counties were open for shooting quail and in 1963-64, 274,236 birds were shot by 32,724 licensed resident hunters. They made 126,302 trips and spent 485,835 hours in the field in this area.

Average time for each trip was 3.9 hours during which they took an average of 2.2 quail with a success rate of 1.8 hours per bird (0.6 bird per hour). Best success in this area was in prime range in the southeast where the rate was 1.4 hours per bird (0.7 bird per hour).

Just to the north of the above, in the central one-third of the state 30 counties were open for shooting, 7 were closed. A total of 45,168 quail were taken by 12,444 hunters during 38,162 trips on which the shooters spent 99,507 hours. Average hours per trip was 2.5, when 1.2 birds were taken per trip at a rate of 2.2 hours per quail (0.5 bird per hour).

In the northernmost one-third of the state, there is a total of 30 counties with the quail season open in 7. Here, 3,226 quail were shot by 922 hunters during 1,659 trips with an expenditure of 5,853 hours. Average quail trips lasted 3.0 hours with 2.0 birds per trip at a rate of 1.8 hours per quail (0.6 quail per hour). In this northern range, the rate of success in hours per quail is similar to that for the best range of southern Iowa; however, only a few reports were received from this area.

Zoographical Regions

The best quality quail range adjoins the state of Missouri; this is the region of southern Iowa loess which is described in "Soils of Iowa" Iowa State College of Agriculture (Brown 1936). The area lies in south central and southeastern Iowa. In this high quality range the postcard survey indicated that the average cooperators had a success rate of 1.6 hunting hours per quail (0.6 quail per hour) with Jefferson County results at 1.4 (0.7 quail per hour) while for Henry and Wapello Counties the rate was 1.5 (0.7 quail per hour).

In secondary or border range where counties are partially within, but north or west of, the main quail range, the survey revealed that average success was 2.1 hours per bird, and the highest success was in Union County at 1.3; Warren, 2.1; Marion, 2.7.

Marginal range lies in better grade soils that are heavily tilled and where there is no extensive quail cover: This is in an area west of the secondary range as well as to the north and it is mostly within the middle one-third of Iowa. The card survey revealed that average hunter success was 3.2 hours per quail with best success in Polk County at 1.4, while Iowa and Montgomery had success rates of 1.5.

Counties Where the Take of Quail was High

Data on bag, hours, trips and number of hunters indicate the distribution of hunting pressure, i.e., heavily hunted counties are pointed out. These counties are extensively hunted because they offer some shooting near large towns, or because they offer outstanding shooting.

Heaviest reported kill of quail was in Lee, Lucas, and Page Counties where the take was about 32,200 in each county. Other counties where the take was high were Davis and Ringgold with 19,300 each; while Warren, Wayne, Van Buren, and Taylor Counties each contributed 16,100. There was an average kill of 4,600 quail for each of the 69 counties open for quail hunting.

As to possible reasons for hunter concentrations, Lee County has hunters from the towns of Burlington and Fort Madison; Lucas is known for good quail hunting. Page County has only a fair quail population, but there are a number of fair sized towns in and near this county. Davis and Ringgold are known for good quail hunting. Warren County is near Des Moines; Wayne and Van Buren are known for good hunting; and Taylor County has fair to good quail hunting during most years. Except for counties in the southeast, pheasant shooting is an item in attracting hunters to certain counties.

Among the heavily hunted areas, only in Page County did the resident (Page County) hunters outnumber those from outside the county. In this group of heavily hunted counties the average was 2 out-of-county hunters for each hunter who lived in the county where he was hunting.

Non-Resident Hunters

In addition to the licensed resident quail gunners, 128 licensed non-residents returned the report cards and 16 of these said they hunted quail, indicating 12.5 per cent of the total had hunted quail in 1963. Non-residents bagged 5,347 quail last year (Table I). Nine hundred thirty-eight such hunters made 2,814 quail hunting trips involving 9,100 hours.

Non-resident quail shooters recorded an average (per man) hunting trip of 3.2 hours, with 1.9 birds per trip at the rate of 1.7 hours per quail (0.6 quail per hour).

Discussion and Comparison with Related Surveys

The 1963 postcard survey provided a statewide sample of quail hunting and it was made during a period when the quail population was on the increase.

