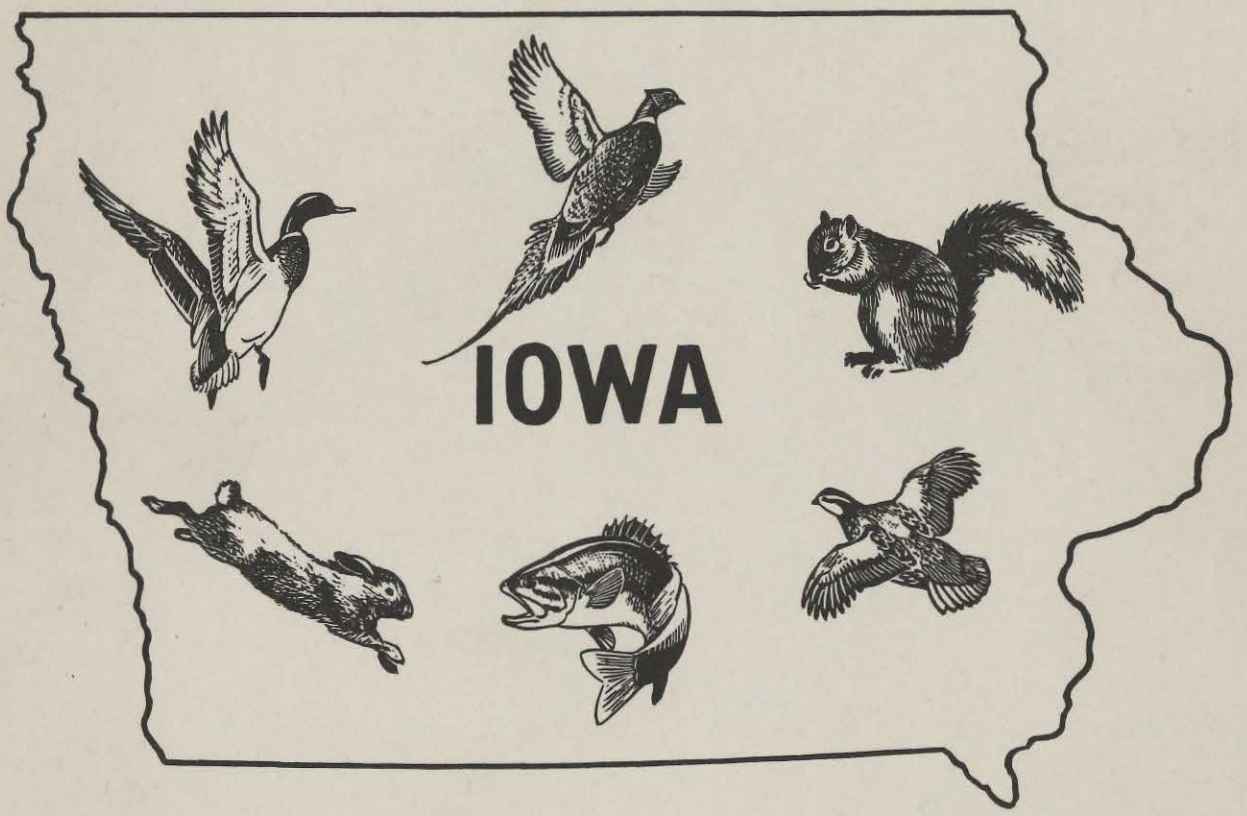
Vol. 4 No. 4 1952

Minnow Henrin

QUARTERLY BIOLOGY REPORTS



FISH AND GAME DIVISION — BIOLOGY SECTION

STATE CONSERVATION COMMISSION

Q U A R T E R L Y B I O L O G Y R E P O R T S

October, November, December 1952

Vol. IV No. 4

Submitted by

Biology Section
Everett B. Speaker, Supt.

State Conservation Commission
Bruce F. Stiles, Director

Fish and Game Division
Ray W. Beckman, Chief

Des Moines, Iowa

TABLE OF CONTENTS

A PRELIMINARY REPORT ON THE 1952 BEAVER HARVEST IN IOWA

Glen C. Sanderson
Game Biologist

The history of the beaver's disappearance and gradual return to Iowa has been discussed in a previous report (Sanderson, 1951). Results of Iowa's first beaver trapping season in many years were discussed by Sanderson (1950). Regulations and results of subsequent seasons were discussed in two previous reports (Sanderson, 1951 and 1952).

In 1952, the Conservation Commission again opened the entire state to beaver trapping, this time for a 30-day season, the longest in recent years. The season was from noon, November 10 through December 9, with a special season from noon, November 10 through December 19 on the Mississippi River from north of Muscatine to the Minnesota border, east of the Milwaukee Railroad tracks. Preliminary results of the 1952 season, as determined from the special beaver reports submitted by fur buyers and from personal checks of fur houses made by the writer, are presented in this report.

Since a short report was asked for this seminar, it was decided to give a preliminary report on the results of the 1952 beaver trapping season even though many of the special beaver reports were not in yet.

METHODS--As in the previous years, a special beaver report form was sent to all fur buyers in the state. This form asked the buyers to report the number of beaver pelts they bought from trappers, the county in which the furs were caught, the size of the pelts (small, medium, or large), and the date on which the pelts were purchased. The writer made personal visits to several fur houses to check on beaver and the fur season in general.

Reports are available from 80 of the approximately 255 resident and non-resident fur buyers holding licenses in the state. This gives a 31.4 per cent return for the entire state.

RESULTS

SIZE OF HARVEST--Weather conditions were favorable for beaver trapping throughout much of Iowa for a good portion of the open season. However, as in recent years, a low average price received by trappers for beaver pelts kept the number harvested lower than might have been expected otherwise.

A number of fur buyers were asked what they paid for beaver pelts of various sizes. On the basis of their replies it is estimated that an average price of $6.00-$7.00 per pelt was paid in 1952. Thus, trappers received about the same or perhaps slightly less for their beaver pelts than the average of $7.42 reported in 1951 by the Commission's fur reports. In 1952, buyers paid from nothing to $1.00 for kits up to a top of approximately $15.00 for blanket beaver pelts. As during the previous season, many local buyers had difficulty getting quotations on Iowa beaver, especially early in the season, and in many cases practically refused to buy beaver pelts at any price.

Table 1 shows the reported harvest by counties for the entire state. This table reveals a range from a high of 135 for Clinton County to no beaver reported for 30 counties. Doubtless the figures for some of the counties are further off than the figures from other counties depending on the number of fur buyers reporting from the county or area in question. However, with some exceptions, the figures probably reflect the relative number of beaver trapped in the various counties. There were 74 pelts which could not be assigned to any county and if the origin of these was known it would probably

Table 1.--Number of beaver pelts bought from each county during the 1952 season as reported by fur buyers.

COUNTY	NUMBER*		COUNTY	NUMBER*	
Clinton	135		Palo Alto	5	
Clay	106		Wapello	5	
Jackson	101		Pottawattamie	5	
Dickinson	68		Delaware	4	
Emmet	64		Van Buren	4	
Calhoun	52		Clayton	3	
Black Hawk	42		Winneshiek	3	
Woodbury	40		Poweshiek	2	
Davis	40		Henry	2	
Butler	39		Cass	1	9*
Johnson	38		Fayette	1	
Crawford	34	1*	Plymouth	1	
Marshall	32	8*	Clarke	1	
Chickasaw	34		Fremont	1	
Iowa	29		Ringgold	1	
Page	28		Hancock	0	17*
Louisa	26		Lyon	0	
Osceola	24		Winnebago	0	
Sac	25		Worth	0	
Muscatine	22		Cerro Gordo	0	
Bremer	17		O'Brien	0	
Harrison	17		Sioux	0	
Monona	17		Cherokee	0	
Taylor	16	6*	Pocahontas	0	
Buchanan	15	24*	Franklin	0	
Des Moines	14		Webster	0	
Jefferson	13		Hamilton	0	
Buena Vista	10		Hardin	0	
Cedar	10		Grundy	0	
Ida	10		Dubuque	0	
Wright	10		Linn	0	
Allamakee	14		Benton	0	
Adams	9		Story	0	
Keokuk	9		Boone	0	
Carroll	9		Audubon	0	
Madison	9		Guthrie	0	
Greene	8		Dallas	0	
Jones	8		Polk	0	
Kossuth	8		Scott	0	
Montgomery	8		Warren	0	
Lee	7		Marion	0	
Mitchell	7		Mahaska	0	
Shelby	7		Mills	0	
Washington	7		Union	0	
Adair	6	9*	Lucas	0	
Tama	6		Monroe	0	
Humboldt	6		Decatur	0	
Floyd	6		Wayne	0	
Howard	6		Appanoose	0	
Jasper	5		TOTAL	1,434	

* Numbers in parentheses indicate pelts bought by a fur buyer who did not report the county in which the pelts were taken.

bring some of the unexpectedly low counties up to where they belong. A few large buyers who buy pelts from widely scattered localities have not reported yet. Doubtless their reports will fill out gaps in the data.

The 1,434 beaver pelts reported to date for the 1952 season on the special report form (Table 1) compares with 1,913 and 2,000 reported on similar forms in 1950 and 1951 respectively. However, so far reports are available from only 31.4 per cent of the buyers compared to 46.9 and 59.6 per cents respectively in 1950 and 1951.

Table 2 shows the number of beaver pelts taken in Iowa through 1951 as revealed by fur reports. The estimated harvest of 2,500 beaver for 1952 is computed from information obtained by this

TABLE 2.--Number of Iowa beaver pelts bought by fur buyers.[1]

SEASON	NUMBER OF PELTS
1942-43	000
1943-44	235
1944-45	259
1945-46	623
1946-47	494
1947-48	210
1948-49	670
1949	2,449
1950	3,103
1951	2,465
1952	2,500[2]

1 All beaver trapped under special permit system until 1949.
2 Estimated from special report forms, all other figures from reports submitted to the Conservation Commission by fur buyers.

project and using experience gained from comparing the results of past reports with the total number of beaver reported by fur buyers. Thus, it appears that the 1952 beaver harvest will be approximately the same as it was in 1951 even though the 1952 season was 10 days longer than the previous one.

Since, trapping conditions, pelt value, and economic conditions in general affect the number of beaver trapped, it is felt that the harvest figures give little, if any, indication as to the state-wide beaver population in Iowa.

SIZE OF PELTS--Information in Table 3 reveals a slight increase in the percentage of large pelts in the harvest from 1949 to 1951. The percentage of medium sized beaver remained relatively constant for the three years while the percentage of small beaver showed a light decline for the same period. The percentage of medium sized pelts remained relatively unchanged from 1951 to 1952; however, the percentage of small pelts showed an increase for the 1952 season while the percentage of large pelts showed a corresponding decrease.

TABLE 3.--A comparison of the percentages each size of pelt contributed to the 1949, 1950, 1951 and 1952 beaver harvest in Iowa.

YEAR	LARGE	MEDIUM	SMALL	SIZE UNK	TOTAL HARVEST REPORTED
	34%	34%	32%		
1949	441	440	426	835	2,413
	38%	35%	27%		
1950	616	576	432	301	1,913
	42%	31%	27%		
1951	726	549	465	269	2,000
	28%	33%	39%		
1952	396	476	562	000	1,434

1 Total number pelts reported on special beaver report forms--for total harvest see figures in Table 2.

SUMMARY

1. Weather conditions were mostly favorable throughout much of Iowa during the 30-day state-wide beaver trapping season in 1952. However low pelt value prevented the beaver harvest from going as high as it might have with a good market.

2. A total of 1,434 pelts were reported by fur buyers on the special beaver report forms.

3. Reports are available from only 31.4 per cent of the fur

buyers in the state.

4. It is estimated that approximately 2,500 beaver were trapped during the 1952 season in Iowa.

5. From 1949, when beaver trapping again became legal in Iowa, the percentage of large pelts in the harvest increased slightly while the percentage of medium sized pelts remained fairly constant and the percentage of small pelts decreased slightly. The percentage of medium sized pelts remained relatively unchanged from the 1951 to the 1952 season, but the percentage of small pelts showed an increase and the number of large pelts a corresponding decrease.

REFERENCES CITED

Sanderson, Glen C. 1950. Iowa's 1949 beaver season. Ia. Conservationist, 9 (3):17,23.

---------- 1951. The 1950 beaver harvest in Iowa as reported by fur buyers. Sixth Biology Seminar, Des Moines, Iowa, April 10, 1951, 4pp., 5 tables (mineo).

---------- 1952. The 1951 beaver harvest in Iowa as reported by fur buyers. Report submitted to the Cons. Comm., March 20, 1952, 6 pp (typed).

THE 1952 PHEASANT SEASON

Richard C. Nomsen
Game Biologist

The opening of the 1952 pheasant season in Iowa was delayed one week because of extremely dry cover conditions. General rains removed the threat of fire several days before the opening on November 18. On that date, 65 counties in Northern Iowa were opened for pheasant hunting for a period of 25 days -- there were 27 counties in Southern Iowa opened for 12 days. In both the long and short zones, shooting hours each day were from noon to four thirty with a bag and possession limit of three cock birds.

Hunter success information was collected by Conservation Officers in the field. The cards and procedure were the same as in previous surveys. The following report includes the results of 1901 cards returned at the end of the season. Each card represents the hunting success for one party of pheasant hunters.

The results of this survey show that hunting success in 1952 was better than in 1951. The 5,464 hunters interviewed hunted 17,156.9 hours to bag 5,176 pheasants. The average time per bird was three hours and eighteen minutes. Average time to bag a bird during each of the past five seasons were--

1952	3 hours and 18 minutes
1951	3 hours and 36 minutes
1950	3 hours and 00 minutes
1949	3 hours and 30 minutes
1948	3 hours and 18 minutes

There were 95 birds checked for each 100 hunters interviewed in 1952 compared with 87 birds the previous year. Hunters lost fewer birds during the 1952 season -- 15% of all birds shot down were not found compared to 17% in 1951.

