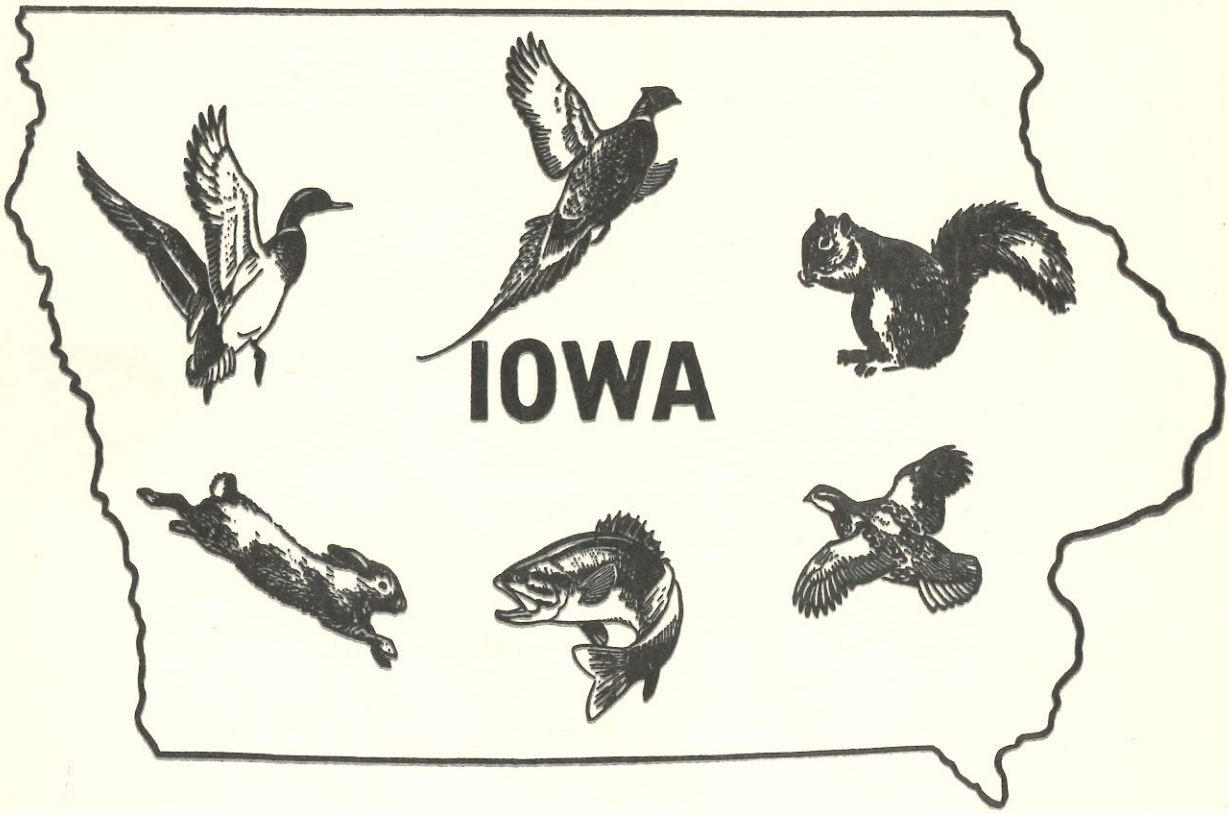
1962

QUARTERLY BIOLOGY REPORTS



FISH AND GAME DIVISION — BIOLOGY SECTION

STATE CONSERVATION COMMISSION

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A RESUME OF WATERFOWL BANDED IN IOWA DURING THE SUMMER OF 1962

James G. Sieh
Game Biologist

Waterfowl drive-trapping crews captured and banded 1638 wild ducks and 589 coot in Iowa during the summer of 1962, the ducks including 1425 blue-winged teal, 95 mallard, 41 redhead, 39 wood duck, 20 pintail, 9 ruddy, 8 shoveller and 1 bufflehead. These bandings constitute a contribution to the cooperative banding effort within the Mississippi Flyway, and contribute to the overall study of North American waterfowl. Such banding is the only way in which we can hope to establish recovery rates of blue-winged teal produced in Iowa, and to obtain a basis for a special early season on this species within the Flyway. The drive-trapping results in Iowa gave proof of the productive potential of her remaining wetlands, indicating that good use of funds might be made in this state as a part of the expenditures of the $105 million recently voted by Congress for the procurement of wetlands for waterfowl production.

RESULTS OF THE JULY, 1962 ROADSIDE RABBIT SURVEYS

Paul Kline
Game Biologist

July roadside counts for 1962 revealed a decline in cottontail populations over much of Iowa. The statewide index decreased from 4.8 in 1961 to 4.0 in 1962. All areas except the Southern Loess and Mississippi Loess showed lower populations. These areas showed increases. Cottontails were most abundant in the Southern Loess areas as during most recent years. Lowest populations appeared once more in the Driftless area of northeast Iowa. The population is somewhat below the average for 12 previous years on a statewide basis, but near normal in southeast and south central areas. Reproduction was poorer than any year since 1951. The age ratio of 2.06 was well below the average index for 12 previous years of 2.56. Production as indicated by age ratios was better in the Southern Loess area, where populations seemed to increase, than over the state as a whole. The fall population index of 2.33 as compared to 3.79 indicates hunting over all but south central and southeast Iowa will be poorer than any of the past 5 years. The severe winter of 1961-62 is believed responsible for the population decline in cottontails over much of the state. Much standing corn, left in the field over winter because of poor harvest conditions, probably was responsible for the comparative security and subsequent population increases in parts of southern and eastern Iowa. The index of jackrabbits per 10 miles of route (0.11) was lower than each of 4 previous years.

PHEASANT REPRODUCTION IN IOWA - 1962

Richard C. Nomsen
Game Biologist

The favorable spring weather which followed our severe winter increased the possibility of a successful pheasant hatch. The results of summer brood counts showed that production of young remained high in the southwest third of the state but appeared to be slightly lower in northwest Iowa. A much better hatch was indicated for northeast Iowa with a slight increase noted in the north central district. The statewide average was equal to or slightly above the 1961 average.

IOWA LATE SUMMER PHEASANT POPULATIONS - 1962

Eugene D. Klonglan
Game Biologist

Several revisions were made in the August roadside pheasant census method in 1962 in an attempt to secure as good or better data with much less time and effort being expended.

The many revisions made it impossible to directly compare much of the data obtained in 1962 with that from 1961. After making allowances for the possible effects of the several changes in techniques, it was concluded that the 1962 statewide pre-hunting season pheasant population did not differ significantly from that of 1961.

The best populations were in north central, northwest and east central Iowa - with the latter area being the only one to indicate an apparently significant increase over 1961.

Several new routes were established for Unit Game Managers and Biologists. Data from these will be available for evaluating next year's trends.

Statewide information on the distribution of the hatch was obtained for the first time. Nearly 70 per cent of the hatch occurred in June, with 17 per cent in July, nearly 13 per cent in May and less than 1 per cent in August. The midpoint of the hatch was June 15, being earlier in southern Iowa and later in northern Iowa.

CALLING QUAIL IN IOWA, 1962

M. E. Stempel
Game Biologist

Whistling quail were counted in July 1962 along 900 miles of selected route. The counts were made after the bobwhites had passed the calling peak and showed a decrease (down 50 per cent from a June peak). The average number of birds per listening stop (per mile) was 0.5, the lowest in 10 years. Since the count was made at a low point in the cycle, the statewide average should be doubled, giving an average of 1.0 which is the same as in 1961.

ANALYSIS OF DATA OBTAINED FROM DEER CHECKING STATIONS - 1961

Eldie W. Mustard
Game Biologist

Biological data were obtained from 756 of the 5,364 deer harvested by Iowa hunters in 1961. Data were taken on the following: age, sex, weight, number of points, and beam diameter. Analyses of these data indicated the Iowa deer herd is in good physical condition and had a typically high rate of reproduction in 1961. Comparison of the age ratio data with similar data from previous years shows the Iowa deer herd was not over-harvested in 1961.

AN EVALUATION OF THE THAYER LAKE FISHERY RENOVATION PROJECT

James K. Mayhew
Fisheries Biologist

(No abstract was submitted)

MISSOURI RIVER COMMERCIAL FISHING STATISTICS, 1960-1961

Bill Welker
Fisheries Biologist

During 1960, 149 resident and 7 non-resident commercial fishing licenses were issued to Missouri River fishermen in Iowa. One hundred sixty-two resident and 8 non-resident licenses were issued in 1961. Basket traps were the most numerous type of gear used both years. They were followed by hoop nets, trot lines and trammel nets in that order during each year.

Only 32 of the 117 catch reports were returned by the fishermen during 1961. Carp, catfish and buffalo were the most important in the reported catch with 19,755 pounds, 9,781 pounds and 4,468 pounds, respectively. No catch data from 1960 are included in this report.

CENTER LAKE PROGRESS REPORT

Tom Moen
Fisheries Biologist

Center Lake, a 329-acre glacial lake in Dickinson County, is being managed for production of largemouth bass and bluegills following eradication with toxaphene in 1958. In 1960, yellow bullheads were added to the list of fish to be stocked. Black crappie adults were accidentally stocked when the bluegill were planted and both species brought off excessive hatches, thus establishing strong year classes. Fish stocking, growth rates and fishing success are discussed. A population estimate through a mark and recapture program in 1962 indicated there were between 500 and 600 thousand bluegills in Center Lake.

Copper sulfate treatments during 1961 and 1962 were particularly successful in controlling excessive blooms of bluegreen algae.

PROGRESS REPORT: MIDDLE RACCOON RIVER RENOVATION PROJECT

Harry M. Harrison
Fisheries Biologist

and

Dale Stufflebeam
Area Fish Manager

In August, 1959, the Middle Raccoon River and its tributaries were treated with rotenone to devastate a fish population dominated by rough fish.

The stocking program that followed involved the release of 876,064 fish of six species, including channel catfish, bullheads, smallmouth bass, largemouth bass, northern pike and walleyes. Subsequent studies revealed successful introductions for fingerling and fry catfish, bullheads and smallmouth bass. Releases of adult and sub-adult channel catfish and fingerlings and fry largemouth bass, northern pike and walleye pike failed.

Surveys conducted 3 years after the chemical kill show bullhead, channel catfish and forage fish populations to be in excellent condition. Rough fish populations continue to be low.

PROGRESS REPORT: RENOVATION OF THE IOWA RIVER, HARDIN COUNTY

Roger Schoumacher
Fisheries Biologist

A portion of the Iowa River in Hardin County, Iowa, was treated with rotenone in 1960. Surveys in 1961 and 1962 indicate the composition of the fish population in the Alden pool is the same as before treatment. Game fish populations have become established in the Iowa Falls pool, whereas rough fish comprise the bulk of the population in the Steamboat Rock pool. Good fishing has occurred below the Steamboat Rock dam since treatment. Remedial stocking is recommended for each area.

A RESUME OF WATERFOWL BANDED IN IOWA DURING THE SUMMER OF 1962

James G. Sieh
Game Biologist

Waterfowl drive-trapping crews captured and banded 1,638 wild ducks and 589 coot in Iowa during the summer of 1962. Fourteen semi-wild Canada geese and 9 semi-wild mallards were banded and released as "experimentals". In addition, Conservation Officer Jerry Hoilien has banded several hundred wood ducks and blue-winged teal in Lee County during the late summer and early fall. These bandings constitute a contribution to the cooperative banding effort within the Mississippi Flyway, and together with other bandings in Canada and the U. S. A. contribute to the overall study of North American waterfowl. Banding data is especially valuable when a large sample is both banded and recovered.

Drive-trapping began about July 5 in Worth and Winnebago Counties with a small crew from the Rice Lake Game Management Unit. The capture of 67 blue-wings, 3 shovellers, and 3 coot from a small slough called "Leland Pond", at the junctions of Highways #9 and #69, indicated high productivity of Iowa marshes even in the immediate proximity of heavy traffic. All of these blue-wings were young birds (locals) raised in the immediate area. On July 17, crews from throughout the state rendezvoused at Eagle Lake in Hancock County and together completed successfully a difficult mass drive on this large lake, capturing and banding 669 ducks and coots. As at Leland Pond, most of the birds were locals raised on or near Eagle Lake. Very few moulting adults were taken. Several large areas were successfully drive-trapped by the combined crews during the next few days. There were 224 birds captured at East Twin Lake in Hancock County, and 334 birds taken at Harmon Lake in Winnebago County. As mentioned before, most of these were local blue-winged teal. After drive-trapping on the larger areas was completed, the combined crew disbanded and returned to their respective areas where some additional banding was done.

A private area called "McCray Slough" located six miles north of Lake View in Sac County was drive-trapped on July 26, and 254 blue-wings, 10 mallards, 2 wood ducks, and 3 shovellers were captured and banded. Of these blue-wings, only 10 per cent were moulting (flightless) adults. This tremendous waterfowl productivity on a small area again exemplifies the value of these few remaining wetlands on private property in Iowa, and clearly indicates what might be accomplished by reflooding suitable wetland areas in this state. These bandings, if nothing else, constitute positive proof of the productiveness of some of the few remaining marshes in Iowa in 1962, and it must be remembered that not all the waterfowl utilizing a given area were captured during a drive-trapping effort.

At McCray Slough the unusual also occurred, a local female bufflehead was captured, banded, and identified by Mr. Gene Goecke, Unit Manager, and Mr. Wesley Newcomb, U. S. Game Management Agent. This record originates considerably south of the accepted breeding range of the species and the banding was called to the attention (by letter) of A. J. Erskine, whose studies may ultimately lead to a monograph of the bufflehead.

Nineteen areas in central, western, and northern Iowa were successfully drive-trapped in 1962 (Table 1). A total of 1,425 blue-winged teal, 589 coot, 95 mallard, 41 redhead, 39 wood duck, 20 pintail, 9 ruddy, 8 shoveller, 1 bufflehead and a few miscellaneous species

TABLE I. The Locations and Numbers of Waterfowl and Coot Banded in Iowa During The Summer of 1962*

Locations	BW Teal	Coot	Mallard	Wood Duck	Shoveller	Ruddy	Pintail	Redhead	TOTALS
Elk Creek Worth County	51				2				53
Leland Pond Winnebago County	67	3			3				73
Ventura Marsh Cerro Gordo County	48	9		1					58
Rice Lake Worth County		4							4
Silver Lake Worth County	18		15						33
Harmon Lake Winnebago County	242	62	13			2	7	8	334
Eagle Lake Hancock County	194	418	18	6		6		27	669
East Twin Hancock County	176	18	10	9			8	3	224
Silver Lake Slough Palo Alto County	20								20
Rush Lake Palo Alto County	10		2	11			5		28

* Recent bandings of wood duck and blue-winged teal will increase these species approximately 200 birds each by this date.

were captured, banded and released during the summer of 1962.

BRIEF DISCUSSION

This was the second year in which a successful organized effort has been made in Iowa to band waterfowl. Sufficient experience has already been gained so that drive-trapping crews have learned to operate effectively and efficiently. In addition to the overall contribution to the continental banding effort, Iowa has established positive proof of the productivity of her remaining wetlands, indicating that some good use of funds might be made in this state as a part of the expenditures of the $105 million recently appropriated by the Congress for the procurement of wetlands for waterfowl production.

