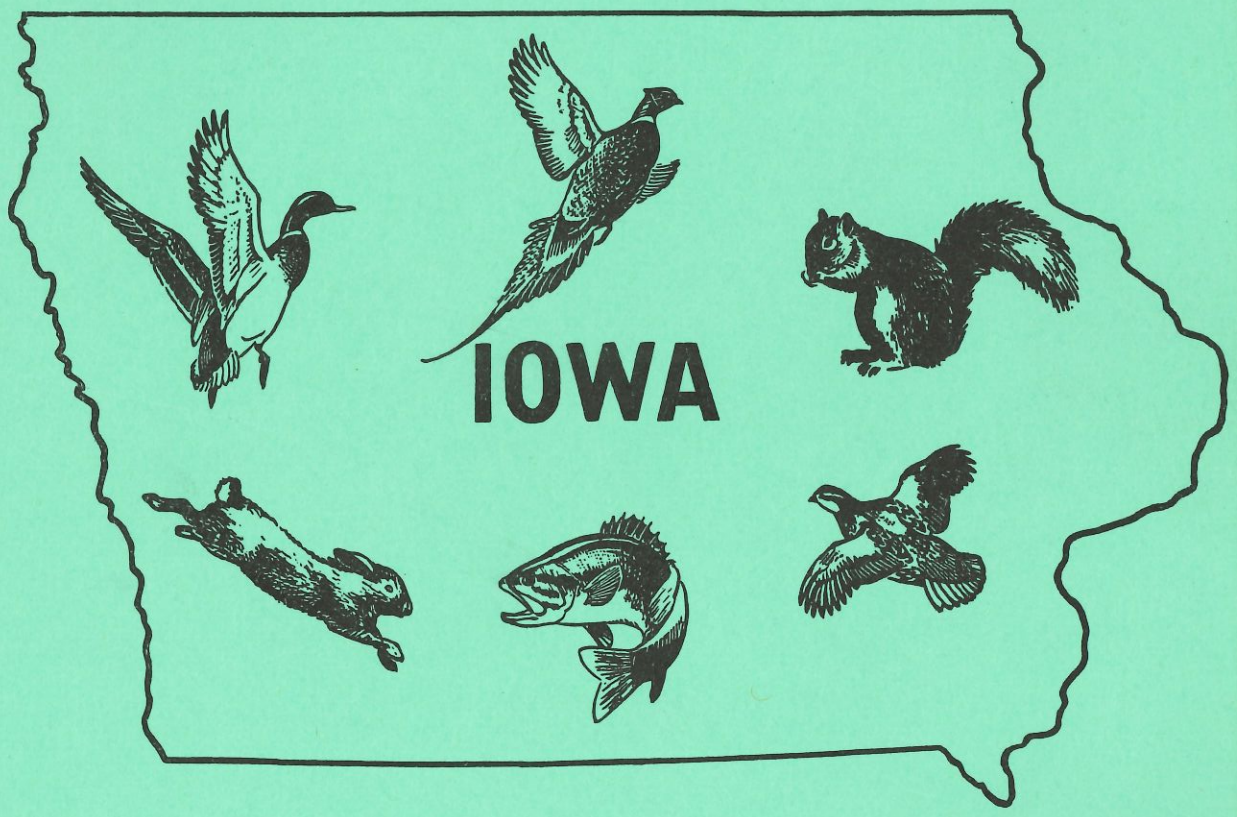
1965

QUARTERLY BIOLOGY REPORTS



FISH AND GAME DIVISION — BIOLOGY SECTION

STATE CONSERVATION COMMISSION

TABLE OF CONTENTS

ABSTRACTS

ABSTRACTS OF ALL PAPERS PRECEDE THE PAPERS IN THE REPORT..... (Page I-V)

GAME — PAGE NO.

1. Trapping Ruffed Grouse in the Yellow River Forest
By Keith D. Larson---------- 1 - 2

2. Reeves Pheasant Sightings and Stockings, 1963-65
By Gene Hlavka---------- 3 - 7

3. Spring and Summer Quail Populations, 1965
By M. E. Stempel---------- 8 - 14

4. Iowa's Late Summer Pheasant Population - 1965
By Richard C. Nomsen---------- 15 - 22

5. Results of July 1964 Roadside Rabbit Surveys
By M. E. Stempel---------- 23 - 27

6. Marked Hen Mallard Study
By Richard Bishop---------- 28 - 30

FISHERIES

1. Stream Improvement Work on Elk Creek Delaware County
By Roger Schoumacher---------- 31 - 32

2. Creel Census Results from Clear and Black Hawk Lakes
By Terry Jennings---------- 33 - 40

3. Five Years of Officer Contact Creel Census on Northeast Iowa Streams, 1960-1964
By Robert Schacht---------- 41 - 43

4. Coralville Reservoir and Lake MacBride Creel Census - 1965
By Don Helms---------- 44 - 51

5. Age Structure of Spawining Channel Catfish
By Gary L. Ackerman---------- 52 - 58

6. Pre-impoundment Studies of the Chariton River in the Vicinity of Rathbun Dam and Reservoir
By Jim Mayhew---------- 59 - 67

ABSTRACTS OF QUARTERLY BIOLOGY REPORTS

TRAPPING RUFFED GROUSE IN THE YELLOW RIVER FOREST

A Progress Report

Keith D. Larson
Game Biologist

Trapping of Ruffed Grouse for transplanting to Shimek Forest from the Yellow River Forest was begun in June 1965. Twenty traps were constructed and operated beginning July 15. Twenty five grouse have been captured, and twelve of these were released in Shimek Forest. Three grouse await transport, four have escaped, two died by predation and four died in holding room. Released birds were strong fliers even after up to 17 days in captivity. The program is continuing.

REEVES PHEASANT SIGHTINGS AND STOCKINGS, 1963-65

Gene Hlavka
Game Biologist

During the 1963-65 period over 2,400 Reeves pheasants have been stocked in the Stephens State Forest. Prior to October 1965 most were surplus cocks or adult brood stock released after the laying season at the Wildlife Research Station. Five Reeves broods consisting of a minimum of 53 chicks have been reported during the past summer, the first during which any significant reproduction would be expected. One nest was found. About 98% of the released birds sighted have been within 5 miles of their release site; almost 90% have been within the first mile.

SPRING AND SUMMER QUAIL POPULATIONS, 1965

M. E. Stempel
Game Biologist

The July whistling quail count is our chief source of information on the quail population. It is supplemented by rural mail carrier surveys, Conservation Officer sight records and by information recorded on the July roadside rabbit and the August pheasant surveys. Winter spring weather was about 2 weeks behind that of 1964. Best populations are again in the south-central and the southeast. The whistling quail counts indicated a statewide increase of 9 per cent in brood stock. Mail carrier counts show a 17 per cent gain. On the August roadside pheasant counts, which include a larger portion of the young quail, there was a 60 per cent gain in quail sighted over 1964. The general conclusion from the several surveys is that the quail population is significantly greater than last year.

IOWA'S LATE SUMMER PHEASANT POPULATION - 1965

Richard C. Nomsen
Game Biologist

The August roadside pheasant count is the primary source of information on the status of the pre-hunting season pheasant population. The winter of 1964-1965 was the coldest since 1935-1936 and two severe March blizzards caused above normal losses to Iowa's brood stock of pheasants. During the August count, observers recorded 9,174 pheasants or 1.66 birds per mile -- a decrease of 39 per cent from the 1964 count. The highest pheasant population was in the southwest and west central Iowa. Lower reproductive success was indicated by most of the various surveys.

RESULTS OF JULY, 1964 ROADSIDE RABBIT SURVEYS

M. E. Stempel
Game Biologist

July roadside surveys for 1965 revealed an increase in the southern and eastern portions of Iowa. Because of changes elsewhere, the statewide index decreased from 6.69 rabbits seen per 10 miles in 1964 to 6.05 in 1965. The statewide index was higher than the 15-year average with only western Iowa showing a decrease. The lowest indices this year were in northern Iowa, though the 15-year-average low occurs in eastern Iowa. Production to the time the 1965 census was completed, as indicated by age ratios (2.37 juveniles per adult), was slightly lower than for 1964 (2.48) and 1963 (2.41) and higher than 1962 (2.06). The average for 14 years previous to 1964 was 2.51. The carryover of cottontails for brood stock from 1964 was less than that of last year. The 1965 fall population index (based on production) was 4.26 compared to 4.79 for 1964, but the 1965 fall index is higher than the fall index for 1963 (3.94) or 1962 (2.33). The index of jackrabbits (0.11) was near the indices for 1964 and 1963 (0.15 per 10 miles and 0.17 respectively). The number of rabbits seen during the spring and summer surveys and quail whistling counts are recorded here and thses also show some statewide decrease from 1964. However the later August pheasant survey indicated a slight increase over August 1964. All factors point to a good rabbit hunting season in prospect with better hunting than usual in southern Iowa.

MARKED HEN MALLARD STUDY

Richard Bishop
Game Biologist

A study was initiated in April of 1964 in an attempt to increase local breeding populations of mallards on Iowa marshes. Approximately 100 marked hen mallards were released on each of three areas, Ventura Marsh, Harmon Lake, and Dan Green Slough, in early April of 1964 and 1965. It was theorized that domestic hens released on individual marshes would mate with wild drakes and produce semi-wild ducklings that would return the following spring to nest on the marsh where they were raised. Hens mated with wild drakes and some attempted to nest; however

nest predation was extremely high and very few nests were successful. Mortality was very high on the released hens and only a few broods were observed. Due to the lack of waryness of domestic hens released to the wild it is doubtful if any of the semi-wild ducklings were reared. Eight other states have conducted more detailed studies but have had similar results.

STREAM IMPROVEMENT WORK ON ELK CREEK DELAWARE COUNTY

Roger Schoumacher
Fisheries Biologist

Since 1963, 60 stream improvement devices have been installed in Elk Creek, and Iowa trout stream, by the Delaware County Conservation Board under the guidance of the Biology Section of the Conservation Commission. These structures were gabions, trash-catchers, diversion dams, and bank stabilization structures. To date nearly all of the structures are performing very well and additional future work is expected.

CREEL CENSUS RESULTS FROM CLEAR AND BLACK HAWK LAKES 1963 and 1964

Terry Jennings
Fisheries Biologist

Data are presented on the comprehensive creel census results from Clear Lake and Black Hawk Lake for the years of 1963 and 1964. The census period on Clear Lake extended from May through September both years. During 1963, Black Hawk Lake was censused again from July through October. The 1964 census period on Black Hawk covered six months of open water fishing from May through October. On the average, each one of the 3,643 acres of water in Clear Lake sustained an estimated fishing pressure of 6 angling trips totaling 18 hours during 1963 and 1964. The 1963 and 1964 fish harvested per acre was quite close (30 and 28 respectively). Likewise, the fishing rate for each year was similar 1.64 and 1.55 fish per hour respectively. During 1963, there was an estimated average of 15 fishing trips totaling 40 hours made per acre of water in Black Hawk Lake. This effort produced 72 fish or 62 pounds per acre. With one added month censused in 1964, the fishing pressure per acre rose to 21 trips totaling 59 hours. A per acre total of 98 fish totaling 77 pounds were estimated to have been harvested. The rate of fishing for each of these two years were 1.87 and 1.66 fish per hour.

FIVE YEARS OF OFFICER CONTACT CREEL CENSUS ON NORTHEAST IOWA STREAMS, 1960-1964

By Robert Schacht
Fisheries Biologist

During a five year period from 1960 to 1964, Iowa Conservation Officers contacted fishermen in the field to obtain a picture of the angler harvest. The officers contacted 5,528 fishermen on Iowa trout streams. These anglers caught 8,098 trout in 11,359 hours at the rate of 0.71 fish per hour. On the Iowa, Cedar, Wapsipinicon, and Maquoketa Rivers, 8,529 fishermen fished 14,603 hours and caught 10,525 fish at the rate of 0.72 fish per hour. Bullheads were the most numerous fish in the creel.

A voluntary creel census of better than average anglers indicated they had a higher success rate that the officer contacts, and caught a higher percentage of catfish, bass, and crappies.

CORALVILLE RESERVOIR AND LAKE MACBRIDE CREEL CENSUS - 1965

Don Helms
Fisheries Biologist

The third consecutive creel census of the Coralville Reservoir-Lake MacBride sport fishery was made during the 1965 summer season. It was determined that the two lakes attracted 523,000 fishermen. They traveled a combined distance of 5,935,700 miles, fished 921,100 hours, and caught 1,192,200 fish that weighed 423,050 pounds. The monetary value of the sport fishery during the summer of 1965 was calculated at $520,349. The primary species fished for and caught in the greatest numbers were bullhead, crappie, channel catfish and carp.

AGE STRUCTURE OF SPAWNING CHANNEL CATFISH

Gary L. Ackerman
Fisheries Biologist

This paper summarizes three phases of the Red Rock pre-impoundment study. First, the design of the study area is discussed. Second, a new proposal on tagging and its' problems are presented. And lastly, some data on migrational tendencies of spawning channel catfish are reviewed.

PRE-IMPOUNDMENT STUDIES OF THE CHARITON RIVER IN THE VICINITY OF RATHBUN DAM AND RESERVOIR

Part I: Annotated List of the Fishes in the Chariton River and Tributaries.

Jim Mayhew
Fisheries Biologist

Fish were collected during the summers of 1964 and 1965 in the vicinity of Rathbun Dam and Reservoir on the Chariton River. The reservoir will be impounded in 1968 and will flood 21,000 acres of agricultural land. The purpose of the study was to report on the number of species and their relative abundance prior to impoundment. Further studies after the river is impounded will determine the influence of a large flood control dam on the native fish populations. Fish from 10 families representing 35 species were found in the stream and tributaries. Nine other species have been reported in this stream by other workers, and the present study added two species not found before.

TRAPPING RUFFED GROUSE IN THE YELLOW RIVER FOREST

A Progress Report
by

Keith D. Larson
Game Biologist

Introduction

On June 1, the biology section began a program of trapping and transplanting grouse from the Yellow River Forest in Allamakee County to the Shimek Forest in Lee County. This is a progress report on the results of this effort. An undergraduate college student was employed for a 90-day period to begin the program. Arrangements were made to provide two inmates of the Luster Heights Camp to assist in the construction of traps and the movement of traps to new sites.

Methods and Materials

The trap design employed was the modified Clover trap that has been used with some success for shorebirds as well as grouse (Gullion, Clover). Twenty traps were built and set up in the Yellow River Forest (Paint Creek and Paint Rock Units). Initially the student spent considerable time familiarizing himself with grouse habitat, particularly trying to locate grouse brood habitat. A search was made for grouse nests to determine how difficult and productive this would be. Considerable driving of forest roads was done to determine frequency of sightings of broods along these roads.

An abandoned farm house was located on an all-weather road and was converted into a holding room for grouse. Fish netting was installed about a foot from the walls and ceiling to protect the grouse from injury when disturbed or first released into the room.

The student was taught the technique of making blood smears so that each grouse could be checked for blood parasites. Hein (1963) found the organism Haemoproteous in fall trapped grouse.

Trapping was begun in the middle of July when the red raspberries were ripe. Traps were set adjacent to berry patches along woods roads. Traps were moved subsequently to black berry patches and then to dogwood late in the summer after the berry season.

Grouse were fed berries initially by rolling them across the grouse room in front of captive grouse. This was done to insure survival at first but later it was found to be unnecessary. Whole berry bushes were placed on the floor and the grouse would help themselves. Later dogwood was cut and placed on the floor. Water was provided but it was never used to a noticeable degree.