Fewer hunters traveled to hunt in 1952. The pheasant range has been increasing in Southern Iowa so that some hunters probably stayed near home instead of traveling north. Also, the 1952 season did not open on a holiday as did the previous seasons. Non-local hunters made up 46% in 1951. The Northern three districts all had fewer non-local hunters -- the Central three districts were about the same both years while Southern Iowa experienced an increase in non-local hunters. Table A-1 lists the per cent of non-local hunters by districts for the past three seasons.

Table A-1
Per Cent of Non-Local Hunters by Districts

District	1950	1951	1952
1. North West	32%	46%	32%
2. North Central	52%	62%	54%
3. North East	41%	45%	33%
4. West Central	37%	32%	34%
5. Central	61%	55%	51%
6. East Central	34%	41%	38%
7. South West	34%	22%	31%
8. South Central	34%	21%	38%
9. South East	62%	53%	69%
STATE	45%	46%	41%

Table A-2 compares the hunting success of local and non-local hunters.

Table A-2
Local and Non-Local Hunters

	% of Total	Average Party Size	% of Parties Using Dogs	Hours per Bird Bagged
Local	59%	2.6	23%	3.2
Non-Local	41%	3.2	20%	3.6

There was a noticeable decrease in the use of dogs by both the local and non-local hunters checked during the past season. Local hunters needed 3.2 hours per bird bagged compared with 3.6 hours for non-local hunters. Their better hunting success was partly due to the fact that they lost fewer birds - 14% - while non-locals lost 17%.

Out of State hunters worked an average of 2.9 hours per bird bagged. Their success is usually better than average because about half the parties use dogs. They lost 15% of the birds shot down compared with 12% a year ago. Table A-3 lists information about non-resident hunters.

Table A-3
Non-Resident Hunters

	% of Total	Average Party Size	% of Parties Using Dogs	Hours per Bird Bagged
1950	3%	3.2	44%	2.5
1951	3%	3.0	50%	3.2
1952	3%	3.5	42%	2.9

Although fewer dogs were used this season, the parties using dogs had their usual better success than those without dogs. Parties of hunters using dogs hunted an average of 2.6 hours per bird bagged and those without dogs hunted 3.7 hours. This difference of more than an hour is the same as during the 1951 season. Table A-4 compares the hunting success of parties with and without dogs.

Table A-4
Hunting Success - With and Without Dogs

	With Dogs			Without Dogs		
	1950	1951	1952	1950	1951	1952
Average Party Size	3.1	3.3	3.1	3.1	3.1	2.8
Percent of Birds Shot Down and Lost	9%	9%	9%	19%	20%	18%
Birds in Bag for Each Bird Lost	10.2	10.1	9.6	4.3	3.9	4.5
Hours per Bird Bagged	2.4	2.9	2.6	3.3	4.0	3.7
Hours per Bird Shot Down	2.2	2.7	2.4	2.7	3.2	3.0

Table A-5 shows the use of dogs by districts. For the State as a whole, the percentage of parties using dogs dropped from 27% to 22% in 1952.

Table A-5
Use of Dogs

	Percentage of Parties Using Dogs		
District	1950	1951	1952
1. North West	28%	22%	15%
2. North Central	24%	30%	14%
3. North East	29%	37%	32%
4. West Central	31%	28%	21%
5. Central	23%	24%	16%
6. East Central	31%	24%	29%
7. South West	28%	24%	30%
8. South Central	28%	37%	28%
9. South East	24%	17%	22%
STATE	27%	27%	22%

Hunters without dogs lost fewer birds this year. Possibly the snow cover that was present during most of the season helped them locate downed birds. The dogs did their usual good job --- losing 9.5% of all birds shot down - just about half as many as those without dogs. Table A-6 lists the types of dogs most frequently used and information regarding each type.

Table A-6
Types of Dogs Used - 1952 Pheasant Season

Dogs	No. of Parties	Hours Hunted	Birds Bagged	Birds Shot Down and Lost	Percent of Birds Lost
Setter	40	415	155	11	6.6%
Lab	106	1278	511	38	6.9%
Pointer	75	698	306	25	7.6%
Cocker	55	478	193	18	8.5%
Chesapeake	23	212	99	10	9.2%
Springer	43	403	136	22	13.9%
Mongrel	36	392	106	21	16.5%

Table A-7 shows the records for each dog for the last five years and lists them according to their five year average.

Table A-7

Dogs	Percent of Birds Shot Down and Not Found					Five Year Average
	1948	1949	1950	1951	1952	
Lab	8.6%	5.4%	4.8%	8.7%	6.9%	6.9%
Chesapeake	6.9%	7.9%	8.5%	5.5%	9.2%	7.6%
Pointer	7.1%	9.4%	7.0%	8.6%	7.6%	7.9%
Setter	13.8%	6.1%	7.9%	7.6%	6.6%	8.4%
Springer	10.9%	7.3%	12.1%	9.9%	13.9%	10.8%
Cocker	11.0%	14.2%	12.3%	13.3%	8.5%	11.9%
Mongrel	23.0%	10.2%	16.0%	13.4%	16.5%	15.8%
ALL DOGS	11.0%	9.0%	9.0%	9.0%	9.5%	9.5%

Pheasant populations for North West and North Central Iowa are nearly the same so these two districts are used to compare hunting success using the different types of dogs. Table A-8 lists the information for districts one and two only.

Table A-8
Hunting Success with Dogs in Districts One and Two

Dogs	Number of Parties Interviewed				Hours per Bird Bagged				Four Year Average
	1949	1950	1951	1952	1949	1950	1951	1952	
Lab	49	48	47	35	1.9	1.6	2.0	2.1	1.9
Chesapeake	18	13	17	8	2.2	2.3	1.8	2.4	2.2
Pointer	15	14	16	6	3.2	1.8	2.1	2.0	2.3
Setter	12	11	20	13	2.5	1.5	3.1	2.0	2.3
Cocker	21	23	24	10	2.8	2.2	2.2	1.9	2.3
Springer	36	15	23	6	2.9	2.2	2.5	2.4	2.5
Mongrel	23	13	21	5	3.2	2.2	2.5	2.6	2.6

Hunting success for all districts is shown in Table A-9. The three Northern Iowa districts showed an increase in time per bird -- less time was needed in all other districts.

Table A-9
Hunting Success by Districts

	Hours Per Bird Bagged				
District	1948	1949	1950	1951	1952
1. North West	2.5	3.2	2.0	2.5	2.7
2. North Central	2.5	3.1	2.5	3.0	3.3
3. North East	2.7	3.5	3.8	3.7	3.9
4. West Central	3.3	3.6	3.1	4.2	3.3
5. Central	4.5	4.3	3.8	6.3	4.1
6. East Central	4.6	4.1	3.8	4.6	3.4
Short Season Zone					
7. South West	---	3.9	5.5	3.6	2.3
8. South Central	---	3.9	3.9	5.4	3.9
9. South East	5.9	3.2	4.0	6.3	3.3
STATE	3.3	3.5	3.0	3.6	3,3

Hunting success depends in part on hunting conditions. Opening week in 1952 was more favorable to the hunter than in 1951. Nearly all corn was picked -- just the opposite of conditions the previous year when only about 15% of the corn had been picked by opening day. The following table lists the hunting success each week during the last three seasons.

Hours per Bird Bagged

Year	1st Week	2nd Week	3rd Week	Last 4 Days
1952	2.6	4.2	5.8	5.3
1951	3.4	3.8	3.5	4.7
1950	2.6	3.5	3.6	3.5

Hunting during the first week was good - much better than a year ago and the same as 1950. However, after the first week, hunters required much more time to bag a bird during each

succeeding period than for previous seasons. A general snowstorm covered the pheasant range at the beginning of the second week. This heavy snowfall helped some hunters the first day or so but after that, caused very difficult hunting conditions. Birds were very wild and stayed well out of range throughout most of the season. Table A-10 lists the results for each week in each district.

Table A-10
Hours per Bird Bagged for Each Week

District	Nov. 18-24 1st Week	Nov. 25-Dec.1 2nd Week	Dec. 2-8 3rd Week	Dec. 9-12 Last 4 Days
1. North West	2.0	2.7	4.9	5.2
2. North Central	2.6	4.5	6.1	7.6
3. North East	2.9	4.4	7.4	6.6
4. West Central	2.5	4.0	6.0	4.2
5. Central	3.0	5.8	6.4	6.7
6. East Central	2.7	5.9	5.0	5.1
. Short Season				
7. South West	2.2	3.6		
8. South Central	3.9	3.8		
9. South East	3.5	2.8		
STATE	2.6	4.2	5.8	5.3

Richard C. Nomsen
Biologist

Table B-3
DISTRIBUTION TABLE OF PHEASANT LEG MEASUREMENTS

		DISTRICT										
	mm	1	2	3	4	5	6	7	8	9	County Unknown	State
Young	11	9	25	2	6	3	0	0	0	0	0	45
	12	9	16	5	4	4	2	1	1	0	3	45
	13	19	32	11	12	8	4	2	3	1	2	94
	14	45	81	20	25	16	8	12	5	3	4	219
	15	118	119	33	67	45	18	20	15	1	15	451
	16	180	200	59	91	69	34	31	12	1	28	705
	17	270	272	70	134	118	71	26	33	1	39	1034
	18	243	263	88	172	157	96	48	25	12	27	1131
	19	221	169	50	141	134	85	52	23	12	34	921
	20	117	67	33	67	74	47	29	10	5	17	466
Adult	21	54	51	12	57	40	28	22	4	8	8	284
	22	39	47	16	35	33	20	17	4	3	10	224
	23	27	38	5	36	21	15	13	8	2	7	172
	24	13	8	7	23	27	15	13	6	1	2	115
	25	13	8	1	14	14	9	7	2	1	7	76
	26	1	5	2	8	5	2	4	5	0	3	35
	27	5	4	1	2	3	0	3	1	1	0	20
	28	0	1	1	0	1	1	0	0	1	0	5
Total Right Legs		1383	1406	416	894	772	455	300	157	53	206	6042
Total Young		1231	1244	371	719	628	365	221	127	36	169	5111
Total Adult		152	162	45	175	144	90	79	30	17	37	931
Young per 100 Adults		810	768	824	411	436	406	280	423	212	457	549

PHEASANT LEG CHECK-1952 SEASON

A total of 6,042 right legs of cock pheasants were received after the 1952 season compared with 4,034 in 1951. All legs were checked for spur length. The spurs measuring over 20.5 millimeters were classed as adults and all below 20.5 as young.

The age ratio of all legs collected was 549 young per 100 adults, compared with an age ratio of 819 in 1951. Table B-1 compares the age ratios by districts for the last five years.

Table B-1
Age Ratios - Young per 100 Adults

District	1948	1949	1950	1951	1952
1 North West	627	509	687	926	810
2 North Central	568	586	696	697	768
3 North East	629	656	593	1396	824
4 West Central	394	360	579	870	411
5 Central	545	475	486	710	436
6 East Central	495	376	564	1050	406
7 South West	---	666	357	370	280
8 South Central	---	---	367	725	423
9 South East	300	292	566	818	212
STATE	526	482	596	819	549

District 2 in North Central Iowa showed an increase in the age ratio. All other districts indicated a decrease.

The peak of hatching occurred earlier this year and therefore the dividing line between young and old birds was not as sharply defined as in 1951. Table B-2 lists the percentage of legs in each size group.

Table B-2
PERCENT OF LEGS IN EACH SIZE GROUP

Length in Millimeters	1948	1949	1950	1951	1952
11	1.8	0.8	1.3	2.3	0.8
12	1.4	1.1	1.2	1.6	0.8
13	2.2	1.4	1.8	3.6	1.6
14	3.9	1.7	4.0	6.8	3.6
15	8.9	5.5	9.4	15.1	7.5
16	13.1	9.0	15.5	15.1	11.7
17	17.1	15.1	19.8	16.7	17.1
18	16.6	18.0	14.9	13.3	18.7
19	10.7	17.0	12.1	9.7	15.6
20	8.2	13.1	5.5	4.9	7.7
21	4.9	6.4	4.1	2.9	4.7
22	3.8	4.1	2.9	2.8	3.7
23	3.4	2.5	2.6	2.4	2.8
24	2.0	1.7	1.9	1.3	1.9
25	1.4	1.7	1.4	0.9	1.3
26	0.2	0.5	0.6	0.3	0.6
27	0.2	0.3	0.4	0.2	0.3
28	---	0.2	0.2	0.1	0.1

Because of the apparent overlap in the 20, 21 and 22 millimeter groups, all legs in those groups that were collected during 1951 and 1952 were also classed as young or adult by their appearance. The following table lists the percentage of young birds in each of the three size groups for 1951 and 1952 when judged by appearance only.

	Percent of Young Birds	
Size Group:	1951 :	1952
20 mm. :	71% :	86%
21 mm. :	62% :	59%
22 mm. :	17% :	27%

The percent of young in all three groups increased from 55% in 1951 to 64% in 1952. Using this method, the age ratio would be 688 in 1952 and 896 in 1951. Both figures are higher than those obtained by using the 20½ mm. dividing line and there is slightly less difference than before.

those obtained by using the 20½ mm. dividing lines and there is slightly less difference than before.

There seems to be an inverse relationship between the leg check and results of the reproduction counts in Summer. More data on Spring populations will be necessary in order to make comparisons with age ratios. It will also be possible then to compare the age ratios with a combination of Spring population counts and Summer reproduction surveys.

THE 1952 BOBWHITE HUNTING SEASON IN IOWA

Elden Stempel
Quail Biologist

The 1952 quail hunting season was open from November 1, through November 15, in fifteen border counties, and November 1, through December 15, in thirty-six counties. Shooting hours were from 8:30 A.M. until 4:30 P.M. Bag and possession limit was six birds.

Data in this report was gathered by conservation officers, other department personnel, and interested sportsmen. Returns are incomplete, as reports have not yet been received from counties; Clayton, Fayette, Keokuk, Mahaska, Marshall, Monroe, Ringgold, Taylor, Union and Appanoose. Other counties on which there are no figures in this report had so little hunting of quail that officers were unable to contact men who had hunted during this season.