Waterfowl banding is the only way in which we can hope to establish recovery rates of blue-winged teal produced in Iowa, and to obtain a basis for a special early season (September and October) on this species within the Flyway. To determine adequate recovery rates, it is necessary to band large samples of local blue-winged teal and to recover a significant proportion of these banded ducks, especially from hunters. Consequently, it is necessary to continue this banding effort over a period of years, and desirable that these bandings coincide with open seasons in early October prior to the fall exodus of blue-winged teal from Iowa and other states within the Flyway.

RESULTS OF THE JULY, 1962 ROADSIDE RABBIT COUNTS

Paul Kline
Game Biologist

INTRODUCTION

The annual July roadside count was continued in 1962. The survey has been conducted with slight modification every summer beginning in 1950. It is made by Conservation Officers and Biologists who drive predetermined routes 30 to 40 miles long on gravelled roads. Participants drive 25 miles per hour starting at sunrise and count and record all rabbits seen along the routes. The July counts were developed for use in surveying cottontail populations. However, starting in 1958, jackrabbits were counted as well.

For each survey, beginning in 1958, records are kept of temperature, wind velocity, per cent cloudiness, and date of last rain. It was hoped that recording these weather factors might aid in evaluation of weather influence on early morning, roadside rabbit activity. Use of dew blocks to measure dew fall was discontinued in 1960 after 5 years of trial. Dew fall, as measured along the survey routes, was not found to correlate with cottontail roadside activity. Each participant in the roadside survey was asked to record numbers of adult and juvenile cottontails observed during the survey period (July 10-20). These age ratio surveys have been conducted annually in conjunction with the roadside surveys.

RESULTS

Sixty-seven routes totaling 2,262.5 miles were surveyed. In all, 896 cottontails were seen for an index of 4.0 cottontails per 10 miles of route (Table 1). Cottontails were most abundant in the Southern Loess Area where they have been most abundant every year starting in 1956 (Table 2). The Mississippi Loess Area, adjoining the Southern Loess, produced an index of 4.75, indicating a rabbit population higher than the state average but below the Southern Loess index of 8.28. All other areas produced indices below the state average. The three southern-most areas produced higher indices than the northern areas. No rabbits were seen along the one route driven in the Driftless area, giving an index of 0.0. Although cottontails are present in that area, the population is extremely low. Traditionally, lowest populations have always occurred in these extreme northeast counties.

The statewide index indicates rabbit populations have declined somewhat after a modest increase in 1961. From a high of 6.86 in 1958 the index of cottontails per 10 miles dropped to 6.21 in 1959, 4.49 in 1960, and climbed to 4.79 in 1961. (Table 3). Average for all years prior to 1962 has been 4.66. Five of the seven areas showed declines in rabbit populations during 1962. The Mississippi Loess and Southern Loess showed increases over 1961.

Only 24 jackrabbits were counted during the surveys. The index of jackrabbits per 10 miles was 0.11, well below the index of 0.2 obtained during 1961. These data indicate a decline in jackrabbit populations since the 1958-60 period when indices were respectively: 0.23 for 1958, 0.44 for 1959, and 0.33 for 1960. These indices may or may not be truly indicative of population changes of jackrabbits as the survey is designed specifically for

TABLE 1. Results of July roadside rabbit surveys for 1962

Area	Number of Routes	Total Miles	Cottontails Observed	Cottontails Observed/ 10 Miles	Jackrabbits Observed	Jackrabbits Observed/ 10 Miles
Tazewell Drift	3	109.0	28	2.57	2	0.18
Missouri Loess	8	277.0	101	3.65	9	0.32
Wisconsin Drift	18	620.0	160	2.58	12	0.19
Iowan Drift	15	493.9	119	2.41	1	0.02
Driftless Area	1	32.5	0	-	0	-
Mississippi Loess	10	330.3	157	4.75	0	-
Southern Loess	12	399.8	331	8.28	0	-
Statewide	67	2,262.5	896	3.96	24	0.11

TABLE 2. Comparisons of July roadside rabbit surveys for years 1956 through 1962

Area	Cottontails Sighted per 10 Miles of Route						
	1956	1957	1958	1959	1960	1961	1962
Tazewell Drift	3.5	3.8	6.5	5.4	4.1	7.6	2.6
Missouri Loess	3.1	4.0	9.4	8.6	4.7	5.2	3.6
Wisconsin Drift	2.8	2.9	4.6	4.5	5.4	4.5	2.6
Iowan Drift	3.5	4.4	4.5	3.6	3.6	3.8	2.4
Driftless Area	2.6	2.6	2.7	1.5	1.9	1.7	0.0
Mississippi Loess	4.3	5.3	6.7	6.1	2.8	3.4	4.7
Southern Loess	6.2	8.5	13.6	10.9	5.8	6.8	8.3
Statewide	3.94	4.89	6.86	6.21	4.5	4.79	3.96

TABLE 3. Comparisons of July rabbit indices for years 1950 through 1962

Year	Number of Cottontails/ 10 Miles of Route	Number of Juveniles/ Adult	Fall Population Index
1950	4.28	2.2	-
1951	3.91	2.0	-
1952	4.17	2.6	-
1953	3.30	2.4	-
1954	3.35	2.5	-
1955	5.67	3.0	-
1956	3.94	2.7	-
1957	4.89	3.2	-
1958	6.86	2.67	4.51
1959	6.21	2.75	4.03
1960	4.49	2.42	2.73
1961	4.79	2.27	3.79
1962	3.96	2.06	2.33
Average Years Prior to 1962	4.66	2.56	3.76

cottontails and not for jackrabbits. Jackrabbits were seen from the Tazewell Drift, Missouri Loess, Wisconsin Drift, and from the Iowan Drift. (Table 1). These areas correspond with the known range of jackrabbits, although some are found in areas where none were observed during the 1962 surveys.

Of 2,762 cottontails aged, 1,860 were juveniles for a ratio of 2.06 juveniles seen per adult (Table 4). This ratio is down from 1961 (2.27), 1960 (2.42) and 1959 (2.75) and indicates low production for 1962. The average ratio for all years prior to 1962 has been 2.56 (Table 3). Rate of production as indicated by these surveys has been poorer than every year since 1951. Best production appeared to occur in the Southern Loess where populations seemed to increase; poorest production in the Driftless Area, where populations were lower than any other portion of Iowa.

TABLE 4. Age ratios of cottontails observed during July counts for 1962

Area	Number of Adults	Number of Juveniles	Ratio of Juveniles/Adults
Tazewell Drift	26	59	2.27
Missouri Loess	124	186	1.50
Wisconsin Drift	224	478	2.13
Iowan Drift	164	306	1.87
Driftless Area	10	9	0.90
Mississippi Loess	133	231	1.74
Southern Loess	221	591	2.67
Statewide	902	1,860	2.06

The fall population index, which is obtained by multiplying the age ratio (1.78) obtained along the survey routes during the actual roadside counts by the number of adults seen per ten miles of route (1.31), was 2.33 compared to 3.79 for 1961, 2.73 for 1960, 4.07 for 1959, and 4.51 for 1958 (Table 3). This indicates rabbit hunting in Iowa will be poorer than any of the past 5 years. Average fall population index for 1958 through 1961 has been 3.76.

DISCUSSION

The fall population index is based on observations of 219 adults and 389 juveniles reportedly seen along the survey routes. Conservation Officers and Biologists are requested annually to indicate the number in each category they observe while making their single survey. About one-half of the Officers fail to record this information which is so vital in calculating the fall population index.

July rabbit surveys, especially when expressed as "fall population indices", have been reliable in predicting relative hunting success during recent years. Hunting success statistics, expressed as rabbits per gun hour, gathered during the season have followed closely the summer data. The 1962 data when compared to the average for years 1956-62 inclusive (Figure 1) shows hunting success should be near average for recent years in south central and southeast Iowa, but well below average for the remainder of the state. Fortunately, the better hunting areas are the ones where cottontails have apparently fared best.

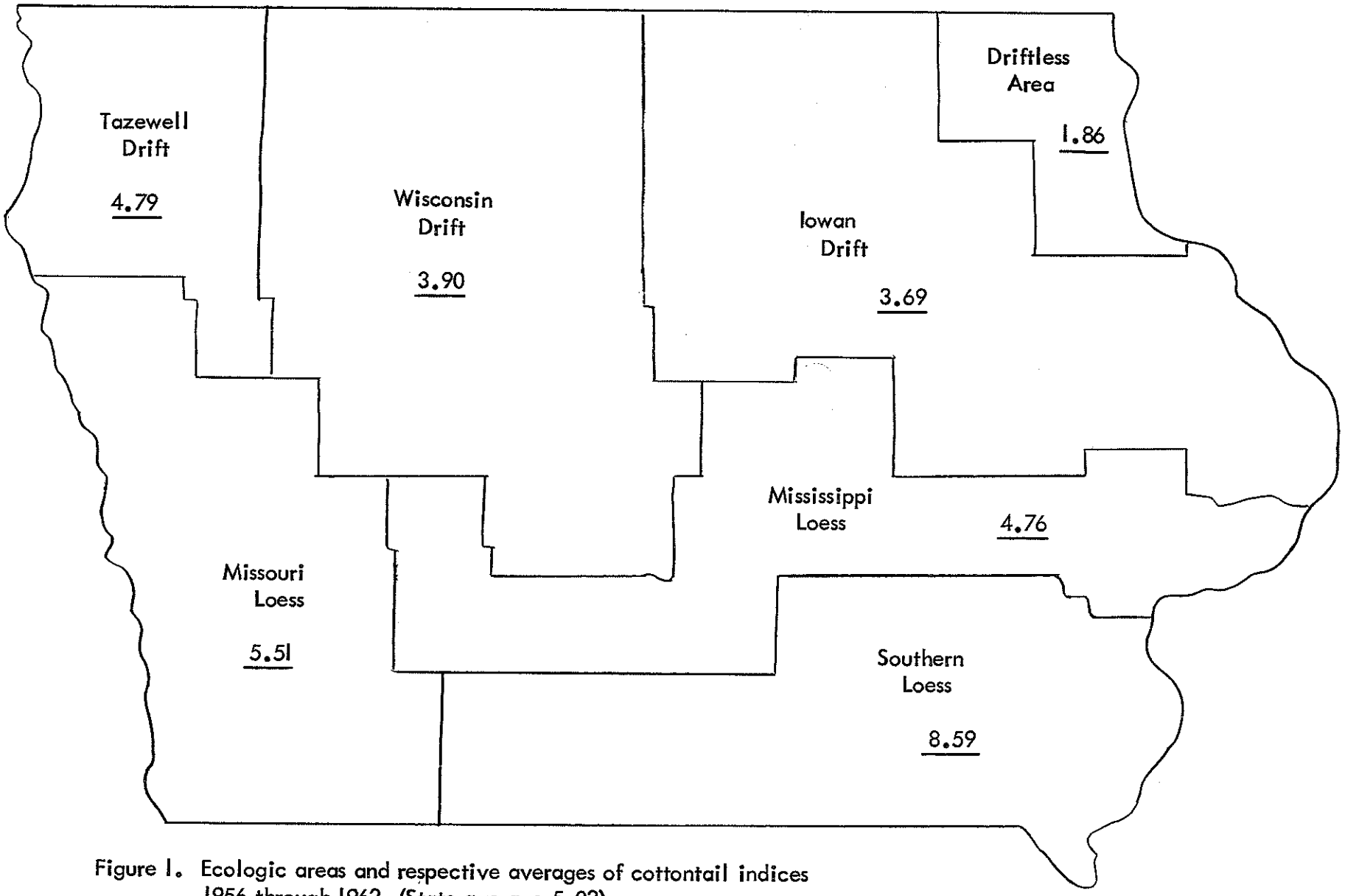

Figure 1. Ecologic areas and respective averages of cottontail indices 1956 through 1962 (State average 5.02).

Rabbit populations over much of the state may have suffered as a result of the severe winter of 1961-62 - the worst winter from the standpoint of persistent cold and deep snow since 1936. That the south central and southeast portions of Iowa show increased populations may have resulted from better winter food and cover conditions through that area. The last issue of Iowa Weekly Weather and Crop Bulletin, dated December 12, 1961, states in regard to corn harvest: "By Monday evening about 90 per cent of the corn in Iowa had been harvested. Last year harvesting was virtually completed by this date and the average is about 95 per cent picked by December 11. Harvesting varies from 65 to 90 per cent completed in the southern and eastern districts and is virtually completed over the remainder of the state." In the opinion of this writer standing corn must have benefited rabbits in those areas considerably.

PHEASANT REPRODUCTION IN IOWA - 1962

Richard C. Nomsen
Game Biologist

The annual summer pheasant surveys were continued in 1961 to determine pheasant reproductive success. Surveys were made by Conservation Officers, Rural Mail Carriers and Biologists.

Iowa's most severe winter since 1936 finally ended during the second week of April. Temperatures had averaged well below normal and snowfall well above normal since late November. Temperatures averaged 5 - 7 degrees above normal during the rapid warm up in late April. Above normal temperatures continued throughout the nesting season. The very favorable spring weather which followed our severe winter weather increased the possibility of a successful pheasant hatch.

The first summer count to determine reproductive success was conducted by rural mail carriers during the week of July 23-28. Response was good again this year; however, the total number of cooperators decreased from 776 to 629.

According to this survey, statewide pheasant production was equal to the 1961 hatch (Table 1). The average number of chicks per brood decreased but the percentage of hens with broods increased. These observers averaged 1.6 broods per card, which was the same as during the 1961 count. Production of young remained high in the southwest third of the state but appeared to be slightly lower in northwest Iowa. Results indicated a much better hatch in northeast Iowa with a slight increase noted in the north central district. Reproductive success figures in other areas were very similar to results obtained in 1961.

TABLE 1. Statewide Results for Rural Mail Carriers Brood Counts, 1961 - 1962

Year	Young per hen	Average brood size	Percent of hens with broods
1961	2.1	5.8	36%
1962	2.1	5.3	39%

Conservation Officers conducted their annual roadside census from August 1-10. These results were not used for comparison because of several changes in census techniques. However, population figures indicated that pheasant numbers were at least comparable to 1961.

Conservation Officers also report pheasants and broods sighted while driving on regular patrol. According to the sight record project, production was better this year (Table 2). The increase in the percentage of hens with broods was very encouraging.

Rabbit populations over much of the state may have suffered as a result of the severe winter of 1961-62 - the worst winter from the standpoint of persistent cold and deep snow since 1936. That the south central and southeast portions of Iowa show increased populations may have resulted from better winter food and cover conditions through that area. The last issue of Iowa Weekly Weather and Crop Bulletin, dated December 12, 1961, states in regard to corn harvest: "By Monday evening about 90 per cent of the corn in Iowa had been harvested. Last year harvesting was virtually completed by this date and the average is about 95 per cent picked by December 11. Harvesting varies from 65 to 90 per cent completed in the southern and eastern districts and is virtually completed over the remainder of the state." In the opinion of this writer standing corn must have benefited rabbits in those areas considerably.

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Conservation Officers also report pheasants and broods sighted while driving on regular patrol. According to the sight record project, production was better this year (Table 2). The increase in the percentage of hens with broods was very encouraging.

TABLE 2. Statewide Results for Officers Sight Record, 1961 - 1962

Year	Young per hen	Average brood size	Percent of hens with broods
1961	4.0	6.3	63%
1962	4.3	6.2	69%

Many pheasants and broods were observed by the author in north central Iowa during the last week of July and the first 2 weeks of August. Fewer hens without broods were observed this year and the hatch was 2 weeks earlier than in 1961. The peak hatching period for 86 broods was June 10-23.

