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THE SIXTEENTH ANNUAL REPORT ON THE RIFLE RIVER AREA, OGEMAW COUNTY, 1960

by

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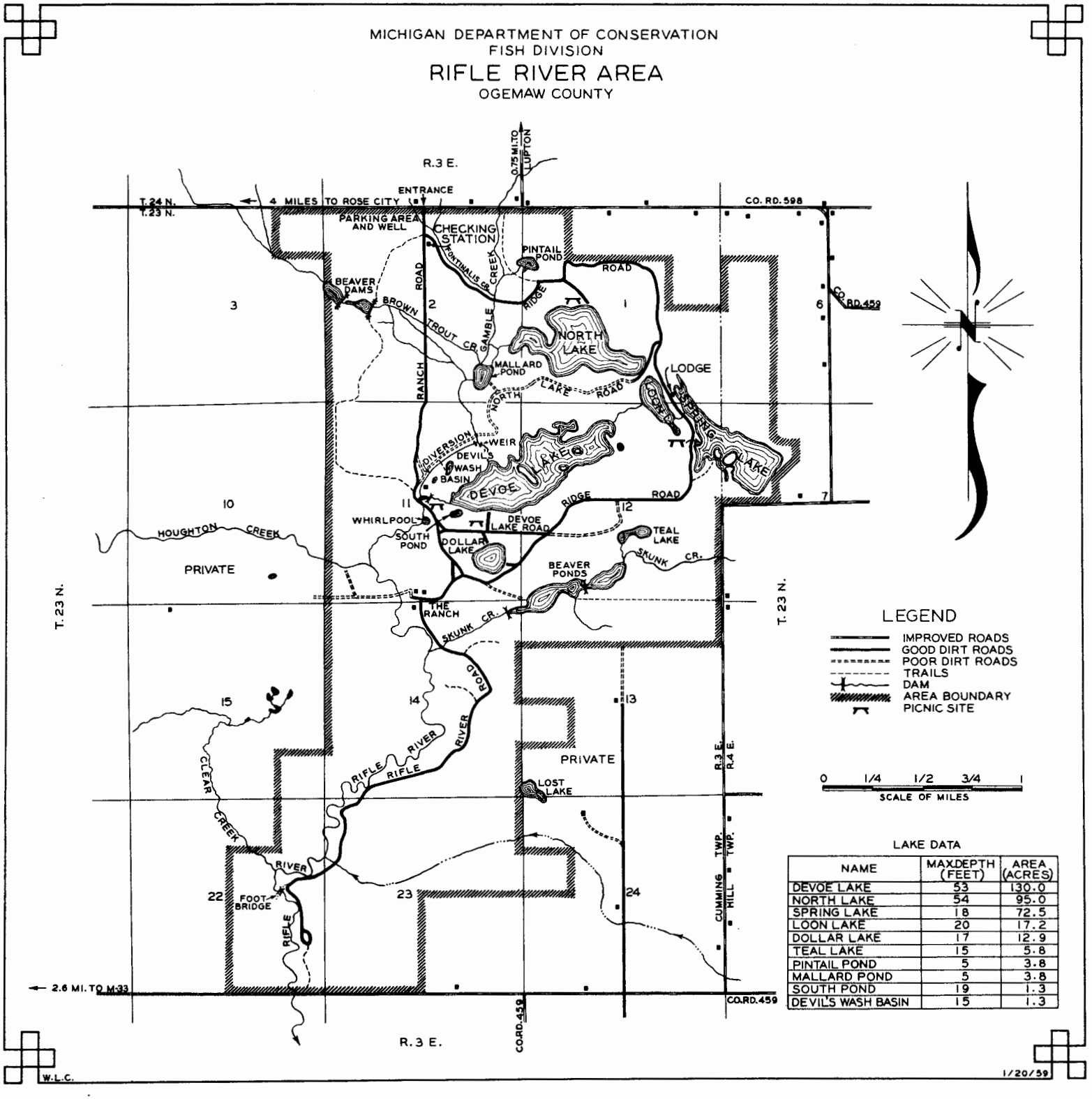
The Rifle River Area is a 4,318-acre wooded tract of land located in northeastern Ogemaw County. Six lakes, a number of ponds, and approximately 9.5 miles of stream are within its fenced boundary (Fig. 1). Purchased by the Department of Conservation in 1944, it has been open to public recreational use since 1945. As visitors pass through the single entrance, they are given free permits which they return to the checking station upon leaving. Here pertinent information is recorded on fish or game taken from the Area.

This sixteenth annual report on recreational use of the Area presents primarily the results of the fishing trips on the lakes and streams. Brief summaries of hunting and trapping activities also are included, and fisheries research projects in progress are briefly reviewed.

For the third consecutive year, more than 25,000 permits were issued to visitors (25,122 in 1960). Of these permits, 17,511 (69.7 percent) were



LAKE DATA

NAME	MAX. DEPTH (FEET)	AREA (ACRES)
DEVOE LAKE	53	130.0
NORTH LAKE	54	95.0
SPRING LAKE	18	72.5
LOON LAKE	20	17.2
DOLLAR LAKE	17	12.9
TEAL LAKE	15	5.8
PINTAIL POND	5	3.8
MALLARD POND	5	3.8
SOUTH POND	19	1.3
DEVIL'S WASH BASIN	15	1.3

Figure 1

RIFLE RIVER AREA

This 4,318-acre tract was purchased in 1945, with money from fishing and hunting licenses, to provide (1) additional public fishing and hunting grounds, and (2) a field laboratory for fish and game research. The former owner was H. M. Jewett, pioneer auto maker, who operated the Area as a private hunting and fishing preserve under the name of "Grousehaven."