Weather Background 1952

Spring was the earliest, the the most favorable in recent years. The hatching period of June, and July was favorable. Prolonged, and vigorous calling of male quail during the nesting period indicated a long nesting peak, and this was reflected in the increased hunting success.

Quail Contact Cards

Before the opening of the quail season, cards were sent to the officers in the quail range. On the cards, officers entered the following information obtained from hunters; date, county, number of hunters, whether hunters were local or non-local, number of hours the party hunted, whether or not the hunters used dogs, number of coveys flushed, number of quail killed. Some cards had spaces in which was recorded the hunter's opinion of whether the season was better, poorer, or the same as in 1951. Quail wings

The Open Season

The following border counties had on open season of 15 days:

Adair	Clayton	Guthrie
Adams	Dallas	Marshall
Allamakee	Delaware	Page
Blackhawk	Dubuque	Polk
Buchanan	Fayette	Winneshiek

Counties in the long zone include:

Appanoose	Iowa	Louisa	Scott
Benton	Jackson	Lucas	Tama
Cedar	Jasper	Madison	Taylor
Clarke	Jefferson	Mahaska	Union
Clinton	Johnson	Marion	Van Buren
Davis	Jones	Monroe	Wapello
Decatur	Keokuk	Muscatine	Warren
Des Moines	Lee	Poweshiek	Washington
Henry	Linn	Ringgold	Wayne

were also collected when the hunter contact was made. Date of collection was recorded for some of the wings. From these wings will be determined the date that most of the 1952 hatch took place. This information will also be used to tell whether or not the hatch of quail corresponds to the peak of the summer whistling period. The two events were parallel in 1950, and 1951.

To date, 290 contact cards have been returned. A total of 355 cards were returned last year.

Results of the Quail Season as Indicated Since 1945 by Quail Hunter Reports as Recorded on Contact Cards

	No. Hunters	Hrs. Hunted	Bag	No. of Coveys	H.P.Q.
1946	703	2610	2514		1.0
1947	1544	6032	4121	1262	1.4
1948	1887	6838	4075	1358	1.6
1949	1424	5041	2538	895	1.9
1950	1252	4088	2548	953	1.6
1951	725	2028.4	1025	378	2.04
1952	650	904.75	1381	481	1.46

Over the entire quail range 29% less time was required to take one quail than was required in 1951. The average party found 1.65 coveys in 1952, and 1.36 coveys in 1951. In 1952 there were 2.87

quail taken from the average covey while in 1951 2.84 quail were taken from the average covey.

A sample of opinion was taken on the season. 27% of hunters interviewed thought that the season was the same as in 1951, 54% thought that the 1952 season was better, and 19% thought that 1952 was a poorer season. In 1951, the interviewed hunters rated the season in this manner: 43% thought the season was worse, 20% better, and the balance thought 1951 was the same as 1950.

Table of Hunting Success by Agricultural Districts
for the years 1949, 1950, 1951, 1952

District	Hours per Quail				
	1949	1950	1951	1952	
South Central	2.6	1.5	2.1	1.34	
South East	1.4	1.5	2.4	1.33	
East Central	2.5	1.2	2.1	3.52	
South West	2.5	2.8	1.9	1.02	
Central	4.4	2.2	1.7	2.65	
Northeast		18.0	3.6		no success

Hunting Success by Periods

Hunting success was highest during the second two weeks of the open season. During the dry weather the fore part of November hunting success in 1952 was 1.4 hours per quail. The last part of the month success rose to 1.0 hours per bird, and during the December part of the open season, The hunter was in the field 1.6 hours for each bird reported killed.

In the 1951 quail season the hunter reported the highest success during December when he spent 1.8 hours in the field for each bird killed.

Use of Dogs

During the 1949 quail hunting season 75% of quail hunters seen were using bird dogs. In 1950 75% of quail hunters seen

were using dogs for hunting quail. During the 1951 quail hunting season 68% of quail hunters used dogs, but during the 1952 fall quail hunting season in Iowa 81% of quail hunters interviewed were using dogs. Inspection of the figures indicates that part of this reported increase is due to less quail hunting being reported from the border counties of the quail range where there are less hunters who own dogs.

Hunters using dogs reported spending on 1654 man hours of hunting. Average size of parties using dogs was 2.2. 1.37 hours were required per bird killed. Each party found 1.3 coveys of quail. Each party hunted 1.77 hours per covey.

Hunters not using dogs reported on 304 hours of hunting. The average party contained 2 hunters. 1.73 hours of hunting was used per man for each bird taken. One covey was found by the average party hunting without a dog. Each party hunting without a dog reported hunting 2.66 hours for each covey seen.

Seasonal Distribution of Interviews

60% of the hunting hours recorded were results of hunting done from November 1 through November 15. 15% of the hours were recorded between November 16 and December 1, and 24% of the hunting recorded was done between December 1 and December 15. This is similar to 1951.

Individual Quail Hunter Report

An individual quail hunter hunting in Lucas and Wayne counties has voluntarily turned in a report of his hunting the past three years.

The hunter reported that he regarded the 1952 season as the best season since 1940. The hunter usually is training young dogs,

and that may explain why he felt that in spite of the increase in hunting time per quail he felt that the season was better.

This cooperator found in 1951, 46 coveys in 30 trips afield. In 1952 he found 48 coveys in 29 trips afield.

Table showing an individual's hunting success, 1950, 1951 and 1952

	1950	1951	1952
Average hunters per trip	2.1	2.4	1.9
Hunter hours	121.8	125.0	160.0
Party hours per covey	1.0	1.4	1.7
Hunter hours per quail	.80	.85	1.0

Summary

1. Southeast Iowa showed complete recovery from the poor hunting of 1951.
2. Twenty-nine per cent less time was required in 1952 than was required in 1951 to bag one quail.
3. Highest hunting success was experienced late in November.
4. Hunters using dogs found quail more quickly, and found more quail than hunters who did not use dogs.

1951 Quail Hunting

County	Parties	Hunters	Hunter Hrs.	Coveys	Quail
Southwest District					
Adair	10	23		17	89
Adams					
Page					
Taylor					
Totals	10	23	90.85	17	89
South Central District					
Appanoose					
Clarke	7	16		13	45
Decatur	9	35		31	108
Lucas	22	41		40	141
Madison	20	48		31	81
Marion	2	4		1	2
Monroe					
Ringgold					
Union					
Warren	16	39		27	82
Wayne	17	43		29	86
Totals	93	226	732.60	172	545
Southeast District					
Davis	26	62		55	193
Des Moines	8	21		13	25
Henry	11	24		16	32
Jefferson	10	19		12	38
Keokuk	1	2		2	1
Lee	57	103		89	182
Louisa	1	2		0	0
Mahaska					
Van Buren	28	62		64	158
Wapello	3	5		4	10
Washington	2	4		3	15
Totals	147	304	876	258	654

1952 Quail Hunting Cont'd

County	Parties	Hunters	Hunters Hrs.	Coveys	Quail
Northeast District					
Allamakee					
Blackhawk					
Buchanan	2	4		0	0
Clayton					
Delaware	1	2		0	0
Dubuque					
Fayette					
Winneshiek					
Central District					
Dallas					
Jasper					
Marshall					
Polk	10	26		9	26
Poweshiek					
Tama					
Totals	10	26	68.9	9	26
East Central District					
Benton	1	3		0	0
Cedar	1	3		1	5
Clinton	2	4		2	5
Iowa					
Jackson	6	9		5	6
Johnson					
Jones					
Linn	5	15		5	10
Muscatine	3	7		2	4
Scott					
Totals	18	41	105.6	15	30

FORNEY LAKE GAME MANAGEMENT UNIT

A REPORT ON THE 1952 WATERFOWL SEASON

BY

John A. Fish and Lester F. Faber

Forney Lake was operated under a controlled hunting system for the third consecutive season in 1952. Only one change was made in the basic system used in 1950 and 1951. This change was to charge $1.00 per person per day instead of the $.50 fee set in 1951.

This increase in fee was made on the basis of recommendations following the 1951 season. The unusual weather and eratic flight of waterfowl in 1952 does not allow a statment as to whether the $1.00 fee will adequately cover operational costs on an average year.

Since costs of operation of the system were outlined in the 1950-51 season it is desirable again to make them a part of this report, expecially so to indicate what happens during an unusual season.

Administrative Costs

Clerical help to process mail for thirty days was 187 hours at $.75 or $140.25.

Fish and Game personnel were used on the area this year. A total of $866.20 was expended for salaries and expenses of the personnel who administered the project during the season.

Total Administrative Costs

Clerical Help	$140.25
Supervisory Help	866.20
Total Costs	$1006.45

Operational Costs

Costs for rebuilding some blinds damaged by spring floods, installation and maintenance totalled $766.20.

Total Administrative Costs	$1006.45
Total Operation Costs	766.20
Total Costs	$1772.65

During the 55 day season 1917 hunters used the area. Costs per man for 1952 then was approximately $.92. This year the charge of one-dollar covered the cost of operation. Other costs were incurred which could not be reported and identified with this project so probably the income about equalled the cost.

The area was utilized only 46% in 1952. Nice weather and few ducks seem the logical reason for this lack of use because practically all blinds were reserved. Bad weather and ice kept hunters off the area during 7 days of the season. These seven days reduced utilization by 12%

Based on data gathered the past three years it appears that it is about as easy to predict the use of the area as it is to predict the flights of waterfowl.

It is recommended that if the system is continued that the charge of $1.00 per person per day be continued. It seems that this charge will cover the situation most years.

Hunting Success

A total of 1917 hunters used Forney's in 1952. As in the past each party was required to fill in data cards at the end of their hunt. Approximately 10% of the cards were not useable because of the lack of one or more items of information. The remainder of this report represents 90% of the total hunters

or 1770 hunters.

The 1770 hunters made up 776 parties or 2.3 men per party. A slight increase in party size over 1950 and 1951. Of the 776 parties, 416 parties or 54% bagged all the ducks. This represents a 12% decrease in the number of hunters with ducks over 1951.

While the percent of parties with ducks decrease 12% in 1952 over 1951, the 54% figure represents only a 3% decline over 1950.

The 1770 hunters brought in 1269 ducks, coots and mergansers and 17 geese.

The average hunter took home 0.7 duck for days effort. He spent 8.23 hours to get one duck and hunted 5.9 hours each trip.

The figure 0.7 ducks per hunter represents a 39% decrease over 1951 and a 9% decrease over 1950 and 8.23 hours per duck is an increase of 37% over 1951 or a 7% increase over 1950.

Logically enough the 5.9 hours per day represents a 10% decrease over 1951. In spite of the poor shooting hunters on Forneys apparently want to make a day of it.

See Table I for composite data.

Species composition of duck and coots in hunters bag is shown in column 4 of Table II.

Only 17 geese were taken in 1952, made up of 8 White Fronts and 7 Canadians.

Weather Data

During each day of the season, records were kept on temperatures, Barometic pressure, wind direction and velocity, condition of sky and precipitation.

The weather data was recorded each day at 5:00 A. M., 9:00 A.M., 1:00 P.M. and 5:00 P.M.

No hunting occurred on the area after November 25th so the following data is based on the first forty-nine days of the season and one day before the season opened or for 50 days.

Temperature

The average temperature for October 7th through November 25th was 48.97 degrees. The following table shows break down of temperature by number of days.

Number of days over 60°	4
Number of days 50° - 60° -	21
Number of days 40° - 50° -	13
Number of days 30° - 40° -	12
Number of days below 30° -	0

Barometic Pressure

Barometic readings were generally quite steady with not much change from low to high readings.

Wind Velocity

The average wind velocity for 50 days was 6.5 miles an hour with the highest reading of 22 miles on one day.

The following table show breakdown of velocity by days.

Number days dead calm	2
Number days 1 to 5 M.P.H.	20
Number days 6 to 10 M.P.H.	20
Number days 11 to 15 M.P.H.	6
Number days over 15 M.P.H.	2

Condition fo Sky

Of the 50 days recorded 36 days were classified as clear, and 16 days as cloudy.

Preciptitation

No precipitation was recorded for the first 48 days of the season. Light snow and rain fell on November 24th and heavy snows on the 25th. Some duck weather.

Table I

Comparative Data-based on 90% of the actual amounts except last two entries.

	1950	1951	Change	1952	Change from 1951	Change from 1950
No. Hunters	1595	1661		1770		
No. Parties	659	711		776		
% parties with ducks	57%	66%	+9%	54%	-12%	-3%
Hours per duck	8.6	6.0	-30%	8.23	+37%	-4%
Hours per day	6.2	6.5	+5%	5.9	-9%	-5%
Ducks per hunter	0.8	1.15	+30%	0.7	-39%	-9%
No. Duck	1263	1841		1269		
% Utilization	70%	54%	-16%	46%	-8%	-24%
Days in Season	35	45	+10%	55	+10%	+20%

Table II

Species Composition

	1950	1951	1952
Mallard	55.0	58.0	65.0
Lesser Scaup	5.0	10.0	10.0
Pintail	6.0	8.0	7.0
Redhead	5.0	4.0	2.0
Green-wing Teal	5.0	3.0	3.0
Gadwall	4.0	3.0	3.0
Blue-wing	6.0	2.0	3.0
Shoveller	5.0	3.0	2.0
Ringneck	Present	2.0	1.0
Baldpate	4.0	2.0	1.0
Ruddy Duck		1.0	0.5
Wood Duck	P	0.5	0.5
Canvas Back	P	0.5	P
Buffle Head	P	P	P
Mergansers	P	0.5	0.5
Coot	5.0	4.0	0.5
Black Duck		P	P

THE WATERFOWL STORY IN IOWA

James G. Sieh, Iowa Conservation Commission
Des Moines, Iowa

Presented before the 14th Midwest Wildlife Conference
Paper #49

In a geographical area the size of the State of Iowa there are many unknowns in the practicable study of waterfowl. Scientific application to this study is relatively new on a continental, as well as a state basis. Populations of waterfowl are notoriously difficult to study because they are mobile to the nth degree, and just about the time we think we understand or can predict the activities of wildfowl in a local area of a few hundred acres of lake or marsh we are often fooled. To pretend to understand the complex structure of waterfowl dynamics on a state-wide basis is pure folly. There are many unknowns surrounding the simple problem of why local marshes retain a few breeding pairs one season, and perhaps twice as many the next. The purpose of this paper is to very briefly acquaint fellow students of waterfowl with some of the basic elements of the waterfowl story in Iowa. This story is not complete and never will be as long as wildfowl grace our continent. The immediate changes yet to come, wrought by the hands of men or nature, will write new chapters in the history of waterfowl, and unfortunately from a scientific standpoint the past is well shrouded in the mystery of fact and fancy.