IOWA LATE SUMMER PHEASANT POPULATIONS - 1962

Eugene D. Klonglan
Game Biologist

INTRODUCTION

The winter of 1961-62 was the most severe experienced in Iowa since 1936. Many people feared that as a result the pheasant population would show a drastic decline during the following months. However, observations throughout the winter indicated losses were not unduly great. The spring crowing cock count, the primary spring pheasant census method, showed that populations in the primary pheasant range of north central and northwest Iowa did not differ significantly from 1961, while populations in marginal habitat (where many fields remained unharvested and provided good food and cover through the winter) actually increased (see preceding Quarterly Biology Reports).

Following the severe winter was a warmer than normal period, extending from mid-April through May. This ordinarily would be favorable for nesting and in most years would mean good reproduction. However, there remained the unanswered question as to what effect the winter might have had on the physiological condition of the hen pheasant with respect to the reproductive effort they would be capable of exerting. Consequently, there was considerable interest in the results of the late summer population surveys which would show how good production was. This report will deal with the results of the August roadside pheasant counts. The report by R. C. Nomsen elsewhere in this issue covers other aspects of the post-nesting season surveys.

METHODS

The roadside pheasant count made by Conservation Officers in early August is one of the primary sources of information on the status of the pre-hunting season pheasant population. These counts have been made in August since 1954; prior to that time they were usually taken in September or October. The change in timing was made on the basis of information showing that counts in August were less variable than those taken in the other 2 months (Klonglan, 1955). Previous to 1962, three routes were run in each county, meaning about half of the Officers had three routes and the other half had six. On these routes instructions were to drive "out" for 1 hour and then turn around and drive "in" over the same route. In 1962 this scheme was changed to give each Officer, regardless of whether he is assigned one or two counties, two 30-mile routes. As a result, in 1962 the number of assigned routes was reduced from 297 to 112, a reduction of over 60 per cent. A total of 18,580 miles of driving was necessary to complete the old system of routes (computed from time Officer left home), while only 6,510 miles was necessary to run the 1962 routes, a reduction of about 65 per cent. Figured at 7¢ per mile, this reduction of 12,070 miles meant a saving of $845 in auto expense alone--to which must be added an undetermined value for the decreased time involved.

New routes were designed for all counties. Many of the old routes had become unsatisfactory because of black-topping and resultant increased traffic or for other reasons.

These new routes were laid out to incorporate the shorter spring crowing count and roadside routes first used last spring. This should enable better interpretation of population fluctuations on local levels--such as might result, for example, from a severe hailstorm during the nesting season. The selection of new routes was based on several factors, among the most important of which were: (1) soil types - to obtain wide sample of different ones, (2) topography - to maximize chances of seeing birds, (3) location of Officer's home town - to minimize driving distance, (4) location of about 30 Unit Game Managers' and Biologists' routes - to avoid duplication and sample more territory, and (5) type of road - to use all-weather, secondary, gravelled roads and avoid roads likely to be black-topped in the near future.

Several changes were also made in the techniques to be followed in making the count. The basic pattern was still the same, however. The counts were to be taken during the first 2 weeks of August. Each count was to be started at sunrise (instead of 15 minutes after) and the car then driven over the 30-mile route at a speed of no more than 15-20 mph., it being permissible to stop the car momentarily to count the number of chicks in a brood, check their age, etc. The data were recorded by 5-mile segments. This was done to be able to check the effect of time of day relative to sunrise on the number of birds seen and to help in determining the minimum suitable route length.

An important change made in the technique this year was that instructions were given to attempt to flush broods sighted within the road right-of-way if it was believed not all chicks were seen at first or a good count was not obtained. Frequently a brood will be sighted in the road some distance ahead of the car, but will run into the ditch before a good count can be made; or oftentimes a bird or two will dart into the road ditch cover before it is possible to clearly identify it. Flushing the birds will eliminate much of the guesswork in such instances.

A column was added to the data sheet for recording hens sighted with broods. Previously in computing the per cent of hens with broods, it has been assumed that a hen was with each brood, and the per cent obtained by dividing the number of broods sighted by the sum of broods and hens without broods sighted. The data from the additional column will enable the calculation to also be made on the basis of actual hens sighted. This will allow better comparisons with certain other states who compute their data in this manner, in addition to continuing comparisons with those who follow the former method.

Another addition this year was the aging of the broods sighted in order to obtain better statewide information on the pattern of the season's hatch. A year with a late hatch can result in a lower than expected August roadside count because some of the small young chicks cannot be sighted from the car. At present we have no good way of determining when or if this might occur in different areas of the state, and the evaluation of the data may be more complicated when a decline occurs and a late hatch is suspected. Since only a general idea of the pattern of hatch is wanted, the Officers were not asked to age broods down to the nearest week - a task requiring a certain amount of time and experience. Instead, they were asked to compare the size of the young pheasants to certain key "indicator" birds commonly sighted along the road - sparrow, meadowlark, mourning dove, pigeon, crow, and adult pheasant. The key letter symbol of the bird nearest the size of the chicks under observation was to be recorded. This information could then be converted to the average age in weeks of pheasant chicks at these various sizes. Though admittedly somewhat crude,

year-to-year hatching trends should be depicted by this method--at least the major changes in which we are most interested.

Dew blocks were not used in 1962. It has been shown that more than 85 per cent of the variation in several counts taken on a single route in late summer in a given year was due to differences in dew (Klonglan, op. cit.). However, to obtain an accurate area-wide dew measurement the block should be placed in an open area in the country, a matter of some inconvenience to the majority of Officers who live in town. Even then, it is difficult to be certain a location that will give a "typical" dew reading has been selected. The same study showed that the percentage variation was much less with counts taken when there was a heavy dew. Therefore, Officers were instructed to make their counts only on mornings with a heavy dew accumulation. Such mornings are usually also clear and calm - ideal for making a roadside count. These mornings can usually be anticipated the preceding evening since the grass will usually be getting quite wet fairly early in the evening, the night being relatively clear and still. If in late evening the wind is blowing, the sky is clouded over, and the grass is completely dry, there is probably little point in "setting the alarm" for the next morning. The amount of dew is a composite result of temperature, humidity, wind, cloudiness and other weather factors. Though each of these factors in individual comparisons may significantly affect the number of pheasants sighted, all of them together add less than 5 per cent to the variation that can be accounted for by differences in dew alone (Klonglan, op. cit.). Thus the importance of taking counts only on mornings with a heavy dew was stressed to those making the counts.

Several new routes were also set up on the nine Game Management Units and several more were designed for Biologists. These were all run in the same manner as described for the Officers.

For purposes of analysis, the state was divided into six regions (Figure 1). The major items considered in delineating the divisions were: (1) similarity of soil types, (2) similarity of pheasant population levels, (3) similarity of agricultural practices, (4) number of routes needed for making statistically valid year-to-year comparisons, and (5) recognizable geographical areas of the state, primarily for publicity purposes.

RESULTS AND DISCUSSION

Conservation Officers' August Roadside Counts

Based on the August roadside count, the highest fall pheasant populations would be found in north central and northwest Iowa, followed by central, western, eastern, and southern Iowa in that order (Table 1). Statewide, an average of nearly two pheasants per mile was sighted, based on 3,180 miles driven on 106 routes. This was an apparent 12 per cent increase over the 1961 counts. However, it must be remembered that all routes in 1962 were new ones, and these were selected in many cases to allieviate problems arising from black-topping of old routes and the resultant increased traffic. Thus, it would be expected that even with the same population level in 1962, an increase in birds sighted per mile would occur. Also, other changes in technique were made which might affect the comparison - particularly the request to flush broods if necessary. Therefore, in view of these changes it seems almost certain there was no significant change in the Fall 1962 statewide pheasant population over that of 1961.

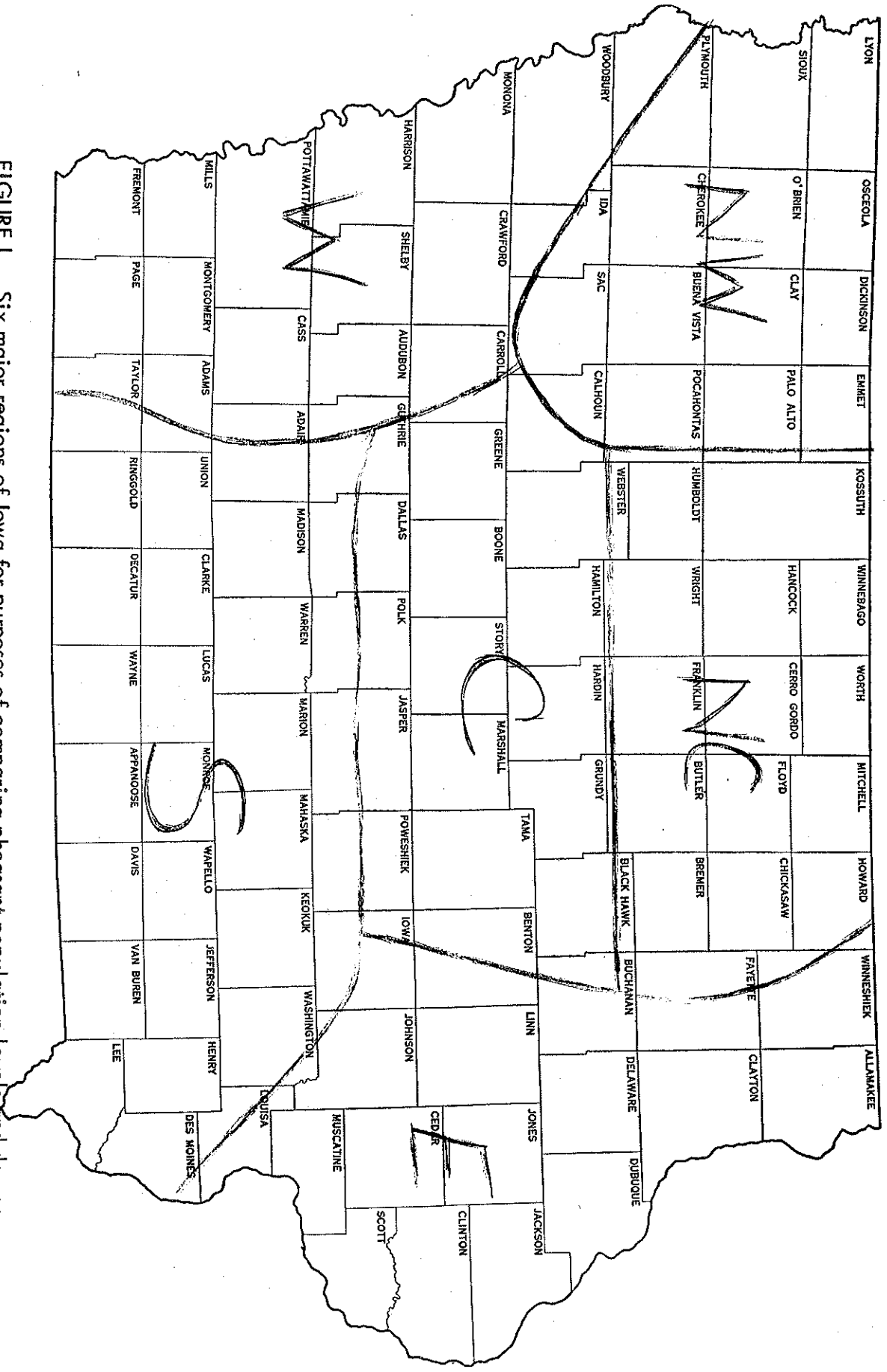

FIGURE 1. Six major regions of Iowa for purposes of comparing pheasant population levels and degree of reproductive success.

One area in which an actual increase probably occurred was the central region, where it would not seem likely that the above-mentioned changes alone would result in a 42 per cent increase. Most of this increase took place in the block of counties in the eastern half of the region. Since, as pointed out in the preceding paragraph, the changes in procedure favored an increase in the counts, the decrease indicated for western Iowa may well be a significant one. It is less certain that the same is true for the northwest region. Because of the many changes in routes and techniques, no statistical analysis of 1962 vs. 1961 was attempted; next year such a comparison will be valid.

TABLE 1. Results of 1962 Conservation Officers' August roadside pheasant counts

Region of state	Number of counts	Number miles driven	Number birds sighted	Birds per mile	1961 birds /mile	Change from 1961*	Number broods sighted	Broods/ 30-mile count
North Central	19	570	2266	3.98	3.22	+24%	262	13.8
Northwest	16	480	1499	3.12	3.25	- 4%	182	11.4
Central	15	450	940	2.09	1.47	+42%	103	6.9
West	16	480	834	1.74	2.07	-16%	96	6.0
East	16	480	442	0.92	0.82	+12%	54	3.4
South	24	720	245	0.34	0.29	+17%	29	1.2
Statewide	106	3180	6226	1.96	1.75	+12%	726	6.8

* See text for comments

Sex ratio index Data from the roadside counts indicated the heaviest hunting pressure has occurred in the central region, followed by the north central and eastern regions (Table 2). As indicated by the sex ratio index (remember, these are roadside observed ratios and not the true ratio in the population), northwest Iowa could support the most additional hunting pressure - and this region contains some of the best pheasant hunting areas in the state. The fact that underharvesting of cocks occurs here is probably related to the distribution of human population within the state. After the opening weekend, there simply are not enough hunters throughout this area to maintain a harvest rate accomplished in the more easterly portions of the state.

The statewide sex ratio index of 1.1 hens per cock from the August roadside counts compares to the index of 1.3 hens per cock observed during the spring (May) roadside counts (these two figures are based on 1671 and 1542 birds, respectively). The decrease in hens from May to August, which encompasses the nesting season, would be expected because of the higher rate of mortality to which hens are subjected during this period (for example, mowing losses in hayfields).

TABLE 2. Data from 1962 Conservation Officers' August roadside pheasant counts

Region of state	Number of cocks	Number of hens	Sex ratio index	Hens without broods	Hens with broods	% Hens with broods	Number of chicks	Young per hen	Average brood size
North Central	270	348	1:1.3	115	233	67%	1648	4.7	6.3
Northwest	251	229	1:0.9	64	165	72%	1019	4.4	5.6
Central	97	135	1:1.4	46	89	66%	708	5.2	6.9
West	88	93	1:1.1	16	77	83%	653	7.0	6.8
East	45	55	1:1.2	19	36	65%	342	6.2	6.0
South	30	32	1:1.1	12	20	63%	183	5.7	6.3
Statewide	781	892	1:1.1	272	620	70%	4553	5.1	6.3

Per cent of hens with broods Of the 892 hens sighted, 70 per cent had broods (Table 2). This was computed by dividing the number of hens with broods by the sume of hens with broods plus broodless hens. Another common way of calculating an index to successful hens is to divide the total number of broods sighted by the sum of the number of broods plus broodless hens. This assumes each brood is still accompanied by a hen. As shown in the Tables, only 620 of the 726 broods reported, or about 85 per cent, had hens sighted with them. In the remaining 15 per cent the hen may have remained hidden from the observer, she may have been lost to some decimating factor at a prior time, she may have deserted the brood temporarily or permanently, the brood may have left the hen, or perhaps what appears to be a brood may be only a fragment of one and the hen is with the remainder of the brood. Computation by this method resulted in a figure of 73 per cent successful hens. The difference of 3 per cent appears to be typical of what might be expected based on results from other states.