The postcard survey indicated fairly good success, and the same was indicated in the Conservation Officers' field contact booklet record of the 1963 season.

Comparison of the success of resident hunters as given by the cards and by the booklets is as follows: In the prime range in the southern Iowa loess area, cards showed an average success rate of 1.6 hours per quail (0.6 quail per hour). Officers' booklet records showed 2.2 (0.5 quail per hunter-hour). In secondary range the cards indicated an average of 2.1 (0.5 quail per hour) while booklets indicated 2.7 hours per quail (0.4 quail per hour). In marginal range, the card results were 3.2 (0.3) while for booklets it was 2.0 (0.5 quail

per hunter-hour).

This postcard survey revealed that 15 per cent of resident shooters and 12.5 per cent of non-residents take quail. Other surveys indicate that from 12 to 28 per cent of average gunners shoot some quail, while a special survey by the biologist indicated that 55 per cent of hunters in prime range take some quail.

TABLE I. Results of the 1963-64 Iowa quail hunting season

	Resident	Non-Resident	Total
Statewide Bag - Quail	322,630	5,347	327,977
Total Hunting Hours	585,343	9,100	594,443
Total Hunting Trips	165,924	2,814	168,738
No. Hunting this Species	46,090	938	47,028
Per Cent Hunting this Species*	15	12.5	14.9
Avg. No. Trips per Hunter	3.6	3.0	3.6
Avg. No. Gun Hours per Hunter	12.7	9.7	12.6
Avg. No. Hours per Trip	3.6	3.2	3.5
Avg. No. Bagged per Hunter per Season	7.0	5.7	7.0
Avg. No. Bagged per Trip	2.0	1.9	2.0
Avg. No. Bagged per Gun Hour	0.6	0.6	0.6
Avg. No. Hours per Bird	1.8	1.8	1.8

* Based on 307,400 resident hunting and combination and 7,500 non-resident hunting licenses.

SUMMARY

1. A sample of approximately 2 per cent of the resident and non-resident hunters in Iowa was contacted after the 1963-64 quail hunting season.
2. A total of 2,616 resident and 128 non-resident hunters filled out and returned the postcards.
3. Returns indicated that 15 per cent of residents and 12.5 per cent of non-residents hunted quail.
4. Resident hunters totaling 46,090 took 322,630 quail at the rate of 1.8 hours per bird.
5. Non-residents totaling 938 took 5,347 quail at the rate of 1.8 hours per quail.

THE 1963 ANGLER SUCCESS AND HARVEST IN IOWA MAN-MADE LAKES

Jim Mayhew
Fisheries Biologist*

Conservation Officers of the State Conservation Commission were supplied with fishermen contact cards for the fourth consecutive year. As a part of their routine patrol duties, Officers were requested to obtain success and harvest information from anglers they contacted. These data are used annually to obtain basic catch statistics throughout the vast network of artificial lakes and reservoirs in Iowa.

Information on success and harvest on a large scale basis such as this is extremely valuable to the fisheries manager. This information not only effectively measures the fishing "pulse" of recreational lakes, but is also valuable as a supplement to fishery inventories. Crappie, bluegill, and largemouth bass angling success is usually determined by year class strength. Often it is possible to combine the catch data with preceding inventory data to determine the development of a large year class. This is also an excellent indicator of the validity of fishery inventories.

Because the number of contacts made, time of day and year anglers are contacted, is up to the discretion of the individual Officer, these data were again analyzed in their simplest form. Catch per unit effort, number of contacts, hours expended fishing, and fish caught are discussed in this paper. The catch of fish was also analyzed only on the major species found in these waters. These were largemouth bass, bluegill, crappie, bullhead, and channel catfish. In a few impoundments green sunfish, flathead catfish, carp, white bass, yellow bass, bowfin, gar, walleye, and northern pike may contribute significantly to the catch, but in the majority of the man-made lakes they are relatively unimportant to the total catch of fish and were listed in the tables as "others".