Iowa comprises some of the most valuable and intensively cultivated land on the face of the earth. On the east, the state is bordered by the Mississippi River, famous as a migratory artery for wildfowl as well as for other species. On the west, below Sioux City, Iowa, is bordered by the Missouri River, and equally

important migratory route. Between these age old travel lanes the state comprises some 56,000 square miles with a lineal east-west dimension of approximately 300 miles and a north-south distance of some 200 miles. The eastern half of Iowa is diagonally subdivided in a southeasterly direction by four larger rivers that function as migratory cappilaries to the main stem of the Mississippi River flyway. On the west, numerous small tributary streams empty into the Missouri in a south, southwesterly direction. Although normal migration probably tends to follow roughly the configuration of the major rivers and their tributaries, mass migration overland sometimes takes place.

Eastern Iowa in general is rolling terrain cut by rivers and creeks with practically no glacial lakes or potholes. River overflows and marshes are no longer numerous, although along reaches of the Wapsipinicon and neighboring rivers there are still some remnants of good waterfowl habitat. Central Iowa contained a few glacial lakes, but practically all marshes and prairie potholes have been drained for agricultural purposes. The rolling farm land in southern Iowa is not generally considered waterfowl habitat except along some river and stream overflows. North central and northwestern Iowa were blessed with numerous glacial lakes, marshes, and prairie potholes which once produced waterfowl on an equal basis with the pothole areas of the Dakotas or southern Minnesota. Only a remnant of the waterfowl producing areas of northwest and north central Iowa remain. The Missouri river flood plain is now well diked, ditched, and drained, and produces relatively few waterfowl. The Mississippi River bottoms and other Iowa streams are producing more wood ducks than in the recent past.

Iowa once produced an estimated 3 to 4 million ducks annually (Janzen, 1952). This number has dwindled to new lows because of continuous habitat removal on private lands. Total annual production, excluding wood ducks, can probably be measured in the thousands or tens of thousands today, when compared with the millions of yesterday. This is a sad admission to make, but a sober warning to neighboring states to safeguard every acre of waterfowl habitat possible, and to do it now. The advent of pump and hose irrigation from surface water supplies of lakes, streams, marshes and prairie potholes has already begun in the drier farming areas of the Dakotas and Nebraska. This could do great damage to the remaining waterfowl producing areas there, much the same as ditching and tile drainage have already accomplished in Iowa. We have learned the hard way that once habitat is lost, it is both more expensive and more difficult, if not impossible to restore. For the biennium ending June 30, 1950, approximately 54,000 acres have been listed as state owned public hunting grounds for waterfowl (Iowa State Cons. Comm., 1951). Half of this total was listed as open water (lakes) refuge, and cannot be considered as good nesting habitat. The additional river or stream acreage, which would amount to a substantial sum, is not included in the total; nor is the acreage of several smaller refuges which represent good nesting habitat. Iowa has a successful land acquisition and habitat development program in operation, but only a small proportion of former nesting areas can ever hope to be rehabilitated.

The migration of wildfowl along the Mississippi River has been treated by many students who have spent years studying the Mississippi valley flights. The writer can add little to the picture of waterfowl along the eastern shore of Iowa. The writer has worked

in the lakes and marsh region of northwest Iowa, and can provide a general picture of this small section of waterfowl habitat remaining in the state. One of the largest and most impressive concentrations of blue and snow geese in North America still spend part of the early spring in the Missouri River flats of southwestern and western Iowa. This concentration has been witnessed by many people, and the size of the aggregate concentration is of significance to the over-all population of the species. The numbers of geese that have passed through Iowa is questioned each year by competent observers, and there is considerable conjecture each season as to the accuracy of one or another estimate. It is difficult to estimate a mobile population of any species, and these blue and snow geese are no exception. During the last few springs estimates running as high as 500,000 migrants and even higher have been common. In any event, competent observers have agreed on one thing, and that is, that the trend of the numbers of these geese in Iowa has been upward and not downward, and the increase has been considerable.

Some of you have not had the opportunity to observe the spring movements of blue and snow geese and I would like to describe the pheonomena. While the inland lakes and marshes of Iowa, Minnesota and the Dakotas are still ice-locked, the spring thaws come early on the black ground of the Lower Missouri River flats and hasten the break up of the Big Muddy. As the warm spring sun on the black plowing melts the snow, and frost disappears from the ground, the geese arrive in southwest Iowa. Single flocks are not unusual, but a series or group of flocks united in wedge-shaped ranks totaling several hundred or a few thousand birds are more common. These harbingers of spring, like falling leaves, alight in the fields.

Here they feed on waste grain, preen, and rest, awaiting the next leg of their northward journey. Their garralous honking and careless flight back and forth from field to field is sight and sould to be long cherished in memory. Their visit in Iowa is short, only a few days or weeks depending upon the weather. The geese do not wait for the rivers and lakes to open, but push northward as soon as melt water in the fields permit them any advance toward the nesting grounds. Blizzards of greater or lesser violence often force these hardy voyageurs back south, but this is only a temporary setback for the birds revel in bad weather, and spring blizzards do not take a heavy toll.

The geese take different routes northward from the larger concentrations in southwestern and western Iowa. Some push west and north up the valley and tributaries of the Platt River into Nebraska. Others continue on up the valley of the Missouri, and many of these head due north up the valley of the tributary James River into the Dakotas. Some move into the Bigstone Lake-Traverse area probably via the Little and Big Sioux River valleys. At each step of the journey the blue and snow geese do not necessarily follow any topographic configuration, but utilize the most accessible airway along the path of melting snow and running water. Rapid thaw on the prairies probably causes more overland distribution and dispersion of the flocks during spring migration. There are other important concentration points along the prairie routes to the nesting grounds, but this ends the brief saga of the blues and snows in Iowa.

Jack Musgrove in his book, Waterfowl in Iowa, has nicely incidated in plate form the concentration points of the blue and snow geese in western Iowa. Incidents in the life history could

be added by large scale banding efforts at these points. The spring flight of blue and snow geese into and through Iowa is the most spectacular migratory event of the year, but not the only one. The Missouri River valley is a main flight artery of the Central Flyway for all of the common species of wildfowl.

The spring migration of waterfowl overland and through central Iowa appear directly geared to weather and surface water present. The calendar dates are likewise important. The interior of Iowa is intensively cultivated and natural drainage has been aided by uncountable miles of tile and other artificial drainage systems. Waterfowl have adapted themselves to the change as far as migration is concerned. In the early spring, when ample runoff provides available surface water, and waste grain is plentiful in the flooded fields, both divers and puddle ducks may become numerous throughout central Iowa. During this period the ground is still frozen and the tile drainage systems do not function. As soon as the ground thaws enough to permit rapid sub-surface drainage the birds move on northward. Local concentrations of spring migrants are found in the natural lake and marsh regions of northwestern Iowa, but in years of late breakup, these lakes and sloughs are largely bypassed. As a rule, a sizeable concentration of mallards, lesser scaup, and blue-winged teal can be depended upon, but there are exceptions. Under normal conditions the lake region of northern Iowa acts as a host to modest numbers of ducks and geese. All recent indications point to reduced numbers of spring migrants through the lakes region.

Some of the best waterfowl habitat remaining in northern Iowa is locally known as the "Ruthven Area" and is located in Clay and Palo Alto counties. The numbers of spring migrants have been

estimated by students of the Cooperative Wildlife Research Unit, Iowa State College. Glover (1950) estimated 176,000 ducks, geese, and coots representing 21 species present in the area during the spring of 1948. In 1949, he estimated 220,000 waterfowl representing 23 species ---- and increase of 26 per cent. Other observers ------Bennet, Low, and Provost ---- estimated the number of spring migrants in the same area in 1934, 1938 and 1942, respectively. Glover concluded that his estimates indicated an 80% decrease in total numbers of migrant waterfowl compared with the earlier three estimates each totaling close to a million or more birds. The decrease in the total numbers of mallards and pintails from 1934 to 1949 was the most noticeable.

Less intensive but more widespread observations in northwestern Iowa and in the Ruthven Area by the writer during the spring of 1949, 1950, 1951 and 1952 concurred with Glover's observations and indicated that migrant numbers have continued to remain low. Since 1950, pintails have been noticeably few during the spring migration in the lakes region. Mallards have not been present in numbers comparable with earlier estimates. It is the opinion of the writer that large numbers of migrant mallards, and pintails shifted eastward into Iowa during the severe drowth of the early and middle thirties to avoid the drier areas of Nebraska and the Dakotas; but a shift of migrant populations back westward does not explain a continued downward trend of spring migrants through northwestern Iowa in recent years. Ups and downs in migratory numbers in this or other areas are normal, but a downward trend in spring migration, if true, is a much more serious matter.

Waterfowl push north up the Mississippi and Missouri River valleys ahead of the spring migration into north central or

northwestern Iowa. The spring thaw usually advances northward more quickly along these two great rivers. In the lakes region the first spring migrants to arrive are the American mergansers, the mallards, and the pintails. These early arrivals congregate near any source of open water while most of the landscape is still covered with ice and snow. Arrival dates vary, but March 10th to 20th would be near average. Practically all the mallards are paired when they arrive; Glover estimated 80% were paired upon arrival. Close behind follow the American golden-eye, the red-breasted merganser, lesser scaup, ringnecks, canvasback, and redhead. The blue and snow geese usually arrive before the white-fronts and the Canadas. The green-winged teal, coot, hooded merganser, and shovelers filter in just ahead of the gadwall, baldpate, and wood duck. Last of all the blue-winged teal, bufflehead and ruddy ducks arrive.

These migrants remain in the lakes region from a few days to several weeks. Of the 23 species named only six of the ducks, the hooded mergansers, and the coot can be considered as nesters in Iowa at the present time. The number of nesting pintails, canvasback, and redheads have decreased appreciably during the last 15 years. Nesting canvasback have become rare. Adult lesser scaup remain in the state well into the nesting season, but no nests, eggs, nor broods have been observed during the last four summers. The number of nesting ruddy ducks has been up and down. Blue-winged teal, mallards, and wood ducks have continued to provide the bulk of waterfowl production in Iowa. Only the wood duck has measurably increased its breeding range and density in Iowa during the last ten years.

It is difficult to realize that prior to 1900 there were an estimated six million acres of waterfowl nesting and rearing habitat in this state (Bennett, 1938). This habitat represented almost 1/8 of the entire surface acreage of Iowa. By 1938, only an estmiated 50,000 acres of equivalent habitat remained (as cited above), and since then there has been continuous removal of many of the remaining 50,000 acres on private land. The production of waterfowl on private land has been reduced to such an extent that it is practically inconceivable today. This situation is deplorable from the standpoint of waterfowl production, but in the eyes of agriculturalists there is no alternative. There is no immediate happy medium from an economic standpoint, and we have to face facts.

There has been a steady increase in duck stamp sales. In 1934-35 there were 16,129 duck stamps sold in Iowa, and by 1951-52 there were 62,169 stamps sold. This represents an almost 4 fold increase, and added hunting pressure. Except for the wood duck, the waterfowl harvest in Iowa depends largely upon migrant birds. The availability of waterfowl largely determines the species composition of the hunter's bag, as well as hunter success. The number of blue-winged teal present in Iowa at the season opening is an important factor in the total harvest of this species. Favorable hunting conditions and coinciding migratory movement of northern mallards into Iowa during the open season largely governs the total harvest of mallards. The harvest of waterfowl in Iowa is dependent upon the number of migrants which pass through the state, and the length of time these ducks remain within its borders.

Prior to the open season there is an annual increase in the numbers of migrants present in the public hunting areas, along the major rivers, and wherever available habitat remains. This pre-season build up is mostly composed of blue-winged teal and mallards. In 1952, there were more green-winged teal present in the lakes region at the opening date (October 8th) than in 1949, 1950, or 1951. The seasons in the Dakotas and Minnesota have opened about a week earlier, and this has caused a rapid build up of migrant birds in Iowa.

The opening afternoon of the waterfowl season disperses the local concentrations of waterfowl. Most competent hunters take their limits the opening afternoon and the following morning. Their bag is usually composed of teal, a mallard or two if lucky, or some other larger duck. Less fortunate or skillful hunters often end up with a bird or two, or none at all. The second morning after the opening day finds most of the waterfowl gone. A few are killed, but the pre-season concentrations are gone. The remainder of the waterfowl season depends upon weather and circumstance. There are always a few successful hunters at the right place at the right time, and more of the disgruntled and unfortunate ones. Rarely are there large prolonged concentrations of waterfowl in Iowa during the open season. Migratory movements of major and minor significance usually coincide with cold fronts from the north and west. Minor migratory flurries or drifts have provided some waterfowl throughout the season regardless of the weather. Flights along the Mississippi and Missouri Rivers have provided the most successful shooting from year to year. The larger inland open water refuges and border river refuges retain minor concentrations of mallards throughout the latter part of

the open season. Sometimes these concentrations provide good shooting depending upon weather and local conditions.

Mass migration across Iowa does occur, but this has only been observed once since 1949, and evidently is the exception rather than the rule. This mass migration of approximately 24 hours duration was observed on November 8th and 9th during the fall of 1950. This large overland flight was composed of mostly mallards, some lesser scaup or ringnecks, and smaller number of canvasbacks, (See MFWC News Letter No. 16). The flight coincided with a cold front from Colorado eastward, freeze-up of the sloughs and potholes, and departure of waterfowl from North and South Dakota and probably elsewhere. Arrivals from this flight were reported from Illinois westward to northwest Iowa, and probably extended to the Missouri River and beyond.