The latter method is the one used in the past in Iowa. Thus the 1961 figure of 63 per cent of hens with broods should be compared to the 73 per cent above, indicating better reproduction in 1962 than 1961. There should be little or no influence from the 1962 technique changes here. The flushing of broods when a complete count was not possible at first glance should have no effect on these figures. It is possible a brood would be sighted without the hen being seen, but the hen then flushed with the brood. Formerly no hen would have been recorded, but this would not affect the calculated 73 per cent since it was assumed here that all broods were accompanied by hens.

Young per hen The statewide young per hen index was 5.1 (Table 2). The 1961 index was 3.7, but the two figures cannot be compared directly because of the changes in procedure. The 1962 figure was computed by dividing the number of young by the sum of hens with broods plus broodless hens, the 1961 figure by dividing the number of young by the sum of broods plus broodless hens. A comparison can be made between the 2 years,

however, since the 1962 data can be handled in the 1961 manner - resulting in a young per hen index of 4.6. Since this is greater than 3.7, it again points toward better reproductive success in 1962. This comparison is somewhat biased, however, by the changes in technique. The flushing of broods in 1962 would tend to increase the relative number of young sighted, and thus the apparent difference is not entirely a true one.

Average brood size The statewide average brood size reported was 6.3 chicks per brood (Table 2). This figure, obtained by dividing total number of young by total number of broods, would again be significantly affected by the changed procedure. The attempt to flush broods when not all chicks were believed sighted at first should result in a definite increase in average brood size, other things remaining the same. The average brood size index in 1961 was 6.0, but there would be no basis for saying there was any difference in brood size between the 2 years.

Broods per 10 miles Another possible index to reproductive success trends from year to year is the number of broods sighted per 30-mile count. This index also conveys an idea of relative population levels from region to region and year to year - something that is not done by other indices to reproductive success such as per cent of hens with broods, young per hen, average brood size, etc. The 1962 statewide index was 6.8 broods sighted per 30-mile count, varying from 1.2 to 13.8 between regions (Table 1). The designing of new routes would tend to complicate any direct comparisons with 1961, but last year 6.3 broods were seen per 30 miles. This would indicate population levels were about the same statewide this year as last.

After allowances for the possible effects of the several changes in the method of taking the August roadside count, the logical conclusion to be drawn is that the statewide pheasant picture in 1962 does not differ significantly from last year's as we approach the hunting season.

Unit Managers' and Biologists' August Roadside Counts

Several routes similar to those used by the Conservation Officers were designed for some of the major public hunting areas within the nine Game Management Units. This was done in an attempt to have a better system of inventorying pheasant populations on and immediately adjacent to some of the more important state-owned areas, as well as to furnish additional information on statewide population trends. If we are to be able to evaluate efforts at improving the habitat for pheasants over the years on such areas, we must have a reasonably accurate measure of yearly population trends on them. Also, a better idea of the relative importance of the several areas will be gained. Twelve such counts were made this year. Since no data are available for earlier years, no comparisons of population trends can be made. Likewise, 14 routes were run in various parts of the state by Biologists. Most of these were also new routes, though a few had been run in earlier years. Hence no attempt was made to illustrate population trends with this group of counts either.

It was, however, possible to make several comparisons between these counts and the Officer counts. In most categories, the data from the combined 26 Unit Manager and Biologist counts compared quite favorably with the data from the 106 Officer counts (Tables 3 and 4). The birds per mile index of the Biologist counts was almost identical

to that of the Officers - 1.98 vs. 1.96 (Table 3). The lower count, 1.54, by the Unit Managers probably resulted from the fact that two-thirds of these routes were in the southern half of the state and sampled only poor to medium pheasant range, thus making the over-all picture surveyed somewhat below the average actually existing statewide. The combined broods per 30 miles index was nearly identical to that of the Officers (7.0 vs. 6.8).

TABLE 3. Comparison of Conservation Officers', Unit Managers', and Biologists' August roadside pheasant counts

Group making counts	Number of counts	Number miles driven	Number birds sighted	Birds per mile	Number broods sighted	Broods/ 30-mile count
Unit Managers	12	360	553	1.54	69	5.8
Biologists	14	432*	863	1.98	112	7.8
Combined	26	792	1416	1.78	181	7.0
Cons. Officers	106	3180	6226	1.96	726	6.8
Statewide	132	3972	7642	1.92	907	6.9

* Some old routes maintained were not exactly 30 miles in length.

TABLE 4. Comparison of data from Conservation Officers', Unit Managers', and Biologists' August roadside pheasant counts

Group making counts	Number of cocks	Number of hens	Sex ratio index	Hens without broods	Hens with broods	% Hens with broods	Number of chicks	Young per hen	Aver. brood size
Unit Managers	58	90	1:1.6	29	61	68%	405	4.5	5.9
Biologists	100	140	1:1.4	46	94	67%	623	4.5	5.6
Combined	158	230	1:1.5	75	155	67%	1028	4.5	5.7
Cons. Officers	781	891	1:1.1	272	620	70%	4553	5.1	6.3
Statewide	939	1122	1:1.2	347	775	69%	5581	5.0	6.1

The sex ratio index was most divergent on the Unit Manager routes, perhaps being indicative of greater hunting pressure on and around the public hunting areas. There was little difference between the three groups in the per cent of hens with broods. The average brood size reported from the Officer routes was slightly higher. Thus, even though the number of broods per 30-mile route was nearly the same, the number of young per hen

was also somewhat higher on the Officer routes.

By combining all data on the various aspects of population levels and reproduction, a set of statewide indices for 1962 was obtained (last line in Tables 3 and 4). This should furnish a sound basis for evaluating 1963 trends.

Hatching Distribution

This year, for the first time, personnel making the August roadside counts were asked to make an attempt to age the broods sighted (according to the scheme described in the Methods section). Age estimates were obtained on 1050 broods during August. This number exceeds the total number of broods reported on the scheduled routes (Table 3). The additional broods were from similar roadside observations made by Biologists on mornings when scheduled routes were not being fun, or were broods sighted before or after the running of the scheduled 30-mile route on a given morning. Most of these were from the central and north central regions.

Nearly 70 per cent of the statewide hatch took place in the month of June (Table 5). July was next in importance with 17 per cent, followed by May with nearly 13 per cent. Less than 1 per cent of the observed broods had hatched after August 1. However, it must be remembered that the counts were run in August, beginning on the 1st and with most completed by the 15th. Therefore, any broods hatched in this month would not have an equal chance of being reported; and many late July broods would be so small the chicks would be difficult to see in the heavy cover present at this time of the year. Thus the percentages for these later months no doubt are low. However, many nesting studies have shown that the amount of production this late in the season is relatively insignificant insofar as determining whether the season will be a really good one or a poor one.

This is an opportune time to once again point out that the many types of information obtained from these roadside surveys are interpreted and used as indices, and no claim is made that they necessarily represent the true condition in the population. In many cases, they are known to give a rather close approximation; in others it is known they do not (sex ratio index is a good example of the latter). As long as the surveys are run in the same manner year after year with instructions followed closely, the trends depicted should give us a reasonably good idea of what is happening within our pheasant population.

The midpoint of the hatch, on a statewide basis, occurred about June 15, with 529 of the reported broods hatching on or before the 15th and 521 after this date. If we consider the northwest and north central regions, which include most of Iowa's primary pheasant range, separately, their midpoint occurred about June 17. In the remaining regions, which comprise approximately the southern two-thirds of the state (only three broods sighted in Allamakee and Clayton Counties in northeast Iowa), the midpoint was about June 12. The limited data from the southern region indicated a midpoint of June 9, while that of the northwest region (which had the latest hatch) was June 18. The true difference between northern and southern Iowa is no doubt greater than appears here, because more late broods, which would not be adequately sampled, are usually hatched in the northern part of the state.

TABLE 5. Bi-monthly distribution of the 1962 Iowa pheasant hatch by region and statewide (figures given are percentages).

Date of Hatch	North Central	Northwest	Central	West	East	South	Statewide
May 1-15	---	---	1.6	---	---	---	0.4
May 16-31	13.0	4.8	15.7	6.1	25.4	11.3	12.2
June 1-15	37.0	33.3	32.4	39.4	59.3	58.5	37.8
June 16-30	30.8	42.9	28.7	39.4	10.2	26.4	31.9
July 1-15	14.0	18.3	19.4	15.1	5.1	3.8	15.1
July 16-31	4.0	0.1	1.2	---	---	---	1.9
August 1-15	1.2	---	0.8	---	---	---	0.7
No. broods in sample	406	186	247	99	59	53	1050

SUMMARY

1. Several revisions were made in the August roadside pheasant census method in 1962 in an attempt to secure as good or better data with much less time and effort being expended.

2. The many revisions made it impossible to directly compare much of the data obtained in 1962 with that from 1961. After making allowances for the possible effects of the several changes in techniques, it was concluded that the 1962 statewide pre-hunting season pheasant population did not differ significantly from that of 1961.

3. The best populations were in north central, northwest and east central Iowa - with the latter area being the only one to indicate an apparently significant increase over 1961.

4. Several new routes were established for Unit Game Managers and Biologists. Data from these will be available for evaluating next year's trends.

5. Statewide information on the distribution of the hatch was obtained for the first time. Nearly 70 per cent of the hatch occurred in June, with 17 per cent in July, nearly 13 per cent in May and less than 1 per cent in August. The midpoint of the hatch was June 15, being earlier in southern Iowa and later in northern Iowa.

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CALLING QUAIL IN IOWA, 1962

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Game Biologist

This report is based on the study of relationships between population, production and the "Bob-white" whistles of male quail. Data were obtained by counting the whistling birds along selected routes. These counts were made by Conservation Officers at sunup on clear, calm mornings.

The method was first used in Iowa on a trial basis in 1947. It was based on work in other states, such as that by Bennitt (1951) and Stoddard (1931). The present work did not directly reflect production since it was done in June or July before production was completed; however, it represented changes in the adult breeding population. Supplemental information indicative of production was obtained by taking counts throughout the summer along sample routes.

METHODS AND TECHNIQUES

Routes to be used were marked on maps which were mailed before July 1 to Officers who took the whistling quail census. Instructions and data sheets were included. In the major range the 12 mile long routes were based in soil types. There were two routes per county censused and the main soils were most heavily sampled. In marginal territary most of the routes were in the best ranges.

Beginning, peak and end of whistling activity was recorded over an extended period along a 10 mile route in southern Wapello and northern Davis Counties. Here the effects of weather and seasonal changes were noted.

Statewide counts revealed a decrease from July 1961. Monroe and Clarke Counties were re-censused to ascertain whether indicated changes were a reflection of an actual loss or if the changes resulted from a mid-season depression in whistling.

A different type of count was used to give an indication of whether our calling bird count was a true picture of trends. For this, the Conservation Officers in the main territory reported quail seen while on routine patrol.

RESULTS

General Information

The statewide census is a means of obtaining data on active breeders. In addition it is necessary to know at what point in the calling period the counts are made. The latter information was gathered along the aforementioned ten-stop route. Here it was learned that a regular pattern ofwhistling began in May with a peak in June. There was 21 per cent less activity about July 1; calling decreased 56 per cent by July 15. Twenty-one per cent recovery in calling was noted as a second peak of activity by August 15.

Double calling peaks occurred in 1963 and 1960. These were lesser peaks before the June-July highs and they were later found to be indications of lesser production peaks.

In the July statewide counts, fewer birds were heard in 1962 than in 1961. August recounts were made along routes in Clarke, Appanoose and Wapello Counties. In mid-July 1962 there were 14 bobwhites at 19 listening stops; in August there were 24.

Most of the statewide counts were made during a decline. Data from the check route and the rechecks indicated that only 50 per cent of the birds that called earlier were heard in July.

Additional information was obtained in early June while making cooing dove counts in Clarke, Decatur and Wapello Counties. Quail were also counted and there were more of these in 1962 than in 1961. Besides the above rechecks, Officers reported numbers of quail seen and this indicated a 1962 increase in both broods and adults.

Counties and Districts

In the main territory there were 23 counties and 12 were censused. Two counties, Jefferson and Lee had higher counts than in 1961. In this territory the highest counts (over 1 whistling quail per mile) were in Davis, Jefferson, Lee, Monroe, Ringgold and Wapello. Davis was highest with 2.2 per mile. There were reductions in Clarke, Davis, Monroe, Ringgold, Wapello and Wayne.

In secondary range, there were 47 counties of which 28 were censused. Here there was a slight upward trend in Benton, Dubuque and Linn. Highest counts of 0.5 to 0.8 birds per mile were in Buchanan, Johnson, Marshall, Monona and Linn; while there was little change in Boone, Buchanan, Clayton, Johnson, Mahaska, Polk, Pottawattamie, Story and Warren. Notable reductions occurred in Adams and Montgomery Counties.

It must be remembered that the above counties are listed without making corrections for the fact that the counts were made during a July decline. This decline was more severe in 1962 than in 1961. Rechecks in Appanoose and Clarke showed that the changes in the main ranges were not serious. After correcting for lateness of the counts, only Clarke, Monroe and Davis had declines from 1961 with only slight changes in the first two and the greatest (1.3 to 0.3) in Clarke.

Corrections in census figures show a population equal to 1961, but the 1962 average is below the 10 year average. Nevertheless there were some areas that had good counts of from 2 to 6 whistling quail per stop in the following counties:

Clarke	Marshall
Davis	Monona
Jefferson	Ringgold
Lee	Wapello
Linn	Wayne

Since the state is divided into agricultural districts, this division was utilized to compare regional populations. Data from these agricultural districts, where most quail

are found along with border areas that have smaller, localized populations is summarized in Table 1.

TABLE 1. Quail population density by agricultural districts as indicated by 1962 whistling cock index.

Agric. Dist.	10-yr. Av.	Whistling Cock Index	
		1962 Actual Census	1962 Corrected Figure
SE	2.0	1.1	2.2
SC	1.9	0.8	1.6
EC	0.3	0.3	0.6
Border	0.7	0.3	0.6

The peak of the 1962 calling was in June. The actual counts were made in July when calling was over 50 per cent lower than the peak. Therefore, these figures were doubled to represent the peak of calling indicated by data from the same route.

Statewide

Early information on the potential fall population was the goal of July counts of whistling bobwhites. Whistling quail patterns reflect production. The 1962 census utilized 900 miles of route, or 900 listening stops. This enabled us to list the number of birds heard on 576,000 acres. Earliest counts were completed by July 6, the latest on July 26 (Table 2).

TABLE 2. Dates 1961 and 1962 July whistling quail counts were taken.

Dates	1961	1962 Number of Counts
July 1-5	1	0
6-10	5	15
11-15	16	8
16-20	32	21
21-25	16	15
26-31	65	2
Totals	75	61

In 1961, the peak of calling was about the time of the census, and the counts were correspondingly high. In 1962 the low point in whistling was July 16 when most counts were made.

The decline mentioned above affected the index obtained. Hence it must be considered when examining the indices since 1958 (Table 3).

TABLE 3. Statewide indices to whistling quail since 1958

Year	Average number of whistling quail per mile of route
1958	1.7
1959	1.5
1960	0.9
1961	1.0
1962	0.5*

* The figure 0.5 represents bobwhites calling at the time of the counts. This should be increased to represent the number whistling during the earlier peak period. The average would then be 1.0. For years represented in Table 3, calling was near a peak during the counts, except in 1959 and 1962.