The man-made impoundments in southern Iowa can be separated into groups based on primary and secondary use or purpose. Many of these lakes were constructed principally for recreation. This group includes all state and county recreation lakes, and several privately owned ponds or small lakes. Other impoundments were constructed for municipal or commercial water supply, with recreation a secondary product. There are also countless agricultural ponds of multiple use such as livestock watering, erosion control, and recreation in this region of the state. The final group consists of abandoned strip mines, gravel pits, and commercial pits that have been stocked with fish by a governmental agency or helpful anglers.

Preliminary analysis of the angler catch and success data were completed for each different group of impoundments. Further analysis of individual impoundments was also completed and is listed in Tables 3, 4, and 5.

* Senior Biologist -- Artificial Lakes and Reservoir Investigations

Angler Catch and Harvest - 1963

During 1963 Conservation Officers contacted 4,824 fishermen. These people caught 12,017 fish after fishing 9,338 hours (Table 1). The state and county recreation impoundments were most frequently visited by fishermen and comprised 3,561 contacts. Municipal reservoirs, strip mines, gravel pits, and farm ponds followed in order of importance. Bluegill comprised 41 per cent of the total catch. Others were as follows: bullhead, 29 per cent; crappie, 13 per cent; largemouth bass, 7 per cent; channel catfish, 1 per cent; and other species, 9 per cent.

TABLE 1. Angler success and harvest in four different types of man-made lakes in 1963

Type of Lake	Total No. Contacts	Total Hours	Total Fish	Fish Hr.	Bass	B'gill	Crappie	B'head	C. Cat.	Others
Recreation	3,561	7,253	9,244	1.3	590	3,811	1,077	2,689	30	1,053
Mun. Res.	853	1,546	2,180	1.4	226	912	418	480	41	103
Farm Ponds	137	210	292	1.4	52	152	1	73	1	13
Comm. Pits	273	329	301	0.9	25	54	16	183	2	21
Grand Total	4,824	9,338	12,017	1.3*	893	4,929	1,506	3,425	74	1,190

* Figure listed is a mean fish per hour instead of summation.

The catch rate of southern Iowa lakes anglers varied considerably in the different types impoundments. Farm ponds and municipal reservoir anglers had the best success, catching fish at a rate of 1.4 fish per hour. Recreation lake fishermen followed closely with a catch rate of 1.3 fish per hour. The lowest success, 0.9 fish per hour, was recorded in strip mines and gravel pits. Mean catch rate for the 4 different types of impoundments was 1.3 fish per hour. This is lower than in 1962 (1.5 fish per hour), but is about the mean for the 4 years censused (Table 2).

For the first time since the beginning of the Conservation Officer census, bluegill became the most prevalent species caught. Since 1960 the bluegill has slowly been increasing in frequency in the catch of anglers. Previously bullhead had comprised more than 40 per cent of the sport fishery. This year bluegill comprised 41 per cent of the angler harvest compared to 29 per cent bullhead. Crappie and largemouth bass were also caught in increased numbers.

DISCUSSION

The system of obtaining angler catch statistics in southern Iowa artificial lakes and reservoirs by routine Conservation Officer contacts has proved very successful in the past 4 years. This information is valuable because it is obtained on a statewide basis, and is available by no other means. The results of this type of census is also applicable to routine fishery inventory information.

Over the 4 year period information has been received from more than 17,000 artificial lakes and reservoir anglers. The number of contacts made by the officers has remained

relatively constant from year to year. More contacts were made in 1963 than any other year, but the total has varied only about 900 during the entire period.

TABLE 2. Comparison of angler catch and harvest from 1960-63 by Conservation Officers in Iowa man-made lakes

Year	Total No. Contacts	Total Hours	Total Fish	Fish Hour*	Bass	B'gill	Crappie	B'head	C. Cat.	Others
1960	4,316	7,901	10,312	1.3	481	3,083	1,929	4,198	80	481
1961	3,836	7,642	8,909	1.2	812	2,325	1,299	3,942	87	459
1962	4,213	5,736	8,258	1.5	667	2,808	1,100	2,997	78	608
1963	4,824	9,338	12,017	1.3	893	4,929	1,506	3,425	74	1,190

* Figure listed represents mean fish per hour in all types of lakes.

The number of contacts made at individual lakes has also remained stable annually. As an example, the number of officer contacts at Thayer Lake in Union County has been 33, 28, 32, and 34 from the 1960 through 1963. This is indicative of many other lakes and reservoirs. In general, those lakes at which a small number of contacts was made during the first census tended to remain small in the succeeding years. The only factors that seemed to affect this was a change of Conservation Officer or complete renovation or manipulation of the fish population.