Public use of the Rifle River Area is governed by the general rules for State-owned lands, except for special regulations which are announced on signs and posters. The Area is open daily, except Christmas; opening and closing hours are posted at the entrance. The Lodge is not open to the public; it is used by Department personnel for small meetings and to house people doing research work on the Area.

EVERYONE MUST REGISTER AT THE CHECKING STATION WHEN ENTERING AND AGAIN WHEN LEAVING THE AREA. Results of fishing, hunting and trapping must be reported to the clerk at the Checking Station. Fish should not be dressed until checked by the clerk. General seasons for fishing, hunting and trapping apply, except as posted. All other recreational activities are permitted except camping. If persons camped on the Area, it would complicate the daily checking out of fish and game which is essential to research on the Area. The clerk can suggest camping areas outside the Area. Permission to build cooking fires at designated sites must be obtained from the clerk on duty. It is unlawful to enter or leave the Area other than through the Checking Station, except by permission of the attendant on duty.

The Area is under the jurisdiction of the Fish Division of the Conservation Department. The other divisions of the Department are consulted on special problems and cooperate in management of the Area. The United States Weather Bureau and Geological Survey provide instruments for daily recording of data on weather, stream flow, and ground water levels.

Public use of Rifle River Area since 1945

Year	Number of persons				
	Sight-seeing	Fish-ing	Hunt-ing	Trap-ping	Total
1945	9,784	4,339	2,207	40	16,370
1946	9,198	2,997	2,447	75	14,717
1947	10,532	3,893	2,342	51	16,818
1948	10,976	3,821	2,132	141	17,070
1949	13,320	4,021	1,968	134	19,443
1950	12,945	4,578	2,109	86	19,718
1951	13,391	4,216	2,018	144	19,769
1952	14,176	3,959	2,915	117	21,167
1953	13,478	5,132	5,994	88	24,692
1954	15,364	5,812	4,021	72	25,269
1955	14,825	5,651	3,236	45	23,757
1956	13,160	5,231	3,541	87	22,019
1957	13,321	4,486	3,266	66	21,139
1958	17,135	5,232	3,511	105	25,983

Research Activities

The many lakes and streams on the Area provide a good opportunity for research on methods to improve fishing. Management techniques developed here might be applied elsewhere in Michigan. Likewise, research on game management problems is carried on throughout the year.

A record of annual harvest of fish and game is obtained at the Checking Station. Studies on age and growth of fish and game species are made from weights and measurements taken at the Checking Station and from scale samples of fish, wings and tail feathers from grouse, and by examining the teeth of deer. Other studies may involve records of fin-clip marks or tags on fish, leg bands on grouse, and blood samples from certain birds or animals. Special research projects on the Area involve: (1) evaluation of stream and lake improvement, (2) fish population census in lakes and streams, (3) effects of fishing and hunting pressures on populations, (4) fish population manipulation, (5) stocking of different combinations of fish, (6) movements of stream fishes, (7) establishment of a flock of Canada geese to encourage local nesting, (8) grouse studies, (9) investigations on other game populations and their habitats, and (10) developing new techniques in fish and game research.

for sightseeing, 4,495 (17.9 percent) for fishing, 3,050 (12.1 percent) for hunting, and 66 (0.3 percent) for trapping.

Anglers from 43 of Michigan's 83 counties fished in the Rifle River Area in 1960, the same number as last year. Eighty-three percent of the fishermen were residents either of Ogemaw County or the eastern Michigan metropolitan areas in Bay, Genesee, Macomb, Oakland, Saginaw, and Wayne counties. Of 102 nonresident anglers, 62 percent were from Ohio.

Stream fishing

Six of the seven streams in the Area are classified as trout water.[1] These trout streams have a combined area of 33.9 acres with the Rifle River representing 22.8 acres. During the season 2,771 fishermen fished 6,941.5 hours on the Area streams for an angling intensity of 204.8 hours per acre (Table 1).

Apparently, trout stream fishing is primarily a masculine pursuit, since 82.2 percent of the anglers were adult males and 9.5 percent were unlicensed minor males. The rest of the angling was done by wives of licensed males (6.8 percent), minor females (1.0 percent), and licensed females (0.5 percent). Stream fishing averaged 2.5 hours per trip.

The yield of fish from the Area streams amounted to 1,446 fish that weighed 772.4 pounds. These fish were caught at the rate of 42.6 fish, or 22.8 pounds, per acre. The harvest of native trout consisted of 1,114 brown and 48 brook trout which, in toto, weighed 568.9 pounds. This is equivalent

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[1] As non-trout water, Skunk Creek was excluded from the catch statistics in the body of the report. One native brown trout, probably a stray fish from the Rifle River, was caught in this creek in the spring. Seven fishermen fished Skunk Creek for five hours.

to 34. 3 trout, or 16. 8 pounds, per acre. Hatchery trout were not planted in the Area waters during the season. However, 126 hatchery trout (92 brown and 34 rainbow trout) were caught in Area streams, 101 of which were survivors from plantings made in previous years. The rate of harvest for these trout was 3. 7 fish, or 1. 8 pounds, per acre. In addition, 158 "other fish" were captured.