Data on the waterfowl harvest in Iowa has been gathered since 1948 (Sieh, 1951). Conservation officers have recorded on tally cards 30,527 ducks, and 1,856 geese killed by 33,744 hunters. These hunters hunted a total of 77,279 hours during the four open seasons of 1948, 1949, 1950 and 1951. These figures represented only a sample or part of the total waterfowl harvest in Iowa.

The average hunter checked bagged one duck in 1.87 hours of hunting in 1951. In 1950, the same average hunter required 4.1 hours of hunting to kill one duck, 3.2 hours were required in 1949, and 2.3 hours in 1948. The 1951 waterfowl season was by far the most successful duck harvest recorded since 1948 (Figure 1.). Goose hunting was slightly poorer in 1951 requiring 41.1 hours afield. In 1949, the same average hunter required only 25.4 hunting hours to kill a goose which in 1948 required 17.6 hours afield. Mallards averaged approximately 50% of the sample kill

each year. The number and per cent of each species recorded during the four open seasons since 1948 are listed in Table I.

Iowa's importance as an over-all waterfowl producing state should improve slightly in the future. We have reason to be more optimistic about increased wood duck production. The State Conservation Commission under the Federal Aid Section (P-R) has established a successful land acquisition and habitat improvement program. Two penned flocks of wild Canada Geese have been introduced in an effort to re-establish nesting geese within the state. Only a small proportion of former nesting habitat can be reclaimed, but this is inevitable under present economic conditions. Waterfowl hunting in Iowa will continue to depend upon migratory numbers present in the state during the open season. This completes a brief resume of the waterfowl story in Iowa.

COMBINED TOTALS AND PERCENTAGES
1948-1949-1950-1951
Table I

	Total Recorded Kill By Species 1948	Total Recorded Kill By Species 1949	Total Recorded Kill By Species 1950	Total Recorded Kill By Species 1951
Hunters Seen Bags Not Checked		3,413	2,807	6,800
Size of Hunting Party 1	700	523	572	1,198
(man) 2	822	951	979	1,907
" 3	417	494	434	800
" 4	215	274	192	362
five (5) or more than 5	91	134	91	207
Total Number of Hunters	4,984	5,862	5,170	9,955
Total Hours Hunted	13,926	18,802	19,132	25,419
None Taken:				
Number of Hunters	1,463	2,021	1,921	2,368
Hours Hunted	3,171	5,563	6,340	5,029
Mallard	3,327	2,735	2,344	7,354
Black Duck	38	26	71	168
Gadwall	120	185	98	207
Baldpate	58	34	50	231
Pintail	546	643	291	1,252
G.W. Teal	766	670	399	885
B.W. Teal	174	691	637	1,502
Shoveller	175	192	91	244
Wood Duck	114	133	148	464
Redhead	102	79	62	264
Ring-necked	48	52	26	138
Canvas-back	47	94	43	229
Blue-bill	439	317	351	787
Golden-eye	21	7	9	36
Bufflehead	30	11	9	10
Ruddy Duck	61	24	19	70
Merganser	19	13	18	29
TOTAL DUCKS	6,085	5,906	4,666	13,870
Canada Geese	39	159	73	127
Blue Geese	84	380	181	214
Snow Geese	70	189	180	128
W.F. Geese		9	7	
Other Geese	13	3		
TOTAL GEESE	206	740	441	469
Coots		127	63	344
Parties with Dogs		300	240	601
Unretrieved Ducks and Geese		37	45	187
Parties without Dogs		2,075	2,028	3,873
Unretrieved Ducks and Geese		260	508	1,680
TOTAL PARTIES CHECKED		2,375	2,268	4,474
Banded Ducks Shot Previous Year		1	2	8

COMBINED TOTALS AND PERCENTAGES
1948-1949-1950-1951
Table I Cont'd

Species	Total Recorded Kill by Percent 1948	Total Recorded Kill by Percent 1949	Total Recorded Kill by Percent 1950	Total Recorded Kill by Percent 1951
Mallard	54.7%	46.3%	50.2%	53.0%
Black Duck	0.6	0.4	1.5	1.2
Gadwall	2.0	3.1	2.1	1.5
Baldpate	0.9	0.6	1.1	1.7
Pintail	8.9	10.9	6.2	9.0
G.W. Teal	12.6	11.4	8.6	6.4
B.W. Teal	2.9	11.7	13.7	10.8
Shoveller	2.9	3.2	1.9	1.8
Wood Duck	1.9	2.3	3.2	3.3
Redhead	1.7	1.3	1.3	1.9
Ring-necked	0.8	0.9	0.6	1.0
Canvas-back	0.8	1.6	0.9	1.6
Blue-bill	7.2	5.4	7.5	5.7
Golden-eye	0.3	0.1	0.2	0.3
Bufflehead	0.5	0.2	0.2	0.1
Ruddy Duck	1.0	0.4	0.4	0.5
Merganser	0.3	0.2	0.4	0.2
TOTAL DUCKS	100.0%	100.0%	100.0%	100.0%
Canada Geese	19.0%	21.5%	16.6%	27.2%
Blue Geese	41.5	51.3	41.7	45.6
Snow Geese	33.1	25.6	41.5	27.2
W.F. Geese		1.2	0.2	
Other Geese	6.4	0.4		
TOTAL GEESE	100.0%	100.0%	100.0%	100.0%

Literature Reviewed and Cited

BENNETT, L.J.
1938a. The blue-winged teal: Its ecology and management. Collegiate Press, Inc. Ames, Iowa, 144pp.

_____.
1938b. The 1934 spring migration of some birds through Clay and Palo Alto counties, Iowa. Iowa Bird Life 8(1):2-6.

GLOVER, F.A.
1950. Spring waterfowl migration through Clay and Palo Alto counties, Iowa. Iowa State College Journal of Science 25 (3): 483-492.

IOWA STATE CONS. COMM. (Compiled Report).
1951. Report of the State Conservation Commission for the biennium ending June 30, 1950. Published by the State of Iowa; pp 179-180.

JANZEN, D.H.
1952. The right kind of water. The Cons. Volunteer. Minnesota Dept. of Cons. 15 (89):5-8.

LOW, J.B.
1941. Spring flight of the diving ducks through northwestern Iowa. The Condor 43(3):142-151.

1945. Ecology and management of the redhead, Nyroca americana, in Iowa. Ecol. Mongraphs 15 (L):35-69.

MUSGROVE, J.W. AND MARY R. MUSGROVE
1947. Waterfowl in Iowa. State Conservation Commission. 124 pp.

PROVOST, M.W.
1946. Spring waterfowl migration in the Ruthven Area of Iowa. Iowa Bird Life 16 (3)142-46.

SCHREINER, K.M. AND GEORGE HENDRICKSON
1950. Wood duck production aided by nesting boxes, Lake Odessa, Iowa, in 1950. Iowa Bird Life 21(1):6-10.

SIEH, J.G.
1951. Analysis of the 1948,1949 and 1950 waterfowl kill samples in Iowa. Proceedings of the Iowa Academy of Science.58:533-551.

1952 Banded waterfowl recoveries in Iowa. (Accepted for publication) Proceedings of the Iowa Academy of Science.59 (in press).

TEER, J.G.
1951. Controlled waterfowl hunting on a state-owned public shooting ground, Forney Lake, Iowa, 1950. Iowa State College Journal of Science. 24(4):541-553.

ESTIMATING FISH POPULATIONS IN IOWA LAKES

Earl T. Rose and Tom Moen, Iowa Conservation Commission
Des Moines, Iowa

Presented before the 14th Midwest Wildlife Conference
Paper #3

Introduction

The analysis of fish populations in Iowa lakes has been attempted on several occasions in order to obtain data toward better management of the fish resources therein and to obtain information pertaining to methods and procedures. Two of these studies have been published, one on the walleyes of Spirit Lake, Rose (1949) and the other concerning several species of game fish in Storm Lake, Rose (1949). Both of these studies have involved marking by tagging or fin-clipping, and the use of the creel census or anglers' catch in the calculation of the number of fish present. Unpublished estimates on the walleyes at Storm Lake, bullheads in Lost Island and Center Lakes, and carp in Lower Gar Lake, were determined by utilizing nets for the recapture of marked fish.

The purpose of this paper is to indicate some of the practical management aspects of population estimates and some of the problems we have encountered. A highly critical evaluation, particularly of the statistics, is not involved.

Spirit Lake Walleyes

In 1947, after several years of declining catches of walleyes, both by anglers and by state gill-netting crews (spring spawn taking operations for hatchery purposes), the Conservation Commission calculated the number of adults in Spirit Lake by the tagging method. A total of 550 adult walleyes was tagged and released in the spring, about a month prior to the opening of the fishing

season. A creel census was taken during the open season and a total of 157 tagged fish were reported caught by anglers. The number of untagged walleyes reported caught was 8,719 which provided a figure of 30,544 as the estimated population of adult walleyes in this 5,600 acre lake at the start of the 1947 fishing season. Since this species is in great demand and the appraisal of 5.3 fish per acre gave further evidence of depletion, new regulations were invoked to reduce interspecific factors possibly functioning as depressants on the walleye. These included elimination of size limits on all species except black bass; a continuous open season on crappie, and a May 15 opening on all lake species except black bass. Also the daily catch limit on bullheads was removed; however, this was reimposed last year due to management difficulties. Carp control activities were greatly enlarged as was recommended.

Whether or not any or all of these factors functioned probably will never be known entirely; however, recent data indicates that the walleyes have increased in abundance at a very satisfactory rate. To add to the difficulty in appraisal, the lake has been stocked heavily (3000 fry per acre) each spring since 1949, as a part of a program to determine the effectiveness of walleye fry stocking.

Probably as important as any portion of the tagging study is the fact that more than 28 per cent of the tagged walleyes were recaptured during the 1947 season. This is considerably greater exploitation than is usually observed in studies of this type. Eschmeyer (1950) reported only 1.5 per cent return on lightly fished Lake Gogebic, and 8.3 per cent from Burt Lake in Michigan. At Clear Lake, Iowa Whitney (1952) reported a 16 per cent recovery of tagged walleyes. Since successive large year classes of walleyes

are exceptional, a harvest of greater than 20 per cent by angling should be considered excessive.

Population Study of Storm Lake Game Fish

An attempt to appraise the entire game fish population of Storm Lake, Iowa, was made principally as an experiment, Rose (1949). Large numbers of each species of game fish were fin-clipped during winter rough fish removal operations in 1947-48. During the summer of 1948 a creel census clerk and cooperating boat liveries examined catches and recorded the marked and unmarked fish caught by anglers. This proved to be a ready means of estimating the population but due to the high degree of systematic error involved, too much credence cannot be placed on the results. On the other hand it provides a means of obtaining a good calculated guess. It is believed that the possibility of overlooking fin-clipped recaptures is very great if unskilled observers are involved, consequently the creel census type of analysis should be avoided if possible. This is especially true if cooperating boat lines add unreliable data to the study. Tagged fish may be more readily observed and turned in due to greater curiosity and possible prizes involved.

In the estimation of the walleye population for instance, the data shows that 1,398 adult fish were fin-clipped and released during the winter seining operations. In the following summer's creel census by clerk and boat liveries there were reported 5,568 unmarked and 118 marked taken by anglers, indicating an adult population of 65,919 walleyes (21.2 fish per acre) in Storm Lake as of May 15, 1948. If only the creel census clerk's figures on walleyes are considered, a vast difference in the estimate is

obtained. He recorded 387 unmarked and 17 marked fish with a resulting population of 32,624. A previous population estimate was made on this species in the spring of 1948 that indicated a still smaller number of walleyes in the lake. For this estimate a total of 1,026 unmarked and 65 marked fish were taken in 16 nights of gill-netting and pond-netting from April 2 to 24. This produced a calculated population of 22,051 adult walleyes in the lake at that time. The latter estimates, although quite divergent, are deemed much closer to the actual number than the published figure even though it may have been biased by the selectivity of the nets (2 and 3½ inch bar mesh gill nets and 1 inch pond nets) and the possibility of inadequate time elapse between the close of the winter seining and the netting operations 36 days later. The estimates calculated on individual night's catches produced a range from a low of 11,292 to a high of 59,373, indicating an inadequate mixing of the marked and unmarked segments in the total population. Unless consistant ratios of marked and unmarked fish are obtained little faith can be placed on the estimate of fish populations.

Harvests of fish at Storm Lake are seldom heavy due to the summer blooms of blue-green algae. Spring and fall angling is usually good for walleye, crappie, white bass and channel catfish. The creel census data (above cite.) indicates that the heaviest harvest was on the walleye, with 8.4 per cent of the fin-clipped fish recorded caught. About 7 per cent of the crappie and white bass were taken and about 5 per cent of the perch and catfish. These certainly are not excessive; however, the possible errors inherent in the population estimates are of course present here

and the harvests may have been heavier.

In determining any estimate of harvest on large lakes with several boat lines it is of course necessary to obtain their cooperation in recording tagged or marked fish, also, a great amount of publicity by press, radio, and conspicuous notices are necessary to encourage anglers to examine their catches for the marked fish. Even so, we can be sure that a great many fish will not be recorded and of course the subsequent exploitation calculation will be erroneous. As with the population estimate the results may be sufficiently accurate to base management practices upon if precautions are taken as advised by Ricker (1948), Carlander (1948) and others in the preparation and conduct of such studies.

Lost Island Lake Bullhead Population

Lost Island Lake, Palo Alto County, Iowa is one of Iowa's famous bullhead fishing centers. A huge over-population of stunted bullheads existed in 1946 and the department removed creel limits in order to increase the take. This coupled with an intensive carp removal program brought about a rapid increase in the size of the bullheads (Rose and Moen 1951). The angler take was enormous and by 1949 local boat livery men were concerned that too many had been removed. Consequently we decided to determine the population by the mark and recapture method in the fall of 1950, after most of the bullhead angling was over.