RESULTS

During the 3-month trapping period through October 19th 25 grouse have been captured, one with a nest trap and 24 with the clover traps. Twelve grouse were released in Shimek forest, three await shipment, two escaped while handling, four died in the holding room, two died by predation, and two flew through the net.

The condition of released birds was excellent; only two birds had scalped heads. All flew strongly, which in general indicated no serious injury due to handling.

Only two of the birds trapped in the clover traps were adults. No bait was used in these traps in the beginning, and when tried later baiting was found not to increase success. Birds were held successfully as long as 17 days prior to release.

REEVES PHEASANT SIGHTINGS AND STOCKINGS, 1963-65

Gene Hlavka
Game Biologist

INTRODUCTION

The Reeves pheasant was first introduced into Iowa in 1963 adjacent to the Cedar Creek Unit of the Stephens State Forest in Lucas County northeast of Chariton. The Reeves in its native habitat of China is primarily a bird of the forest. Its diet consists of mast, berries, seeds and insects. The Reeves normally roost in trees at night. The forested river valleys, timbered pastures and other woodlands of southern Iowa appear to resemble in several respects the wooded hills of central and northern China. In Europe, the Reeves has become established in England, France, Austria, Hungary, Czechoslovakia and Yugoslavia.

The Reeves cock is a big pheasant weighing about 4 pounds. The spurs are long and sharp. The spectacular tail, which may reach 4 or 5 feet in the cocks, can be used as a "brake" or "rudder". The cock can be easily recognized by the black "Lone Ranger" mask that encircles the white head. The brownish hens haveless noticeable markings.

STOCKINGS

To date, over 2,400 Reeves have been stocked in the 5 units of the Stephens State Forest (Table 1). Most of the early releases were comprised of surplus cocks, the hens being held over for brood stock at the Wildlife Research Station near Boone. The October 1965 releases, totaling 885 cocks and 624 hens, freed juvenile birds in all of the units. Cocks only were stocked in the 1000-Acre and Lucas units; the hens will follow after the 1966 laying season.

The stocking of 927 Reeves adjacent to the Cedar Creek Unit in the 1963-June '65 period might be considered in a sense as one year's "mass" release. The October 1965 stocking of 1500 birds is actually the first such "mass" release at a single time.

SIGHTINGS

Five Reeves broods consisting of a minimum of 53 chicks were reported to us in the summer of 1965 (Table 2). These broods were seen along roadsides. Four broods were sighted within 5 miles of the release site which was in (Section 6, Cedar Twp.). Hens were reported seen with four of the broods. Two broods were sighted by Commission personnel. This observer saw no broods, only released birds. Fire lanes and woodland edges were walked at various hours of several days. The surrounding roads were also driven at various hours when road conditions were favorable. The farmers in the vicinity of the release site reported no brood sightings. Only 181 hens had been released in 1963 and 1964 and only the survivors of these would be in position to produce young in 1965. Though the actual number of survivors is not known, it is believed unlikely there were more than 50 hens remaining. Because of the very dense cover present, it is not known how many broods may have actually been produced.

The only Reeves nest found was reported by a local resident. This nest was observed during the first half of June, 1965 in an old roll of fence covered with brush. The sitting hen and nest were not disturbed.

Table 1. Summarization of Reeves Pheasant Stockings in or Near The Stephens State Forest, 1963-65

		1963 Cedar Creek Unit	1964 Cedar Creek Unit	1965 Cedar Creek	White Breast	Chariton	1000-Acres	Lucas	
Cocks	Adults	56	42	46	-	-	-	-	
	Juveniles	89	266	145	220	240	120	160	
	Total	145	308						931
Hens	Adults	76	-	247	-	-	-	-	
	Juveniles	-	105	164	220	240	-	-	
	Total	76	105						871
Total Birds		221	413						1,802

All Three years

		Cedar Creek	White Breast	Chariton	1000-Acres	Lucas	
Cocks	Adults	144	-	-	-	-	
	Juveniles	500	220	240	120	160	
	Total	644	220	240	120	160	1,384
	Adults	323	-	-	-	-	
	Juveniles	269	220	240	-	-	
	Total	592	220	240	-	-	1,052
Total Birds		1,236	440	480	120	160	2,436

Table 2. Summary of Reeves Pheasant Brood Sightings, 1965

Miles From Release Site When Seen	No. Broods Sighted	No. Chicks Per Brood	Hen With?
0-1	2	16-20	Yes - Yes
1-5	2	1-8	Yes - ?
5-10	1	8	Yes
totals	5	53	

The pattern of sightings of released birds in 1965 was similar to that of 1963 and 1964 (Klonglan, Eugene D. & Hlavka, G. 1964, Reeves Pheasant Introduction into Iowa. Qrtly. Biol. Reports, Iowa Conservation Comm. (16) 4: 4-9). A great majority of the Reeves were seen within 5 miles of the release site (Table 3). In 1965 verified sightings were made on 29 different days. A total of 149 "bird-sightings" was recorded. From 1963-65 about 98% of the released Reeves were seen within 5 miles of the release site; almost 90% within the first mile. Most sightings by local residents are of birds seen at roadsides. However, the observer did sight Reeves cocks in a pastured woodland and along a woodland edge.

DISCUSSION

Sighting reports by local people usually include a remark about tameness. Newly released Reeves are especially reluctant to get out of the way of an on coming vehicle. Enountering a single cock along a woodland edge, I approached to less than 10 feet. When I grabbed at the bird the cock darted and half-flew across the adjoining pasture. In hot pursuit I succeeded in the undergrowth at the far edge in stepping on one tail feather, thereby collecting a splendid souvenir. When I walked away, the cock turned and followed. Another grab meant another miss. When I gave up the chase, this confident cock walked parallel to me for a short time before fading into the woodland. On another occasion while I was following a cattle trail in a different timber tract, four chattering cocks came toward me. I could see leg bands on 3 birds. I eased to 10 feet of one cock. After I stopped, the cocks gradually faded into the timber.

The mast crop for the autumn of 1965 is excellent in the Stephens State Forest. A few Reeves will be collected and the crops and gizzards examined to ascertain if the birds are utilizing this bountiful food supply. After one of the wettest Septembers on record, water seems to be plentiful With the release of 624 juvenile hens in October 1965 in the Stephens State Forest, it is hoped that brood production in 1966 will be noticeably increased.

Table 3. Summarization of Reeves Pheasant Sightings Made in Vicinity of the Cedar Creek Release Site, 1963-65.

Miles From Release Site When Seen	1965			1963-64-65			
	No. Days Sightings Made	No. Birds Sighted	Avg. Per Sighting	No. Days Sightings Made	No. Birds Sighted	Avg. Per Sighting	
0-1	12	112	9.3	45	605	13.4	(89%)
1-5	14	34	2.4	29	65	2.2	(98%)
5-10	3	3	1.0	6	6	1.0	
10-15	-	-	-	1	1	1.0	
15-20	-	-	-	1	1	1.0	
Totals	29	149	5.1	82	678	8.3	

SPRING AND SUMMER QUAIL POPULATIONS, 1965

M. E. Stempel
Game Biologist

INTRODUCTION

The July count of whistling cock quail is the primary means of determining breeding quail populations. A resume of this procedure is given in the 1963 July-September Quarterly Biology Reports. The method, as used in Iowa, is based on 91 ten-stop routes distributed throughout Iowa.

Additional information used in calculating the prospective fall population is obtained each year from commission personnel game sight records on which quail are recorded. These censuses are taken from April through August. In July, rural mail carriers also count quail, together with other small game species. Information from all these counts gives a fairly complete picture of post-winter survival, summer adult populations, and of the production up to late summer.

Favorable weather preceeding pairing and nesting is necessary so that breeding quail will be in prime condition. In this respect, in the quail territory the 1964-65 winter had no excessive snowfall, but it was one of the coldest since 1935-36. Spring quail populations over the state were lower than in 1964. April weather was mostly favorable through rainfall was above normal. May was warm and wet. June was a fine month with some localized storms. Early July was cool. Early August weather tended to be hot and dry, but a month-long wet period began in late August. Weather conditions were reflected in the development of corn during summer; in July the corn developed slowly because of cool weather; slow development continued through September which was cool and very wet.

(The above weather and crop information for dates concerned is from Iowa Climatological Data and Iowa Weekly Weather and Crop Reports.)

The censusing system was essentially the same as described in the Quarterly Biology Reports for July-September 1964, and as mentioned there, the changeover to uniform ten-stop routes was completed in 1965.

RESULTS

Whistling Quail Census: Statewide

This July count indicates annual variations in the Iowa breeding quail numbers (Table 1). The 1965 count was made on 91, ten-stop routes. On a total of 910 stops, 1,122 cocks were heard calling. This amounted to a mean of 1.23 per stop compared to 1.13 in 1964, which is a 9 per cent increase.

The increase in numbers of quail in prime range (south-central and southeast) was 10 per cent. In the areas which border the prime range (central, east and southwest) the change ranged from 35 per cent loss to 93 per cent gain; however, these areas have relatively few quail. In northern Iowa there was a decrease, but since the number of quail is so small a precise measure of

TABLE 1. July Whistling Quail counts, Iowa. 1965

Region of State	No. of Routes	No. of Stops	No. of Whistling Cocks	Mean no. Whistling Cocks per Stop	1964 Mean /stop	Per cent Change from 1964
NW	13	130	3	0.02	0.06	-67
NC	10	100	8	0.08	0.33	-76
C	17	170	193	1.14	0.59	+93
E	19	190	219	1.15	0.63	+83
SW	11	110	73	.67	1.03	-35
SE & SC	21	210	626	2.98	2.70	+10
Statewide	91	910	1,122	1.23	1.13	- 9

TABLE 2. Quail counted by rural mail carriers, late July, Iowa , 1965

Region of State	No. of Routes	No. of Miles Driven	No. Quail seen	No. of quail Seen / 100 Miles	1964 No. of quail seen / 100 Miles	Per cent Change from 1964
NW	116	7,683	144	1.88	1.83	+ 2
NC	69	4,524	3	0.06	0.13	- 54
C	108	7,403	75	1.02	1.49	- 32
E	116	6,670	290	4.37	3.77	+ 16
SW	194	6,210	187	3.03	3.90	- 22
SC & SE	100	5,078	1,184	23.49	14.24	+ 65
Statewide	1,069	37,235	1,883	5.06	4.32	+ 17

the population change is difficult to obtain.

June, July and August Whistling Quail Routes

Additional 1965 calling quail counts were made by biologists, biologists' aids and game managers along routes in central and in southern Iowa. In 1965 on routes in this category, 108 whistling quail were counted in June, 107 in July and 61 in August. Of these routes, several were run in both 1965 and 1964. On these comparable routes in 1965, 36 were heard in June; 42 in July and 37 in August. In 1964 on these same routes, 32 quail were heard in June, 23 in July, and 14 in August. More were heard and seen in 1965 in each of the three months.

Calling began about the same time both years, and the early calling rate was higher in 1964. However, the 1965 whistling rate remained high over a longer period.

Wapello and Wayne-Decatur Research Areas

Sunrise whistling activity in quail begins in late March or in April. It ends in September. The activity is checked at frequent intervals regardless of weather on a five-stop route in the Wapello County Research Area. About once each two weeks the number of calling males are recorded along a ten-stop route at sunrise when the sky is clear and wind is moderate: This is the same procedure used on the statewide routes.

In 1965 on the aforementioned route, sunup calling began in April, it peaked June 24 and after a short decline, the calling increased, then the calling dwindled in late August at which time (August 20) 18 calling males were counted. In 1964 only the Wapello route was in use and sunup calling began in April, it peaked June 3; then there was a slight recession with another peak July 10; thence calling diminished and it was seldom heard after August 19. The calling peak was most extensive in 1965.

The Wayne-Decatur County route was first run in 1965, and the calling peak was at about the same time as for the Wapello Route.

Rural Mail Carrier Counts

Second in importance to the whistling quail counts, because of the large numbers of quail reported (Table 2), is the rural mail carriers' count. The quail seen during one week of late July is reported. In 1965 the returned postcards showed 1,883 quail in 37,235 miles. This averages 5.06 per 100 miles compared to 4.32 in 1964. This is a 17 per cent increase. The north-west and north-central portions of Iowa have fewest quail and here the numbers and the miles were nearly the same as in 1964. Within the fair to good quail range, the gain was up to a plus 65 per cent in the south.

QUAIL SIGHT RECORDS IN CONJUNCTION WITH OTHER COUNTS

On Spring Pheasant Counts

A measure of quail winter survival is obtained from the numbers of quail sighted on the April-

May spring pheasant surveys. In 1965 this covered 1,910 miles of ten-mile routes with 41 quail seen, which was an average of 2.15 per 100 miles. In 1964 along 1,770 miles of ten-mile routes 52 quail were seen, which was an average of 3.01 per 100 miles. This is a decrease of 29 per cent since 1964. The corresponding figure for 1963 was 2.83 per 100 miles. In 1962 it was 1.20.

On Rabbit Counts

Quail are also counted on the regular July rabbit counts. These are made along roads that were selected because they are in rabbit territory, which in southern Iowa is also quail range. The procedure is described in the 1963 July-September Biology Reports in the rabbit report. In 1965 this count was made on 3,454 miles of routes throughout the state. Altogether, 133 quail were reported seen for an average of 3.85 per 100 miles (Table 3). In 1964, on 3,139 miles of route throughout the state 121 quail were reported for an average of 3.85 per 100 miles. While the totals for the two years were similar, and averages were identical, there was a gain of 158 per cent in the east, with 76 per cent gain in the south-west and there were losses of 57 per cnet in the central portion and 31 per cent in the south. The numbers of coveys seen should be an indicator of the stage of production at the time of the census. Since coveys are not recorded, any report of 9 or more quail is considered as an indicator of a covey. In 1965 2 such coveys were seen, the figure in 1964 was 3.

On August Roadside Pheasant Count

A late summer pheasant count is made in August, with quail sighted also being counted. Along 5,550 miles of route, 369 quail were seen. This was an average of 6.65 per 100 miles, which is an increase of about 60 per cent over 1964 (Table 4). Of the six districts, there were increases in four districts in the numbers of quail seen, with none being seen in northwestern Iowa either year. Increase amounted to 104 per cent in the east, 76 in south and the southeast and 64 per cent in the south-west.

On Calling Quail Surveys

Records are also kept of quail seen on whistling quail routes. In 1965, 42 quail were seen along routes comprising 1,047 miles, or 4.01 quail per 100 miles (Table 5). In 1964, 112 were seen in 934 miles for a mean of 12 quail per 100 miles. This indicates a 1965 decline of 67 per cent from 1964.

DISCUSSION

In late April and in May, the first count is made of the adult quail which eventually produce the new coveys. This is done in conjunction with the spring pheasant survey, and indicated that less quail may have survived the 1964-65 winter than had survived the 1963-64 winter. Next to be taken is the whistling cock quail count in early July, and contrary to the earlier count, this indicated an increase of 9 per cent in brood stock. On this same census, 85 per cent of cooperators said they thought there were as many or more quail than in 1964. June, July and August surveys of calling quail along sample routes revealed that the 1965 high production period lasted longer than that of 1964. July 10 to 20, additional sight counts of quail were made on the rabbit surveys.

TABLE 3. Quail observed on the July rabbit count, Iowa 1965.