The percentage of anglers who succeeded in catching at least one native trout was highest for Fontinalis Creek (45. 6 percent) and lowest for Brown Trout Creek (11. 1 percent). For all streams, percentage of success was 17. 0 (Table 2). On the Rifle River where the bulk of Area stream fishing occurred, the percentage of success was 16. 1. Angling quality, based on catch per hour per angler, ranged between 0. 09 on Brown Trout Creek and 0. 55 on Fontinalis Creek. For all streams combined, the average catch per hour per angler (native trout) was 0. 14. Including hatchery trout, the average catch was 0. 16 trout per hour per angler. If, in addition, non-trout species are included, the overall index of angling quality was 0. 19 fish per hour per angler.

In 1960, as in past years, most fishermen (64. 6 percent) continued to use worms in preference to any other lure. The second most frequently used lure was artificial flies (18. 2 percent) and artificial lures, other than flies, ranked third. Compared to 1959, there was a small increase, percentagewise, in the use of both flies and artificial lures and a decrease in the use of worms. The increased use of artificial lures probably reflected an increasing preference for spinning gear.

Rifle River. --Of the 6,941.5 hours of fishing spent on Area streams, angling on the Rifle River accounted for nearly 90 percent, or 6,196.5 hours (Table 1). Fishing pressure was 271.8 hours per acre. The average length of a fishing trip, based on 2,398 angler-trips, was 2.6 hours.

Fishermen harvested 980 native brown and 10 brook trout. The brown trout averaged 10.6 inches in length and 0.50 pound in weight. The catch of native trout represented about a 90 percent increase over that of 1959 even though angling pressure this year dropped slightly (3.1 percent).

In 1960, no trout plantings were made in Area waters until October, after the close of the trout season. As a result, only 111 hatchery trout (88 brown, 23 rainbow) were caught in the Rifle River. These trout originated from the following plantings:

Locality of release	Year released	Species	Number caught
Rifle River, below Area	1960	Brown	9
Rifle River, below Area	1960	Rainbow	15
Rifle River, in Area	1959	Brown	71
Houghton Creek, above Area	1959	Rainbow	2
Devoe Lake	1959	Rainbow	6
Rifle River, in Area	1958	Brown	5
Rifle River, in Area	1957	Brown	3

In 1960, as shown above, 24 trout from waters outside the Area appeared in the catch made on the Area. Customarily, trout planted in streams in the Area, or out of it, have been given the same mark. Consequently, there is always some doubt as to the precise origin of some of the hatchery trout, particularly those caught in the Rifle River.

Table 1. --A summary of angling on the trout streams of the Rifle River Area in 1960[1]

Stream	Area (acres)	Number of anglers	Hours of fishing	Fish caught							
				Hatchery-reared trout		Native fish					
						Trout		Others		Total	
				Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds
Rifle River	22.8	2,398	6,196.5	111	49.16	990	497.92	155	141.64	1,145	639.56
Gamble Creek	5.9	180	370.0	8	6.82	66	34.74	2	1.40	68	36.14
Houghton Creek	0.9	76	180.0	3	1.56	26	12.31	1	1.12	27	13.43
Fontinalis Creek	0.9	57	110.5	2	0.64	66	18.04	...	...	66	18.04
Diversion	0.8	33	47.0	2	1.16	11	4.42	...	...	11	4.42
Brown Trout Creek	2.6	27	37.5	...	...	3	1.48	...	...	3	1.48
Totals	33.9	2,771	6,941.5	126	59.34	1,162	568.91	158	144.16	1,320	713.07

[1] Skunk Creek is not included.

In 1959, when Area streams and those outside of the Area were stocked, 579 hatchery trout were caught. In 1960, when Area streams were not stocked and those outside the Area were stocked, only 111 hatchery trout were caught.

In 1960, the quality of angling for native trout in the Rifle River was 0.13 fish per hour per angler (Table 2). This represented a marked improvement over that of 1959 when the catch was 0.05 fish per hour per angler. Only 9.7 percent of the fishermen in 1959 were successful in catching at least one native trout whereas 16.1 percent were successful in 1960.

As in the past, the bulk of the catch of native brown trout was composed of two- and three-year-old fish (Table 3). Yearlings contributed 12.5 percent of the catch. About 7.5 percent of the trout (66 fish) were older than three years.

Annually, nearly all of the non-trout species caught in Area streams are taken from the Rifle River. In 1960, six species (158 fish) were captured; white suckers were the most numerous (71.5 percent) followed by rock bass and yellow perch (Table 4).

Of the 2,398 fishermen that fished the Rifle River, about 64 percent used worms for bait and accounted for 53 percent of the total catch of native trout. The second most popular lure was flies which were employed on 18.8 percent of the angler-trips. Fly fishermen caught 38.4 percent of the native trout.