Fyke nets (pond nets with leads) were set in tandem in the deep regions of the lake (about 15 feet) and lifted daily. Two sizes of bullheads were present, the smaller size averaging about 6 inches and the larger about 9 inches in total length. These fish were fin-clipped (adipose) and recorded as to size-group and number and then returned to the lake by scattering in regions at least a

mile from the traps. Recaptures were recorded in succeeding days and a preliminary estimate of 429,759 bullheads was determined by the weighted average or Schnabel method (Table 1).

Table 1. Population estimate of Lost Island Lake bullheads as of Oct. 7, 1952, determined by the weighted average or Schnabel method (formula $P = \frac{S(AB)\ 1}{S(C)}$).

Date	A	B	AB	C
9-26-50	97	0		
9-27	97	360	34,920	0
9-28	457	80	36,560	0
9-29	537	232	124,584	0
9-30	769	280	215,320	1
10-2	1,049	877	919,875	3
10-3	1,926	167	321,641	1
10-4	2,093	681	1,425,333	6
10-5	2,774	340	946,560	2
10-6	3,114	723	2,258,652	1
10-7	3,837	286	1,107,936	1
			S(AB) 7,391,381	S(C) 15 P= 492,759

1- A-number of fin-clipped bullheads in lake; B-number of bullheads caught that were then clipped and returned to the lake; C - number of marked bullheads recaptured.

It was felt that this estimate of 341 fish per acre (122 lbs. per acre) was too low for the total bullhead population of the lake, with too great a number of recaptures obtained in spite of efforts to adequately distribute the fin-clipped fish. Consequently the following spring, from May 1 to 6, another estimate was made using the Peterson method (formula $P = \frac{AB}{C}$, where A is the number of marked fish in the lake; B the number of fish taken and C the number of recaptures). After five days of netting operations a total of 4,758 bullheads were taken, including 15 marked fish, giving us a total population estimate of 1,307,815 fish or about 360 pounds per acre. This is about three times the calculated number obtained in October.

A great deal of confidence is placed on the spring estimate

since many of the factors that contribute toward systematic errors were avoided. A large sample of fish were marked, widely distributed among the unmarked segment, and extended time lapse permitted to facilitate thorough mixing before sampling. Recruitment of smaller size groups into the population was not significant since survey data indicated that there was no age group that could approximate the smallest size marked. Mortality of the marked and unmarked segments are assumed negligable, and if present, both elements should be equally vulnerable since the bullhead is notoriously hardy. All of the trapping, marking and handling of the fish was done with biology section personnel, consequently a minimum of losses due to injury of marked fish and errors in counting should be present.

Center Lake Bullhead Population

An exceptionally large year-class of bullheads in this lake resulted from the 1947 hatch. By 1950 these were all of a very uniform size (averaging 6.5 inches in total length and 0.14 pounds in weight). Practically all of the old brood stock had died of old age. In view of the slow growth and an obvious over-crowding problem, an estimate of the population was made to determine improvement practices.

A total of 10,232 bullheads were caught in fyke nets set in the deepest portion of the lake in early October of 1950.[1] These fish were fin-clipped (adipose) and scattered evenly and carefully over the entire lake. The lake is comparatively small, covering only 264 acres. On April 24, 1951, the nets were set in the lake and checked each day for marked and unmarked fish.

All fish captured were transferred to other

1- The Schnabel method gave us over three million fish as an estimate; considerably higher than seemed reasonable, and just the reverse of our experience at Lost Island.

lakes. On April 28, the nets were removed and an estimate calculated on the basis of daily ratios and finally on total catch (Table 2). It should be pointed out that the ratio of marked recaptures "C" to the daily catch "B" is very uniform throughout the five days of netting and the individual estimates ran very close to the final estimated population of 1,503,959, or about 800 pounds per acre.

This estimate confirmed our earlier observations concerning an over-crowded condition and recommendations were made to remove at least one-half of this population. This has been accomplished but the average weight has increased to only 0.20 of a pound per fish. This is considered an unsatisfactory growth and more bullheads will be removed next year. The bullhead fishing in this little lake has been excellent in past years and this effort has been made to reduce the population sufficiently to permit adequate growth and still retain sufficient fish for the anglers.

Estimate of the Lower Gar Lake Carp Population

The problem of estimating populations and the degree of harvest of rough fish prompted a carp marking experiment in Lower Gar Lake in June and July of 1948. Consderable experimental work on the marking technique was conducted prior to the actual population estimate in order to perfect a tag that met the various conditions of rough fish operations.

The tag or marking device consisted of a small, colored, plastic bar attached with dental wire to the dorsal spine. On June 30, 95 carp were marked in this manner and released in Lower Gar Lake. In an effort to achieve random distribution the marked carp were released at regular intervals around the entire shoreline. Again we are dealing with a small lake of only 268 acres. Between

Table 2. Center Lake Bullhead Population Estimate

Date	Total number marked in the lake "A"	Total caught and removed "B"	Marked Recaps "C"	Ratio B/C	$P-\frac{AB}{C}$
Oct. 12, 1950	10,232				
April 24, 1951	10,232	492	4	1:123	1,253,536
April 25, 1951	10,228	1,584	13	1:123	1,246,242
April 26, 1951	10,215	661	6	1:111	1,125,353
April 27, 1951	10,209	2,903	23	1:126	1,288,554
April 28, 1951	10,176	4,796	25	1:192	1,952,124
Final estimate	10,232	10,436	71	1:147	1,503,959

July 3 and July 23 a series of nine seine hauls were completed, accounting for 5,254 unmarked and 33 marked fish. The population was calculated for each haul and for the total catch (Table 3).

Table 3. Estimated population of carp in Lower Gar Lake computed for each haul from July 3 through July 23, 1948.

Date	lbs/haul	A Fish per haul[1]	B marked	C Recaps	D Pop.	C/A ratio
July 3	580	166	95	2	7,885	.012
6	1,160	331	93	2	15,391	.006
15	1,750	500	91	5	9,100	.010
16	3,000	857	86	9	8,179	.010
19	2,250	643	77	2	24,755	.003
20	2,700	771	75	2	33,912	.002
21	1,350	443	73	0		
22	2,500	714	73	5	6,424	.007
23	3,100	886	68	6	10,041	.006
Totals	18,390	5,254	95	33	15,125	.006

1-The number of fish in each haul was calculated from an average weight of 3.5 pounds per fish.

Calculations based on each haul varied from 6,424 to 33,912 with the total catch providing an estimate of 15,125 fish or 197 pounds per acre in Lower Gar Lake as of June 30, 1948. Prior to the marking experiment the seine crews had removed some 23 pounds per acre bringing the pre-seining figure to 220 pounds per acre and the total removed to 91 pounds per acre representing a 41% harvest.

During the summer of 1948 this lake was considered a typical "biological desert". The water was turbid, there was no vegetation, bottom samples were extremely poor in potential fish food organisms, and desirable game fish were scarce. In this lake it was quite apparent that the carp were not the only detrimental species. This fact was born out by both the population estimate and by the quantity of bullheads obtained in the hauls. In most of the seine hauls, which were made with 1500 feet of sein having a ½ inch bag, the bullheads out-weighed the carp.[2] The usual carp

2-All bullheads taken during the seining operation were also removed from the lake.

removal seine would have passed most of the bullheads through the web. This apparently high bullhead population, that would not ordinarily have been handled, served to lend weight to the accuracy of the population estimate of the carp. A carp population of 220 pounds per acre is not considered as excessively high in northern Iowa lakes but when combined with an equal or greater weight of other bottom feeding fish, a rather high percentage of the carrying capacity is occupied by this group and to the detriment of the more desirable species. Although there may have been more than the usual number of systematic errors in this population estimate and in spite of the fact that we have not made additional estimates, we believe that more work could be profitably done on the rough fish species, particularly along the line of per cent of harvest necessary to bring about permanent improvements in game fish environments.

In the foregoing discussion we have endeavored to point out some of the aspects, both successful and unsuccessful, of our experience in making population estimates in Iowa lakes. We feel that these estimates were worth the time and effort, both from the standpoint of experience and from the standpoint of information gained. Such practices as poisoning an entire bay to determine fish populations is impractical in Iowa with the limited water areas; we must rely on seining, netting and population estimates as described above. If due consideration is given to the many factors involved in conducting a population estimate, a valuable tool is available to the fisheries investigator.

Literature Cited

Carlander, Kenneth D. and William M. Lewis
1948 Some precautions in estimating fish populations. Prog. Fish-Cul. Vol. 10 No. 3, pp 134-137.

Ricker, William E.
1948 Methods of estimating vital statistics of fish popuations. Ind. Unv. Publications, Sci. Series No. 15.

Rose, Earl T. and Tom Moen
1951 Results of increased fish harvest in Lost Island Lake. Trns. Am. Fish. Soc. Vol. 80 (1950), 1951. pp 50-55.

Rose, Earl T.
1949 The population of yellow pike perch (Stizostedion v. vitreum) in Spirit Lake, Iowa. Trns. Am. Fish. Soc. Vol. 77 (1947) pp 32-41.

Rose, Earl T.
1949 A fish population study of Storm Lake; Iowa Acad. Sci.; Vol. 56, pp 385-395.

RECOVERY STUDIES OF FISH POPULATION IN THE SKUNK RIVER FOLLOWING SEVERE WINTER KILL

Harry M. Harrison and K. M. Madden, Iowa Conservation Commission
Des Moines, Iowa

Presented before the 14th Midwest Wildlife Conference
Paper #21

The Skunk River has up until the year 1951, had a long history as an excellent catfishing stream and a much used recreational area. This was particularly so in the five counties through which the lower reaches of the river flow.

Following the winter of 1950-51, fishing success in the Skunk River fell off abruptly and to the point of almost ceasing. This was the case over the whole river, as far down stream as Oakland Mills and even for several miles below that point fishing has been poorer than for many years. The reason for the poor fishing of recent date is attributed to a heavy winter loss for the winter just mentioned. That which caused the fish kill is not known. Several factors, however, are believed to have been contributory. First, the river froze up at a very low stage. This, of course, would concentrate the large resident fish population in holes and in turn would put an unusually heavy demand upon the dissolved oxygen in these restricted areas. Secondly, there is a source of domestic pollution at Colfax, and because of the minimum flows of 1950, this may have imposed a heavier than usual detrimental influence upon the waters of the Skunk River for that winter. And, thirdly, the State Department of Health reported detecting lethal concentrations of chemicals, principally cromates and cyanides at the effluence of the disposal plant at Newton.

To what degree any of the afore mentioned factors contributed to the kill or if other factors took part and were more important

is not known. The magnitude of the kill, however, was and is yet quite apparent. Fishermen and other interested people have reported seeing fish by the "tons" and by the "thousands" floating dead at the time the river broke up in February 1951, and as will be shown later in this report our surveys have found very low populations of fish present in the stream yet at the completion of our 1952 work.

For the reason that the Skunk River has a long record of supporting a good sport fishery, and because there is a demand and need in this area for good fishing, the Iowa Conservation Commission has set up a management plan which it is hoped will bring the Skunk River back to its rightful position as a good fishing stream.

The plan as it is now conceived is a cooperative thing involving the Fisheries and Biology Sections of the Conservation Commission together with the Conservation Officers and sportsmen who work and fish along the Skunk River in Mahaska, Keokuk, Washington, Jefferson, Henry and Des Moines counties.

For their part in the program, the Fisheries Section is supplying 40,000 fin-clipped sub-adult catfish to be stocked in the first four of the above counties. The Biology Section has been charged with the duty of following the fish population in the area by maintaining a continuing inventory. While the Conservation Officers and sportsmen have been called upon to report the harvest or catch of fish from the river.

The fish supplied by the Fisheries Section are from the Mississippi River. They are sub-adults averaging about eight inches in total length and are fin-clipped as stocked with fish stocked above Highway #77 bridge in Keokuk County being identified

by the removal of the adipose fin while those introduced below that point can be recognized by the absence of the right pelvic. It was thought best to use only two markings in order to avoid as much confusion as possible on the part of those reporting on the harvest. The fact that the stocked fish are marked will show whether or not they are entering into the harvest. In addition, their recapture if in significant numbers in our routine surveys may indicate something of the size of the population. The removal of the two different fins should shed some light on the broader movements, at least of stocked fish.

The continuing inventory being carried out by the Biology Section is employing the technique of using baited hoopnets and using a catch per net hour factor as the criterion for measuring the fish population. In addition reproduction and forage fish populations are being followed by the use of drag seines, and during the present winter it is anticipated that some sort of supplementary surveys will be conducted under the ice.

To get information on the harvest, a series of public meetings were arranged for by the Conservation Officers concerned. These were held in the larger towns with all fishermen interested in the Skunk River invited to attend. At the meetings our program was explained in detail and those who fished the Skunk River were asked to keep records of their respective catches. To do this they were furnished forms on which to keep information and self-addressed envelopes in which to forward such records to our office. To supplement this the Conservation Officers were also furnished the same data forms and asked to keep records as they made their contacts in the field. The information sought on the data forms

included: The date of fishing, county, and location fished, number and kind of fish caught, size of the fish, the number of hours fished, and whether or not the fish had been fin-clipped.

The remainder of this report will concern the progress made to date toward the achievement of the goal set forth in the program for the management and study of the Skunk River.

Fish Stocking - Restocking of the Skunk River commenced in the fall of 1951. It was planned then to release 20,000 channel catfish, with an additional 20,000 going in during the fall of 1952. An unusually early freeze-up however, put an end to the trapping activities on the Mississippi River in early November which resulted in only 4,000 fish being stocked. Of these approximately one-half were released below Highway #77 bridge with the remainder going in above.

Stocking for the year 1952 has been completed. However, due to the exceptionally poor run of catfish on the Mississippi this fall, our quotas were not reached and will be another year, at least, before the stocking program is concluded.

Inventories - During 1952, baited hoop nets were set for a total of 4,810 hours on nine areas in the Skunk River.