Catch rate and angling success has varied only slightly since the census began. In 1962 anglers had the highest success of 1.5 fish per hour, compared to a low of 1.2 fish per hour in 1961. This year could be considered as an average year for angling success in the artificial lakes and reservoirs. Farm ponds have always had the highest rate of catch, ranging from 1.4 to 2.2 fish per hour. They are followed in order by municipal reservoirs, recreation lakes, and strip mines - gravel pits. This is exactly the same order from highest to lowest angler success rate that occurred in 1963.

During the past census, species composition of angler catch changed. Previously bullhead had comprised the bulk of the southern Iowa fishery. This year bluegill surpassed this species in importance to the angler. Since the beginning of the census in 1960 it was apparent the artificial lake and reservoir fishermen was slowly changing species preference. Many conclusions and reasons could be given for this evolution, but the most important seems to be progression by the angler to lighter and more efficient tackle. In many areas the bluegill is also becoming more available to the angler.

Several other observations from the information are of general interest. They are as follows:

1. Angling success was about average in Iowa man-made lakes. The average angler caught about 2.2 fish after fishing 1.7 hours.

2. The census has proved extremely valuable in interpreting fishery inventory results. Year class abundance that is detected by routine sampling methods can later be evaluated in their importance to the angler harvest.

TABLE 3. The 1963 angler catch and harvest in man-made recreational lakes

Lake	Total Contacts	Total Hours	Total Fish	Bass	B'gill	Crappie	B'head	C. Cat.	Others
Hannen	30	49	20	7	9	1	2		1
Swan Lake	210	194	917	12			898		7
Cold Springs	24	37	26		6	15	5		25
Wapello	103	119	278	14	111	97	29	2	
Nine Eagles	50	102	296	26	256	11	3		27
Backbone	93	173	328	40	9	251	1		
Delhi	25	33	44	5	1	35	3		
Spring Lake	15	39	7						1
Bays Branch	227	407	186	5	33	10	126		12
Pine Lake	124	193	100	8	18	57	17		813
Rock Creek	1,354	3,641	4,165	136	2,131	250	826	9	5
Odessa	67	121	115	1	18	9	82		
Cone Marsh	12	7.5	15				15		
Williamson	11	24							
Colyn	24	32	62	36		1	25		8
Red Haw	145	328	602	10	535	49			
Keomah	113	258	304	22	104	78	100		
Weise Sl.	2	2							19
Manawa	287	481	199	3	126	4	38	9	3
Walnut Cr.	20	38.5	116	3	2	15	93		4
Thayer	33	32	23	6			9	4	37
G. Valley	64	133	232		2	34	159		
Union Grove	81	99.5	223		64	101	58		
Three Fires	26	69.5	72		61	5	6		
Lacey Keo.	4	3.5	16				16		86
Ahquabi	311	422	479	55	246	28	64		1
Darling	6	10	20		10		4	5	
Allerton	19	71	23	1	14	1	7		
Geode	43	85	67		52	12		1	2
MacBride	22	33	103		3	7	92		1
Coralville	16	13	6				5		1

TABLE 4. The 1963 angler catch and harvest in municipal reservoirs

Lake	Total Contacts	Total Hours	Total Fish	Bass	B'gill	Crappie	B'head	C. Cat.	Others
U. Centerville	13	13.5	19		15	2	1		1
L. Centerville	9	8.5	4		3				1
U. Moulton	18	20.5	20		15	4	1		
Griswold P.	43	67	58				58		
East Osceola	48	87	83	12	43		27		
West Osceola	145	320	382	17	92	45	195	29	4
Fisher Lake	102	111	144	2	9	19	109	4	1
Fairfield #1	34	61	188	31	39	116	1	1	
Fairfield #2	4	8	10	5			5		
Morris	20	73.5	93	1		89	3		
Ellis	151	282	571	12	464	75	14		6
Cedar Lake	10	13	35		15	14	6		
L. Albia	9	11	13		13				
U. Albia	19	20	48	3	34	4	7		
Diamond	147	306	352	137	145	50			20
Lock Ayr	4	4.5	12		5		3	4	
Summit	14	35.5	73				16		57
Afton	14	19	25	6	17		2		
McKinnley	29	46.5	33				24	1	8
Cheery Lake	7	4.5	3		1			1	1
East Lenox	2	5	6				6		
West Lenox	2	7	1					1	
Humeston	6	8	2				1		1
Corydon	2	4							
East Corning	2	4.5							
West Corning	4	12	5		2		1		2