Whirlpool. --A small oxbow-like pond (0.6 acre), designated the "Whirlpool," adjoins the Rifle River about 300 feet below Devoe Lake dam. The Whirlpool represents a lentic rather than a lotic environment and therefore angling records for this water are kept separate from those for the Rifle River. Altogether, 79 anglers fished the Whirlpool for 152 hours and caught

Table 2. --A summary of angling quality for native trout on the trout streams of the Rifle River Area in 1960

Stream	Trout caught per acre of stream		Catch per hour per angler	Percentage of fishermen successful
	Number	Pounds		
Rifle River	43.4	21.8	0.13	16.1
Gamble Creek	11.2	5.9	0.22	20.6
Houghton Creek	28.9	13.7	0.15	17.1
Fontinalis Creek	73.3	20.0	0.55	45.6
Diversion	13.8	5.5	0.20	15.2
Brown Trout Creek	1.2	0.6	0.09	11.1
Average	34.3	16.8	0.14	17.0

Table 3. --Number (N) and percentage (P) of native brown trout of different age groups caught in streams of the Rifle River Area in 1960

Age group	Stream											
	Rifle River		Gamble Creek		Houghton Creek		Fontinalis Creek		Diversion		Brown Trout Creek	
	N	P	N	P	N	P	N	P	N	P	N	P
I	110	12.5	2	3.3	3	12.0	1	3.0	..	....	..	....
II	534	60.4	29	48.4	17	68.0	16	48.5	8	72.7	..	....
III	174	19.7	24	40.0	5	20.0	15	45.5	2	18.2	1	100.0
IV	56	6.3	3	5.0	..	....	1	3.0	1	9.1	..	....
V	8	0.9	2	3.3	..	....	..	....	..	....	..	....
VII	1	0.1	..	....	..	....	..	....	..	....	..	....
VIII	1	0.1	..	....	..	....	..	....	..	....	..	....
Totals	884	....	60	....	25	....	33	....	11	....	1	....
Total catch[1]	980	....	61	....	26	....	34	....	11	....	2	....

[1] Includes fish for which age was not determined.

Table 4. --Number of fish of different species caught in six streams of the Rifle River Area in 1960[1]

Kind of fish	Stream						Total number of fish	Percentage of total catch
	Rifle River	Gamble Creek	Houghton Creek	Fontinalis Creek	Diversion	Brown Trout Creek		
Brown trout								
Native	980	61	26	34	11	2	1, 114	77.0
Hatchery	88	2	..	2	..	..	92	6.4
Rainbow trout								
Hatchery	23	6	3	..	2	..	34	2.4
Brook trout								
Native	10	5	..	32	..	1	48	3.3
White sucker	111	1	1	..	..	..	113	7.8
Rock bass	18	..	..	..	..	..	18	1.2
Yellow perch	15	1	..	..	..	..	16	1.1
Bluegill	5	..	..	..	..	..	5	tr
Longear sunfish	5	..	..	..	..	..	5	tr
Carp	1	..	..	..	..	..	1	tr
Totals	1, 256	76	30	68	13	3	1, 446	...
Percentage of total area catch	86.9	5.2	2.1	4.7	0.8	tr	...	...

[1] In body of table "tr" = less than 0.5 percent.

60 fish that weighed 200. 3 pounds. Winter spearing and hook-and-line fishing in the summer accounted for the entire catch, as summarized below:

Species	Summer fishing (June 18-Sept. 5) Number	Pounds	Winter fishing (Dec. 1-March 31) Number	Pounds
Carp	5	28. 1	17	105. 2
White sucker	20	24. 6	7	6. 4
Northern pike	6	14. 7	4	18. 2
Northern redhorse	1	3. 0		

Gamble Creek. --While there was a slight drop (9. 1 percent) in the number of angler-trips on Gamble Creek in 1960 as compared to 1959, the average length of a fishing trip in 1960 was somewhat longer. As a result, the stream was fished at the rate of 62. 7 hours per acre in 1960 compared to 57. 4 in 1959. The catch of native trout, 61 brown and 5 brook trout, rose sharply over that of 1959 when 29 brown and 6 brook trout were caught. The catch per hour per angler increased from 0. 10 in 1959 to 0. 22 in 1960. Hatchery trout made a relatively small contribution to the catch in 1960. Of the eight trout caught, six were rainbow trout from a Devoe Lake planting in 1959; one brown trout was derived from a 1959 planting in the Rifle River; and one brown trout originated from a fingerling stocking in Gamble Creek in 1953. In contrast, 44 hatchery trout were caught in Gamble Creek in 1959; most of them came from a planting of legal-length rainbow trout made in Devoe Lake in the spring of 1959.

The catch of native brown trout consisted primarily of two- and three-year-old fish (Table 3). The contribution of three-year-old fish was proportionately greater in Gamble Creek than in the Rifle River.

Houghton Creek. --Seventy-six anglers fished for 180 hours on the 0.2 mile of Houghton Creek within the Area. The catch consisted of 26 native brown trout and three hatchery rainbow trout. The brown trout averaged 10.4 inches in length. Of the rainbow trout, two originated from a planting in Devoe Lake in the spring of 1959 and one rainbow trout probably moved downstream after having been planted in Houghton Creek above the Area in 1959. Age groups I through III were represented in the catch with two-year-old fish predominant (68.0 percent). A comparison of the 1959 and 1960 seasons showed angling quality to be 0.06 and 0.15 fish per hour per angler, respectively. While the catch for both years was comparable, angling pressure (hours per acre) dropped 26.6 percent in 1960.

Fontinalis Creek. --This relatively small creek was fished by 57 anglers at the rate of 122.7 hours per acre. Nearly 46 percent of the fishermen were successful and as a result 66 native trout were caught, 34 brown and 32 brook trout. The catch per hour per angler was 0.55--the best angling quality of any stream in the Area. Most of the native brown trout (94 percent) were two- and three-year-old fish.

Each year, most of the brook trout caught in Area streams come from Fontinalis Creek. Number and percentage contribution of the three age groups in the 1960 catch were as follows: age-group I (8 fish) 25.0 percent; age-group II (22 fish) 68.8 percent; age-group III (2 fish) 6.2 percent.