The results of our hoop net catches are tabulated by counties in the Table. In these surveys only 599 channel catfish were taken. This represents a catch of only .12 fish per net hour. When compared to our surveys on other watersheds, the figure .12 is significantly low, but when broken downby size and age and disregarding the catch from Des Moines County where there was a little if any fish loss, the effect of the kill becomes

even more apparent. Of the 599 catfish taken in the nets, 559 came from the kill area. Of these only 37 were of a size considered large enough to be creeled. Sixty-seven were fiddlers of an age older than 1951, while 395 were young of the 1952 hatch. This means that of the fish trapped in the kill area only 104 were survivals of the kill of 1950-51. On a catch per hour basis this gives a figure of .02 fish. Expressed otherwise, it would take roughly two days or fifty hours of hoop netting to catch one fish. Comparing this to similar work being carried on concurrently in other watersheds with normal to good catfish population where our yearly hoop net catches range from a low of about .3 to a high 1.5 fish per net hour, it becomes apparent that winter loss of catifh in the Skunk River for 1950-51 was very serious.

With regard to the recapture of fin-clipped fish, none have been taken in our surveys.

Harvest - At our meetings along the Skunk River early this spring, about 100 fishermen volunteered to report their catch. None of these have responded. The reason for not getting harvest reports is probably due to the very poor fishing success of early spring this year. With good fishing on the near by Des Moines River, it is believed that most Skunk River fishermen moved to and did their fishing in the Des Moines. In a little over two months spent in our surveys along the Skunk River this past summer, not one fisherman was observed above the power plant at Oakland Mills.

The Conservation Officers in charge of Mahaska, Keokuk, Jefferson and Henry counties found it exceptionally hard to find fishermen on the Skunk River in their territories. Doing their

best both officers made less than 40 contacts. In those, the fishing success was very poor with only a few small bullheads and stone cats being caught.

The Conservation Officer in Des Moines County turned in a report on 268 man hours of pole and line fishing. In that time 66 catfish were caught. This gives a figure of approximately .25 fish per hour. Since this is the first year of study there are no figures for comparison. However, a catch of only one fish in four hours is not considered very good.

Of the 66 fish caught two were fin-clipped, one with the adipose, the other with the right pelvic removed. In that no fish were stocked in Des Moines County, it follows that both fish had moved down stream. The fish with the adipose gone was taken at Oakland Mills. Since fish with the adipose removed were stocked only above Highway #77 bridge, it means that this individual had moved down stream something in the order of 40-50 miles at least.

As mentioned above, the recovery of forage and other small fish are also being followed. Time does not permit for anything but a very brief synopsis of this work at present. Fortunately we had made a species survey of the Skunk River prior to the time of the kill. At that time there was a well developed minnow population present in the Skunk River. The plains red shiner Notropis l. lutrensis Baird and Girard, dominated the minnow population. With the central bigmouth shiner N. d. dorsalis (Agassiz) and the sand shiner N. deliciosus subsp., ranking second and third respectively. The fathead Pimephales p. promelas Ratinesue and the brassy minnow Hybognathus hankinsoni Hubbs, were also important species at that time.

The winter kill virtually annihilated the small fish population, and it was not until the fall of 1952 that the forage fish had fully regained their former abundance. During the period of low minnow populations the Northern creek chub Semotilus a. atromaculatus (Mitchill), and the Northern common shiner N. cornutus frontalis (Aggassiz) constituted the great bulk of the population.

As the minnow population developed during the summer of 1952, the creek chub fell to a rank of unimportance. The common shiner also decreased but yet dominates the population. The plains red shiner and the central bigmouth shiner, the formally abundant species, were making strong bids for dominance at the completion of our fall seining this year.

CHANNEL CATFISH TRAPPING RECORDS FOR THE LOWER SKUNK RIVER,1952

County	Fish Caught	Total Net Hrs.	No. of Keepers	No. of Fiddlers	No. of Coll. Made in Co.
Mahaska	812		2	1	2
Keokuk	1648		4	10	3
Jefferson	1001		26	360	1
Henry	1153		5	51	2
Des Moines	196		10	30	1
Totals	4810		47	452	9

THE BLUE-GREEN ALGAE PROBLEM IN IOWA LAKES

E. T. Rose, Iowa Conservation Commission
Des Moines, Iowa

Presented before the 14th Midwest Wildlife Conference
Paper #7

Introduction

Almost all of the natural lakes of Iowa develop at certain periods throughout the summer months, heavy growths of small floating plant life commonly known as blue-green algae. These tiny, primitive organisms develop rapidly in certain lakes and often form unsightly, paint-like scums over surfaces and particularly along lee shores. Upon decomposition terrifically foul, pig-pen odors issue from these masses, making human living conditions in the vicinity intolerable.

In addition to these unwholesome attributes, certain species of the blue-green algae may develop poisonous substances that cause almost instant death to birds and mammals that drink water containing these plants. Our experience indicates that the healthy, living plants are the most poisonous to birds and livestock. Upon decomposition of large masses of algae, fish are sometimes killed in great numbers. Also, fish have been killed due to loss of dissolved oxygen at night even though no decomposition of algae occurred, and the algae present were not toxic at the time. Our experience also indicates that only a few species of the algae may be toxic, and that toxicity usually developes during spore formation particularly in the fall.

Many important recreational lakes in Iowa are subject to these unsightly blooms of blue-green algae. Included primarily are: Storm Lake in Buena Vista County, East Okoboji, Silver, Center and Minnewashta lakes in Dickinson County and North Twin Lake in

Calhoun County. Several other natural lakes have periodic blooms, but usually in lesser amounts. Red Haw Lake at Chariton, an artificial impoundment often has blooms as heavy as in any of the natural lakes. Fortunately, the algae problem is mostly of a nuisance nature in most lakes and no serious effects occur. However, with the ever increasing demand for wholesome recreational areas, and the threat of the toxic algae, some definite control program is indicated for the acute problem lakes.

This report concerns primarily a blue-green algae control program for Storm Lake where most severe algal conditions have prevailed for the past several seasons. Beaches are often closed to swimming, and farmers warned to keep stock away from the lake; also, game birds, song birds, game mammals and farm animals are unavoidably killed from drinking the lake water. The huge, unsightly scums preclude the usual outdoor recreation such as boating, sight-seeing, picnicing and fishing during much of the summer. The report also includes a brief summary of our experience with algal blooms in other Iowa lakes especially where toxic species have killed livestock.

The Storm Lake Algae Problem

Storm Lake has developed blooms of blue-green algae every summer within the memory of the oldest residents of the city of Storm Lake, and doubtless long before white men came to the region. In the early 1930's, the city of Storm Lake treated the lake with copper sulfate to improve the lake for water supply. The first record available concerning the development of poisonous algae occurred on August 29, 1948. At this time, a few dogs were apparently killed from drinking water from Storm Lake. Upon examination it was found that the water contained vast quantities of Anabaena

flos-aqua. At the same time, a large number of fish perished in the region of the heaviest accumulation of the algae. It is believed that this was due to loss of dissolved oxygen since all of the fish perished at night. Since 1948, several serious losses of migratory waterfowl have occurred that has caused much local concern. Due to this annual threat to livestock and waterfowl the city of Storm Lake, in cooperation with the Conservation Commission has kept a constant check on these blooms. Collections are made regularly by the Lake Patrolman, and examined by the city Health Physician for the presence of Anabaena. As soon as it appears, and proves toxic to laboratory animals the beaches are closed and livestock owners informed. Usually the bloom disappears several weeks prior to freeze-up. Anabaena appears to be more abundant in the fall than the other bloom forming species in all of the lakes.

In the fall of 1952, the most serious development of the poisonous Anabaena flos-aqua occurred that has ever been witnessed at this lake. The prolonged "Indian Summer" conditions developed huge quantities of the algae, accompanied by lesser amounts of Aphanizomenon and Microcystis. Our studies have shown that of the major bloom forming species that Anabaena flos-aqua is the most toxic. The species of Aphanizomenon, Microcystis, Coelosphaerium, Gleotrichia, Lyngbya and the other species of Anabaena have never been clinically proven as toxic in Iowa lakes. Aphanizomenon and Microcystis are often associated with the Anabaena in the blooms, but usually in smaller amounts in the fall. Moyle (1949) reported losses of livestock apparently attributable to Microcystis. According to Ingram and Prescott (1952), the following genera appear to be toxic: Microcystis, Anabaena, Aphanizomenon

Nodularia, Gleotrichia and Coelosphaerium.

Early in October, 1952, an estimated 2,000 Franklin's Gulls died on Storm Lake, and upon microscopic examination of lake water on October 13, it was found that the profuse bloom was composed of entirely Anabaena flos-aqua. The plants were all green and fresh, with no evidence of decomposition. Large quantities of spores were formed in each cell colony. This spore forming period may therefore be the period when the algae is most toxic; however, much research may be necessary to determine this rather academic factor. Another heavy loss of Franklin's Gulls, together with a few Herring Gulls, ducks, and coots occurred on October 29. At this time it was estimated that about 5,000 Franklin's Gulls were dead or dying on the lake; also a total of 21 ducks (14 mallard, 4 ruddy and 3 green-winged teal) were picked up from the open waters of the lake. Seven of the ducks were still alive and several gulls were obtained that were partially paralized. The live ducks upon transfer to a stock watering tank soon recovered and were released after wind action broke up the lake's deadly surface accumulation. All losses to date have been in very calm weather during which the algae drift in high concentrations near the surface. Again on November 16, the lake was very calm and another loss occurred principally in mallard ducks. A total of 60 weak, partially paralized ducks were picked up from the open water and placed in a large pen. Game biologists flushed their digestive tracts with a solution of potassium permanganate and epsom salts. These were transferred to a game nursery (Lake View) and all but three of the ducks have recovered.

In order to obtain further data concerning etiological factors

involved in these losses, a number of dead and dying gulls, ducks and coots were collected on October 24 and sent to the Veterinary Clinic at Iowa State College for examination and study. Also, a large quantity of fresh Anabaena was included in collecting jars for experimental work. A report from Dr. Lloyd D. Jones, D. V. M. of the Iowa Veterinary Diagnostic Laboratory concerning these losses states"_____Examination of these fowl revealed them to be suffering from a poisoning. Amounts of this material (algae) were force-fed and voluntarily fed to chickens, guinea pigs, rabbits and mice with the results of death in all cases. Bacterial filtrates inoculated into these animals also resulted in sudden death. The neutralization tests of bacterial filtrates using botulinus antitoxin A, B and C all produce negative neutralization results. _____it is my opinion that the death of these animals was due to a toxic substance incidental to the high concentration of algae present in the water. Bacteriological studies conducted on the vital organs of a representative sample of the birds yielded negative results." Another test was made on December 8, 1952, of the algae collected on October 24, and it proved to be just as toxic as when first received.

Conflicting reports have been made concerning the chemical responsible for the sudden paralysis and death to animals that drink water containing these plants. It has been reported, that one of the amines (hydroxylamic) is formed at certain periods, and also possibly one of the isocyanides. Conformation of these reports cannot be made at this time. Apparently the agent is developed only during certain unpredictable periods in the life-history of the algae, it is highly unstable and difficult to isolate. There is no question concerning its poisonous qualities

to domestic animals, game birds, song birds, game mammals and the potential danger to man should not be overlooked. Many cottage owners along the shores of Storm Lake have as their water supply sand-point wells that might readily carry the toxic in lethal quantities to these people.

The total loss of animals that have been killed at Storm Lake this fall by the Anabaena have been recorded by the local Conservation Officer, Frank Starr, as follows: Franklin's Gulls, 5,000 to 7,000; ducks 560; coots 400; pheasants 200; fox squirrels 50; msukrats 18; dogs 15; cats 4; hogs 2; hawks 2; skunk 1 and mink 1. Also there were numerous song birds observed dead on the beaches. The above list is doubtless not exact, but is the record of those animals buried by the officer.

Other lakes in Iowa have on comaratively rare occasions developed similar poisonous blooms of blue-green algae. In the fall of 1944 and 1945, heavy losses of livestock, including hogs, cattle, horses, and poultry occurred in East Okoboji, Lower Gar and Center Lakes. The bloom at that time contained predominantly Anabaena flos-aqua. At that time the Veterinary Research Institute at Iowa State College, the State Board of Health and the Conservation Commission cooperated in the investigation of the cause of these losses. Some reports from these studies may be of interest. From Dr. H. F. Beardmore, Assistant Professor of Veterinary Pathology, "_____bacterial free filtrate from this algae material which has upon injection into guinea pigs produced that typical symptoms which have been described in the literature by previous workers. Thus we feel without any doubt that these losses occurring on the lake were due to this plankton toxicosis _____". Also, from Dr. H. E. Biester, Assistant Director of

Veterinary Research Institute, a letter of November 13, 1945, _____"The algae samples sent by you arrived in excellent condition. Both of these samples contained toxic properties, killing laboratory animals upon injection of the crude material. The three samples from Center Lake (Anabaena) proved toxic in crude as well as refined material." A report from Dr. W. G. Port, of the State Department of Agriculture, described the studies of Dr. Beardmore in some detail as follows: "_____the material (algae) was processed into bacterial free filtrate___when this process was completed, approximately 10 to 15 cubic centimeters were injected intraperitoneally into two guinea pigs. Both of these pigs were dead in twelve minutes____". Four tenths of one cubic centimeter of the same material was injected into a mouse which lived only about four minutes. It is interesting to note that from the material collected last year, two cubic centimeters were retained in the laboratory. Approximately one cubic centimeter was injected into a mouse which did not succumb. This of course indicated that no toxin was contained therein after a period of one year."

The American Veterinary Medial Association Journals record many losses of livestock particularly in the Dakotas, Minnesota and Canada, due to algal poisoning. The usual treatment given to farm animals that become ill from algal poisoning is identical to that for cyanide poisoning. However, Dr. J. M. Jones (D.V.M.) of Milford, Iowa, found this treatment ineffective on algae poisoned animals on East Okoboji Lake in 1944.