TABLE 5. The 1963 angler catch and harvest in farm ponds and gravel pits

Lake	Total Contacts	Total Hours	Total Fish	Bass	B'gill	Crappie	B'head	C. Cat.	Others
Farm Ponds	137	210	295	52	152	1	73	1	13
Gravel Pits	273	329	301	25	54	16	183	2	21

MISSISSIPPI RIVER CATFISH INVESTIGATIONS IN 1963

PART II: SMALL CHANNEL CATFISH AND FLATHEAD CATFISH STUDIES

Roger Schoumacher
Fisheries Biologist

SMALL CHANNEL CATFISH STUDIES

As a part of the Mississippi River catfish studies undertaken in 1963, 3,128 small channel catfish (generally under the 13-inch legal size limit) were measured to determine the size composition of these fish. Spine samples were taken from a portion of the fish for age determinations. Some of the fish were caught in nets set by Biology Section personnel, and others were taken in cooperation with commercial fishermen who assisted us by plugging basket traps or making special sets.

Length Frequency

Fish varied from 2.5 to 15 inches in length (Table 1). Ninety per cent were from 6 to 12 inches, with 64 per cent from 6 to 9 inches.

Age Composition of the Catch

Five hundred forty fish were aged - 17 per cent of the number measured. Sixty-nine per cent of the 3,128 fish measured were age II (1961 year class), 19 per cent age III, and 12 per cent age I (1962 year class). Nearly all of the age I fish were taken in August, when they had reached a size large enough to be retained in small mesh nets.

Growth

The average size of fish of various ages was calculated by month for each pool (Table 2). Averages are not included if there were less than five fish in an age class.

FLATHEAD CATFISH STUDIES

During 1963, 196 commercially taken flathead catfish were examined at markets in the course of examining channel catfish catches. Flatheads, then, comprised only about 2 per cent of the numerical catch of catfish examined. However, because they had a considerably larger average size than did the channel catfish, their contribution to the total weight and, therefore, dollar value of the catch would be greater than 2 per cent.

Measurements and spine samples were taken from 187 flathead catfish.

Length Frequency

Flatheads ranged from 11 to 38 inches in length (Table 3). Forty-eight per cent of the

TABLE 1. Length frequency of 3, 128 small channel catfish from the Mississippi River in 1963

		Length group (inches)													
		2	3	4	5	6	7	8	9	10	11	12	13	14	15
Number		1	144	3	47	435	903	662	363	262	180	116	9	2	1
Per cent		Tr.	5	Tr.	1	14	29	21	12	8	6	4	Tr.	Tr.	Tr.
Cumulative Per cent					6	20	49	70	82	90	96	100-			

TABLE 2. Average size of various aged channel catfish from the Mississippi River in 1963

Pool No.	Month	Average size (inches) at various ages		
		I	II	III
10	May		7.6 (77)*	
11	May		7.6 (40)	10.3 (8)
18	May		7.5 (14)	9.5 (26)
9	June		7.9 (67)	
9	June		9.1 (37)	11.1 (31)
14	July		9.1 (10)	10.7 (57)
19	July		10.7 (31)	12.1 (32)
13	August	6.6 (17)	9.2 (24)	
17	August		9.2 (11)	
17	August	6.1 (13)		

* Number in parenthesis indicates sample size.

TABLE 3. Length frequency of 187 commercially caught flathead catfish from the Mississippi River in 1963

		Length group (inches)																											
		11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
Number		1	3	13	18	29	26	16	14	12	4	12	5	9	7	3	1	1	4	1	1	1	1	1	1	2	1	1	
Per cent	Tr.	2	7	10	15	14	9	7	6	2	6	6	3	5	4	2	Tr.	Tr.	2	Tr.	Tr.	Tr.	Tr.	Tr.	Tr.	1	Tr.	Tr.	
Cumulative Per cent			34	48	57	64	70	78	86	90	92																		

fish were under 17 inches, and 70 per cent under 20 inches. Ten per cent were 25 inches or longer.