Region of State	No. Routes	No. Miles	No. Quail seen	Quail seen / 100 Miles	1964 No./ 100 Miles	Per cent change from 1964
NW	12	506	0	0.00	0.00	0
NC	11	408	1	0.25	0.00	up
C	14	586	6	1.02	2.36	- 57
E	19	695	36	5.18	2.01	- 158
SW	13	504	14	2.78	1.58	- 76
SC & SE	23	755	76	10.07	14.63	- 31
Statewide	92	3,454	133	3.85	3.85	0

TABLE 4. Quail sighted on the August pheasant count, Iowa, 1965

Region of state	No. Routes	No. Miles Driven	No. Quail seen	No. quail seen/100 Miles	1964 No. Quail seen /100 Miles	Per cent change from 1964
NW	26	780	0	0.00	0.00	0
NC	26	780	1	0.13	0.11	↑ 18
C	37	1,110	6	0.54	1.17	- 54
E	32	960	49	5.10	2.50	↑104
SW	23	690	31	4.49	2.73	↑ 64
SC & SE	41	1,230	309	25.12	14.27	↑ 76
Statewide	185	5,550	369	6.65	4.15	↑ 60

TABLE 5. Quail sighted on whistling quail counts, Iowa 1965.

Region of state	No. Routes	No. Miles Driven	No. quail seen	No. of quail seen/100 Miles	1964 No. quail seen /100 Miles	Per cent change from 1964
NW	13	152	0	0.00	0.00	0
NC	10	120	3	2.50	1.16	+116
C	17	191	5	2.62	4.06	- 35
E	19	226	2	1.13	6.94	- 84
SW	11	124	5	4.03	4.42	- 9
SC &SE	21	234	27	11.54	34.73	- 66
Statewide	91	1,047	42	4.01	11.99	- 67

TABLE 6. Summary of combined results of quail sighted on calling quail census, rabbit count and pheasant survey, July and August, Iowa 1965 and 1964

	1965				1964				
Region	No. Routes	No. Miles	no. quail seen	quail/ 100 miles	No. Routes	No. Miles	no. quail seen	quail / 100 Miles	Per cent change 1964-1965
NW	51	1,438	0	0.00	42	1,292	0	0.00	0
NC	47	1,308	5	0.38	49	1,352	2	0.15	+ 160
C	68	1,887	17	0.90	73	1,906	34	1.78	- 49
E	70	1,881	87	4.63	60	1,533	45	2.94	+ 57
SW	47	1,318	50	3.79	45	1,216	30	2.47	+ 53
SC & SE	85	2,218	412	18.57	79	2,024	340	16.80	+ 11
Statewide	368	10,051	571	5.68	348	9,323	451	4.84	+ 17

During this time the new coveys were beginning to appear. Production of young as indicated by my records for June, July and August was similar to production in 1964. In 1965, seven coveys were seen up to early August; in 1964, six were sighted.

Because of the relatively small number of quail sighted on the quail, rabbit and pheasant surveys made during the summer by Commission personnel, it is possible a better idea of the overall quail picture would be obtained by combining the data from these three counts. When this was done, it was found that 5.68 quail were seen per 100 miles in 1965 as compared to 4.84 in 1964, an increase of 17 per cent (Table 6). This compares to the 17 per cent increase shown by the rural mail carriers July Survey. It must be remembered that those counts made in July are actually not sampling the entire year's production, since the hatching season is not yet over at that time. Many of the birds counted then are adults, and thus still must be classed as brood stock. The August pheasant surveys show a higher proportion of young birds, and it is possible the 60 per cent gain shown by this count may be the best estimate of the actual pre-hunting season population trend. However, a few more year's data on these recently installed quail census methods will be necessary before their relative worth can be fully evaluated.

SUMMARY

1. The 1965 winter and spring weather was favorable to quail in the main southern Iowa quail range. It was unfavorable in the north, where there are few quail regardless of weather.

2. Breeding quail were more numerous in 1965 than in 1964 as shown by the calling males in July counts. The number seen on spring pheasant counts had been lower than in 1964. The calling male count includes the larger sample.

3. Counts of adult and young quail were made in May, June, July and August. Of a total of 5 statewide counts, 3 showed increases in quail seen, one was the same as in 1964, and the other showed decrease.

4. For the summer counts, the quail sighted on quail, rabbit and pheasant censuses showed a 17 per cent increase over 1964; while the count by mail carriers also gave a 17 per cent increase.

5. The general conclusion is that there is a discernible increase in numbers of quail from 1964 in the prime quail territory.

IOWA'S LATE SUMMER PHEASANT POPULATION - 1965

Richard C. Nomsen
Game Biologist

INTRODUCTION

The roadside pheasant count made in August is the primary source of information on the status of the pre-hunting season pheasant population. The number of routes was increased to 184 this year in order to obtain a more accurate estimate of our population trend following the severe winter storm loss. Routes were checked by Conservation Officers, Unit Game Managers and Biologists.

Additional information is obtained from counts made by rural mail carriers during a 1-week period in late July. Pheasant broods are also recorded along rabbit and quail routes during July. Results of these early counts furnish preliminary figures pertaining to reproductive success.

The winter of 1964-1965 was the coldest since 1935-1936 and two severe blizzards in March caused above normal losses to Iowa's brood stock of pheasants. Storm loss was evident in about one-third of northwest, north central and central Iowa.

The spring of 1965 was generally wet and somewhat late. Thawing of the record snowfall in March was followed by frequent heavy rains which delayed field work and planting of crops. Temperatures were slightly below normal during this period.

METHODS

The techniques used this year were the same as in 1964. The number of routes was increased from 150 to 184 to obtain a more accurate count. Records were kept by regions in order to make comparison with previous years.

RESULTS AND DISCUSSION

Birds per Mile

There were 9,174 pheasants sighted on the 184 routes (5,520 miles) censused, for an average of 1.66 birds per mile (Table 1). This count represents a 39 per cent decrease from the 2.70 birds per mile reported in 1964, which was an excellent year. Counts for the past 11 years have ranged from 1.28 to 2.72 birds per mile with an average of 2.00 birds per mile (Figure 1).

The greatest pheasant population this fall will be found in southwest and west central Iowa - the count in this region was nearly double the state average. Counts were down considerably in the area affected by last winter's storms. Generally, the population is down from 40-60 per cent in this part of Iowa's primary pheasant range. Higher populations were reported in eastern and southern Iowa.

TABLE 1. Results of the 1965 August roadside pheasant counts, and comparison with 1964 results.

Region of State	No. of Counts	No. Miles Driven	Total No. Birds Sighted	Birds per Mile	1964 Birds Per Mile	% Change From 1964
Northwest	27	840	1,270	1.51	3.33	- 54%
North Central	27	780	1,707	2.19	5.16	- 58%
Southwest	24	720	2,195	3.05	3.93	- 22%
Central	32	960	1,249	1.30	2.50	- 48%
East	35	1,050	1,383	1.32	1.25	+ 6%
South	39	1,170	1,370	1.17	0.95	+ 23%
STATEWIDE	184	5,520	9,174	1.66	2.70	- 39%

TABLE 2. Comparison of number of broods sighted on August roadside pheasant counts in 1965 and 1964

Region of State	No. Broods Sighted	Broods per 30 Mile Count	No. Broods Sighted 1964	1964 Broods Per Count	% Change in Broods
Northwest	165	5.9	244	12.2	- 51%
North Central	204	7.8	449	18.7	- 58%
Southwest	285	11.9	341	15.5	- 23%
Central	157	4.9	236	9.1	- 46%
East	157	4.5	107	4.5	no change
South	175	4.5	111	3.5	- 29%
STATEWIDE	1,143	6.2	1,488	10.1	- 38%

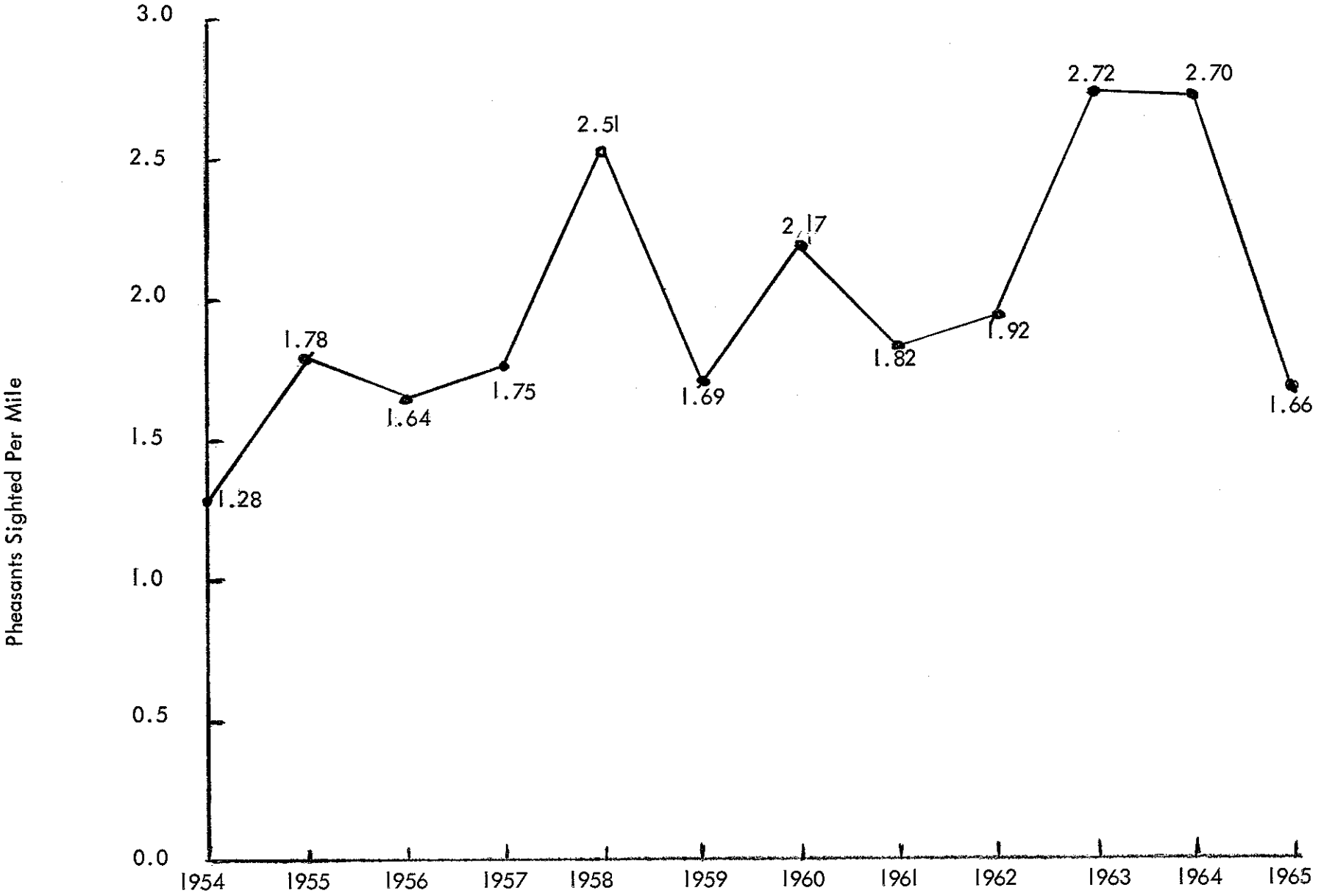


FIGURE 1. Statewide fall pheasant population trends as shown by the August roadside pheasant survey in Iowa 1954 through 1965

Broods per 30-Mile Count

There were 1,143 broods sighted on the 184 counts, an average of 6.2 per 30-mile route (Table 2). More broods were reported in the east and south but fewer in all other areas. The rate of decrease was very similar to the birds-per-mile figures.

Per Cent of Hens With Brood

There were 1,457 hens sighted and 943 (64.7 per cent) were with broods (Table 3). This is somewhat lower than the 70.5 per cent of hens with brood reported in 1964. Highest success was reported in southwest and southern Iowa. Good success was indicated in the north central region. Many hens were reported without broods in eastern and central Iowa - less than 60 per cent of the hens were reported with broods which was somewhat below average. Unsettled weather conditions last spring with the corresponding delay of farm field work probably caused many disrupted nesting attempts.

Average Brood Size

The statewide average brood size for 1965 was 6.1 chicks per brood (Table 3). This was slightly below the 6.3 chicks per brood last year but above the 5.9 figure obtained in 1963. An average of 5.4 chicks per brood was reported in the northwest region - all other regions were near average and varied from 5.8 to 6.4 chicks per brood.

Young per Hen

The statewide young per hen index for 1965 was 4.7 (Table 3). This was the lowest reproductive success figure since the count was revised in 1962. Three regions - northwest, central and east - were below the state average and the remaining three were higher. Production was apparently best in the southern third of the state. The lower rate of reproductive success was not totally unexpected following one of the most severe winters in recent years. In addition to the immediate loss of birds, very cold temperatures and heavy snow are usually associated with a reduced rate of production the following spring.

Hatching Date Distribution

Hatching was quite evenly distributed during the month of June this year (Table 4). About the same percentage was hatched in June (72 per cent) as in 1964 (73 per cent), but a definite peak occurred in 1964 during mid-June. Nearly 20 per cent of the hatch was recorded in July compared to 22 per cent a year ago.

Rural Mail Carrier Counts

Iowa rural mail carriers made their annual count during the week of July 26-31. Results of this survey serve as a perliminary indicator of pheasant reproductive success.

According to this survey the rate of pheasant reproduction was good this year, and nearly as high as in 1964 (Table 5). The average brood size increased slightly but a few more hens were

TABLE 3. Data from 1964 August roadside pheasant count

Region of State	No. of Cocks	No. of Hens	Sex Ratio Index M:F	Hens Without Brood	Hens With Brood	% Hens With Brood	No. of Young Chicks	No. of Young Per Hen	No. of Young Per Brood
Northwest	149	217	1:1.5	70	147	67.7%	897	4.1	5.4
North Central	168	261	1:1.6	82	179	68.6%	1278	4.9	6.3
Southwest	130	326	1:2.5	98	228	70.0%	1739	5.3	6.1
Central	115	221	1:1.9	94	127	57.5%	913	4.1	5.8
East	123	243	1:2.0	115	128	52.5%	1017	4.1	6.4
South	102	189	1:1.9	55	134	70.9%	1079	5.7	6.1
STATEWIDE	787	1457	1:1.9	514	943	64.7%	6923	4.7	6.1

TABLE 4. Distribution of the 1965 Iowa pheasant hatch by regions and statewide for 1964 and 1965 (figures given are percentages by 10-day periods)

Date of Hatch	Northwest	North Central	Southwest	Central	East	South	1965 Statewide	1964 State
May 1-10	-	-	-	-	-	-	-	-
11-20	-	-		1.0	-	1.0	0.7	0.6
21-31	1.2	5.9	7.3	7.0	7.5	16.1	7.6	13.5
June 1-10	30.0	15.8	31.7	27.1	30.6	23.7	26.7	24.8
11-20	26.1	21.3	18.7	24.1	22.4	25.3	22.4	31.0
21-30	18.6	34.2	22.6	22.4	20.4	19.4	23.2	17.2
July 1-10	19.2	12.9	14.6	10.0	13.6	11.3	13.5	7.2
11-20	3.7	7.9	3.6	8.2	4.1	3.2	5.0	4.6
21-31	1.2	2.0	0.5	1.2	0.7	-	0.9	1.4
Aug. 1-10	-	-	-	-	-	-	-	0.3
11-20	-	-	-	-	-	-	-	-
No. Broods in Sample	161	202	331	170	147	186	1197	1570

reported without broods. However, we must remember there were far fewer hens in the breeding population, which tempers somewhat the fact that the rate of production was good.

Table 5. Statewide results of rural mail carriers July pheasant counts, 1962-1965

Year	Young per Hen	Average Brood Size	% of Hens With Broods
1962	2.1	5.3	39%
1963	2.6	5.7	45%
1964	2.7	5.8	47%
1965	2.6	5.9	45%

Pheasant Broods Sighted on Rabbit and Quail Counts

Pheasants broods sighted along rabbit and quail survey routes were recorded again this year (Table 6). These results are also used as early indicators of hatching success.