Diversion. --This was the ninth season of angling on this man-made channel that links Gamble Creek directly to the Rifle River. Thirty-three anglers fished the Diversion for 47 hours and caught 11 native brown trout and 2 hatchery rainbow trout (from a Devoe Lake planting in 1959).

Brown Trout Creek. --As in past years, little fishing was done on this creek in 1960. Twenty-seven angler-trips involving 37.5 hours resulted in a catch of two native brown and one brook trout.

All streams. --There was a small drop in both the number of fishermen (7.7 percent) and hours fished (3.2 percent) in 1960 as compared to 1959. In 1959 and 1960, respectively, angling intensity was 211.5 and 204.8 hours per acre.

The quality of fishing on all Area streams in 1960 was improved over that of 1959. The percentage of successful fishermen increased from 9.8 to 17.0 percent and the number of native trout caught increased from 612 to 1,162. The quality of angling rose from 0.06 to 0.14 fish per hour per angler. Area streams were stocked in 1959 and were not stocked in 1960; this fact was the prime cause of the marked drop (81.1 percent) in the catch of hatchery trout in 1960.

Lake fishing

The total yield of fish from Area lakes plunged to a new all-time low in 1960 and continued the downward trend begun after 1953. Only 1,886 fish were caught during 5,523 hours of fishing (Table 5). The 1960 catch weighed 498.1 pounds, or 292 pounds less than 1959's low yield. Twenty-three percent of the anglers caught one or more fish and the average catch per hour per angler was 0.34. The increased yields in 1960 of North, Loon, South Pond, and Teal lakes were more than offset by decreased catches from Devoe and Dollar lakes. In 1959, the Devoe Lake population was bolstered by a spring planting of rainbow trout but in 1960 the lake was not planted till late in the

Table 5. --The fishing pressure, yield, and fishing quality on seven Rifle River Area lakes in 1960

Lake[1]	Fishing pressure				Yield				Fishing quality	
	Number of fishing trips	Trips per acre	Hours of fishing	Hours per acre	Number of fish	Fish per acre	Pounds of fish	Pounds per acre	Catch per hour per angler	Percentage of fishermen successful
Devoe	906	7.0	2,848	21.9	575	4.4	156.3	1.2	0.19	16
North	444	4.7	1,224	12.9	387	4.0	101.4	1.1	0.31	18
Dollar	453	35.1	1,094	84.8	481	37.3	158.5	12.3	0.41	36
Loon	65	3.9	177	10.5	198	11.8	40.1	2.4	0.95	51
South Pond	71	54.6	116	89.2	156	120.0	21.0	16.2	1.05	31
Teal	25	4.3	53	9.1	89	15.3	20.8	3.6	1.52	52
Spring	9	0.1	11	0.2	0	...	...	...	...	...
Totals	1,973	5.9	5,523	16.5	1,886	5.6	498.1	1.5	0.34	23

[1] Number of surface acres for each lake are: Devoe, 130.0; North, 95.0; Dollar, 12.9; Loon, 16.8; South Pond, 1.3; Teal, 5.8; Spring, 72.5. Total acreage, including 1.3-acre Devil's Wash Basin: 335.6.

fall. Bluegills, the mainstay of the fishery in Dollar Lake, had not recovered from the various effects discussed in the 1959 annual report so that the total catch from this lake dropped to a record low. There were only 1,973 fishing trips to the Area lakes in 1960, the fewest since 1951.

Bluegills and yellow perch, together, comprised 61.2 percent of the Area catch (Table 6). None of the other 14 kinds of fish made up more than 10 percent of the catch. No fish were caught in Spring Lake and Devil's Wash Basin.[2]

Procedures for scale sampling and estimation of the age composition of the catches followed those of the past 4 years and are described in Report Nos. 1550 and 1575 of the Institute for Fisheries Research. Fishing records for the lakes and ponds were tabulated by method of fishing and by season of the year. Delineation of the seasons generally follows the pattern used previously, i.e.: spring, open-water angling prior to the opening of the bass season (June 18, 1960); summer, June 18 to September 5 (Labor Day), inclusive; fall, open-water fishing after Labor Day; and winter, fishing through the ice.

Devoe Lake. --In 906 fishing trips, anglers fished 2,848 hours and caught 575 fish (Table 5), the largest number caught from any Area lake in 1960. The total catch of 156.3 pounds of fish amounted to 1.2 pounds per acre, which is somewhat below the average for this lake. More than half of the catch (55.5 percent) consisted of yellow perch, with bluegills ranking next. In 1959, during high water, a movement of small centrarchids from Loon Lake into

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[2] Although no fish were caught in Spring Lake, 12 persons caught 31 frogs weighing 7.1 pounds.

Table 6. --The species composition, by number (N) and percentage (P), of the catch from six lakes on the Rifle River Area, 1960[1]