Age Composition of the Catch

Seventy-seven per cent of the catch was comprised of fish of three age classes - III (38 per cent), IV (22 per cent), and V (17 per cent) (Table 4). There were good numbers (4 per cent of the total catch or more) of ages VI, VII, VIII, and IX. The oldest fish aged was 16 years.

Growth

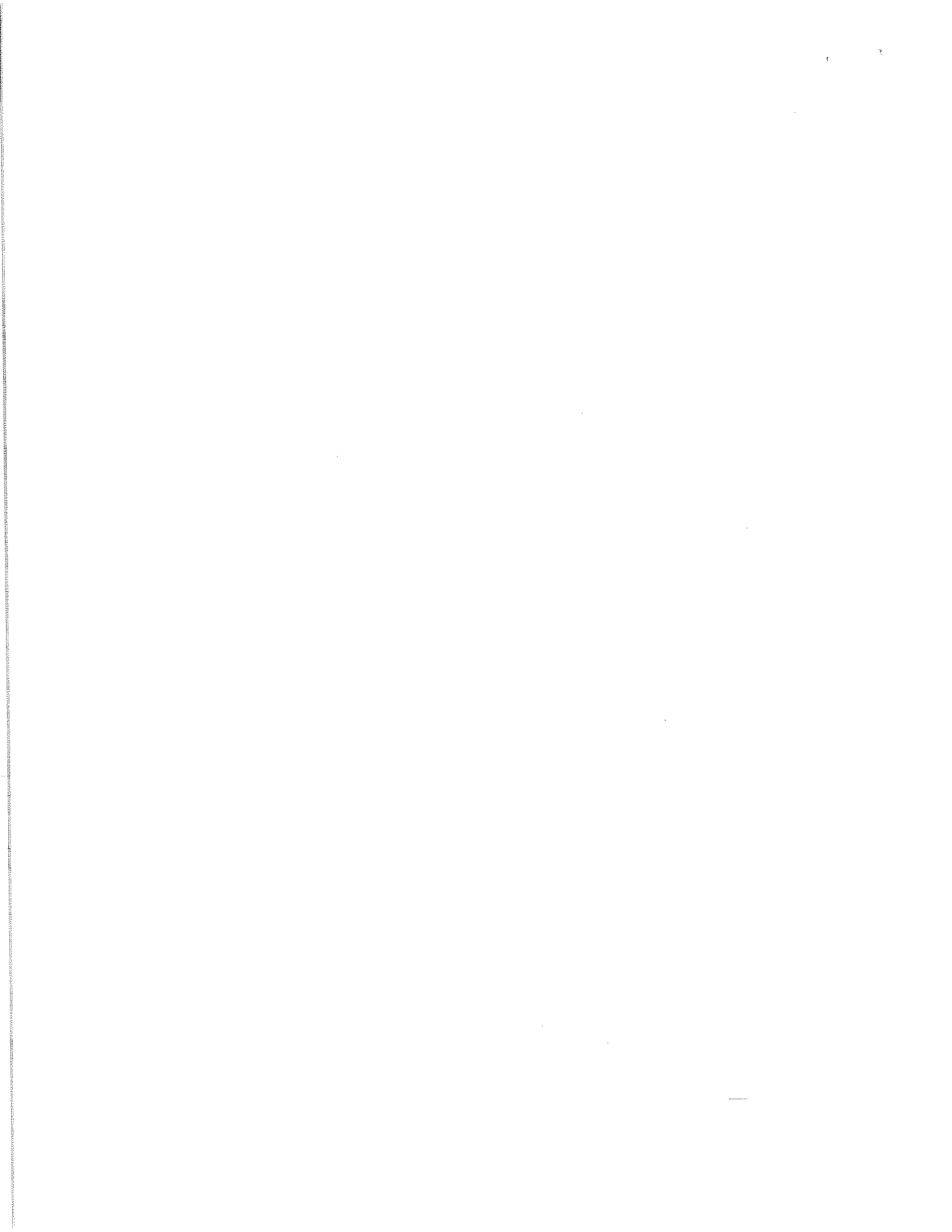
Because of the relatively small sample sizes from individual pools, all fish were lumped together for growth analysis. Table 5 gives the average sizes of fish of various ages. A considerable size range was found to exist among fish of the same age.