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ANALYSIS OF DATA OBTAINED FROM DEER CHECKING STATIONS - 1961

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Game Biologist

INTRODUCTION

Deer were checked by personnel of the State Conservation Commission operating from 17 locations during the 1961 Iowa shotgun season for deer. Biological data were obtained from 756 deer, or 14.1 per cent, of the total 1961 harvest of 5,364 animals. These data are very important in the formulation of management plans and furnish much of the information on which harvest recommendations are based.

I wish to acknowledge the zeal, spirit, and skill with which the personnel approached the herculean task of gathering biological data during the 1961 deer season. The continued support of all our field personnel is needed if we are to maintain a progressive deer management program in the State of Iowa based on knowledge instead of supposition.

RESULTS

Data pertaining to sex, age, weights, number of antler points, and beam diameters were gathered for analysis. In addition, reproductive tracts, blood samples, and stomach samples were collected whenever possible.

The data are, in most instances, presented by primary deer regions and for the state as a whole. A map showing deer regions may be found in Figure 1.

Sex Ratios

The sex of 755 of the 756 deer checked during the 1961 season was ascertained, with the sample comprised of 398 males and 357 females for an observed sex ratio of 112 males: 100 females. Fawns exhibited a sex ratio of 118 males:100 females, while the sex ratio for adults was 110 males:100 females. Table 1 is a summary of the deer checked during the 1961 season.

Gun hunters, on their 1961 hunter report cards, said they harvested deer in the ratio of 117 males:100 females (Mustard, 1962). This is in close agreement with our check station data for 1961. There were several seasons, however, when the gun hunters reported a much greater ratio of males in the harvest than our check station data revealed. This biased reporting on the part of the hunters began in 1958 when a letter was included in their license packet asking them to collect female reproductive tracts and continued until 1961 when the letter was not included. Table 2 gives the sex ratios from the hunter report cards and from the check station data since 1953.

There is no doubt in my mind that many deer hunters took our request to collect reproductive tracts as a requirement and then deliberately lied about the sex of the animals they harvested if they failed or did not want to collect the tracts. The prime lesson to be

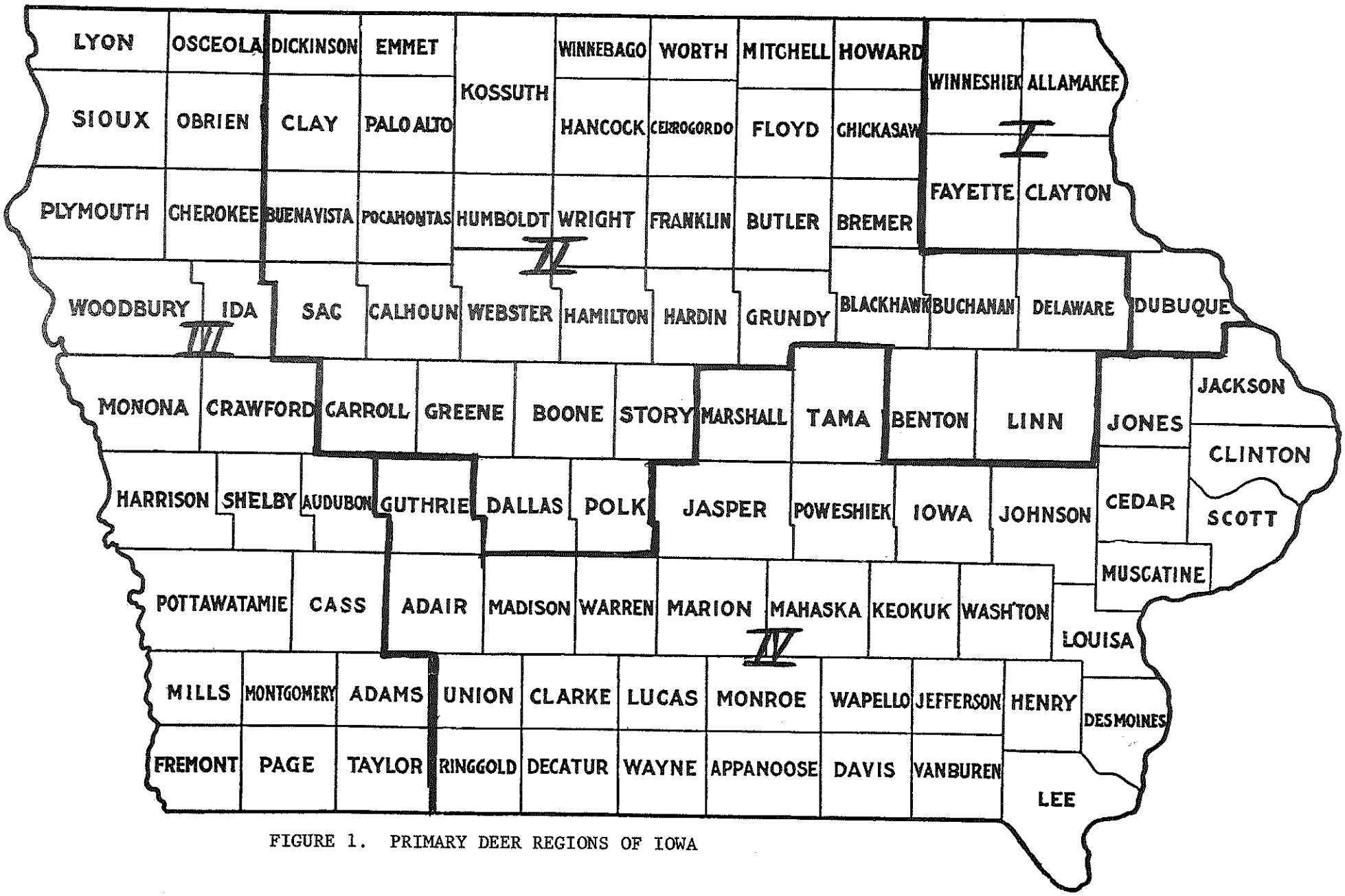

FIGURE 1. PRIMARY DEER REGIONS OF IOWA

TABLE 1. Sex, Age, And Number of Deer Checked, Iowa, 1961

Age Class	REGION I		II		III		IV		Unk.		Statewide			
	M	F	M	F	M	F	M	F	M	F	M	F	Unk.	Total
Fawn	20	18	34	28	37	34	48	41	34	26	173	147	1	321
Adult (Age Unk.)	-	1	2	1	3	4	6	-	2	-	13	6		19
1.5 Yr.	18	11	19	17	23	22	22	15	21	14	103	79		182
2.5	6	2	13	13	16	22	10	25	12	11	57	73		130
3.5	4	3	5	7	9	4	7	5	6	5	31	24		55
4.5	4	3	3	3	1	4	1	1	2	1	11	12		23
5.5	-	2	1	-	1	-	-	1	-	1	2	4		6
6.5	1	1	-	-	-	-	1	-	-	-	2	1		3
6.5 Plus	-	2	1	1			1				2	3		5
Age Unk.				4			3	4	1		4	8		12
Sub Total	53	43	78	74	90	90	99	92	78	58	398	356	1	755
Sex Unk.	1											1		1
Total	97		152		180		191		136					756

TABLE 2. Comparison of Sex Ratio Data Obtained From Deer Hunter Report Cards and Deer Check Stations, Iowa, 1953-61

Year	Source of Information 1/		Difference
	Hunter Card Returns	Check Stations	
1953	115	116	1
1954	120	137	17
1955	133	110	23
1956	132	118	14
1957	120	113	7
1958 2/	177	112	65
1959 2/	280	132	148
1960 2/	195	126	69
1961	117	110	7
Means	154	119	35

1/ Data presented as males:100 females.

2/ Years hunters were asked to save reproductive tracts from female deer.

learned from this experience is simple: If you rely on information from hunters don't ask them to do anything for you which takes any great effort on their part.

Fortunately, we do not rely on the data from the hunter report cards for our sex ratio information or, as can be seen in Table 2, we would have been puzzled for several years by what was reported.

Age Ratios

Age was determined for 743 deer during the 1961 season; however, 19 of these were classified only as adults on the field data sheets (Table 1). An age ratio of 76 fawns:100 adults was indicated from the sample of the harvested deer which included 321 fawns and 422 adults. A fawn:100 adult females (1.5 years plus) ratio of 160:100 was found, or 1.6 fawns:1.0 adult female. Reproduction, it appears, was typically high during 1961.

Age ratio data are used in Iowa to interpret the degree to which our deer herd is being utilized, i. e., too few harvested, too many harvested, or harvested about right. Comparison of the age ratio data for 1959-1961 indicates we are not overharvesting the deer, at least on a statewide basis (Table 3).

The data, given in Table 3, are especially significant when it is realized that the 1959 harvest was the second lowest on record, the 1960 harvest was 56 per cent greater than the 1959, and the 1961 harvest was 96 per cent greater than 1959. The point is, even though the harvest in 1961 was almost twice that of 1959, the percentages the various age groups contributed to the kill remained almost constant, with deer 1.5 years and younger furnishing about two-thirds of the kill each year of the 3-year period. As far as management is concerned, it is important to note that the increased harvests were not accomplished at the expense of older deer and this would indicate that we are not overharvesting. If the deer were being over harvested, a greater percentage of older deer would be showing up in our check station data, but this is not the case as is brought out in Table 3.

Weights

Past analyses of deer check station data have included the average weights for all deer checked and weighed by region, sex, age, and for the state; with the primary comparison being the average calculated liveweight for all deer. I feel this figure, when used for comparative purposes, is invalid because we do not harvest deer so that each age group comprises the same percentage of the total sample each year. Therefore, the mean weights for all deer are not based on comparative data.

Valid comparisons of weights can best be made of deer in the same age class and of the same sex, however, some limitations are even placed on this comparison. For instance, fawns typically represent the largest single group of deer on which weights are obtained, but there can be several months difference in the age of animals classified as fawns. This difference in age can make a great difference in the weights among deer classified as fawns and introduce large variations. For this reason I do not feel that fawn weights offer a valid comparison of deer weights either.

The next most numerous age group on which we obtain weight data is the 1.5-year old class.

TABLE 3. Comparison of Age Classes Represented in Deer Sampled During Three Iowa Deer Seasons, Check Station Data, 1959, 1960, and 1961 1/

Age Class	Percent of Total Sample			Cumulative Percent		
	1959	1960	1961	1959	1960	1961
Fawn	38.3%	41.2%	43.1%	38.3%	41.2%	43.1
1.5 yrs.	28.9	26.4	24.5	67.2	67.6	67.6
2.5	17.8	16.0	17.5	85.0	83.6	85.1
3.5	7.5	8.0	7.4	92.5	91.6	92.5
4.5	3.3	3.2	3.1	95.8	94.8	95.6
5.5	0.8	0.5	0.8	96.6	95.3	96.4
6.5	0.2	0.5	0.4	96.8	95.8	96.8
Over 6.5	0.4	0.2	0.7	97.2	96.0	97.5
Unk. Adults	2.7	3.7	2.6	99.9	99.7	100.1

1/ Deer kill for 1959 was the second lowest on record, with a total harvest of 2,731. Kills for 1960 and 1961 were 56 percent and 96 percent greater respectively, with the total harvests for the two years of 4,269 and 5,364.

Here, I believe, is our best choice if we are to make comparison among years and among regions of average deer weights. Comparisons among regions may be weak, however, because of inadequate sample size; one region did not report weighing any 1.5-year old male deer and two of the four regions obtained weights on only two and three 1.5-year old male deer, respectively, in 1961. It must be recognized that any statistical analysis, to further reduce variation, would undoubtedly include the separation of the males from the females.

Determination of the number or sample size of 1.5-year old male deer needed for statistical analysis of deer weights on a statewide basis at the 95 per cent level of confidence indicated that a sample of 16 was needed in 1961. A sample of 17 was taken in 1961; however, 12 of these came from one region so sample distribution was not good. These same tests showed we needed 11 deer from Region I and we had 12, but 72 were needed from Region II where only 3 were secured.

Calculations on the sample size needed were made by using the formula:

$$N = \frac{\left[(t)\ (.05)\right]^2\ (s)^2}{\left[(.05)\ (\bar{x})\right]^2}$$

where: N equals number of observations or sample size needed.
t .05 equals tabular value for "t" for number of observations made at desired level of probability.
s equals standard deviation for sample

$\bar{x}$ equals mean of sample

A sufficient number of deer weights, to use in making statistical tests to determine if apparent differences in deer weights are true differences when different years and regions are compared, is difficult to obtain. Our permanent deer checking stations are equipped to gather weight data as well as the other biological information in which we are interested. In fact, these weight data, along with some public relations, are the only additional benefits derived from permanent checking stations over the roving field checkers who examine deer in the field and at locker plants.

If we are not receiving a sufficient number of deer weights to be meaningful, it would perhaps be wise to eliminate the permanent checking station and utilize the personnel as roving field checkers. We will try to emphasize the collection of weight data in 1962 and see what happens before determining the fate of the checking stations.

Because we did not receive a sufficient number of weights in 1961 for comparisons among the regions the data are presented only for the state as a whole in Table 4.

Antler Points

The number of points per antler, as is true of weights, is one measure of condition of our deer herd. This type of datum is much easier to collect than weight datum and the sample is usually much greater, with much better distribution in the sample.

TABLE 4. Calculated Liveweights of Deer Checked, By Age and Sex, Iowa, 1961 (to nearest whole pound) 1/

	Males		Females	
Age	Number	Mean Weight	Number	Mean Weight
Fawn	29	99	32	86
1.5 Yrs.	17	160	13	138
2.5	11	208	14	148
3.5	12	210	3	148
Over 3.5	8	236	8	161
Unk. Adults	1	254	2	158
All Adults	49	197	40	148
All Deer	78	161	72	120

1/ Calculated liveweight equals 1.272 x hog-dressed weight (Hornaday, 1935).

Comparison of 1961 antler point data with 1960 data for 1.5-year old deer indicates very little difference between the 2 years with an average number of points per antler of 3.28 in 1960 and 3.27 in 1961. The mean number of points per antler for all deer was 3.88 in 1960 and 3.71 in 1961.

Deer from Region IV were well below the state average in 1961 as is shown in Table 5.

Beam Diameters

Beam diameters also are used as criteria of general condition in deer and this measurement is relatively easy to obtain which results in a fairly large well distributed sample, at least for 1.5-year old deer.

Statistical tests to determine the sample size needed showed that on a statewide basis 47 measurements on 1.5-year old deer were necessary at the 95 per cent level of confidence; 63 measurements were obtained. On a regional basis the samples were too small for the 95 per cent level of confidence, but were adequate, except in 1 region, for the 90 per cent level. The region where an inadequate sample was secured was Region IV.

Comparison of the mean beam diameters of all deer, by region and for the state, indicated that Region I deer antlers were slightly smaller than those from other regions. The most valid comparisons, because of sample size, can be made of measurements from 1.5-year old animals and here too Region I deer were smaller than the state average (Table 6).

The statewide mean beam diameter found in 1961 was .90 inches for 1.5-year old deer and was .91 in 1960, so there is little difference between the 2 years. Comparison of the mean beam diameter for all deer for 1960 and 1961 shows little difference with a mean of 1.13 inches in 1961 and 1.12 inches in 1960.

Beam diameter measurements by age class, region, and for the state may be found in Table 6.