Species	Lake												Total number of fish	Percentage of Area total
	Devoe		North		Dollar		Loon		South Pond		Teal			
	N	P	N	P	N	P	N	P	N	P	N	P		
Bluegill	103	17.9	121	31.3	162	33.7	51	25.8	124	79.5	36	40.4	597	31.7
Yellow perch	319	55.5	176	45.5	3	0.6	45	22.7	11	7.1	2	2.3	556	29.5
Pumpkinseed	5	0.9	16	4.1	101	21.0	45	22.7	13	8.3	7	7.9	187	9.9
Rock bass	56	9.7	19	4.9	53	11.0	10	5.1	6	3.9	..	...	144	7.6
Largemouth bass	12	2.1	24	6.2	115	23.9	10	5.1	...	...	..	...	161	8.5
Smallmouth bass	10	1.7	9	2.3	...	...	...	...	...	...	..	...	19	1.0
Black crappie	16	2.8	1	tr	11	2.3	...	...	...	...	..	....	28	1.5
Hybrid sunfish[2]	1	tr	7	1.8	23	4.8	6	3.0	...	...	43	48.3	80	4.2
Redear sunfish	...	...	...	...	11	2.3	...	...	...	...	..	...	11	0.6
Bullheads[3]	1	tr	2	0.5	2	tr	30	15.1	1	0.6	1	1.1	37	2.0
Brown trout	31	5.4	...	...	...	...	...	...	...	...	..	...	31	1.6
Rainbow trout	12	2.1	...	...	...	...	...	...	...	...	..	...	12	0.6
Northern pike	1	tr	3	0.8	...	...	...	...	...	...	..	...	4	tr
White sucker	8	1.4	4	1.0	...	...	1	0.5	...	...	..	...	13	0.7
Longear sunfish	...	...	1	tr	...	...	...	...	1	0.6	..	...	2	tr
Smelt	...	...	4	1.0	...	...	...	...	...	...	..	...	4	tr
Totals	575	...	387	...	481	...	198	...	156	...	89	...	1,886	...

[1] In the table, tr = less than 0.5 percent.

[2] Bluegill x pumpkinseed.

[3] Black bullhead or brown bullhead.

Devoe Lake was observed and these contributed to the large catch (for Devoe Lake) of bluegills in 1960. The mean length of the bluegills caught was 6. 2 inches, and 3-year-old fish (1957 year class) dominated the catch (Table 7).

The 1957 year class also dominated the catches of perch and rock bass. The mean length of perch caught was 6. 5 inches; for rock bass, 6. 2 inches. For at least the past 5 years, three-year-olds have predominated in the catch of perch. The total catch of smallmouth bass dropped to a 16-year low of 10 fish.

In 1959, rainbow trout comprised about 40 percent (39. 6) of the total catch. These trout were of hatchery origin and planted as legal-size fish in April. The 1960 planting schedule called for a late fall planting (planting date, October 19), with the result that only 12 rainbows were caught in 1960. One of these fish had been attacked by a sea lamprey and 8 of the 31 brown trout caught this year bore scars, presumably from sea lampreys residing in the lake.

Anglers who still-fished with only worms as bait made 39 percent of the trips and 64 percent of the catch. Trollers who used a worm and spinner combination accounted for two-thirds of the brown trout (nearly all were caught in the spring) and 7 of the 12 rainbows. Sixty-two hours of casting artificial lures resulted in a total catch of only four crappies.

Hoad fish shelters (an artificial brush shelter) were put in the lake in 1958 and their locations marked with signs. Sixty-eight anglers fished over these shelters but with little success. Forty hours of experimental angling over these shelters and 40 hours over the adjacent control areas were done by station personnel. The 1960 catch from this experimental angling amounted

Table 7.--The estimated age composition of the catch of three species of fish from Devoe Lake in 1960

[N = number; P = percentage]

Age group	Year class	Species					
		Yellow perch		Bluegill		Rock bass	
		N	P	N	P	N	P
II	1958	9	3.0	1	1.0	..	...
III	1957	179	58.7	86	83.4	22	39.3
IV	1956	91	29.8	7	6.8	14	25.0
V	1955	20	6.6	8	7.8	13	23.2
VI	1954	4	1.3	1	1.0	6	10.7
VII	1953	2	0.6	...	...	1	1.8
Totals		305[1]	...	103	...	56	...

[1] Fourteen fish were neither measured nor scale-sampled.

to 397 fish that weighed an estimated 33.9 pounds. Perch comprised 75 percent of the catch. Thus, the total 1960 yield from Devoe Lake equalled 972 fish that weighed 190.2 pounds.

North Lake. --More fish were caught in this lake in 1960 than in any one year since 1948. In 444 fishing trips, anglers caught 387 fish that weighed 101.4 pounds (Table 5), or at the rate of 0.31 fish per hour per angler. Perch and bluegills also dominated the catch from this lake, comprising 76.8 percent of the catch (Table 6). The average size of the bluegills was 6.0 inches; for perch, 6.6 inches. As suggested for Devoe Lake, the presence of so many bluegills in the catch is attributed to the influx of fish during the flood in 1959. Most of these fish probably originated from adjacent Mallard Pond. More largemouth bass were caught in 1960 than in any year since 1948; it is probable that Mallard Pond was the source of some of the bass as well as bluegills.

The age composition of the catch of bluegills, perch and largemouth bass is shown in Table 8. The 1957 year class contributed most of the bluegills, whereas nearly half of the bass were 4 years old. Three age groups dominated the perch catch. Only 9 smallmouth bass were taken in 1960, one of which was a 7-year-old fish, 19.1 inches long. None of the bluegills and largemouth bass planted in 1954 were caught.

A moderate amount of winter fishing (more than on any other Area lake) resulted in a catch of 64 perch, 4 smelt, and 2 pike.

A variety of lures and methods were used throughout the year but most fish were caught by still fishermen using worms. Anglers fishing only artificial lures accounted for 6 of the 33 bass.