Fewer broods per 100 miles were reported in 1965. Statewide, there were 5.4 broods recorded per 100 miles compared with 8.1 broods in 1964- a decrease of 33 per cent.

SUMMARY

1. The August roadside pheasant count is the primary source of information on the status of the pre-hunting season pheasant population. It is supplemented by the rural mail carrier survey and information recorded on the rabbit roadside and quail surveys.

2. The winter of 1964-1965 was the coldest since 1935-1936 and two severe blizzards in March caused above normal losses to Iowa's brood stock of pheasants. The spring of 1965 was generally wet and somewhat late.

3. A total of 184 routes was checked in 1965. Observers recorded 9,174 pheasants or 1.66 birds per mile. This count represents a 39 per cent decrease from the 2.70 birds per mile reported in 1964.

4. The highest pheasant population was in the southwest and west central region. Counts were down considerably in the area affected by winter storms. Higher populations were reported in eastern and southern regions.

5. Lower reproductive success was indicated by the various production indices. Production was best in southern Iowa - good in north central Iowa.

6. Rural mail carrier counts indicated good rate of production - nearly as high as in 1964.

7. Fewer pheasant broods per 100 miles were sighted on the mid-July rabbit and quail routes.

TABLE 6. Pheasant broods observed on 1965 mid-July rabbit roadside survey and quail whistling counts

Region of State	Rabbit Survey			Quail Survey			Combined 1965			1964
	No. Miles	No. Broods	Broods per 100 Miles	No. Miles	No. Broods	Broods per 100 Miles	No. Miles	No. Broods	Broods per 100 Miles	Broods per 100 Miles
NW	506	21	4.2	150	9	6.0	656	30	4.6	10.3
NC	398	36	9.0	120	10	8.3	5.8	46	8.9	14.5
SW	504	40	7.9	123	12	9.8	627	52	8.3	10.3
C	587	43	7.3	181	5	2.8	768	48	6.3	7.0
E	735	25	3.4	217	5	2.3	952	30	3.2	9.6
S	754	26	3.4	239	13	5.5	993	39	3.9	1.4
State	3,484	191	5.5	1,030	54	5.3	4,514	245	5.4	8.1

RESULTS OF JULY 1964 ROADSIDE RABBIT SURVEYS

M. E. Stempel
Game Biologist

INTRODUCTION

The annual July rabbit roadside counts were continued in 1965. This survey has been conducted with slight modification every summer beginning in 1950. It is made from July 10 to 20 by Conservation Officer, Biology, and Game section personnel. They drive predetermined routes about 30 to 40 miles long on gravelled roads. Participants drive 20-25 miles per hour, starting at sunrise, 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.

The age of rabbits was recorded as adult or juvenile to obtain age ratios and for computation of the fall population index. Numbers of quail, Hungarian partridge, and numbers of pheasant broods seen during each survey were also recorded. Pheasant and partridge data were given to the pheasant biologist for evaluation, and I process the quail data. Similar data on cottontails and jackrabbits taken in conjunction with quail and pheasant surveys are reported in this paper.

RESULTS

One hundred routes totaling 3,317 miles were surveyed. This is an increase of 9 per cent in total miles. In all, 2,008 cottontails were seen for an index of 6.05 cottontails per 10 miles of route (Table 1). Cottontails were most abundant in the Southern Loess area, where they have been most abundant since 1953 (Table 2). Populations of cottontails in the other three areas ranked in descending order were western Loess, Eastern and Northern Glaciated. The order of relative abundance was similar to the 15-year average for the four areas (Table 2).

The statewide index indicates populations have declined from 1964. From a high of 6.86 in 1958 the index of cottontails dropped to 6.33 in 1959 and 4.56 in 1960, climbed slightly to 4.79 in 1961, dropped to 3.88 in 1962, and climbed again in 1963. Average index for all years, to and including 1964, has been 4.78 cottontails seen per 10 miles of route. Two of the four areas (south and east) show increase over 1964, west and north areas show decrease. Except for the west, populations in 1965 were higher in all parts of the state than the 15-year means.

Thirty-one jackrabbits were counted during the surveys. The index of jackrabbits seen per 10 miles was 0.11 in 1965, 0.15 in 1964, 0.17 in 1963, 0.11 in 1962. These indices indicate a decline in jackrabbit populations since the 1958-61 period when indices were 0.23 for 1958, 0.44 for 1959, 0.33 for 1960 and 0.20 for 1961. These indices may or may not be truly indicative of populations of jackrabbits, as the survey is designed specifically for cottontails and not for jackrabbits. As is normal, most jackrabbits were seen in northern and western sections of Iowa.

Of 2,008 cottontails aged, 1,413 were juveniles for a ratio of 2.37 juveniles per adult (Table 3). This ratio may be compared to 1964 (2.41) and 1962 (2.06) and it is below the 1950 to 1963 average of 2.51. Best production appeared in the southern Loess area where the index was 3.91 juveniles per adult. The average 1965 statewide population is near the 1963 figure as far as the age ratio is

Table 1. Results of July Roadside Rabbit Surveys For 1965.

Area	No. of Routes	Total Miles	Cottontails observed	Jackrabbits observed	Cottontails observed 10 Miles	Jackrabbits observed 10 Miles
Northern glaciated	43	1,500	592	31	3.95	0.21
Western Loess	13	464	237	2	5.11	0.04
Southern Loess	29	819	949	2	11.59	0.02
Eastern	15	534	230	0	4.31	0.00
Statewide	100	3,317	2,008	35	6.05	0.11

Table 2. Comparison of July Roadside Rabbit Surveys For Years 1951 Through 1965. Cottontails seen per 10 miles.

Year	Area				
	Western Loess	Northern glaciated	Southern Loess	Eastern	Statewide
1951	6.69	3.37	5.68	2.13	3.92
1952	6.74	3.70	6.14	1.78	4.18
1953	4.26	2.70	4.23	3.33	3.31
1954	3.90	2.97	4.55	2.36	3.35
1955	3.55	4.60	6.03	5.31	4.96
1956	3.51	3.06	5.99	4.44	4.07
1957	4.72	3.32	7.59	4.79	4.87
1958	8.76	4.68	12.95	4.65	6.86
1959	7.92	4.36	10.46	4.66	6.33
1960	5.07	4.62	5.41	1.80	4.56
1961	6.12	4.25	6.58	2.19	4.79
1962	3.53	2.94	6.67	1.80	3.88
1963	5.27	4.19	10.17	3.87	5.61
1964	6.95	4.79	11.27	4.18	6.69
1965	5.11	3.95	11.59	4.31	6.05
15 Yr Average	5.47	3.83	7.69	3.37	4.90

Table 3. Age Ratios of Cottontails Observed During July 1965 Surveys.

Area	Number of Adults	Number of Juveniles	Juvenile / Adult
Northern glaciated	218	374	1.72
Western Loess	96	141	1.47
Southern Loess	193	756	3.91
Eastern	88	142	1.61
Statewide	595	1,413	2.37

Table 4. Rabbits Seen During 1965 Spring Pheasant Surveys

Area	Number Miles	Cottontails observed	Jacks seen	Cottontails per 10 Miles	1964 Index	Jacks per 10 Miles
Northern glaciated	1,973	285	133	1.44	1.92	0.67
Western Loess	622	149	4	2.40	5.17	0.06
Southern Loess	1,447	347	1	2.40	2.99	0.01
Eastern	578	90	2	1.56	2.04	0.03
Statewide	4,620	871	140	1.89	2.53	0.30

Table 5. Rabbits Seen On Quail Whistling Surveys, July 1965

Area	Number Miles	Cottontails observed	Jacks seen	Cottontails /10 Miles	1964 Index	Jacks/ 10 Miles
Northern glaciated	454	137	6	3.02	3.90	0.13
Western Loess	168	104	1	6.19	10.80	0.06
Southern Loess	259	315	0	12.16	11.42	0.00
Eastern	168	60	0	3.57	4.23	0.00
Statewide	1,049	616	7	5.87	7.34	0.07

concerned.

The fall population index, which is obtained by dividing the number of juvenile cottontails seen along the survey route (1,413) by the number of miles (3,317) and multiplying by ten, was 4.26 as compared to 4.79 for 1964, 3.94 for 1963, 2.33 for 1962, 3.79 for 1961, 2.73 for 1960, 4.07 for 1959 and 4.51 for 1958. Only two seasons had a better index than does 1965. This indicates that rabbit hunting success will be well above average for this year.

Numbers of cottontails seen per 10 miles during the spring pheasant surveys averaged 1.89 in 1965 with 2.53 in 1964, 1.78 in 1963, 1.43 in 1962. Highest populations as indicated by spring pheasant surveys occurred in the southern Loess and the western areas (Table 4). On the quail whistling surveys, made during the same approximate time as the rabbit counts, 5.87 cottontails were recorded per 10 miles. Again highest indices were obtained from the southern Loess area (Table 5). The statewide index of 7.34 obtained during the 1964 quail surveys is considerably more than that obtained for 1965; nevertheless, the index in the south has increased. This is in line with the data from the July rabbit survey.

The index of cottontails seen during the 1965 August roadside pheasant surveys was 2.72 as compared to 2.44 for 1964 and 2.50 in 1963. Highest indices were from the south and the east.

DISCUSSION

Conditions have been mostly favorable for cottontail rabbits during the past year except in the northern regions where the late winter was unusually severe. Deep snow combined with extended periods of cold and wind were encountered in the north. In the south, it was very cold but snowfall was moderate. The carry-over of cottontails was best in the south. It is assumed that most of the early production was slowed, or prevented, because of the late spring. Despite the somewhat depressed spring population, the southern Iowa rabbit numbers show increase over 1964. Even in the north there is evidence of recovery from the severe winter. When a judgment of the success for the forthcoming rabbit shooting season is rendered, it is believed that the success will be slightly better than for 1964 in the south and slightly under 1964 in the north.

Table 6. Rabbits Seen During 1965 August Roadside Pheasant Surveys

Area	Number Miles	Cottontails seen	Jacks seen	Cottontails /10 Miles	1964 Index	Jacks / 10 Miles
Northern glaciated	2,610	300	63	1.15	1.37	0.24
Western Loess	810	256	17	3.16	3.33	0.21
Southern Loess	1,500	874	0	5.83	4.45	0.00
Eastern	810	128	0	1.58	1.24	0.00
Statewide	5,730	1,558	80	2.72	2.44	0.14

MARKED HEN MALLARD STUDY

Richard Bishop
Game Biologist

INTRODUCTION

During April, 1964, domestic mallard hens were released at three prairie marshes in northern Iowa. Ventura Marsh in Cerro Gordo County, Dan Green Slough in Dickinson County and Harmon Lake in Winnebago County were selected as the marshes to receive these birds. Four Mile Lake in Emmet County was set up as a control area. The initiation of this study was derived from an interest to increase mallard nesting populations on Iowa marshes. It was hoped that released mallard hens would mate with wild drakes, nest and rear semi-wild young mallards. These young mallards would then migrate and return the next spring to nest at this natal marsh. If the released mallards would survive and reproduce, Iowa's mallard production could be increased.

RESULTS

One hundred hen mallards were released at each of the three marshes in early April of 1964. Two release sites were used at Dan Green Slough and the entire one hundred birds were released on Harmon Lake at one site. Observations were made by Game Section personnel on Harmon Lake, Four Mile Lake and Dan Green Slough and by the waterfowl biologist at Ventura Marsh.

Released hen mallards tended to remain near the release site and stay in small flocks. Numerous wild drakes were enticed to stay and mated with the domestic hens quite readily. As many as seven or eight wild drakes were observed chasing one marked hen. Late April and early May found some of the marked hens mated with wild drakes and setting up nesting territories. Many hens attempted to nest; however, some were unsuccessful due to the lack of inherent wildness which is necessary if nests are to be successful in the wild.

Observations were taken weekly during April, May and June and occasionally during July and August. During 1964 no broods were observed on Harmon Lake and only four were observed on Dan Green Slough. The four broods sited on Dan Green Slough consisted of three, four and seven small ducklings indicating rather poor production. Ventura Marsh produced three somewhat larger broods from domestic hens. Fifteen wild mallard broods were observed on Ventura Marsh during the same observations. These domestic hens lack the degree of waryness needed to rear a brood in the wild and it is doubtful if many of these semi-wild ducklings survived.

Data gathered in 1965 was even less optimistic than 1964. No broods were reported sighted on any of the study areas. At Ventura Marsh, 96 hens were released, mated with numerous wild drakes and a few attempted to nest. Two active nests were found in June but both were destroyed shortly after. One nest was located in an animal trail along a fence line 100 yards from the edge of the marsh.

Remains of several domestic hens were found along the marsh edge and other hens could be easily captured along the shore. By late August few hens were observed and none were

accompanied by broods. Observations taken on Ventura Marsh indicate a very high mortality on the released birds.

Similar results were reported from Harmon Lake. In early May, 29 mallard nests (all believed to be marked hen nests) were found, 19 of which were occupied by marked hens. It was believed that a large number of broods would be produced, however, by the middle of May all 29 nests were destroyed by predators believed to be coon and skunks. Some renesting was noted but these were destroyed also.

No nests were found at Dan Green Slough and no marked hens were observed with broods during 1965.

DISCUSSION

The data gathered in 1964 and 1965 strongly indicates the pitfalls of this program. Domestic hens released to the wild lack the secretiveness to nest successfully and in many cases lack the waryness to survive. Mortality of released birds was extremely high and reproductive success was extremely low. Very few, if any, semi-wild mallards were reared tp flight stage during this study. If this study is characteristic of the results of stocking domestic or even semi-wild mallards, such practices are not practical in present waterfowl programs.

Several other states have embarked on similar studies, trying to increase local breeding populations of mallards with much the same results.

Studies have been conducted in Michigan, New York, Pennsylvania, Wisconsin, Minnesota, Ohio, Indiana, and Iowa. Results of these projects are for the most part very discouraging. Pennsylvania concluded that summer and early fall stocking has only limited value, and obtained at great cost, as a technique for improving local breeding populations of mallards.

Brakage (1953) found that hand-raised wild mallards migrate similar to wild birds and home to their natal marsh at a rate similar to wild trapped birds banded on the same marsh. He also found that mortality rates for the first year of life is 30% higher for hand-reared birds than for wild birds. Hand-reared birds were 40% more vulnerable to the gun and most were taken within a few miles of the release site. He concluded that channeling funds into development, restoration, or improvement of habitat seems more justifiable and more biologically practical than releasing hand-reared stock.

Lincoln (1934) found that hand-reared birds did not disperse from the release point and did not survive at the anticipated rate.

New York experimented with released redheads and found a low survival rate and poor nesting ability. However, New York's hand-reared mallard program is the only instance where breeding populations were claimed to be improved.

Wisconsin has been experimenting with hand-reared mallards produced from domestic and wild mallard matings. Birds released resulted from five-year crosses with wild drakes. In order to keep ducks semi-wild, continued breeding with wild drakes is necessary. During the years 1949-1953, 10,371 hand-reared mallards were raised at a cost of $2.04 per 30 day

old mallard. Approximately 27 per cent of the birds released were recovered. Most of the birds were bagged by hunters in the first year of release and within 20 miles of the release site.

They also found few birds survive to become breeders, and the females surviving to breed apparently lack the secretive behavior in nest site selection that is so necessary for successful nesting in the wild. When so few birds survive to breed, prehunting season stocking of mallards does not appear eith economically or biologically justifiable as a technique for increasing local breeding populations.