DISCUSSION

Data collected by the technical personnel of the State Conservation Commission during the open deer seasons and the interpretation of these data, along with the acceptance of the interpretation by administrators, have provided for the orderly growth in the number of permits issued to gun hunters. Since 1959 there has been an increase of 4,000 permits, or a 66 per cent increase in the number of licensed hunters allowed to participate in the sport of deer hunting in Iowa. Our data indicate that even though more hunters have been allowed, the harvests, except perhaps in some local instances, have not been excessive.

I feel we have done a fairly good job of keeping up with the population growth and I am disturbed that some would open the deer season to unlimited numbers of hunters, primarily because of difficulties created by persons who apply for deer permits, but who do not receive them. It is my unpleasant task to remind those who would allow all applicants to hunt deer that the deer were once eliminated from Iowa at a time when cover conditions were much better than we have present today.

TABLE 5. Average Number of Points Per Antler, By Age, Region, and For State, Iowa, 1961

Age	REGION I	II	III	IV	Unknown	Statewide
1.5	3.22 (27) 1/	3.28 (35)	3.57 (28)	3.04 (24)	3.16 (24)	3.27 (138)
2.5	4.00 (6)	4.50 (16)	3.70 (23)	2.00 (12)	3.88 (16)	3.66 (73)
3.5	4.12 (8)	4.25 (8)	4.62 (13)	4.50 (12)	4.50 (8)	4.43 (49)
4.5	4.50 (8)	5.50 (6)	5.00 (2)	4.00 (1)	6.00 (2)	5.00 (19)
Over 4.5	---	4.75 (4)	---	4.00 (1)	---	4.50 (6)
Mean	3.67 (49)	3.96 (69)	3.86 (66)	3.19 (51)	3.72 (50)	3.71 (285)

1/ Number in parenthesis ( ) indicates sample size.

TABLE 6. Average Beam Diameter Measurements, By Age, Region and For State, Iowa, 1961 (in inches)

Age	REGION I	II	III	IV	Unknown	Statewide
1.5	0.87 (25) 1/	0.88 (29)	0.92 (26)	0.96 (20)	0.88 (24)	0.90 (124)
2.5	1.20 (4)	1.20 (15)	1.23 (17)	1.30 (8)	1.31 (16)	1.25 (60)
3.5	1.36 (6)	1.49 (8)	1.36 (10)	1.54 (12)	1.43 (8)	1.45 (44)
4.5	1.44 (8)	1.61 (6)	1.44 (2)	---	1.49 (2)	1.50 (18)
5.5	---	1.38 (2)	---	---	---	1.38 (2)
Over 5.5	---	1.56 (4)	---	1.50 (2)	---	1.53 (4)
Mean	1.07 (43)	1.14 (62)	1.11 (55)	1.22 (42)	1.13 (50)	1.13 (252)

1/ Number in parenthesis ( ) indicates sample size.

Our present system of issuing licenses to deer hunters is as fair and equitable a system as can be obtained and I do not feel we should let a few disappointed applicants dictate what the management policies should be in regard to the number of permits we will issue. Our personnel have worked too hard and diligently to provide good data on which to manage the Iowa Deer Herd to have it literally pushed aside because we pay too much attention to some disappointed hunters or misinformed individuals.

I trust we will continue to put our faith in the data and to provide for additional permits if these data so warrant.

SUMMARY

1. A total of 756 deer, or over 14 per cent of the total number harvested, were checked by Commission personnel during the 1961 gun season for deer.

2. The sample yielded an observed sex ratio of 112 males:100 females for all deer, 118 males:100 females for fawns, and 110 males:100 females for deer classified as adults.

3. Although the 1961 deer harvest was the greatest on record, the age composition indicated the Iowa deer herd was not overharvested.

4. An age ratio of 76 fawns:100 adults was observed in the deer sampled which indicated typically high reproduction. A fawn:100 adult females (1.5 years and older) ratio of 160:100 was noted in the sample.

5. Statistical analysis suggested we did not obtain an adequate sample of deer weights in 1961 to allow us to make regional comparisons of the weights. Average calculated live-weights on a statewide basis are given in the text.

6. Little difference was noted in the mean number of points and in the mean beam diameter measurements for 1960 and 1961.

7. All indications were that the Iowa deer herd is in good physical condition.

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AN EVALUATION OF THE THAYER LAKE FISHERY RENOVATION PROJECT

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Thayer Lake, a 10.5 acre state-owned recreational lake in Union County, Iowa, was chemically treated to eradicate the fish population in June 1958. The impoundment had been designated an experimental fish production lake during the previous year. Poor angling and fish quality made eradication and restocking of the lake necessary.

The lake was treated with a concentration of 1.0 p.p. m. emulsified Pro-Noxfish. A total of 15 species of fish, weighing in excess of 5,900 pounds was destroyed. Largemouth bass, bluegill, white crappie, black crappie, and yellow bass comprised the major species in the lake. Small indigenous populations of channel catfish, carp, yellow bullhead, black bullhead, quillback, golden shiner, yellow perch, warmouth, green sunfish, and tadpole madtom were also present. The estimated number and weight of individual populations can be found in previously published Quarterly Biology Reports. (Vol. X, No. 2)

Past history of the lake is not complete and much of it has been determined by contacting local persons who have familiarized themselves with the lake by living in the vicinity for many years. Construction of the earthen dam was completed in approximately 1920 by the Chicago, Burlington, and Quincy Railroad. The water was used principally for commercial railroad use. In 1947 the area was sold to private enterprise for development and agricultural use. The State Conservation Commission acquired the lake and part of the watershed in 1957 through a Federal Aid Project.

The lake is a typical small southern Iowa artificial impoundment. It is located in a relatively long, narrow valley with approximately 1,200 acres of watershed. More than one-half of this is under general agricultural use. The original maximum depth was reported in excess of 20 feet, but siltation and bank erosion has reduced this to slightly over 14 feet at present. Bottom contours are relatively steep in the lower reaches of the lake and shallow in the upper end. The shoreline is covered with climax woodland. Physical and chemical studies indicate the lake stratifies only on rare occasions, and then only near the bottom.

Restocking, Species Status, and Fish Growth

Restocking of Thayer Lake began as soon as the Pro-Noxfish detoxified. The species and number of fish restocked in the lake was determined before the existing fish population was eradicated. Once this population development schedule was initiated it was followed precisely for the first 2 years of the study. After that, intensive fisheries investigations and inventories were used to determine management procedures and stocking quotas.

For experimental purposes the species restocked in the lake were restricted to largemouth bass, channel catfish, black crappie and black bullhead. The sequence of fish stocking and fish management for the first 4 years of development was as follows:

First Year

1. Introduction of a primary largemouth bass population through the stocking of fry.

2. Construction and placement of channel catfish spawning devices such as hollow clay tile, wooden boxes containing gravel, etc.

3. Introduction of adult channel catfish.

Second Year

1. Stocking of adult bullheads (two separate plantings) for public angling.

2. Introduction of a second year class of largemouth bass by planting fingerlings in lake summer.

Third Year

1. Intensive fishery investigation and inventory to determine the success and magnitude of natural largemouth bass and channel catfish reproduction.

2. Introduction of a parent stock of adult black crappie.

3. Additional planting of adult bullhead for angling.

Fourth Year

1. Continued intensive fishery investigation to determine species status and game-fish reprotduction.

2. Continued stocking of adult bullhead for angling, with the number determined by early spring netting.

Largemouth Bass : The largemouth bass population was started with an original planting of 11,000 fry, 20 days after chemical eradication. Electro-fishing samples later in 1958 indicated this population was well established, with a mean of 1.75 bass observed per minute of shocking. This sample also confirmed a residual population of green sunfish that survived the chemical treatment.

During 1959 a secondary year class of largemouth bass was introduced by planting 1,000 fingerlings. This was necessary because the original bass were not mature and would not reproduce. Survey samples by electro-fishing proved both year classes were abundant in late September.

The first natural reproduction of bass occurred in 1960. During June electro-fishing samples, fingerling bass were taken in excess of 5 per minute. Later in the summer natural mortality had reduced this to 2.2 bass observed per minute of shocking. At this time the third year class, from natural reproduction, was considered abundant enough to cancel further fingerling stocking.

During 1961 both bass age groups II and III (year classes 1958 and 1959) were successful in reproducing young. Fingerling bass were abundant in both the summer and fall investigations. No further stocking of largemouth bass was made.

Growth of largemouth bass in Thayer Lake has been completely satisfactory. However, as expected, growth varied greatly as each successive year class and/or other species were introduced and filled the fish population to near capacity. The original planting of bass exhibited extremely rapid growth, attaining a mean total length of 10.5 inches in 2 years (Table I). Thereafter, the rate of growth decreased significantly with additional age groups. As an example, the 1959 and 1960 year classes averaged 7.8 and 7.2 inches in total length at the end of 2 years. No difference could be observed between the growth of natural reproduction and stocked fish after the first year of the project.

TABLE I. Growth of largemouth bass at the end of each year of life in Thayer Lake, Iowa

Year Class	Total length in inches during each sampling year			
	1958	1959	1960	1961
1958	6.0 (4.3-7.6)*	10.5 (6.2-12.0)	12.8 (9.0-13.9)	14.2 (13.0-15.7)
1959		5.0 (3.7-5.9)	7.8 (6.0-8.8)	11.2 (9.6-12.8)
1960			3.6 (3.0-4.2)	7.2 (5.9-8.1)
1961				3.5 (2.2-4.4)

* Range in total length.

Channel Catfish: Channel catfish were restocked in Thayer Lake shortly before freeze-up in the fall of 1958. A total of 2,971 adult and sub-adult (age groups I and II) were planted on two different dates. Approximately one-third of these fish were capable of reproducing the following spring.

To aid and encourage natural channel catfish reproduction, artificial spawning devices were placed at several strategic locations around the shoreline of the lake. During the following 3 years no further channel catfish stocking was made in an effort to evaluate the success of these spawning aids.

Fishery investigations in 1959 and 1960 failed to produce any young channel catfish. During 1960, two young-of-the-year channel catfish were taken in several small mesh seine hauls. In the 3 years a total of 47 channel catfish was examined and all were from the original planting. Later in 1961 an additional 3,752 fingerling channel catfish were stocked. With this near failure of natural reproduction of this species, despite efforts to induce successful reproduction, periodic stocking of fingerlings will have to be made to maintain the population in high abundance.

Black Crappie: This species was not introduced into the lake until the third year after renovation. This was necessary in order to develop the largemouth bass population with two separate year classes of high abundance without interference of crappie predation. The crappie population was started by planting 500 large adults for parent stock.

Fisheries surveys during 1961 indicated a high degree of natural crappie reproductive success. Young-of-the-year crappie were captured in both seine hauls and electro-fishing samples. The latter technique produced a mean of 0.6 young per minute of operation. Growth of young black crappie was excellent during the first year, averaging 3.8 inches in total length.

Bullhead: The bullhead has always been an extremely popular species of fish in this region of the state. Therefore, during the second year of renovation two separate stockings of adults were made 35 days apart. Each planting contained 2,500 fish. This was done primarily to attract public angling.

During the following year 5,000 additional adult bullheads were stocked in one planting.

In 1961, early spring netting studies indicated adult bullheads were abundant. Therefore, the stocking quota was reduced to 2,500 adults to be stocked prior to spring angling activity.

Other Species: Investigations shortly after the lake was treated with the fish toxicant revealed a small residual population of green sunfish and bluegill. Ideally, restocking of renovated lakes is most desirable without competition from other species of fish. This was also desired in Thayer Lake, but total renovation was only a partial success. Detailed studies on the abundance of surviving fish indicated they were present in very low numbers and restocking of the lake began.

During the 1959 fishery surveys, young-of-the-year green sunfish were extremely abundant. However, as the second year class of largemouth bass was established, heavy predation reduced their abundance rapidly. Adults were also abundant during early investigations, but as other fish populations were introduced and developed, they also declined in numbers.

Several adult bluegill have been captured in surveys since the lake was renovated, but they have never become numerous. During the 4 years of the study young bluegill have never been observed or captured. Apparently, the remaining bluegill have been unable to reproduce successfully.

Angler Success and Harvest

The final success of a lake renovation project is dependent on the increased public angling success and fish harvest upon the completion of the project. By necessity there is a period of unproductive fishing until fish populations are re-established and have developed to near population capacity. Another important factor is that if the fish are not large enough to be of interest to the angler, the latter simply will not participate. Species such as largemouth bass, which must be started from young fish stocking due to successful year class development and the high cost of stocking adults, usually take a minimum of 2 years to develop into a satisfactory size to the angler. Others such as bullheads can be stocked as adults, because natural reproduction in Iowa artificial lakes is minimal and they are

periodically stocked as adults to furnish public angling.

At Thayer Lake public angling was minimal until the spring of 1959. After local people caught several large stringers of bullheads, angling activity increased abruptly. However, public angling did not become significant until the spring of 1960. Since that time it has increased steadily.

Information relative to angler success and harvest was obtained in 1960 and 1961 by Conservation Officer contacts while on routine duty. The second year additional information was obtained by a creel census conducted by Biology and Fisheries Section personnel. Data relative to the number of hours fished, number and species of fish caught, and miles travelled to the lake were asked of each fishing party.

Angling success increased from 1.0 fish per hour in 1960 to 1.2 fish per hour in 1962. During the latter year the census by the officer contact method was slightly lower than by the creel census. Bullheads comprised the bulk of the angler catch both years of the census. In 1960 this species made up approximately 65 per cent of the total catch. The following year they comprised slightly over 50 per cent of the total angler harvest. Green sunfish, largemouth bass, crappie, and channel catfish followed in that order during both years.

TABLE 2. Angler harvest and success in Thayer Lake during 1960 and 1961

Year	Method of Census	Total Hours	Total Men	Total Fish	Fish Hr.	Species				
						B'head	Bass	Crappie	Cat.	G Sunfish
1960	Officer	43	33	43	1.0	27	5	-	-	11
1961	Officer	60	28	55	0.9	27	5	6	3	14
1961	Biology	115	60	138	1.2	72	6	18	-	42

DISCUSSION

Four years after renovation of Thayer Lake fish populations have reached peak capacity. Largemouth bass, channel catfish, crappie, and bullheads are abundant and being caught by anglers at a rate in excess of 1.0 fish per hour. Angling for bullheads has been more prevalent than for any other species. This does not mean this species represents the only fish available to the angler, but rather it is the result of primary angler interest. All other species of fish are present in high abundance and will in the future undoubtedly contribute materially to the fishery.

In general, this project cannot be considered wholly successful. From the inception of renovation it was the purpose of this project to develop and maintain fish populations and angler harvest to the maximum. The fish populations have been developed to the maximum, but angler success and harvest have not been significantly higher than most Iowa recreational impoundments.

The factors which control angler success and harvest are difficult to analyze because of the lack of detailed information and unobtainable data. In Thayer Lake it is even more difficult than usual because of the lack of time for contacting anglers. However, the

following observations made by the author are considered either individual or multiple answers for the complex question of poor angler success and harvest.

First, most of the anglers contacted in the creel census were from the local vicinity. These reports revealed that the average distance travelled to the lake was slightly more than 9 miles. They also expressed a vast preference for bullheads. Only 2 per cent of the anglers contacted in 1961 stated a preference for other species. This means that if bass, crappie, and channel catfish are caught by anglers in most cases they are incidental to primary fishing interest, leaving vast populations of these species unharvested.