Table 8. --The estimated age composition of the catch of three species of fish from North Lake in 1960

[N = number; P = percentage]

Age group	Year class	Species: Yellow perch N	Yellow perch P	Bluegill N	Bluegill P	Rock bass N	Rock bass P
II	1958	52	30.2	...	...	..	...
III	1957	46	26.7	88	82.2	6	25.0
IV	1956	58	33.7	8	7.5	11	45.8
V	1955	13	7.6	11	10.3	7	29.2
VI	1954	3	1.8	...	...	..	...
Totals[1]		172	...	107	...	24	...

[1] Fourteen bluegills and four perch were neither measured nor scale-sampled.

Dollar Lake. --Only 481 fish were caught in 1,094 hours of angling (Table 5). A dramatic decline, since 1958, in the bluegill catch has culminated in the lowest total yield and poorest over-all fishing quality for Dollar Lake in the 16 years of the creel census. Despite their poor showing, bluegills constituted one-third of the total catch (Table 6). The catches of perch and bullheads also showed a sharp drop to the smallest ever recorded for this lake. On the other hand, many more pumpkinseeds and rock bass were caught in 1960 than in 1959, and the 115 largemouth bass caught represent the highest yield of bass ever recorded for Dollar Lake.

This improvement in the bass catch probably resulted from two factors: (1) presence of a strong 1957 year class which provided 45.2 percent of the catch (Table 9), and (2) increase in catchability--perhaps because of the scarcity of bluegills. Although the three-year-old bass (1957 year class) were abundant, nearly as many (39.1 percent of total) older bass also were caught. More effort was expended in bass fishing in 1960 than in recent years, as judged by time spent casting with artificial lures, and this switch from "worm" fishing presumably was prompted by the poor bluegill fishing (Table 10).

Table 9 also presents the estimated age composition of the catch of bluegills, pumpkinseeds, and rock bass. Half of the bluegill catch consisted of 4-year-old fish spawned in 1956. The once-dominant 1952 year class has now disappeared from the population. Only two age groups were represented in the pumpkinseed catch while 3-year-old rock bass comprised well over three-fourths of the harvest of that species.

Exploitation rates were determined from the number of marked fish recaptured by anglers between May 20-December 31 (Table 11). The large

Table 9. --The estimated age composition of the catch of four species of fish from Dollar Lake in 1960

[N = number; P = percentage]

Age group	Year class	Species							
		Largemouth bass		Bluegill		Pumpkin-seed		Rock bass	
		N	P	N	P	N	P	N	P
II	1958	18	15.7	...	...	...	...	..	...
III	1957	52	45.2	30	18.6	58	57.4	46	86.8
IV	1956	8	7.0	82	50.9	43	42.6	5	9.4
V	1955	10	8.7	30	18.6	...	...	..	...
VI	1954	21	18.3	15	9.3	...	...	1	1.9
VII	1953	4	3.5	4	2.6	...	...	..	...
VIII	1952	...	...	...	...	...	...	1	1.9
XI	1949	2	1.6	...	...	...	...	..	...
Totals		115	...	161	...	101	...	53	...

Table 10. --Fishing effort in 1958-60 in Dollar Lake in relation to bass fishing success

Year	Total bass catch	Hours of fishing artificial lures	Number of bass caught on artificials	Catch of bass per hour	Ratio of worm fishing to total (hours)
1958	58	134	19	0.14	0.732
1959	44	102	20	0.20	0.676
1960	115	198	56	0.28	0.504

Table 11. --Exploitation rates of fish by angling in Dollar Lake, 1960

Species	Minimum length (inches)	Number of marked fish	Number of marked fish caught	Percentage exploitation
Largemouth bass	10.0	138	65	47.1
Bluegill	5.0	151	50	33.1
Pumpkinseed	5.0	139	46	33.1
Rock bass	5.0	55	17	30.9
Hybrid sunfish	5.0	37	10	27.0
Redear sunfish	5.0	44	10	22.7
Black crappie	6.0	50	8	16.0
Brown bullhead	7.0	44	2	4.5
Yellow perch	6.0	69	0	...
Totals		727	208	28.6

catch of largemouth bass was reflected in the highest rate of exploitation ever recorded for bass in this lake--47.1 percent. The previous high of 35.5 percent was obtained in 1958. No marked perch were caught, a noticeable departure from the previous 3 years when more than 40 percent of the marked perch were caught each year. Redear sunfish planted in 1954 and 1956 have contributed little to the annual catches. Few were caught this year but their rate of exploitation (22.7 percent) exceeded that of crappies and bullheads. None of the largemouth bass and bluegills stocked as fingerlings in 1954 were caught in 1960.

In 1959, the bluegill population was reduced by seining in an attempt to improve their growth rate. The removal amounted to 52.6 percent (by weight) of the 4.0- to 6.0-inch bluegills, but did not produce a noticeable change in the mean length of the bluegills caught by anglers. The mean lengths of bluegills caught in the past 4 years (1957-1960) have ranged from 6.2-6.5 inches.

Loon Lake. --In spite of a winterkill in March 1960, fishing in Loon Lake showed a marked improvement over that of 1959. As shown in Table 5, 198 fish (92 in 1959) were caught in 177 hours of angling.[3] Fifty-one percent of the fishermen caught at least one fish. Bluegills, perch, and pumpkinseeds, whose mean lengths were 6.2, 7.3, and 5.6 inches, respectively, dominated the catch (Table 6). The 1956 year classes were most abundant among the bluegills and pumpkinseeds, whereas the 1957 year class comprised almost two-thirds (64.4 percent) of the perch catch. The exploitation rates shown

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[3] The area of Loon Lake (16.8 acres) indicated in the footnote of Table 5 is 0.4 acre smaller than shown in previous years. The lake was re-mapped in March, 1960.

in Table 12 reflect the rather light fishing pressure exerted on this lake. They ranged from nil (black crappies) to 22. 2 percent for largemouth bass.