Wisconsin concluded from their studies that hand-reared ducks were considerably more vulnerable to hunting and it would take 155,000 released mallards to increase Wisconsin's duck kill by 10 per cent. They believe the problem of providing more ducks seems to be one of making additional existing wetland areas more attractive for breeding and migrating waterfowl and to restore and create more areas to attract wild ducks for a longer period of time, rather than to artificially and temporarily supply shooting through stocking.

Weller and Ward (1959) conducted a study to increase local breeding populations at LaCreek Refuge in South Dakota and to establish breeding redheads at Seney Refuge in Michigan. These redheads were hand-reared from wild eggs. The released birds followed the same migration route as wild birds but suffered higher mortality. Although homing of females was good, no increase in breeding redheads resulted from either release.

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STREAM IMPROVEMENT WORK ON ELK CREEK, DELAWARE COUNTY

By Roger Schoumacher
Fisheries Biologist

One of the tools used in managing a trout fishery is stream improvement, e.g. the installation of various types of structures in the stream channel which are designed to improve the habitat for trout. Extensive work of this type has been carried out in many parts of the country, although evidence of increased trout production resulting from scientific evaluations of the effects of the devices has usually been lacking, especially when considering the costs involved. Since Iowa has very little good trout water, some stream improvement work to preserve or improve the better water seems justified.

Elk Creek, near Greeley in Delaware County, is a small but fairly good quality trout stream which receives moderately heavy fishing pressure. The Delaware County Conservation Board owns over 1 1/4 miles of the upper end - nearly all of the present trout water - and the area is being managed for recreation and conservation with the stream the most important feature. Because of the importance of the stream, the Board decided to install some stream improvement devices under the guidance of the Biology Section of the Conservation Commission.

Work was begun in June of 1963, and so far 60 stream improvement devices have been installed. These devices have been of four types:

1. Gabions. A gabion is a wire basket that can be filled with rocks. High quality, commercially produces gabions were used, as well as home-made devices of wire, steel fence posts, and steel corn crib material. The commercially produced gabions were one meter square and 2,3, or 4 meters long. A 1x1x4 meter gabion holds about five tons of rock.

2. Trash catchers (Navarre, 1962). Trash catchers are low hog-wire fences reinforced with rock. At increased water flows they become filled with floating trash, enabling them to divert water.

3. Diversion dams. These are log or log and rock wing dams used to divert water in any desired direction.

4. Bank stabalization devices. These are usually log and rock structures which protect a bank from erosion by absorbing the force of the water.

The initial effort, in June of 1963, was concentrated on a short stretch of wide, shallow stream which was eroding one bank and providing no trout habitat. Nine commercial gabions were purchased and installed by the Delaware County Conservation Board - 8 on the eroding bank at intervals of 20 to 30 feet, and one on the bank opposite one of the series of gabions so as to form a narrow funnel for the water to flow through. The purpose of the funnel was to dig a hole at increased stream flows, whereas the series of gabions would protect the bank and narrow and deepen the stream channel.

In spite of several "gully-washers" these gabions have performed admirably. There has been no bank erosion, and the series of structures has trapped silt and sand between the gabions to a depth of nearly 2 feet, narrowing and deepening the stream channel. This new bank is being stabalized with willows and annuals, and watercress in the stream is providing additional erosion control as well as cover for trout. The gabion funnel has dug a large deep hole, and numerous other pockets capable of holding trout have been created. Two more gabion funnels were added in 1964, and these have begun to create additional trout habitat.

Another series of gabions was installed in 1965. Eleven devices, spaced 20 to 30 feet apart, were placed along a high cut bank. The stream, again, was wide and shallow, and bank erosion was severe and threatening the road. Three additional gabions were installed on the other bank to create three funnel arrangements. Silt deposition between the gabions has already begun, and the channel has become narrower and deeper. Bank erosion has been stopped, and pockets for trout have been formed. Additional cover has been provided by the establishment of watercress.

Twenty-two trash catchers have been constructed, mostly in the winter of 1963. Eighteen were installed in pairs, with the purpose to channel the water between them and scour out a hole. To date two pair have been washed out and the remaining seven pair are functioning with good to excellent results. All of the five installed as single wing dams are functioning satisfactorily.

Four wing dams to divert water, all about 30 feet long, have been installed. They are made of logs and some rock and all are intact and functioning after about two years.

All five home-made gabions are intact and diverting water as planned. These perform satisfactorily if not undercut by the current. Commercially produced gabions, if undercut, will settle and not be damaged, whereas undercutting usually ruins the home-made devices.

Two areas of bank protection with logs and rocks are working perfectly after one and two years.

To date the stream improvement work on Elk Creek has been very successful as far as the functioning of the devices is concerned, and the available habitat for hatchery trout has been increased. The work will undoubtedly be continued by the Delaware County Conservation Board to increase the amount of suitable trout habitat more in the future.

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CREEL CENSUS RESULTS FROM CLEAR AND BLACK HAWK LAKES
1963 and 1964

Terry Jennings
Fisheries Biologist

Clear Lake

Clear Lake, Iowa's third largest natural lake having a surface area of about 3,643 acres, is a relatively shallow lake with a maximum depth of approximately 20 feet. The bottom topography of Clear Lake is roughly comparable to that of a saucer with its gently sloping sides to the deepest portion which is about in the middle. As a result of this physical characteristic a considerable area of Clear Lake is less than 10 feet deep.

Creel census data have been collected from this lake each year since 1949. However, it was not until 1958 that the present comprehensive type of creel census was first used. The censusing periods since 1958 have been rather inconsistant. During 1963 and 1964 the censusing periods covered five months of open water fishing from May through September. There is some fishing in the lake during the other months of the year but fishing pressure is too light to warrant a full scale census.

Creel Census Results, 1963

The records indicate that, with the exception of one year, yellow bass have been an important fish to the angler each year since 1958. During the 1963 census period, yellow bass accounted for about 52 per cent of the creeled fish (Table 1). Nearly 57,600 yellow bass were estimated to have been creeled during the five months of censusing in 1963. This is the largest estimated total catch of yellow bass since the comprehensive type of creel census was first used on this lake. Each year since 1958, crappies have also played a rather important role in the creel catches of anglers and 1963 was no exception. The estimated total catch of crappies (nearly 37,000) for the five-month census period accounted for about 33 per cent of the estimated total fish creeled during this period (approximately 111,000). Bullheads were the third most abundant fish taken comprising about 7 per cent of the hook and line harvest. Walleyes and bluegills were the next species in abundance each comprising about 2 per cent of the creeled fish. Northern pike, yellow perch and channel catfish each totaled about 1 per cent of the fish creeled. Sunfish, white bass and largemouth bass, in that order of abundance, accounted for the remaining 1 per cent of the estimated total fish take.

When listed by estimated total weight yellow bass continues to be number one followed by crappies, walleyes, northern pike, bullheads and channel catfish. These fish accounted for 30, 28, 12, 11, 9 and 6 per cent respectively. Together they comprised about 96 per cent of the estimated total weight of fish harvested during this period.

Fishing during 1963, was quite good with an average of 1.64 fish being creeled each fishing hour. September was the best fishing months with an average of 2.30 fish creeled per hour. However, there were more estimated total fish creeled in May when the rate of fishing was 1.51. fish per hour. The fishing rate was good during each of the five months censused with the lowest

Table No. 1 Total harvest of fish, as determined by comprehensive creel methods, from Clear Lake through September, 1963.

Species	May	June	July	August	September	Total	Ave. Wt. Fish	% of Total Fish
Bluegill	95	271	590	1,164	126	2,246	.21	2.0
Crappie	17,926	7,229	5,107	1,825	1,212	36,944	.37	33.0
Walleye	1,350	1,542	115	151	204	2,325	2.64	2.0
Channel catfish	9	183	180	277	210	859	3.86	1.0
White Bass	25	24				49	1.37	T *
Yellow Bass	15,052	2,898	14,349	7,611	17,683	57,598	.25	52.0
Northern Pike	1,077	173	131	146	192	1,719	3.07	1.0
Black Bullhead	3,154	1,553	2,021	521	196	7,445	.66	7.0
Largemouth Bass	32					32	3.33	T
Yellow Perch		282	497	202	477	1,458	.32	1.0
Sunfish				293		293	.46	
Totals	38,725	19,949	19,804	12,190	20,300	110,968	.44	99.0
Total Angler Trips	7,591	4,566	3,357	2,807	2,835	21,156		
Total hours	25,638	14,522	10,184	8,587	8,819	67,750		
Fish per Man	5.10	4.37	5.90	4.34	7.16	5.24		
Fish per Hour	1.51	1.37	1.94	1.42	2.30	1.64		

* Less than 1 per cent

rate being recorded during June when there were 1.37 fish creeled per hour. Eventhough the catch rate remained good, the estimated total number of anglers dropped each month from May through August but remained relatively stable throughout September.

During the 1963 census period, an estimated 21,156 angling trips were made to the lake. Each of these trips lasted an estimated 3.2 hours for a censusing period total of 67,750 fishing hours. This amounts to approximately 6 trips and 18 hours per surface acre. This total effort average produced about 30 fish totaling 13.5 pounds per acre.

Creel Census Results, 1964

The importance of yellow bass to the person fishing Clear Lake is clearly seen from Table 2. During the months of August and September, when angling for all other species was poor, yellow bass fishing was excellent; in fact nearly 80 per cent of the fish harvested from the lake during each of these two months were yellow bass. Considering the censusing period as a whole, yellow bass headed the list as the most abundant fish in the creel. They comprised about 40 per cent of the estimated total number of fish taken from the lake by anglers. Crappies were of considerable importance early in the season (May and June). They were the second most abundant fish creeled, and made up approximately 33 per cent of the catch. Bullheads were the third most abundant species. When compared with the previous year, bullhead fishing was much better during 1964, they accounted for nearly 16 per cent of the fish in the creel. Together the three species (yellow bass, crappies, and bullheads) comprised nearly 89 per cent of the fish caught Northern pike and walleyes comprised about 6 and 2 per cent respectively of the 1964 creel. catches. Channel catfish, white bass, carp, and largemouth bass accounted for the remaining 1 per cent.

When listed in order of the estimated total weight each contributed to the creel, the top four species would be: Crappies, northern pike, bullheads, and yellow bass. These four species added 28, 21, 20 and 19 per cent respectively to the estimated total weight harvested from the lake during 1964.

Excellent yellow bass fishing helped to make August the best fishing month when an average of 1.94 fish were creeled during each hour of fishing. However, once again there were more estimated total fish creeled during the month of May, but the average number of fish harvested each fishing hour (1.33) was considerably below that of August. Eventhough fishing in Clear lake was good (an average fish per hour rate of 1.55), for some reason the estimated total number of anglers for each successive month of the censusing period declined from the previous month's estimate.

There were an estimated 6 anglers fishing an estimated total of 18 hours on each surface acre of water in Clear Lake. This fishing effort produced an estimated 28 fish totaling 13 pounds per acre.

Table No. 2 Total harvest of fish, as determined by comprehensive creel census methods, from Clear Lake May through September 1964.

Species	May	June	July	August	September	Total	Ave. Wt. Per Fish	% of Total Fish
Bluegill		335	840	84	38	1,297	.35	1
Crappie	15,779	13,117	2,811	1,602	1,158	34,467	.42	33
Walleye	453	478	282	221	284	1,718	2.10	2
Channel catfish	23	5	101	215	28	372	3.60	T
White Bass	2	65				67	1.27	T
Yellow bass	3,598	7,289	6,042	13,800	10,676	41,405	.22	40
Northern Pike	5,376	512	21	114	400	6,423	1.54	6
Bullhead	4,119	6,152	4,064	910	867	16,112	.57	16
Largemouth Bass		5				5	3.60	T
Yellow Perch	425	423	78	264	149	1,339	.38	1
Carp	12					12	10.0	T
Totals	29,775	28,393	14,239	17,210	13,600	103,217	.47	99
Total Angler Trips	8,113	5,850	3,162	2,951	2,877	22,953		
Total Hours	22,326	17,081	9,384	8,892	8,553	66,236		
Fish per Man	3.67	4.85	4.50	5.83	4.73	4.50		
Fish per Hour	1.33	1.66	1.52	1.94	1.59	1.55		

Table No. 3 Total Harvest of fish, as determined by comprehensive creel census methods, from Black Hawk Lake May, then July through October, 1963

Species	May	July	August	September	October	Total	Ave. Wt. per Fish	% of Total Fish
Bluegill		138	70	51	154	438	.39	T
Crappie	7,655	183	590	1,893	3,893	12,508	.49	17
Walleye	50	118	230	155	544	1,097	2.15	2
Channel Catfish	3,523	4,197	4,162	4,386	2,888	19,156	1.29	27
White Bass			23			23	.70	T
Yellow Bass	5,879	1,944	3,053	1,396	199	12,471	.38	17
Northern Pike					3	7	5.57	T
Bullhead	11,931	1,453	721	845	287	15,237	.41	21
Largemouth Bass	34				11	45	4.13	T
Carp	85	738	3,093	2,418	3,101	9,435	1.36	15
Totals	29,157	8,794	11,923	11,144	9,374	70,392	.81	99
Total Angler Trips	4,457	2,119	2,973	2,489	2,070	14,180		
Total Hours	10,586	6,337	8,328	6,804	5,538	37,593		
Fish Per Man	6.54	4.15	4.01	4.48	4.53	4.96		
Fish per hour	2.75	1.39	1.43	1.64	1.69	1.87		

Black Hawk Lake

Black Hawk Lake is a relatively small (923 acres) lake of glacial origin. A small bay at the west end of the lake has been dredged, making it the deepest portion of the lake with a maximum depth of about 14 feet. The remainder of the lake has a maximum depth of about 10 feet. The lake is located such that it is favored throughout the summer by many pleasure boaters. Moen (1964) determined from periodic pleasure boat counts, that of the six lakes in northern Iowa checked Black Hawk Lake sustained the heavest pleasure boat traffic on a per acre basis. The shallow depth, heavy boat traffic and wind action combine to help keep the lake quite turbid throughout the summer months. However, the fishing is such that the turbidity apparently has little effect on fishing success.

Each year since 1947 creel census data have been obtained from Black Hawk Lake. With the exception of 1961, a comprehensive type creel census has been used since 1957. Usually the census period each year begins in May and continues through October. However, during 1963 creel census data was obtained during the month of May and again from July through October. The 1964 census period encompassed the months from May through October. During the remainder of the year when the lake is not censused, fishing pressure is quite light.

Creel Census Results, 1963

During 1963, channel catfish accounted for about 27 per cent of the fish in the creel (Table 3) This was the first year since the comprehensive type of creel census was used on this lake that channel catfish were the most abundant fish. Bullheads were the next most abundant fish creeled, making up approximately 21 per cent of the estimated total fish taken. Yellow bass and crappies each made up about 17 per cent of the estimated total harvest of fish. Five species (channel catfish, bullheads, yellow bass, crappies and carp)combined accounted for nearly 97 per cent of the fish harvested. Walleyes made up about 2 per cent of the total catch. Bluegills, largemouth bass, white bass, and norhtern pike made up the remaining 1 per cent of the hook and line harvest.

Fishing was the best during May when approximately 29,000 fish were estimated to have been creeled at an average rate of 2.75 fish per hour. July was the poorest fishing month with an average of 1.39 fish per hour. As a whole fishing in Black Hawk Lake was quite good during the entire 1963 censusing period with an average of 1.87 fish caught per fishing hour.

There was an estimated average of 15 fishing trips and a total of 40 hours of fishing per acre on Black Hawk Lake. This effort harvested an average of 72 fish or 62 pounds of fish per acre.