Second, during the last 2 years of the study the angler was continually bothered by excessive aquatic vegetation during the summer months. In 1961 the vegetation beds became so inpenetrable to the angler it was impossible to fish from the shoreline. Creel census data also revealed that most of the fishing in Thayer Lake is from the bank. Without free access to productive waters the angler simply did not fish except in early spring or late fall.

Third, very little public information has been released concerning effort of special fisheries management at Thayer Lake. This is borne out by the fact that a majority of the anglers are from the immediate vicinity. With the development of a sound public information program, many additional anglers would undoubtedly fish in Thayer Lake.

MISSOURI RIVER COMMERCIAL FISHING STATISTICS, 1960-1961

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Fisheries Biologist

All Iowa commercial fishermen are required by law to report their catch on monthly report forms which are provided by the Iowa Conservation Commission. Total pounds of different species of fish taken by various types of gear are recorded on these forms. Since most of the weights are estimated and some of the fishermen do not report, a bias does exist in these data. The 1961 commercial fishing report forms plus information taken from the Iowa Conservation Commission files were used in the preparation of this paper.

During 1960, 149 Iowa resident and 7 non-resident commercial fishing licenses were issued to persons living in counties bordering the Missouri River. One hundred sixty-two resident and 8 non-resident licenses were issued in 1961 (Table 1). Only those fishermen using over one trot line and one basket trap were considered commercial fishermen according to a 1958 Iowa law. Fishermen holding an owner's commercial license may sell their catch. An operator's license only entitles the holder to check commercial fishing gear for an owner. All of the non-resident fishermen each year were from Omaha, Nebraska. The central Missouri River counties of Woodbury, Monona, Harrison and Pottawattamie received the major portion of the total number of licenses issued each year (Table 1).

Basket traps were the most numerous type of gear used during both years (Table 2), followed by hoop nets, trot lines and trammel nets in that order. Four of the six counties listed indicated a decrease from 1960 to 1961 in total number of gear licensed; however, the overall total number of gear licensed by all counties each year showed an increase from 1960 to 1961 (Table 2).

Although Iowa law requires all commercial fishing operators to file a monthly form showing weights of fish taken by each type of gear, few comply. During 1961, only 32 of the 117 operators returned their forms. Of the 32, 25 reported a catch (Table 3). Therefore, the values in Table 3 are probably considerably less than the values compiled if all 117 operators had returned their forms.

Carp led all other fish in the reported catch with 19,755 pounds. Catfish and buffalo were second and third with 9,781 pounds and 4,468 pounds, respectively (Table 3). Nets and traps caught the major portion of the carp, catfish and buffalo. No catch data from 1960 are included in this report.

TABLE 1. Commercial Fishing Licenses Issued by County, Missouri River, 1960-1961

County	1960		1961	
	Owner	Operator	Owner	Operator
Woodbury	10	17	11	28
Monona	7	22	11	35
Harrison	14	27	12	17
Pottawattamie	9	23	10	20
Mills	3	7	0	4
Fremont	6	4	5	5
Ida	0	0	1	3
Non-resident	2	5	3	5
Totals	51	105	53	117

TABLE 2. Commercial Fishing Gear by County, Missouri River, 1960-1961

Type of Gear	Number Licensed		Counties											
	1960	1961	Woodbury		Monona		Harrison		Pottawattamie		Mills		Fremont	
			1960	1961	1960	1961	1960	1961	1960	1961	1960	1961	1960	1961
Trot Line	78	63	30	8	11	8	21	29	11	4	1	3	4	11
Trammel Net	41	37	4	6	10	9	11	7	8	11	1	0	7	4
Basket Trap	117	157	12	13	38	61	59	48	8	35	0	0	0	0
Hoop Net	104	99	15	26	6	5	23	19	18	32	5	0	37	17
Gill Net	2	6	1	4	1	0	0	2	0	0	0	0	0	0
Fyke Net	2	3	0	0	0	0	0	0	2	2	0	0	0	1
Totals	344	365	62	57	66	83	114	105	47	84	7	3	48	33

TABLE 3. Commercial Fishing Catch by Pounds, Missouri River, 1961

Type of Gear	Buffalo	Sheepshead	Catfish	Sturgeon	Carp	Misc.*
Nets and Traps	3,397	267	7,282	400	14,802	254
Seines	1,071	298	1,860		4,737	459
Trot Lines			639		216	
Totals	4,468	565	9,781	400	19,755	713

* Various species of sucker

CENTER LAKE PROGRESS REPORT

Tom Moen
Fisheries Biologist

Center Lake in Dickinson County is a typical, small, glacial lake with a surface area of 329 acres when the water level is at the mean high water mark. The shoreline is boulder and sand with a fair stand of trees around most of the lake. Shoal area of sand and scattered boulders extend out to about the 5-foot contour during normal water levels. This area comprises about 20 per cent of the lake bottom. The remainder of the lake bottom is composed of mud and silt. Center Lake is highly fertile, producing heavy blooms of blue-green algae during the summer months, and it is subject to oxygen depletion about one winter in every four.

Center Lake has had a history of "boom and bust" as far as fish populations and fishing are concerned. Many of the older fishermen recall catching large numbers of northern pike, crappie, and yellow perch. In more recent times it has produced excellent largemouth bass and bluegill fishing, but not on a consistent basis. Due to winter-kill problems, the main species for the fishermen has been bullheads. Even the bullheads have had extreme fluctuations in numbers. The appearance of a carp population in the early 1950's added to the management problems in this lake. Late in the summer of 1958 stunted bullheads (3 years old, averaging 3.7 inches in length) were present at a population of about 580 pounds per acre. Carp were the next most abundant species, comprising 213 pounds per acre. Other species, - including walleye, northern pike, largemouth bass, black crappie, Bluegills, and common sucker, - accounted for less than an estimated 5 pounds per acre.

Because of the poor fishing and the obviously stunted population of bullheads, the decision was made to eradicate the fish population and restock the lake on the basis of a farm pond for maximum production of largemouth bass and bluegills. The species list was amended in 1960 to include the yellow bullhead, Ictalurus natalis. The lake was treated with 0.05 ppm toxaphene on October 1, 1958. As far as could be determined this treatment produced a complete fish kill. The lake remained toxic to test fish through most of the winter months, but minnows survived for 2 weeks in live cars during May of 1959, and thus it was assumed that the lake had detoxified. Restocking was initiated in June (Table 1).

TABLE 1. Species, numbers and size of fish stocked in Center Lake 1959-1962

DATE	SPECIES	NUMBER	SIZE
June - 1959	LM Bass	60,000	advanced fry
September - 1959	LM Bass	22,000	fingerling (3" average)
March - 1960	Bluegill	9,000	adults
July-August - 1960	Yellow Bullhead	200 10,000	adults young
August - 1960	LM Bass	35,000	fingerling
June - 1962	LM Bass	30,000	advanced fry

RESULTS

The 1959 season: Seine hauls and electro-fishing completed about mid-July failed to demonstrate the presence of largemouth bass fingerling. It was assumed at this time that, although the lake was relatively non-toxic to the minnows, it had been slightly toxic to the bass fry. A heavy bloom of blue-green algae during the last week in July brought about a severe oxygen depletion which killed 95 per cent of the zooplankters. No fish were found following this oxygen depletion. Natural disintergration of the algae and the application of 500 pounds of copper sulfate brought the algae under control and it presented little or no problem for the remainder of the season. On October 27, 1959, two 10-minute trawl hauls captured 11 largemouth bass fingerling from the group stocked in September, indicating a reasonably good survival.

Bluegills and crappies: The early spring stocking of adult bluegills (Table 1) apparently contained a number of adult black crappies. Seine hauls in August of 1960 indicated a heavy hatch of both bluegill and black crappie with a ratio of about one crappie for every four or five bluegills. This ratio of about 20 per cent crappies was found throughout most of the sampling that was done in 1961 and 1962. Although the population of bluegill was considered excessive, growth rates of both bluegills and crappies were about average during the past three seasons (Table 2).

TABLE 2. Average total length in inches of bluegill and black crappie in Center Lake during 1960, 1961, and 1962.

DATE	Average total length in inches	
	BLUEGILL	CRAPPIE
August 29, 1960	2.2	3.4
October 31, 1961	4.8	6.4
September 25, 1962	5.6	7.3

An attempt was made to reduce the bluegill population and improve growth rates by the removal of 50,000 fish in the fall of 1960. No noticeable increase in growth occurred.

During the 1961 season a number of anglers began fishing the bluegills and crappies, but relatively few (estimated at less than 5,000) were taken because of the small size. During the 1962 season, especially the latter part, bluegills were fished quite heavily. Center Lake was advertised as the "family" lake, a place to take the kids fishing. The bluegill fishing also attracted a number of older people who could bring a chair and fish bluegills from shore. There were several reports of individual families that took home over 200 fish from one day's outing. Although no routine creel census was conducted, it has been estimated from car counts and other figures that at least 35,000 bluegills and 2,000 crappies were taken during 1962.

A population estimate of the bluegills in Center Lake was completed during the month of September, 1962. Fourteen 5-minute trawl hauls captured an average of 173 bluegills and 47 crappies per haul. All bluegills were fin clipped and returned to the lake.

Subsequent trawling one week later produced an average of 165 bluegills per haul. Five marked fish were captured in a total sample of 1,154 bluegills for a population estimate of 562,000 bluegills. Examination of 742 bluegills taken in a seine haul turned up one marked fish, while one marked bluegill was found among 305 fish from a second seine haul, and one marked bluegill in a sample of 382 fish from a third seine haul. These three recaptures in a total sample of 1,429 fish pushed the population estimate up to 1,157,000 fish. The ratio of marked to unmarked in the seine haul samples was considered too low because they were collected from shoreline areas whereas the marking was conducted in the portions of the lake not reached by the seine. Thus it would appear that a population estimate of between 500 and 600 thousand bluegills would be a fair figure, or between 180 and 200 pounds per acre. Black crappies would then account for another 50 pounds per acre.

The three seine hauls mentioned above captured 60,000 bluegills and 7,500 crappies, which were removed from the lake, a reduction of about 25 pounds per acre.

Seine hauls made with 500 feet of 1/4-inch web failed to indicate bluegill or crappie reproduction during 1961 or 1962. Trawling operations in the deeper portions of the lake during population studies in September of 1962 did indicate a limited reproduction of bluegills. Both bluegills and crappies were mature and capable of spawning in 1962.

Largemouth bass: Electro-fishing in April of 1961 demonstrated an abundance of largemouth bass of both the 1959 and 1960 year classes. The older bass averaged 11.2 inches in length and 0.94 of a pound. The young bass averaged about 4 inches in length. The growth of these young bass during 1961 was poor. They attained a length of about 5.7 inches by August 25, 1961, and they were exactly the same length on July 6, 1962. An August seine haul failed to sample any bass. As noted in Table 1, advanced bass fry were stocked in June of 1962. The July 6 seine haul collected eight young bass either from this stocking or natural reproduction. The August seine haul failed to sample these fish.

Approximately 45 minutes of electro-fishing on September 28, 1962 indicated an abundance of bass of the 1959 year class and a few of the 1960 year class. The older bass averaged 14.8 inches in length and 2.28 pounds in weight, while the 1960 year class had found some food since July and now averaged 8.0 inches in length and weighed 0.28 pounds. Examination of scales from fish of both year classes showed the expected results.

It is interesting to note that three seine hauls with 2,200 feet of net failed to capture a single bass of the 1959 year class and only three of the 1960 year class.

Hook and line fishing for bass during 1961 and 1962 has been relatively good due to the high population of bluegills acting as forage. A few good bass fishermen have had excellent fishing and several limits have been reported.

Miscellaneous species: The yellow bullhead stocking appears to have been relatively unsuccessful. Only one yellow bullhead has been collected for measurement. Trawling has produced only a few black bullhead, and the population is considered very low in spite of the fact that bullhead fishing was considered good by some fishermen. In addition to the two species of bullheads, a single northern pike and a yellow perch have been collected.

Copper sulfate applications: Copper sulfate has been used to control blue-green algae blooms in each of the last three seasons. As noted above, 500 pounds were used in 1959. A total of 1,750 pounds was used during the summer of 1960. Applications were necessary through the entire summer but did not exceed 300 pounds in any one application. During 1961 an application of 1,500 pounds between June 20 and July 1 brought the algae under control and the lake remained free from objectionable blooms until freeze-up in late November. Treatments totalling 2,500 pounds were necessary to bring the algae under control by mid-June of 1962. The lake was free of algae until mid-September, when algae blooms were noted again.

SUMMARY

It is the opinion of the author that the cost of the project of rehabilitation of Center Lake has been justified by the fishing this lake has produced during the past and current season. Although the bluegills have not grown as fast as they might have, thousands have been taken on hook and line each week, with individual parties often taking as many as 200 in one day. Blue-green algae control the past two seasons has been particularly successful. A series of applicaations totalling 1,500 pounds of copper sulfate brought the nuisance under control by the first week in July and lasted the remainder of the season. In 1962 2,500 pounds were required for control and this lasted until September 15. Only fair fishing has been obtained on largemouth bass, moderate fishing on black bullheads and very little results noted from yellow bullhead stocking. Stocked fingerling and/or natural reproduction of bass have failed to establish strong year classes of intermediate-sized bass.

PROGRESS REPORT: MIDDLE RACCOON RIVER RENOVATION PROJECT

Harry M. Harrison
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and

Dale Stufflebeam
Area Fish Manager

INTRODUCTION

In August, 1959, the Middle Raccoon River and its major tributaries above the town of Redfield in Dallas County, Iowa, were treated with rotenone to devastate a fish population dominated by rough fish. This was done to create a void into which game fish would be stocked in an effort to improve the sport fishery in that stream.

A progress report which describes the scope of the project together with a description of the area, the procedures and techniques employed, and the results obtained through the year 1960, is contained in the October, 1960, Quarterly Biology Reports.

The present paper is a second progress report. It will be concerned only with the fishery aspects of the project, and will include a review of our stocking program together with the successes and failures of that work. Additionally, it will review the present status of the various fish species inhabitating the area as determined by surveys run in August and September, 1962.

STOCKING

Table I lists by species, age and number the fish stocked in the Middle Raccoon since rotenone treatment. A total of 876,064 fish involving six species has been released. Of the six species, the channel catfish and bullhead occurred in small to fair numbers before our chemical kill. Smallmouth bass were present, but in very small numbers. Largemouth bass, northern pike and walleye pike were not known from the stream in modern times.

In view of this knowledge, hopes for rapid repopulation in the Middle Raccoon were based upon the release of mature and sub-adult channel catfish and bullheads. The other species were introduced for experimental reasons, in that they occur in nearby areas or are found in similar habitat. They were stocked to ascertain if they could or would become established in marginal or sub-marginal habitat under conditions of minimum competition from other species.

Survival of stocked fish has been studied annually since the initial releases. Techniques employed have involved the use of seines, hoopnets, electrical shocking apparatus, and treatment of short segments of stream by sub-lethal doses of rotenone. The pertinent information resulting from this work follows by species.