TABLE 4. Per cent of 186 flathead catfish taken commercially in 1963 in various age classes

Age	Per cent of catch	Age	Per cent of catch
II	1	VII	4
III	38	VIII	5
IV	22	IX	4
V	17	X	1
VI	7	XVI	1

TABLE 5. Average size at various ages of 186 flathead catfish from the Mississippi River in 1963

Age	Average size (inches)	Sample size
II	13.1	2
III	15.4	70
IV	17.2	40
V	20.0	32
VI	22.3	14
VII	26.4	8
VIII	25.0	10
IX	25.8	8
X	24.4	1
XVI	34.0	1



help of Durward Allen and David Frey, this is a topic of fundamental interest to all of us who deal professionally with fish and game problems.

3. Tuesday afternoon, December 8, is the time for business meetings of the North Central Division of the American Fisheries Society and the North Central Wildlife Society Section. As our profession grows the results of these regional business meetings play increasingly important roles in the development of national society policy.
4. The banquet will be held Tuesday night, December 8. We guarantee a good meal, no formal speeches, and lots of pretty girls in a night-club atmosphere. A performance by the "Belles of Indiana", an outstanding singing group, will be the main attraction.

Housing

Fill in the enclosed reservation form and return to the Indiana University Conference Bureau as indicated. Please note that you may make reservations at either the Union or at any one of three hotels and motels. Take special precautions to fill out your transportation needs from the Indianapolis airport to Bloomington if this is a factor in your travel plans.

Transportation

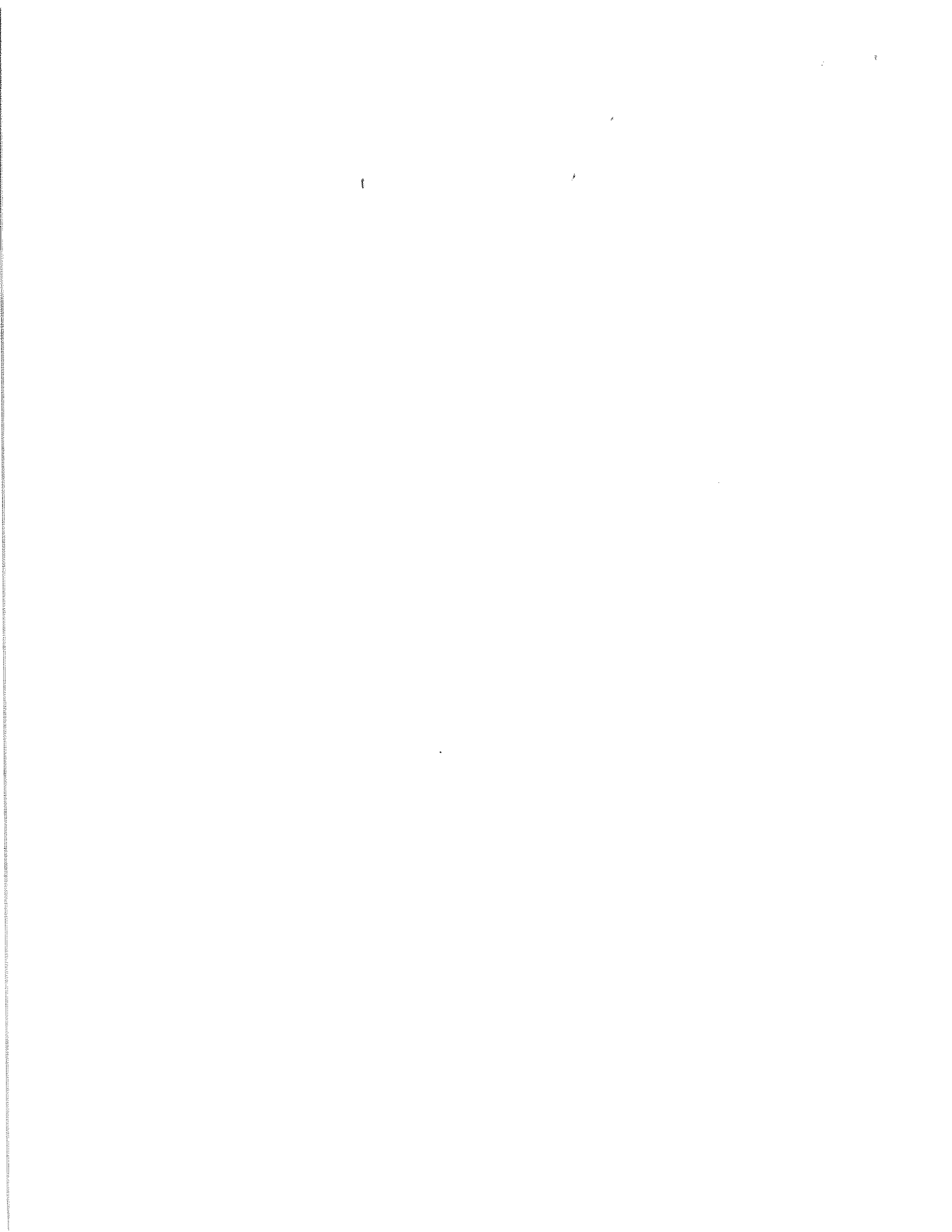
Bloomington is served by train, bus, and airlines. The Monon railway carries passengers from Chicago and Louisville once each day. Lake Central Airlines has three flights each day which land in Bloomington. Bloomington can be reached by bus from all points.