Creel Census Results, 1964

During the six-month censusing period of 1964, crappies were the most abundant species caught. They made up about 39 per cent of the estimated harvest. (Table 4). Bullheads were the second most abundant fish in the creel making up approximately 34 per cent. Eventhough channel catfishing dropped off slightly during 1964, they accounted for 14 per cent of the 1964 catch. During this censusing period, carp continued to rank as one of the favorites of anglers fishing Black Hawk Lake. They comprised approximately 8 per cent of the fish creeled. Four species (crappies, bullheads, channel catfish, and carp) made up approximately 95 per cent of the fish harvested. Walleyes and yellow bass were of lesser importance making up about 3 and 1 per cent respectively. The remaining 1 per cent of the estimated total harvest was divided among bluegills, largemouth bass and white bass.

In general fishing was very good throughout the censusing period with an average of 1.66 fish being creeled each hour. The monthly fishing success ranged between an excellent 2.22 fish per hour in May to 1.29 fish per hour in August.

For the entire 1964 censusing period, the average acre of water in Black Hawk Lake yielded an estimated total of 98 fish totaling 77 pounds. An estimated 21 angling trips and a total of 59 hours per acre were required to harvest these fish.

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Table No. 4 Total harvest of fish, as determined by comprehensive creel census methods, from Black Hawk Lake May through October, 1964.

Species	May	June	July	August	September	October	Total	Ave. Wt. per Fish	% of Total Fish
Bluegill	22	81	92	340	35	58	628	.33	T
Crappie	18,131	4,120	1,113	3,306	4,405	4,755	35,830	.46	39
Walleye	1,257	728	291	40	57	30	2,403	2.35	3
Channel Catfish	2,124	3,760	2,634	1,266	1,958	758	12,500	1.47	14
White Bass	7						7	.57	T
Yellow Bass	25	369	496	358	103		1,351	.36	1
Bullhead	6,001	6,812	6,685	4,196	4,753	2,453	30,900	.46	34
Largemouth Bass	42	18	7			5	72	2.35	T
Carp	1,261	1,656	1,458	686	1,011	916	6,988	2.13	8
Totals	28,870	17,544	12,776	10,192	12,322	8,975	90,679	.78	99
Total Angler Trips	4,527	4,038	3,597	3,056	3,014	1,794	20,026		
Total Hours	12,992	11,800	9,565	7,915	8,070	4,392	54,734		
Fish per Man	6.38	4.34	3.55	3.34	4.09	5.00	4.52		
Fish per Hour	2.22	1.49	1.34	1.29	1.53	2.04	1.66		

FIVE YEARS OF OFFICER CONTACT CREEL CENSUS ON NORTHEAST IOWA STREAMS, 1960-1964

By Robert Schacht
Fisheries Biologist

In 1960 Iowa Conservation Officers were supplied with field contact books and asked to check fishing and hunting success by interviewing sportsmen in the field. It was felt that a picture of the harvest of sport fish across the state could be obtained by this method (Speaker, 1962). Information that was recorded by the officer included the number of fishermen in the party, hours fished, and number and species of fish harvested. Over the five years of contact much data has been collected. In many cases it shows trends in angling success; however, there are areas of bias which must be considered:

1. Insufficient contacts - There may be an insufficient number of contacts in an area to give valid results.

2. Unequal sampling - Along the entire river there should be a nearly equal number of contacts per county. This is usually not the case. Because of this, a species that is abundant in one area may give an untrue picture of the river as a whole. Contacts that are made at points of angler concentration such as bridges and dams may not indicate fishing success in other areas. Finally, contacts should be spaced over the entire fishing year, and not limited to one or two months.

Iowa Conservation Officers contacted 5,528 fishermen on the trout streams over the five year period. These fishermen caught 8,098 trout in 11,359 hours at the rate of 0.71 fish per hour (Table 1). Fishing success remained rather constant from year to year with the exception of 1960, in which the catch rate was 0.51 fish per hour, and the number of fish per fishermen dropped from the five year average of 1.5 to 1.1.

On the Cedar, Maquoketa, Iowa, and Wapsipinicon Rivers, 8,529 fishermen fished 14,623 hours and caught 10,525 fish at the rate of 0.72 fish per hour (Table 2). Angling success was quite similar on each of the four rivers, and the annual variations in fishing success in the individual rivers were generally slight.

The catch rate on the Cedar River over the five year period was 0.73 fish per hour. Each fisherman harvested an average of 1.0 fish per trip. Fishing success varied from 0.61 to 1.00 fish per hour (Table 3). Sixty-five per cent of the catch consisted of carp (26%), channel catfish (20%), and bullheads (19%).

The catch rate on the Maquoketa River was 0.90 fish per hour, and each fisherman averaged 1.6 fish per trip. Fishing success varied from 0.31 to 1.61 fish per hour. The high catch rate in 1962 was due to a large number of contacts in Delaware County where good catches of crappies were recorded. Sixty-five per cent of the catch over the five years consised of crappies (54%), and bass (largemouth and smallmouth combined) 11%.

Table 1. Results of five years of officer contacts on Iowa trout streams.

Year	No. Fishermen	Hours fished	No. of trout caught	Fish/hour	Fish per fisherman
1960	1082	2323	1192	0.51	1.1
1961	1021	2023	1489	0.74	1.5
1962	1095	2120	1607	0.76	1.5
1963	1221	2860	2095	0.73	1.7
1964	1109	2051	1715	0.83	1.5
Totals	5528	11359	8098	0.71	1.5

Table 2. Five year totals and averages of officer contact creel census data on four northeast Iowa rivers, 1960 - 1964.

River	No. fishermen	Hours fished	No. fish caught	Fish/hour	Fish per fisherman
Cedar	3429	4806	3510	0.73	1.0
Maquoketa	584	1025	921	0.90	1.6
Iowa	2231	4690	3256	0.70	1.5
Wapsipinicon	2285	4102	2838	0.69	1.3
Totals	8529	14623	10525	0.72	1.2

Table 3. Angling success on four northeast Iowa rivers according to officer contact creel census.

River	Fish per hour 1960	1961	1962	1963	1964
Cedar	0.61	0.68	0.66	0.98	1.00
Maquoketa	0.39	0.89	1.61	*	0.69
Iowa	0.83	0.81	0.55	*	0.69
Wapsipinicon	0.57	0.56	0.75	0.90	0.69

Table 4. Catch rates for voluntary creel census of better than average fishermen on northeast Iowa rivers.

River	Fish per hour 1962	1963	1964
Wapsipinicon	1.01	1.22	0.99
Cedar	0.94	0.86	0.97
Iowa	1.02	0.90	0.74

* Insufficient data for interpretation

The catch rate on the Iowa River over the five year period was 0.70 fish per hour, and fishermen averaged 1.5 fish per trip. Fishing success varied from 0.55 to 0.83 fish per hour. Seventy-six per cent of the catch consisted of bullheads (37%), channel catfish (20%), and carp (19%). Data in 1963 was insufficient for valid interpretation.

The catch rate on the Wapsipinican River averaged 0.69 fish per hour, and varied from 0.56 to 0.90. Seventy-six per cent of the catch consisted of bullheads (37%), channel catfish (18%), crappies (13%), and carp (8%).

In addition to the officer contact creel census, a voluntary creel census of better than average fishermen is conducted annually in northeast Iowa (Schoumacher, 1962). The results of this census from 1962 to 1964 show a higher catch rate and different catch composition than does the officer contact census. The catch rate was close to 1.00 fish per hour for the better than average anglers (Table 4), whereas it was about 0.70 for the officer contacts. An even greater difference was noted in the catch composition, with better than average fishermen harvesting a higher percentage of catfish, bass, and crappies, and relatively fewer bullheads and carp.

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CORALVILLE RESERVOIR AND LAKE MACBRIDE CREEL CENSUS - 1965

Don Helms

Fisheries Biologist

The Coralville Reservoir - Lake MacBride complex is located on the Iowa River several miles upstream from Iowa City in Johnson County. It is the first of a series of large flood control reservoirs to be constructed in the state. An intensive investigation of this area is of prime importance to fisheries research in Iowa as fundamental information can be obtained that will be valuable in the management of future areas of similar magnitude. It is with this goal in mind that creel census is being conducted on a continuing basis.

The following is a report on the third summer creel census conducted on the Coralville - MacBride complex.

METHODS

The sampling design is a modification of a method used by Mayhew (1956) in other artificial lakes and is essentially identical to the procedure followed during the 1963 and 1964 censuses of this area.

The census began on May 1 and terminated September 17, and censusing was completed for 40 periods. Complete censuses were made at both impoundments on alternate time periods (8 A.M. to 2 P.M. --2 P.M. to 8 P.M.) on a predetermined census schedule. The census clerk interviewed all fishermen possible on the reservoir within 6 hours. He was instructed to leave at the end of the time period regardless of the number of fishermen that he failed to interview. Information was obtained from each fishing party on the number of people in the party, hours fished, number and kind of fish caught and kept, species desired, and distance travelled to the lake. In addition to this information, weights were taken on a sample of the various panfish species and on all of the larger species taken less commonly, such as bass walleye, catfish, etc. Anglers at Coralville Reservoir were divided into three catagories: boat anglers, shore anglers, and tailwater anglers. Lake MacBride fishermen were divided into the first 2 groups only.

These data were then expanded by simple multiplication of the data by the number of uncensused periods.

RESULTS OF CORALVILLE RESERVOIR CREEL CENSUS

During the census period it is estimated that 172,900 fishermen used Coralville Reservoir. Fifty-one per cent of the anglers were contacted at the tailwaters; whereas 18 and 31 per cent were boat and shore anglers respectively. These fishermen caught 204,000 fish that weighed a total of 175,322 pounds (Table 1) after fishing 298,100 hours, or at a mean rate of .68 fish per hour. Tailwater anglers caught .70 fish per hour, while boat and shore anglers caught fish at the rate of .58 and .74 fish per hour respectively.

Table 1. Estimated catch rate and species composition of the sport fishery in Coralville Reservoir for the summer of 1965

Species	Number and Weight of Fish Caught by Type of Contact								Per cent	
	Boat		Shore		Tailwaters		Combined			
	Number	Weight	Number	Weight	Number	Weight	Number	Weight	Number	Weight
Bullhead	27,800	8,340	53,400	16,020	31,300	7,199	112,500	31,559	55.3	18.1
Crappie	1,400	448	100	32	34,700	20,473	36,200	20,953	17.8	12.0
Carp	2,200	3,520	9,800	31,360	19,500	42,900	31,500	78,010	15.5	44.5
Channel catfish	500	650	1,900	4,370	15,600	26,520	18,000	31,540	8.9	18.1
Buffalo					2,800	8,680	2,800	8,620	1.4	4.9
Green sunfish			200	50	1,000	200	1,200	250	.6	.1
Bluegill			300	135	500	95	800	230	.4	.1
Walleye			100	220	400	1,240	500	1,460	.25	.8
Flathead catfish					200	1,900	200	1,900	.1	1.1
Largemouth bass					100	220	100	220	.05	.1
Northern pike					100	400	100	400	.05	.2
Carpsucker					100	120	100	120	.05	.1
Totals 31,	31,900	12,958	65,800	52,187	106,300	109,947	204,000	175,322		

Bullhead, crappie, carp and channel catfish comprised the major portion of the catch by numbers and weight for anglers of all 3 catagories. Bullhead and carp ranked first and second respectively by numbers for boat and shore fishermen; however, these species were exceeded by crappie in the tailwaters. Buffalo, green sunfish, bluegill, walleye, flathead catfish, largemouth bass, northern pike and carpsucker were also recorded.

Fifty-eight per cent of the anglers interviewed showed no preference as to what species of fish they caught (Table 2). The remaining anglers indicated a preference for channel catfish, bullhead, crappie, walleye, carp, flathead catfish, largemouth bass, bluegill and buffalo in that order.

RESULTS OF LAKE MACBRIDE CREEL CENSUS

During the census period it is estimated that 350,100 anglers fished Lake MacBride. Twenty-eight per cent were boat fishermen and 72 per cent were shore fishermen. They caught 888,300 fish weighing a total of 247,728 pounds (Table 3) after fishing 623,000 hours, or at a mean rate of 1.42 fish per hour. Boat and shore anglers had equal success.

Bullheads comprised 85.5 per cent by number and 70.5 per cent by weight. Crappie and bluegill made up 13.7 per cent of the catch by number and 19.9 per cent by weight. The remainder of the catch was divided equally between walleye, largemough bass, channel catfish and carp and made up approximately 1 per cent of the total number.

Although over half of the angling parties expressed no preference as to what species they caught (Table 4), those who did prefered bullhead, crappie, bluegill, largemouth bass, channel catfish, walleye, northern pike and carp in that order.

DISTANCES TRAVELED

Anglers traveled a combined distance of 1,784,800 miles to fish in Coralville Reservoir and 4,150,900 miles to fish Lake MacBride. However, distances traveled by individual anglers to fish in each of the lakes were similar (Tables 5 and 6). There was also a similarity of distances traveled by boat, shore and tailwater fishermen at the two lakes.

ECONOMIC VALUE OF THE SPORT FISHERY

An estimate of the monetary value of the sport fishery is based on previous studies of southern Iowa artificial lakes by Mayhew (op. cit.). According to his study, a sport fishery in southern Iowa was valued at $1.23 per pound of fish caught and the average fish caught weighed 0.48 pounds. For purposed of the present study, the 0.48 pound average per fish is being substituted with the actual estimated weight of fish caught on the Coralville-MacBride complex. Thus, the sport fishery is capitalized at $215,643.60 for Coralville and $304,705.44 for Lake MacBride, or a total of $520,349.04 for the complex. This is just a fraction under the estimated $529,638.00 for the summer of 1964 (Helms and Mayhew, 1964).

TABLE 2. Species preference of fishermen in Coralville Reservoir for the summer of 1965

Species	Number of Parties Contacted				Per cent
	Boat	Shore	Tailwaters	Combined	
No preference	69	145	235	449	58.0
Channel catfish	19	35	103	157	20.3
Bullhead	13	44	9	66	8.5
Crappie	14	6	41	61	7.9
Walleye	3	3	14	20	2.6
Carp		2	11	13	1.7
Flathead catfish			5	5	.6
Largemouth bass	1	1	1	3	.4
Bluegill		2		2	.3
Buffalo			1	1	.1

TABLE 3. Estimated catch rate and species composition of the sport fishery in Lake MacBride for the summer of 1965

Species	Number and Weight of Fish Caught by Type of Contact						Per cent	
	Boat		Shore		Combined			
	Number	Weight	Number	Weight	Number	Weight	Number	Weight
Bullhead	239,000	54,970	519,700	119,531	758,700	174,501	85.5	70.5
Crappie	30,500	10,980	37,500	13,500	68,000	24,480	7.7	9.9
Bluegill	29,900	14,053	23,200	10,804	53,100	24,857	6.0	10.0
Walleye	1,800	3,780	600	1,260	2,400	5,040	.3	2.0
Largemouth bass	1,600	4,320	800	2,160	2,400	6,480	.3	2.6
Channel catfish	1,200	2,040	900	1,530	2,100	3,570	.2	1.4
Carp	300	1,650	1,300	7,150	1,600	8,800	.2	3.6
Totals	304,300	91,793	583,900	155,935	888,300	247,728		

TABLE 4. Species preference of fishermen in Lake MacBride for the summer of 1965

Species	Number of Parties Contacted			Per cent
	Boat	Shore	Combined	
No preference	286	561	847	54.7
Bullhead	53	293	346	22.5
Crappie	64	89	153	9.9
Bluegill	30	41	71	4.6
Largemouth bass	62	13	75	4.9
Channel catfish	10	18	28	1.8
Walleye	15	3	18	1.2
Northern pike	1	0	1	.1
Carp	1	0	1	.1

TABLE 5. Distance traveled by anglers to fish in Coralville Reservoir for the summer of 1965.