TABLE 1. Summary of stocking by years, species, and age of fish, in Middle Raccoon River, 1959 through 1962

SPECIES	NUMBER OF FISH STOCKED				
	1959	1960	1961	1962	TOTAL
Channel catfish					
(a) Fry		184,000	98,000	100,000	382,000
(b) Fingerling	117,000			20,000	137,000
(c) Yearling	9,898				9,898
(d) Sub-adult	7,956	13,750	618		22,324
(e) Adults	342				342
Smallmouth bass					
(a) Fry				5,000	5,000
(b) Fingerling	2,000				2,000
Largemouth bass					
(a) Fry		22,000	20,000		42,000
(b) Fingerling	500				500
Bullhead					
(a) Adults	6,000	6,000		3,000	15,000
Northern pike					
(a) Fry			10,000		10,000
Walleye					
(a) Fry				250,000	250,000
TOTAL	143,696	225,750	128,618	378,000	876,064

Channel catfish: It was mentioned above that our hopes for repopulating the stream rapidly with fish rested upon the stocking of mature and sub-adult catfish. In line with this, 17,854 sub-adults and 342 mature channel catfish were stocked in 1959. This was followed by 13,750 sub-adults in 1960 and 618 in 1961. Studies conducted since have revealed an almost complete failure of these introductions. The reasons for failure have not been determined, but information accumulating since indicates substantial mortalities associated with the transfer of sub-adult catfish from one body of water to another. The losses experienced in Middle Raccoon are in all probability not unique.

Liberal plantings of hatchery-reared fry and fingerling catfish have been made each year (1959 through 1962, Table 1). Subsequent surveys revealed the loss of the 1959 stock, but the introductions made in 1960, 1961 and 1962, have succeeded in establishing excellent year classes. The loss of the 1959 fish is suspected to have resulted from insufficient food supply (bottom fauna) destroyed by rotenone in the kill operation.

Bullhead: Fifteen thousand adult bullheads have been stocked in the Middle Raccoon. The primary purpose of this endeavor was to furnish immediate angling while the game fish populations developed. Little has been learned about the actual success or failure of our bullhead releases. The resident bullhead population would not have been destroyed by

rotenone, and as a consequence, it has not been possible to distinguish between native and introduced fish. Nonetheless, the bullhead population exploded into the void created by our chemical treatment.

Smallmouth bass: Two thousand fingerling smallmouth bass were stocked in 1959 and 5,000 fry in 1962.

Studies during the past 2 years indicate a successful survival of the initial release. The species is not abundant but is scattered over a long reach (50 to 60 miles) of the stream. Since only 2,000 were released and they occurred in small numbers on most survey stations, it is reasonable to conclude that the species has survived well.

Of the fry released in 1962, a few have been observed in our seines. Due, however, to the limited amount of seining accomplished since that planting, we are not at this time aware of the success of the current year's stocking.

Largemouth bass, northern pike, and walleye: Table 1 gives the number and age of largemouth, northern, and walleyes stocked in the study area. For all practical purposes these plantings have resulted in failure. Occasionally, largemouth bass and northern pike are observed in our survey activities. Walleye pike have not been found.

STATUS OF FISH POPULATIONS, LATE SUMMER, 1962

The status of the fish population living in the renovated reach of the Middle Raccoon during the late summer of 1962, was determined by hoop netting, electrical shocking, application of sub-lethal doses of rotenone and seining. Eight segments of stream, distributed along its entire length and considered representative of the whole area, were checked by one or more of the afore-mentioned devices. Relevant information derived from this work follows. The major species will be discussed individually while the species of lesser importance will be discussed by related groups.

Channel catfish: Channel catfish has been and continues to be the most important species endemic to the Middle Raccoon. This importance comes essentially from the favor as an angling species, rather than from the standpoint of abundance. Prior to our renovation program, channel cat ranked no higher than fifth from an abundance point of view. At that time, they constituted less than 3 per cent of the population by both weight and total numbers. Presently, the species ranks second in abundance and makes up 15 per cent or more of the total population. The largest numbers are found from the headwaters of the Redfield impoundment up-stream to a point midway between Springbrook State Park and Coon Rapids.

Three distinct age groups occur. It is quite evident they originated from hatchery fish released in 1960, 1961 and 1962. The 1960 fish have a mean total length of about 12 inches, but range between 11 and 15. The 1961 fish average 8 inches and vary between 6 and 10. In September, the 1962 fish had attained a length of 2 to 3 inches.

Bullheads: Bullheads are far and away the most abundant species living in the Middle Raccoon today. Two species, the black and yellow, are present with the black variety outnumbering the yellow in a ratio of about 30 to 1. Together, the two species make up approximately 70 per cent of the total population by weight. They occur in profusion along the entire length of the stream. Length and weight distributions are excellent, with large numbers of 8 - 11 inch fish weighing in excess of one-half pound found in every pool and around every pile of drift material.

Smallmouth bass: This species is widely scattered in small numbers from the upper end of the impoundment at Redfield to Coon Rapids. The specimens observed in our current surveys were 10 - 11 inches long and are believed to be remenants of the 1959 stocking. If this is true, growth rate must be considered quite poor.

Rough fish: Before chemical treatment, rough fish including carp, carpsuckers, and common suckers, in that order of importance, dominated the fish population in the Middle Raccoon River. In combinations, they constituted 95 per cent or more of the fishery. The eradication program devastated the three species, and after 3 years only a slight recovery has been accomplished. At this time, these species make up no more than 10 per cent of the population. Common suckers are the ranking members, followed by carp. Carpsuckers are yet almost non-existent.

The failure of these fish to make a substantial comeback is believed to be essentially due to two factors: (1) an exceptionally proficient eradication program and (2) severe egg and fry predation by large bullhead and northern creek chub populations.

Forage Fish: Sixteen species considered as forage fish were found in the Raccoon River in our current surveys. Of these, northern creek chubs, bluntnose minnows, fathead minnows, brassy minnows, bigmouth shiners and sand shiners are the abundant species. Together they provide a rich forage condition.

ANGLING

At present, both bullhead and catfish populations are at levels sufficient to provide good to excellent fishing. There is little evidence, however, to show that this resource is being utilized. A few fishermen are found at convenient access points, but many miles of stream show no sign of recent use by anglers. From the information available, it appears that only minimum effort has been given to catfishing this past season. Bullhead fishermen are encountered more frequently and they are, for the most part, successful. But in general, public interest for fishing in the Middle Raccoon is low.

PROGRESS REPORT: RENOVATION OF THE IOWA RIVER, HARDIN COUNTY

Roger Schoumacher
Fisheries Biologist

In September, 1960, a portion of the Iowa River in Hardin County was rotenoned to eradicate a high population of rough fish in order to create a void into which game fish could be successfully introduced. An estimated 650,000 pounds of fish, mostly carp and catostomids, were removed from the following areas:

1. Alden impoundment.
2. Alden dam to Iowa Falls dam.
3. Steamboat Rock impoundment.
4. Below Steamboat Rock dam, with at least a partial kill to Eldora.

Cleary and Moen (1961) have reported on the initial phase of this program. One month after the kill they found a few carp and suckers had re-invaded the Alden pool, but only game fish, stocked after detoxification of the water, were present in the Iowa Falls pool. They suggested a lag in the resiliency of sucker populations following such projects.

Cleary (unpublished) conducted a survey in July of 1961, using both trap nets and shocker. The electro-fishing gear revealed a fish population in the Alden pool that was almost identical to the population present before chemical treatment (Table 1). In the Iowa Falls impoundment, however, there seemed to be a slight increase in the game-fish population, whereas the sucker population was much lower. Unfortunately, the "lag" in the sucker population was accompanied by a proportionate increase in the carp population.

The purpose of this paper is to report on observations as to the fish populations as expressed by trap nets, baited hoop nets, and electro-fishing gear in 1962, and to record the comments pertaining to fishing quality in the area before and after chemical treatment as reported to me by the Conservation Officer in the area, Mr. Duane Wilson.

Alden Impoundment

Trap net catches in 1962 seem to show that percentage-wise the game-fish population is down from 1961 and the non-game fish population is up (Table 2). The sucker portion of the population has increased considerably.

Channel Catfish: One hundred forty-four hours of fishing with cheese-baited hoop nets failed to catch a single catfish. One thousand sub-adults were stocked in October, 1960.

Largemouth Bass: No largemouth bass were taken. Five thousand fry were stocked in June, 1961.

TABLE 1. Per cent composition of pre- and post-eradication fish populations, by weight, in the Alden impoundment of the Iowa River, as expressed by electro-fishing gear (Cleary, unpublished)

	Pre-kill (1960)	Post-kill (1961)
Game fish	3	10
Non-game fish		
Suckers	16	20
Carp	81	70
TOTALS	100	100

TABLE 2. Per cent composition, by weight, of trap-net catches in the Alden impoundment of the Iowa River in 1961 and 1962

	1961	1962
Game fish	20	12
Non-game fish		
Suckers	3	28
Carp	77	60
TOTALS	100	100

Smallmouth Bass: None were taken. Five thousand fry were stocked in June, 1961.

White Crappie: Nine hundred adults were stocked in the fall of 1960. None were taken in 1962, although 12 were caught in the 1961 netting operations.

Bluegill: No bluegills were taken. One thousand adults were stocked in 1960 following chemical treatment.

Black Bullheads: No bullheads were stocked. In 1961, however, 152 were taken, and in 1962 there were 26 in the trap-net catch. Their average weight in pounds declined from 0.34 to 0.24 between 1961 and 1962.

Northern Pike: Two fish averaging 1.7 pounds were taken in 1961. The 1962 catch consisted of one 6.2-pound fish. No northern pike were stocked in the area after chemical treatment of the water.

A report on the fishing in the area by Conservation Officer Duane Wilson revealed the following information:

1. There is not at present, nor was there prior to chemical eradication, a fishery of any significance for channel catfish, largemouth bass, smallmouth bass, crappie, bluegills, or northern pike.

2. There was a good fishery for bullheads both before and after chemical treatment.

The Alden impoundment, then, seems to be of about the same population composition now as it was prior to treatment. Bullheads and northern pike, neither of which were stocked, comprise the bulk of the sport fish population. A tremendous population of crayfish taken in the cheese-baited hoop nets fished for catfish indicates that the fish population has not yet reached a level at which it is utilizing the available food supply. A fairly heavy stocking of sub-adult or adult catfish might be successful in getting the species started and utilizing the crayfish population.

Alden Dam to Iowa Falls Dam

Electro-fishing data (Table 3) indicated that the game fish segment of the population is up, the sucker portion remains the same as in 1961, and the carp population is down proportionately. Trap net catches also indicate an increase in game fish over the 1961 data (Table 4).

Channel Catfish: One 2.3-pound catfish was taken in trap nets, and 175 were taken in 288 hours of fishing with cheese-baited hoop nets above the Iowa Falls impoundment. These fish averaged about 5.5 inches, and were the result of 60,000 fingerlings stocked in 1960 and 1961. Baited hoop nets set immediately below the Alden dam failed to catch a single catfish in 144 hours of fishing.

TABLE 3. Per cent composition of pre- and post-eradication fish populations, by weight, in the Iowa Falls impoundment of the Iowa River, as expressed by electro-fishing gear

	Pre-kill (1960)	Post-kill (1961)	Post-kill (1962)
Game fish	2	6	22
Non-game fish			
Suckers	43	2	3
Carp	55	92	75
TOTALS	100	100	100

TABLE 4. Per cent composition, by weight, of trap net catches in the Iowa Falls impoundment of the Iowa River in 1961 and 1962

	1961	1962
Game fish	9	33
Non-game fish		
Suckers	12	0
Carp	79	67
TOTALS	100	100

Largemouth Bass: Stockings of 8,120 fingerlings in 1960 and 3,880 in 1961 have established a fishery for this species. Sampling with nets and shocker indicates that largemouth bass comprise about 10 per cent of the fish population by weight. Sixteen bass taken had an average length of 10.5 inches and were extremely fat.

Smallmouth Bass: This species is present in small numbers, a result of a stocking of 12,000 fry in 1961. The fish have made good growth.

White Crappie: Only six crappies were taken in sampling operations. These are the result of a stocking of 1,200 adults in 1960.

Bluegill: No bluegills were taken, although 1,200 adults were stocked in October of 1960.

Black Bullhead: Nearly 100 bullheads were taken in baited catfish nets, and they averaged about 6 inches in length. This species was not stocked in the area following chemical treatment.

Northern Pike: Although no pike were stocked in this area, there is a good population of these fish at the present time. They comprised 75 per cent by weight of the game fish taken in trap nets in 1962, and averaged better than 2.5 pounds each.

White Bass: None of this species was taken this year. Five hundred adults were stocked in October, 1960, and one fish was taken in the 1961 sampling program.

Walleye: None of the one million fry stocked in May of 1961 have been taken in the sampling program.

A report on the fishing, by Duane Wilson, reveals the following information:

1. There is not now, nor has there been in the past few years, a fishery of any consequence for white bass, walleyes, or bluegills.

2. Channel catfish fishing was good before chemical treatment. The fish present now are too small to catch.

3. Some largemouth bass were taken before eradication. Fishing was good in the fall of 1961, and indications are that it will be at least fair again this fall.

4. Smallmouth bass fishing was pretty good in the river, and quite a few of them have been taken this year.

5. Crappie fishing was good in the impoundment prior to treatment. It remained good in the spring of 1961, but there was very little this year.

6. Northern pike fishing has improved somewhat since chemical treatment, and the people who fish the impoundment are anxious to have more of these fish.

Harrison (1962) found that it took 5 to 6 years for catfish to reach catchable size in numbers sufficient to support a fishery following chemical treatment of a portion of the Des Moines River. It will probably be 3 years, therefore, before good catfishing can be expected in this area. A heavy population of crayfish was found again the Iowa Falls area, indicating there is still "room" for more fish. Catfish, smallmouth bass, and largemouth bass might be profitably stocked to fill this space. It is also recommended that walleye stocking be discontinued, and that the possibilities of northern pike stocking, based on future surveys, be investigated.

Steamboat Rock Impoundment

Sampling in this pool was limited due to bad weather. Electro-fishing disclosed a fish population comprised chiefly of suckers and carp, with some largemouth bass present. Cheese-baited hoop nets captured 47 channel catfish averaging 6.0 inches and 23 black bullheads averaging 6.5 inches in 288 hours of fishing. No smallmouth bass, bluegill, crappie, or walleye were found. The Conservation Officer reports that fishing was good for channel cat and smallmouth bass before treatment. Since the eradication there have been a few largemouth and smallmouth bass caught.

Additional stockings of channel catfish and smallmouth bass seem justified.

Below Steamboat Rock Dam

Since chemical treatment this area has produced good catches of walleye, bullheads, catfish, smallmouth bass, and some northern pike. The only stocking consisted of 351 sub-adult walleyes and one million fry. Fish evidently moved into the area from the stream below. No sampling was done due to high water conditions.

SUMMARY

1. A portion of the Iowa River in Hardin County was treated with rotenone in the fall of 1960. Six hundred and fifty thousand pounds of fish were removed.

2. Surveys in 1962 indicate the composition of the fish population in the Alden pool is the same as it was before treatment. A heavy stocking of catfish might be successful in establishing the species.

3. The game fish population between the Alden dam and the Iowa Falls dam is up, and a fishery for northern pike and bass has been established. Stocking of these species should be continued. The catfish population consists of fish that are still too small to be caught.

4. The Steamboat Rock impoundment fish population is compised chiefly of suckers and carp. Smallmouth bass and catfish stocking should be continued to establish these species.

5. Fishing got catfish, walleyes, smallmouth bass, and bullheads has been good below the Steamboat Rock dam.

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