In view of the clinical confirmation of the cause of death to animals and the other unwholesome manifestations, it seems only

logical that some provision should be made to control the algae wherever circumstances indicate the real need.

Control

It has been known for many years that copper sulfate ($CuSO_4.5H_2O$) is an effective algacide. Many experiments have proved that under proper application the chemical is not harmful to other biota. Usually from 0.25 to 0.50 parts per million (referred to as p. p. m. hereafter) by weight is effective in controlling summer blooms. As mentioned previously, most blue-green algae disappear in the fall and treatments are not required; consequently little actual experience has been recorded in the treatment of cold waters. The Anabaena flos-aqua blooms most heavily in the fall at Storm Lake, and may not be affected by any previous summer treatments. Laboratory experiments this fall on Storm Lake's Anabaena indicated that for water temperature of 47° F. it would be necessary to treat at the rate of 0.75 to 1.0 p. p. m. to obtain effective controls of high concentrations. This is a matter which must be determined by experience, since large concentrations usually require heavier dosages than small quantities of the algae. During the summer of 1952, treatments at North Twin Lake, in Calhoun County, Iowa of 0.5 p. p. m. were effective in controlling Microcystis; however, the small amount of Anabaena was not effectively reduced by this amount.

Storm Lake has a volume of 7,272,498,816 gallons of water at crest level. A treatment of 1 p. p. m. of copper sulfate will require a total of 60,811 pounds, or 30,405 pounds of the chemical for a 0.5 p. p. m. dosage. Even at this lowest level (15 tons) the cost may well be prohibitive. Copper sulfate costs in the neighborhood of $250.00 per ton. Therefore the costs of one

treatment would require a minimum of $3,750.00 for copper sulfate only. Usually two or three treatments are required each year to reduce summer blooms, and an additional treatment would doubtless be necessary for fall blooms at Storm Lake.

All of the bloom forming species of blue-green algae are of course planktonic, drifting with winds to accumulate on lee shores in foul, paint-like scums. Upon shifts of the wind, these accumulations move out into the open waters forming peculiar parallel lanes over lake surfaces. The vast bulk of the algae may readily be killed by treating the concentration areas only, and timing the treatment so that shifting winds do not scatter the algae all over the lake. The marginal treatments will of course require much less chemical and reduce costs considerably. Treatments would have to be made more frequently than where the entire lake is treated however.

Our experience at North Twin Lake, last summer where the community purchased the copper sulfate, proved conclusively that local treatments are very effective; however, two complete treatments were made when heavy growths developed over most of the lake. Localized treatments around the main beach were made to eliminate algae trapped in this bay region. In the State of Wisconsin, (Mackenthun, 1946, 1952), most of the lakes are treated by spraying a solution of copper sulfate over the algal infested waters primarily along the marginal areas. A few lakes are treated in their entirety especially where they are used for public water supply.

Providing a program of algal control is planned for Storm Lake, it is emphasized that at least two or more complete treatments will be necessary for control of the algae. There is no

means of predicting exactly how much copper sulfate would be needed, since the severity of blooms and their recurrences will determine the extensiveness of treatments. Possibly from $10,000 to $12,000.00 worth of copper sulfate would be required for complete treatments of this lake. Localized marginal, and bay treatments would require less chemical but more time in supervision and application.

Two methods are currently used in treating lakes with copper sulfate for the control of blue-green algae. The power spray method is usually accepted as the best, and of course requires elaborate equipment. The other method consists of dragging bags of copper sulfate from outriggers attached to the gunwales of boats. In either method, careful calculations of volumes and equitable distribution of the chemical is imperative.

The city of Storm Lake used the bag-dragging method from 1930 through 1933, treating the entire lake several times each summer to control the heavy blooms of algae. In the summer of 1934, the writer used a small power spray unit on this lake as an experiment. The lake was kept fairly free of algae most of the summer by marginal treatments only. During these years the city was using the lake for public water supply and fortunately no toxic algae developed during this period.

Summary

In view of the increasing demand for recreational areas in Iowa, and with our limited number of lakes, it is desirable that all bodies of water be as suitable for total recreation as possible. Due to toxins developed periodically by Anabaena flos-aqua, and possibly species of other genera, chemical control of these plants seems to be the only possible course of action at this time.

Copper sulfate is the best algacide known, although much research is being conducted on other chemical. Some of these show much promise in providing more effective control; however, to date they are not recommended. It is emphasized that copper sulfate treatments are palliatives, not cures. The development of natural controls is highly desirable, and it is hoped that further research will provide a practical solution.

The elimination of municipal sewage pollution, and other sources of fertility may, in the long run, aid in a natural control of algae; but, Storm Lake, like the other Iowa lakes, has the richest land in the world as watersheds. We can expect these drainage basins to be equally rich with the elements from these soils. Consequently, local pollution is but one factor in the production of blooms of algae.

The development of an algae control program will involve many problems. Many and varied interests are concerned that will require consideration. For instance, a lake that is far removed from a community and has comparatively little recreational pressure may have occasional heavy blooms of algae, but no great demand for control. On the other hand, blooms on a lake with a high recreational value and surrounded by resorts, will concern not only the adjacent communities but thousands of visiting people who use the lake for fishing, boating, swimming and sight-seeing. Furthermore, a lake that develops toxic algae, such as Storm Lake and a few others, will concern more than the recreation seekers, since the public health and welfare are also involved.

In a measure, this report summarizes the existing information concerning the algae problemin Iowa lakes, and particularly of

Storm Lake, where the most serious manifestations have occurred. Costs and methods of control are outlined for consideration toward a program to minimize dangers and improve lake recreation.

Literature Cited

Ingram, William M. and G. W. Prescott, 1952. Illustrations of Fresh-Water Algae Toxic to Animals. Ohio--Tennessee Drainage Basins Office. Division of Water Pollution Control. Federal Security Agency. Public Health Service, Cincinnati, Ohio.

Moyle, John B. 1949. The use of copper sulfate for algal control and its biological implications. American Association for the Advancement of Science.

Mackenthun, K. M. 1946. Aquatic Nuisance Control in Wisconsin. Comm. on Water Pollution, Madison, Wisconsin.

Mackenthun, K. M. 1952. Aquatic Nuisance Control, Progress Report. Not published.

A CONTINUING INVENTORY OF SOME STREAM FISHES IN IOWA

R. E. Cleary and Harry M. Harrison, Iowa Conservation Commission
Des Moines, Iowa

Presented before the 14th Midwest Wildlife Conference
Paper #

Since Iowa's lakes are limited in number and confined primarily to the northwestern part of the state, the major portion of the state's angling pressure is applied to its inland rivers and streams. Although both the Missouri and Mississippi Rivers receive Iowa tributaries, the unfavorable physical conditions of those in the Missouri drainage system limit both the fish populations in the streams and favorable conditions for angling. For this reason, while the river netting surveys are state-wide in scope, only the rivers of the central and eastern portion of the state are surveyed annually at fixed stations.

Stated briefly, the rivers of the northeastern portion of the state are relatively clear and have a moderate to steep gradient. While the central and west-central rivers, flowing south through the gently rolling Iowa prairie are progressively more turbid and of a flatter gradient. These changes in the physical characteristics of the rivers give rise to selective angling with more effort being put on smallmouth bass, northern pike, walleyes and crappies in the eastern rivers of the state. While the channel catfish is the most sought-after river fish over the entire state, the pressure on this species increases as one moves west or south across the state. It was decided to direct the major effort of the western river surveys to the catfish populations, while in the north and east, in addition to the catfish, checks on the trends of the pike, bass and crappie populations seemed desirable. After checking the effectiveness of various commercial gear, it was

decided to use cheese-baited hoop nets, 22 inches in diameter by 10 feet long, constructed of ½-inch webbing, in central and west-central rivers. In the northeast, a combination of these bait nets and 2' X 4' trap nets of 1-inch mesh and 30-foot leads, seemingly gave the best results.

TABLE 1
BAIT-NET CATCH OF CHANNEL CATFISH IN DES MOINES RIVER, 1946-1952

Fish/Net Hr.						
1946	1947	1948	1949	1950	1951	1952
.11	.21	.31	.47	.28	.35	.15

On the Des Moines River the results of the annual netting survey are given in Table 1. The nets are set as soon as the ice goes out and are fished till the river discharge stabilizes, which is usually in July. An average of 13 stations are netted annually on the upper and middle reaches of the Des Moines River. Despite the fact that every effort is made to revisit these stations at the same time of the year and under similar water conditions, catch fluctuations at the same station from year to year were rather severe, and in an effort to smooth off the catch-per-hour curve, the total catch of all stations during a particular year are combined to give a river-wide picture of the number of fish per net hour.

In eastern Iowa, the mechanics of setting and maintaining trap nets plus the fact that this net can be fished only under certain favorable conditions, limit the number of stations which can be visited during a netting season. These nets are fished at eight stations during relative stable water conditions for a period of five days. Bait nets were first used in conjuntion with trap nets in 1952, therefore only trap net catches for the last four years are used in Tables 2 and 3.

TABLE 2

TRAP NET CATCH OF GAME FISH IN NORTHEAST IOWA RIVERS 1949-1952

	Fish/Trap Net hour			
	1949	1950	1951	1952
Cedar River	.32	.25	.24	.13
Wapsie River	.28	.28	.15	.10
Iowa River	.41	.11	*	.19
Turkey River	.27	.08	.10	*
Maquoketa River	2.15	.57	.33	.07

* No Survey

TABLE 3

TRAP NET CATCH OF ALL FISH IN NORTHEAST IOWA RIVERS 1949-1952

	Fish/Trap Net Hour			
	1949	1950	1951	1952
Cedar River	.56	.65	.47	.48
Wapsie River	.45	.42	.28	.16
Iowa River	.92	.43	-	.49
Turkey River	.59	.17	.25	-
Maquoketa River	2.20	.62	.34	.09

In an effort to secure the best possible insight into the bionomics of a single population, two methods are being used in Iowa. In the western rivers the catfish populations are divided into a rough length-frequency ratio, while in the eastern rivers the number of pounds per net hour, which can be converted into average weight per fish, is used to augment the often misleading fish-per-hour data. In addition to weights and measurements of individual fish, representative scale and backbone samples are taken from the various netted populations.

As can be seen, there are marked changes in the annual catch. Perhaps if a more successful method of capturing fish were devised, these figures, which are low as to be readily and markedly altered by the addition or subtraction of a few fish, could be stabilized into a more gradual curve. Since both the bait nets and the trap nets are fixed fishing devices which depend on the

fish to entrap themselves, these data represent a product of the size of the population times its movement. The movement which determines the catches in trap nets may be a response to any number of tropisms, while movement into the bait nets is thought to be primarily a physiological response to the odor or taste of the cheese in the nets. During the spawning season this movement into the net is thought to be sex-motivated for "baiting" nets with mature specimens of either sex brings about a larger catch than "unbaited" nets.

While the catches represent a sample of the river species inhabiting the test area at the time of the survey only, assuming environmental conditions to be nearly the same at each annual visitation, these catch statistics should indicate population trends. It has been noted that the catch in both bait nets and linear seines at five to seven stations in one county or in adjoining counties, are, for all practical purposes, the same if run simultaneously or within a stable climatic period. Therefore, one or two survey stations per ecological reach of the various rivers should give as sound data as numerous stations within a given area.

Efforts to secure a statistical estimate of an individual population by a mark and recapture system met with indifferent results. Daily population estimates could fluctuate radically due to the marked fish moving out of the survey area and the recruitment of unmarked fish from eith above or below. In the usual survey operation, the time spent at any station is of necessity of limited duration, which in itself limits a valid sampling of a population.

For all rivers except the Cedar, the highest catch was made in 1949, with corresponding lows in 1952. Even using different

equipment and comparing trends of a single species, a group of species, or a total catch, these years had something in common which accelerated and depressed the catches. In the Des Moines River the catch-per-hour data coincide almost directly with the ratio of sub-adult and fingerlings to adult catfish in the catch (Table 4). Therefore, besides indicating trends in the population, these catch figures also indicate the annual reproductive success.

TABLE 4

COMPARISON BETWEEN CATCH AND RATIO OF ADULTS TO FIDDLERS IN CHANNEL CATFISH POPULATIONS IN THE DES MOINES RIVER, 1946-1952

Year	Ratio Adults - Fiddlers	Fish/Hour
1946	1 - 3.2	.11
1947	1 - 5.0	.21
1948	1 - 7.4	.31
1949	1 - 9.5	.47
1950	1 - 4.3	.28
1951	1 - 3.4	.35
1952	1 - 2.9	.15

With annual fluctuations in game fish catches (tables 2 and 3) there are corresponding changes in the forage and rough fish catch, indicating these figures to be true statistics of the population in the survey area. There is little to indicate compensatory adjustments between various categories of fish. In other words, the game fish population was not down during a certain year because of pressure by rough fish or vice versa.

The Maquoketa is definitely a "sick" river and indications are that the Wapsie is tending toward this condition. On the Maquoketa there was a 37% drop in creel statistics and a 42% drop in net catches between 1950 and 1951. In the Wapsie this decline was 45% and 46%, respectively.

In the Cedar the drop in creel and net catch were 3% and 4% respectively while in the Turkey it was up 36% and 25% respectively. This is a surprisingly close correlation between changes in net and angling catches from year to year and indicates that our netting surveys are giving fairly accurate pictures of population trends in Iowa rivers.

TABLE 5
NUMBER PER ROD HOUR COMPARED WITH NUMBER PER NET HOUR OR GAME FISH CATCH IN NORTHEAST IOWA RIVERS, 1950 AND 1951

Stream	Year	No./Rod Hour	No./Net Hour
Maquoketa	1950	1.03	.57
	1951	.65 (-37)*	.33 (-42)
Turkey	1950	1.31	.08
	1951	1.78 (+36)	.10 (+25)
Cedar	1950	.75	.25
	1951	.73 (-3)	.24 (-4)
Wapsie	1950	.77	.26
	1951	.42 (-45)	.14 (-46)

* Percent increase or decrease over 1950