Distance (Miles)	Number of Parties Contacted				Per cent
	Boat	Shore	Tailwaters	Combined	
0 - 10	13	38	34	85	10.3
11 - 25	88	176	342	606	78.1
26 - 50	5	10	17	32	4.2
51 - 100	9	10	14	33	4.4
over 100	5	6	11	22	2.9

TABLE 6. Distance traveled by anglers to fish in Lake MacBride for the summer of 1965

Distance (Miles	Number of Parties Contacted			Per cent
	Boat	Shore	Combined	
0 - 10	55	94	149	9.5
11 - 25	411	706	1,117	70.9
26 -50	35	81	116	7.4
51 - 100	50	94	144	9.2
over 100	18	26	44	2.8

DISCUSSION

The Coralville Reservoir experienced a very severe winter-kill during the first 3 months of 1965. As a result, there were some major changes in the fishermen's creel. Heavy mortality of the game species and the survival of more hardy species, namely carp and bullheads, turned the catch almost entirely to those species. There was thus a tendency for fishing pressure to shift from the reservoir proper to the tailwaters and to Lake Mac Bride.

Lake MacBride presented much the same picture as it did a year ago.

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AGE STRUCTURE OF SPAWNING CHANNEL CATFISH

Gary L. Ackerman
Fisheries Biologist

INTRODUCTION: Effort has been directed toward keeping an accurate inventory of the fish populations which exist within the Des Moines River in the vicinity of the future Red Rock Reservoir. Undoubtedly the most important game species now present within this river system is the channel catfish, Ictalurus punctatus Rafinesque. Thus the many phases of the life history of this species are being explored so that as answers are found and coordinated, constructive efforts can be inaugurated toward determining and applying proper management techniques.

Among the many phases of the life cycle of the catfish, a most important function is reproduction and the ultimate annual recruitment of young fish. The purpose of this paper is to present data illustrating the length and age structure of spawning catfish.

METHODS: During the months of May-June, 1965 eight stations were selected over a 19-mile reach of stream at an average 2.4-mile interval. At each station one conventional slat net and one 3/4 inch nylon hoop net was fished in comparable habitats for the purpose of securing spawning channel catfish. Each net was "baited" with a single ripe female catfish from 14-18 inches in total length. All nets were located either along mud banks or along rocky shallows where the current was moderate to slow. All nets were located at depths not more than 8 feet.

On May 21, 1965 the first catfish were secured which exhibited spawning behavior and which could be accurately sexed. At this time the surface water temperature was 69° F. The spawning season continued through June 30.

During this period, 3240 channel catfish were examined. The data collected included measurement (total length in tenth inches), weight (in tenth pounds), maturity (whether male, female or immature), and all these fish were tagged using a subcutaneous abdominal tag. In addition, 50 catfish were processed for stomach analysis. Other data recorded were the date, location, net type, total number of fish per net, total weight per net, and total net hours fished.

On June 16 a spine series was collected. Emphasis was placed upon securing a cross-section of sizes so as to include both immature as well as mature catfish. A total of 146 left pectoral spines was examined, assessing the age by utilizing a binocular microscope at 10x power. Growth was determined on the basis of average observed total lengths for a given age group instead of by the system of back-calculation.

RESULTS: Of 3240 catfish examined, 83% (2676) were regarded as being sexually mature fish. Within this group, the ratio of males to females was 56:44. Only 17% (564) catfish were regarded as being immature fish. These fish ranged from 6.0 inches up to 16.5 inches in total length. No immature fish was older than age VII.

A length frequency histogram was constructed illustrating size differences and the maturity of the sample of 3240 fish (Figure 1). This data reflected several important points. First, no year class can be clearly established because of the high degree of overlap in

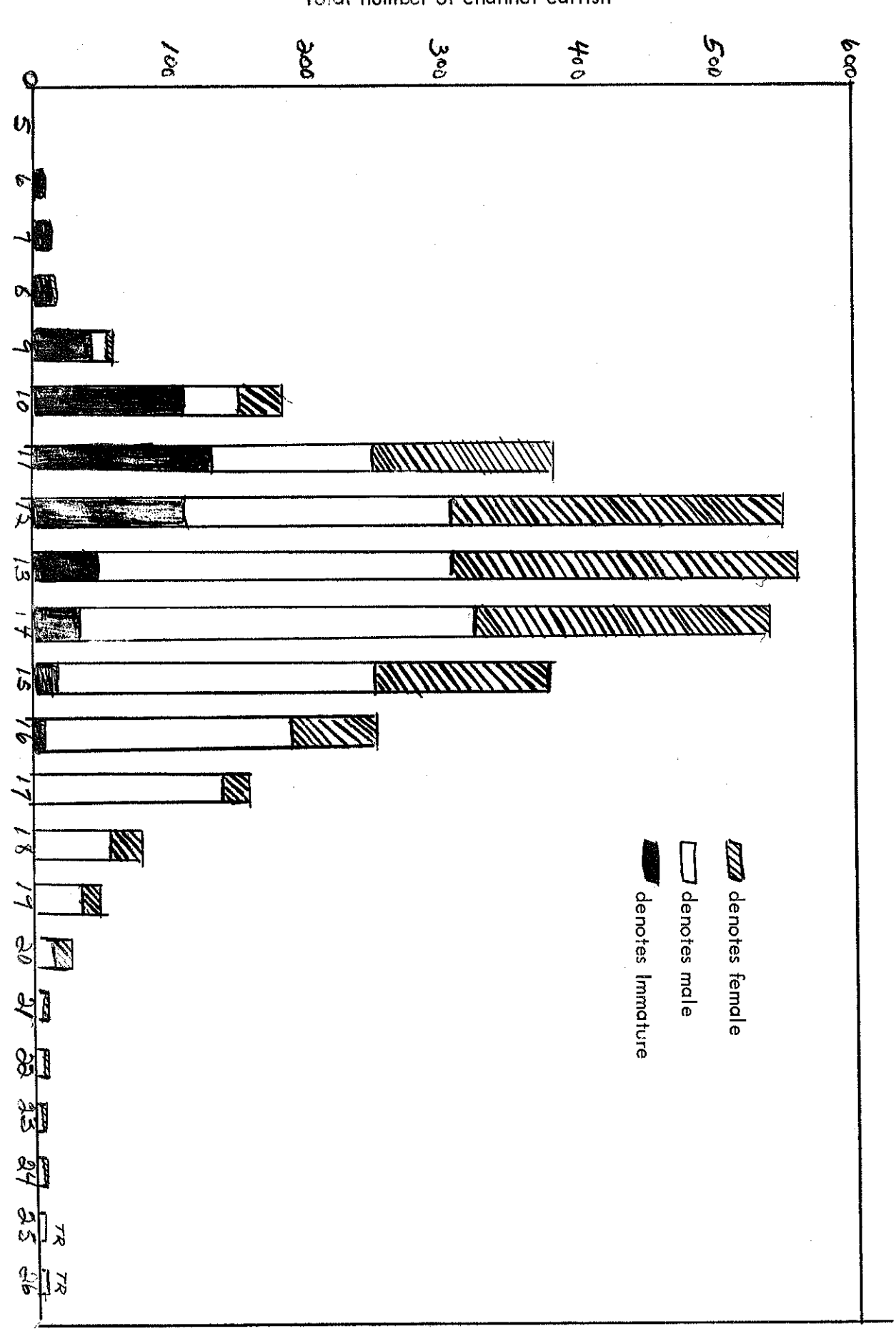

Figure 1. Length Frequency Histogram by 1-inch groups, Des Moines River, 1965.

lengths between age groups, and there is some indication that the range in lengths within the different age groups increased with an increase in age (See Table I). For example, fish larger than 10 inches may belong to four or five different age groups. Second, length frequency data indicated that sexual maturity greatly increased at a length of 10 inches in total length.

Length structure comparisons indicated the percentage of immature, male, and female catfish which are within 1-inch length groups without regard to the age of the fish (Table 2). Neither sex reached maturity less than 8.8 inches in total length. The range was from a 8.8 inch female to a 26.2 inch male. Nevertheless, only 0.4% (7) mature fish were less than 10 inches in total length. The percentage of immature fish in an inch group tends to decrease until no immature fish was observed in excess of 16.5 inches in total length.

Canfield (1947) observed that catfish held in ponds did not produce eggs until the fourth year of life. Of 146 catfish sexed and processed for aging purposes in the present study, no fish in their first three years of life were regarded as being sexually mature, and no fish were observed over VII years of age as being immature catfish (Table 3).

Table 3. Percent of Sexually Mature Male and Female Channel Catfish in each age group taken at Red Rock, Des Moines River, 1965.

	AGE GROUP									
SEX	I	II	III	IV	V	VI	VII	VIII	IX	X
Male	-	-	-	38	46	33	54	61	63	100
Female	-	-	-	44	39	63	46	39	37	-
Immature	-	100	100	18	15	4	-	-	--	-

The average observed total length of spawning catfish indicated that the growth of this population was very slow, and these findings closely compare with previous investigator's findings (Harrison, 1957). Upon the comparison of male and female growth of a given age group the females tends to be longer and heavier than males. For example, at age V ten females averaged 12.6 inches in total length while twelve males averaged 11.7 inches (Table 4)

Upon examination of the stomach and lower digestive tract of 50 sexually mature catfish, it was concluded that these fish do not extensively feed during spawning activities. Only two fish contained good materials (unknown eggs), and all stomachs examined were in a shrunken condition.

DISCUSSION:

Since only 17% of the fish sampled were regarded as being immature channel catfish, I assume that the methods previously outlined indicate that a low catch of immature fish is to be expected when using a female catfish for baiting purposes. It would be probable that if one were to bait the nets with either cheese or soybean meal during the spawning season, larger immature fish and a larger sample of immature fish would enter each age group and each size group. This selectibility will tend to bias the data.

Table 1. Overlap of Fish in Each Age Group (Sexes Combined) for Channel Catfish taken from Des Moines River, 1965.

SIZE BY 1-INCH INTERVALS	AGE GROUPS II	III	IV	V	VI	VII	VIII	IX	X	TOTALS
26-26.9	-	-	-	-	-	-	-	-	1	1
25-25.9	-	-	-	-	-	-	-	-	-	0
24-24.9	-	-	-	-	-	-	-	-	-	0
23-23.9	-	-	-	-	-	-	-	-	-	0
22-22.9	-	-	-	-	-	-	-	1	-	1
21-21.9	-	-	-	-	-	-	-	1	1	2
20-20.9	-	-	-	-	-	-	1	3	-	4
19-19.9	-	-	-	-	-	-	3	1	-	4
18-18.9	-	-	-	-	-	-	3	1	-	4
17-17.9	-	-	-	-	1	8	5	2	-	16
16-16.9	-	-	-	-	2	5	3	-	-	10
15-15.9	-	-	-	-	2	9	3	-	-	14
14-14.9	-	-	-	1	7	3	-	-	-	11
13-13.9	-	-	-	6	7	1	-	-	-	14
12-12.9	-	-	5	7	1	-	-	-	-	13
11-11.9	-	-	16	9	1	-	-	-	-	26
10-10.9	-	2	10	2	-	-	-	-	-	14
9-9.9	-	2	2	1	-	-	-	-	-	5
8-8.9	1	1	1	-	-	-	-	-	-	3
7-7.9	4	-	-	-	-	-	-	-	-	4
Number of fish	5	5	34	26	21	26	18	9	2	146

Table2.. Length Structure Comparisons of Immature, Male, and Female Spawning Channel Catfish, Des Moines River, 1965.

SIZE GROUPS	% IMMATURE	% MALE	% FEMALE	TOTAL SAMPLE
6-6.9	100 (4)	-	-	4
7-7.9	100 (13)	-	-	13
8-8.9	72 (13)	-	28 (1)	14
9-9.9	89.4 (51)	5.8 (3)	5.8 (3)	57
10-10.9	65.7 (119)	176 (32)	168 (30)	181
11-11.9	35.2 (134)	31.2 (119)	33.6 (128)	381
12-12.9	18.9 (103)	39.6 (217)	41.5 (227)	547
13-13.9	13.3 (74)	47.2 (262)	34.5 (219)	555
14-14.9	6.7 (36)	50.6 (271)	42.7 (228)	535
15-15.9	4.2 (16)	54.9 (206)	40.8 (153)	375
16-16.9	.4 (1)	67.2 (168)	32.4 (81)	250
17-17.9	-	74.0 (116)	26.0 (40)	156
18-18.9	-	72.2 (54)	27.8 (21)	75
19-19.9	-	70.0 (34)	30.0 (14)	48
20-20.9	-	53.5 (15)	46.5 (13)	28
21-21.9	-	57.1 (4)	42.9 (3)	7
22-22.9	-	37.5 (3)	62.5 (5)	8
23-23.9	-	33.3 (1)	66.7 (2)	3
24-24.9	-	50.0 (1)	50.0 (1)	2
25-25.9	-	-	-	0
26-26.9	-	100 (1)	-	1
TOTALS	17% (564)	47% (1507)	36% (1169)	3,240

* parenphiss denotes sample size

Table 4. Average Observed Total Lengths of Spawning Channel Catfish for Different Age Groups taken from the Des Moines River - Red Rock Area, 1965.

MATURITY	SAMPLE	AGE GROUPS									
		I	II	III	IV	V	VI	VII	VIII	IX	X
Immature Fish	20	-	7.5 (5)	9.6 (5)	11.2 (5)	11.8 (4)	13.2 (1)	-	-	-	-
Mature Female	62	-	-	-	11.3 (16)	12.6 (10)	14.6 (13)	16.4 (12)	16.9 (7)	20.1 (4)	-
Mature Male	64	-	-	-	10.7 (13)	11.7 (12)	13.8 (7)	15.8 (14)	17.9 (11)	19.4 (5)	23.7 (2)
All Fish Combined	146	0	7.5 (5)	9.6 (5)	10.7 (34)	12.1 (26)	14.3 (21)	16.1 (26)	17.5 (18)	19.7 (9)	23.7 (2)

* Number in parenthesis indicates sample size.

Appeleget and Smith (1951) found in their Mississippi River studies that no fish were regarded as being sexually mature in their first four years of life. "In the fifth year of life 17.6 per cent of both sexes showed some degree of sexual development. Not until the ninth year of life were 100 percent of the males and 90 per cent of the females mature. The percentage of fish attaining sexual maturity increases until 100 per cent are mature at a length of 22 inches." Thus, there is some disagreement in the current study in this respect.

CONCLUSIONS:

(1) The rate of growth for this species is very slow.

(2) Channel catfish reach sexual maturity at age IV.

(3) Channel catfish do not actively feed during spawning activities.

(4) The largest group of spawning catfish is between 10 and 17 inches in total length.

(5) Females tend to be larger and heavier than males for a given age group.

(6) Baiting nets with a female channel catfish is a very effective method of obtaining this species during the spawning season.

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PRE-IMPOUNDMENT STUDIES OF THE CHARITON RIVER IN THE VICINITY OF RATHBUN DAM AND RESERVOIR

Part I: Annotated List of Fishes in the Chariton River and Tributaries.

By Jim Mayhew
Fisheries Biologist

The Chariton River is a major tributary of the lower Missouri River. This stream drains approximately 925 square miles of agricultural land. Its source is located in the southwest corner of Clarke County, Iowa, then flows northeasterly through portions of Lucas and Monroe Counties, and southeasterly through Wayne and Appanoose Counties. The stream enters the state of Missouri in the southeast corner of the latter county (Figure 1).