You may arrive in Indianapolis by a number of different airlines and travel to Bloomington by taxi. See the reservation forms for details.

If you arrive by car, parking on the campus is restricted to a limited number of visitor spaces and the Union parking lot. There is a \$1.00 per day charge in the latter.

Steering Committee

Shelby D. Gerking, Chairman
William Barnes
Woodrow Fleming
Charles Kirkpatrick
Robert G. Wetzel



Tentative Program

26th MIDWEST WILDLIFE CONFERENCE

Indiana Memorial Union Building

Bloomington, Indiana

Sunday, December 6

5:00 p. m. --8:00 p. m. Registration -- Conference Lounge

8:00 p. m. --9:30 p. m. Screen show

Monday, December 7

8:30 a. m. --5:00 p. m. Registration -- Conference Lounge

9:00 a. m. --12:00 noon General Session -- Whittenberger Auditorium

"Wildlife and Pesticides--Present and Future"

Presented by a panel consisting of Dr. Robert Anderson of the U. S. Department of Agriculture, Mr. Lansing Parker from the Patuxent Refuge of the U. S. Fish and Wildlife Service, and Dr. Donald Mount of the Robert A. Taft Sanitary Engineering Center.

1:30 p. m. --4:30 p. m. Fisheries Session -- Whittenberger Auditorium
Game Session -- Georgian Room

Tuesday, December 8

9:00 a. m. --12:00 noon Fisheries Session -- Georgian Room
Game Session -- Whittenberger Auditorium

1:30 p. m. --3:30 p. m. Fisheries Session -- Whittenberger Auditorium
Game Session -- Georgian Room

3:45 p. m. --5:00 p. m. North Central Division of American Fisheries Society --
Whittenberger Auditorium

North Central Wildlife Society Section --
Georgian Room

6:30 p. m. Banquet with songs by the "Belles of Indiana" --
Frangipani Room

Wednesday, December 9

9:00 a. m. --12:00 noon Fisheries Session -- Georgian Room
Game Session -- Whittenberger Auditorium

Presentation of Papers at the
26th Midwest Wildlife Conference

Title: _____

Author: _____

(Please type or print)

Brief description: _____

Facilities provided will be: (1) 2" X 2" projector, (2) 3 1/2" X 4" projector,

(3) blackboard. If other facilities are required, please advise: _____

Signature: _____

Business address: _____

Send papers on aquatic life to:

Dr. Robert G. Wetzel
Department of Zoology
Indiana University
Bloomington, Indiana

_____ Send papers on game to:

Dr. C. M. Kirkpatrick
Department of Forestry and Conservation
Purdue University
Lafayette, Indiana