For the most part the stream flow is slow and sluggish. Daily flow records since 1956 reveal an average daily discharge of 338 c.f.s. Maximum flow during the 10 year study was 21,800 c.f.s. on June 24, 1960. On October 24, 1957, a minimum discharge of only 0.1 c.f.s. was recorded. Originally the stream followed a tortious course through the 5 county area. Most of the original channel in Wayne and Appanoose Counties has been straightened to promote rapid agricultural land drainage. However, in Lucas and Clarke Counties much of the natural channel remains. In rechanneled regions there are many small cut-off oxbow ponds. The river banks vary from 5 feet in height in the upper reaches to as much as 25 feet high in the lower regions. The South Chariton River, Wolf Creek, and North Jordan River are the main tributaries. These also have, for the most part, been rechanneled.

Rathbun Dam and Reservoir is a proposed flood control impoundment in the upper Chariton River Basin. It was authorized under the Flood Control Act of 1954 by the United States Congress. Construction was started in July 1965 and is scheduled for completion the autumn of 1968.

The damsite is located at mile 145 in sections 25, 35, and 36, T 70 N R 18 W in Appanoose County. At conservation pool elevation the reservoir will impound 11,000 surface acres of water. During full flood pool the lake will have an area of slightly more than 21,000 acres. The dam will control 549 square miles of the drainage area.

HISTORY AND PRESENT STATUS OF FISHES OF THE CHARITON RIVER

The changing of stream environment by an impoundment of this magnitude will undoubtedly influence fish populations. Species most tolerant of lotic environment will increase in number, while those intolerant of this habitat will be reduced in abundance. Man will also certainly influence the species composition of the reservoir. The recreational value of the fishery in the Chariton River is limited. With impoundment and a projected 990,000 recreational visits annually, required intensive fisheries management will further influence the abundance of some species

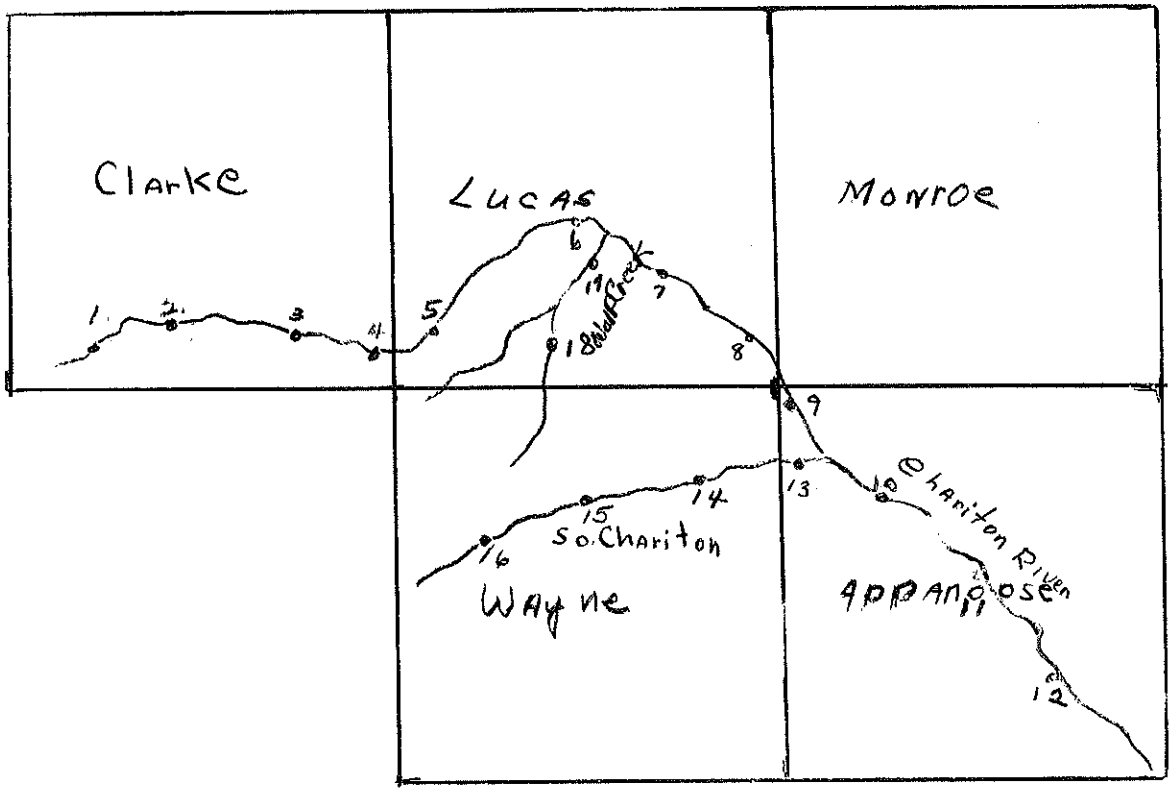

Figure 1. Diagramatic sketch of the approximate locations of sampling station on the Chariton River and tributaries. Stations 2, 4, 7, 9, 10, and 12 were used by Harrison and Speaker

of fish. The purpose of this study is to record the number of species present and their relative abundance prior to impoundment.

The earliest scientific work in this area was compiled by Seth E. Meeks between 1884 and 1887 (Meeks, 1892). Several other collections by personnel from Iowa State University and State Conservation Commission were made between 1932 and 1946. The most recent collection of fishes from this stream was made by Harrison and Speaker (1954) as a part of a survey of fishes in the Missouri River tributaries. All collections of fish from the Chariton River Basin as well as other Iowa streams were combined in a single report by Cleary (1956).

The present list of fishes in the Chariton River System was compiled from seine hauls from 18 different sampling stations. Twelve stations were located on the Chariton River, 4 stations on the South Chariton, and 2 stations on Wolf Creek. Size of these sampling stations were identical to those used by Harrison and Speaker. The exact location of each station is listed in Table 1.

Several seine hauls were made at each sampling station with a short, small mesh drag seine. All specimens were examined for identification in the field. If positive identification could be made the species was marked as present at the sampling station and a note was made of relative abundance. When positive identification was impossible the specimen was preserved and identified later. All types of habitat, including riffle and pool areas, were seined during low stream flow. Specimen captured later in the summer while using fish toxicants for sampling total fish populations on small stretches of stream were also included.

The present list includes 35 species representing 10 families. Other workers listed 9 additional species that were not found in this survey. The present list includes only two species that has not been previously reported. There has undoubtedly been significant changes in the relative abundance of several species since the collections of Meeks. The greatest change occurring as a result of rechannelization. Over flow stocking from the multitude of small ponds and lakes built in the watershed the last 3 decades has also influenced the abundance of several species.

Table 1. Location and description of the sampling stations in the Chariton River Basin.

Station Number	Stream	County	Location	Description of Stream Habitat
1	Chariton	Clarke	R 25 W T 71 N Sec. 34	Series of short swift riffle and shallow short pools. Mud bottom.
2	Chariton	Clarke	R 24 W T 71 N Sec. 29	Same as above station
3	Chariton	Clarke	R 24 W T 71 N Sec. 24	Same as above station
4	Chariton	Lucas	R 23 W T 71 N Sec. 14	Long deep pool separating short swift riffles. Most of sampling in the pool
5	Chariton	Lucas	R 22 W T 71 N Sec. 2	Similar to station 1
6	Chariton	Lucas	R 21 W T 71 N Sec. 15	New channelization made this a intermittent stream during the sampling. Long deep pool with long riffle at the head of pool.
7	Chariton	Lucas	R 21 W T 71 N Sec. 29	Pool and riffles immediately below the outlet of North and South Colyn Lakes.
8	Chariton	Lucas	R 20 W T 71 N Sec. 35	Long pool and several short riffles within one-half mile of Brown's Slough area.
9	Chariton	Appanoose	R 19 W T 70 N Sec. 14	Long pool and swift riffles flowing through exposed bedrock
10	Chariton	Appanoose	R 18 W T 70 N Sec. 20	Rechanneled area, mostly swift flowing.
11	Chariton	Appanoose	R 18 W T 70 N Sec. 36	Same as above station.
12	Chariton	Appanoose	R 17 W T 69 N Sec. 7	Short pool and riffle area. Some sand bar development. Heavy strip mining area on each side of station
13	So. Chariton	Appanoose	R 19 W T 70 N Sec. 28	Short pool and riffle. Mud bottom
14	So. Chariton	Appanoose	R 20 W T 69 N Sec. 10	Rechanneled
15	So. Chariton	Wayne	R 21 N T 69 N Sec. 1	Immediately below confluence of Chariton and So. Chariton. Some exposed bedrock. Long deep pool and short swift riffles.

16	So. Chariton	Wayne	R 21 W T 71 N Sec. 31	Rechanneled but with some sand bar development in low flow.
17	Wolf Creek	Lucas	R 21 W T 71 N Sec. 39	Small stream with low flow in late summer and fall. Sandy bottom.
18	Wolf Creek	Lucas	R 21 W T 71 N Sec. 15	Partly rechanneled, partly original channel. Sand bar development is pronounced.

Herring Family
(Clupeidae)

Dorsoma cepedianum (LeSuer). Gizzard Shad. Common. Widely distributed throughout the entire stream. Becomes more abundant in the lower reaches of the river.

Mooneye Family
(Hiodontidae)

Hiodon alosides (Rafinesque). Goldeye. Rare. One specimen taken at station 10, another specimen was known caught by an angler during the summer. This species was not reported by Meeks or Harrison.

Sucker Family
(Catostomidae)

Ictiobus cyprinellus (Valenciennes). Bigmouth buffalo. Abundant. Species found at almost all stations. Probably comprises the largest portion of the population by weight.

Ictiobus bubalus (Rafinesque). Smallmouth buffalo. Rare. Two specimen captured, both were in the headwaters region of the river. Harrison and Speaker also reported this species rare.

Carpiodes carpio (Rafinesque). River carpsucker. Abundant. Found at all stations. Probably more abundant than any other species of fish.

Carouides cyprinus (LeSuer). Quillback carpsucker. Common. More numerous in the upper reaches of the river. Particularly abundant in Brown's Slough, a man-made impoundment adjacent to the Chariton River near station 8.

Moxostoma aureolum (LeSuer). Northern Redhorse. Rare. Less than 5 individual captured. Most of these were with fish toxicants. Three were captured at station 9.

Catostomus commersoni commersoni (Lacepede). White sucker. Found only above station 6 in the Chariton River, and at stations 15 and 16 on the South Chariton. Rather abundant in early spring seine hauls in the headwaters.

Minnow Family
(Cyprinidae)

Cyprinus carpio (Linnaeus). Carp. Abundant. The carp is generally distributed throughout the Chariton River Basin. Found in abundance at all sampling stations.

Notemigonus crysoleucas auratus (Rafinesque). Western golden shiner. Common. Found at almost all sampling stations. This species is common to abundant in all lakes in the watershed with

the exception of farm ponds. More abundant in the lower portion of the river than in the upper reaches.

Semotilus atromaculatus atromaculatus (Mitchill). Northern creek chub. Common. Well distributed throughout the entire length of the river. They were not concentrated in any area.

Hybopsis storeriana (Kirkland). Silver Chub. Rare. One specimen captured at station 17 on Wolf Creek. Harrison and Speaker also only found one specimen, but Meeks reported species as common.

Phenacobius mirabilis (Girard). Plains suckermouth minnow. Common. Generally distributed throughout the Chariton River System. Harrison and Speaker reported this species rather common throughout the Missouri River Basin.

Notropis dorsalis dorsalis (Agassiz). Central bigmouth shiner. Common. Species was found at almost all stations, but showed a distinct preference for the small clear streams, such as Wolf Creek and the headwaters of the South Chariton River.

Notropis lutrensis (Baird and Girard). Plains red shiner. Common. Widely distributed throughout the river system. Particularly abundant at stations 9 and 13 in flowage through exposed bedrock and gravel.

Notropis deliciousus (Cope). Plains sand shiner. Common. Found at nearly all sampling stations, but most abundant in Wolf Creek and South Chariton River.

Hybognathus nuchalis nuchalis (Agassiz). Silvery minnow. Common. Distributed throughout the entire Chariton River Basin. This species is quite tolerant of turbidity which may account for its abundance. Harrison, Speaker, and Meeks also reported it common in the Missouri River drainage.

Pimephales promelas promelas (Rafinesque). Fathead minnow. Abundant. Probably the most abundant species of fish in the Chariton River. It also abounds in the small lakes and ponds in the watershed.

Catfish Family
(Ameiuridae)

Ictalurus lucustris (Walbaum). Channel catfish. Common. This species found at all stations on the Chariton River, but was absent in the samples from Wolf Creek, and found at only one station on the South Chariton River. Most abundant in areas where the original channel still remains.

Ameiurus melas melas (Rafinesque). Northern black bullhead. Abundant. The most abundant species of fish in the Chariton River system. Found in large numbers at all stations.

Ameiurus natalis (LeSueur). Yellow bullhead. Rare. Species was rare to common. Distributed evenly throughout the region. Most abundant in the lower reaches of the river.

Ictalurus olivaris (Rafinesque). Flathead catfish. Rare. Found only at stations 6, 8, and 10. Then only as young-of-the-year. Adults reported cought commonly near the Missouri-Iowa border several miles below station 12.

Noturus flavus (Rafinesque). Stone cat. Rare. Nine individual specimens captured, with all taken station 8.

Noturus gyrinus (Rafinesque). Tadpole madtom. Common. Species found quite commonly in the fish toxicant sampling, but rare in the seine samples.

Trout-Perch Family
(Percopsidae)

Percopsis omiscomaycus (Walbaum). Trout-perch. Rare. A few individuals were captured in the lower reaches of the river. Several more were taken at station 12 with fish toxicants.

Bass Family
(Serranidae)

Roccus mississippiensis (Jones and Eigenmann). Yellow bass. Rare. Two specimens taken in the south Chariton River. This species is quite abundant in Allerton Reservoir, which forms the headwaters of this stream.

Sunfish Family
(Centrarchidae)

Micropterus salmoides (Lacepede). Largemouth bass. Common. Species is quite abundant below the Brown's Slough-Colyn Lake area, but undoubtedly influenced by overflow stocking. Not found in the South Chariton River or Wolf Creek.

Lepomis cynellus (Rafinesque). Green sunfish. Common. Generally distributed throughout the region. Found mostly in the deep sluggish pools.

Lepomis machrochirus (Rafinesque). Bluegill. Common. Another species that is more abundant below the lake areas. Population density influenced considerably by overflow stocking.

Lepomis humilis (Girard). Orage-spotted sunfish. Common. Found commonly in the deep pools at nearly all stations.

Pomoxis annularis (Rafinesque). White crappie. Common. Species was found evenly distributed throughout the region. Also abundant in the lakes in the watershed, but the contribution of these populations to the river is generally unknown. Some apparently natural reproduction

was found in the late summer.

Pomoxis nigb-maculatus (LeSuer). Black crappie. Rare. Only a few individuals captured. This species is intolerant of turbidity which may contribute to its rarity.

Perch Family
(Percidae)

Perca flavescens (Mitchill). Yellow perch. Rare. Only two specimens captured, and these were immediately below the Brown's Slough area, which indicates they might be from overflow stocking.

Etheostoma nigrum (Rafinesque). Johnnny darter. Rare. Reported rare in the collection of Harrison and Speaker. No change in this survey, they are still rare.

Drum Family
(Sciaenidae)

Aplodinotus grunniens (Rafinseque). Freshwater drum. Rare. Two adult specimens caught at stations 12. Species not reported prior to this in the Chariton River.

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