A small amount of experimental fishing was done in January in connection with the artificial circulation of the lake beneath the ice. Nine perch and eight bluegills, having a total weight of two pounds, were caught. Thus, there was a total yield for 1960 of 215 fish (42. 1 pounds).

South Pond. --This 1. 3-acre pond had the most fishing pressure in terms of hours per acre of any Area lake or pond in 1960 (Table 5). Anglers caught 156 fish (124 were bluegills) at the rate of 1. 05 fish per hour per angler (Table 6). Five other species also were caught. The average length of the bluegills was 5. 9 inches and 92. 0 percent of them were members of the 1957 year class. It was pointed out in the report for 1959 that the expected appearance of the 1955 year class failed to materialize. No bluegills from this year class were caught in 1960 either, thus virtually confirming the unexplained total mortality for this year class sometime between 1955-1958. The absence of this brood from catches by traps and nets set in the pond in 1956 and 1957 constitutes good evidence that spawning efforts were a total failure.

Teal Lake. --Despite a serious winter mortality, fishermen caught 89 fish in 53 hours of fishing for the highest catch rate among the Area lakes (Table 5). Nearly 90 percent of these fish were either hybrid sunfish or bluegills, but perch, pumpkinseeds, and a bullhead also were caught (Table 6). The bluegill catch was divided almost equally between age-groups III and V, whereas the catch of hybrids (bluegill x pumpkinseed) was split equally between age-groups III and IV (one from age-group VI). The average lengths of these bluegills and hybrids were 6. 9 and 6. 6 inches, respectively.

Table 12. --Exploitation rates of fish by angling in Loon Lake, 1960

Species	Minimum length (inches)	Number of marked fish	Number of marked fish caught	Percentage exploitation
Largemouth bass	10.0	9	2	22.2
Bluegill	5.0	135	26	19.3
Bullhead spp.	7.0	103	14	13.6
Yellow perch	6.0	153	19	12.4
Rock bass	5.0	43	5	11.6
Bluegill x pumpkinseed	5.0	46	4	8.7
Pumpkinseed	5.0	327	16	4.9
White sucker	11.0	73	1	1.4
Black crappie	6.0	7	0	...
Totals		896	87	9.7

Winterkill in 1960

Winter mortalities from oxygen depletion affected the fish populations in four lakes and ponds on the Area in 1960. Winterkill had occurred in all of these lakes in earlier years but, because the mortality was unusually prevalent in 1960, this summary of observations is presented.

Devil's Wash Basin. --This pond contained a population of redear sunfish, mostly progeny of 25 adults stocked in 1958. The first intimation of an impending mortality occurred on February 22 when the oxygen at 4 feet was 2.7 p. p. m. Between March 9 and 25, values less than 1.0 p. p. m. were recorded (minimum, 0.3 p. p. m. 1 foot beneath the ice). On April 20, the first day the pond was free of ice, one dead 9-inch fish and a number of dead fingerlings were found. Netting for one week in May and periodic observations until August failed to reveal any fish. This pond undoubtedly winterkilled also in 1955-56. While we have no physical evidence of this occurrence, prior to that year anglers caught several species but none have been caught since. Toxaphene applied in 1957 killed only mudminnows.

Loon Lake. --The detailed report (in preparation), describing winter aeration experiments on this lake, includes data on the 1960 winterkill. Suffice it to say here that oxygen values below 1.0 p. p. m. were obtained between March 9 and 27 (lowest value, 0.7 p. p. m.). A moderately heavy winterkill of fish (mostly bluegills) occurred. Ninety-four percent of the 461 dead fish (over 3.0 inches long) that were counted were bluegills. Numerous small sunfishes, bullheads, and frogs were also observed on the bottom.

Spring Lake. --This lake was stocked with 25 adult black crappies and 755 fingerling pike in 1959, the objective being to establish a winterkill-resistant population of game fish. Dissolved oxygen was virtually depleted by March 18, accompanied by a strong odor of hydrogen sulphide gas. On April 18, an estimated 771 dead yearling crappies were piled up along the east shore, plus one larger adult. Twenty-seven pike were picked up. The lake was fished with an assortment of nets on May 24-27 in search of survivors. Twenty-two pike were caught plus several black bullheads. No crappies were caught either at this time or in September when the survey was repeated. Forage fish, including redbelly dace and mudminnows, appeared to be abundant.

Teal Lake. --Teal Lake was depleted of oxygen by February 8. The lake was searched for dead fish on April 17, the first day it was ice-free. Among the many dead fish found were 34 largemouth bass (8-13 inches long), 3 pike (24-27 inches), 14 large carp (estimated weight, 4-6 pounds each), and several bluegills, crappies, suckers, pumpkinseeds, and bullheads. In a search for survivors, this lake was netted on May 26-31 when fish are normally quite active. Only one pike and a few bullheads were caught. However, a small fish population, consisting of about the same species as before, was re-established by mid-summer. Presumably they immigrated from lakes outside the Area via Skunk Creek and the outlet of Teal Lake.

Hunting

A summary of the 1960 hunting pressure and game bagged is presented in Table 13. Despite an increase in hunting pressure in the small game season over that of 1959, only 69 ruffed grouse were shot in 1960 as compared

Table 13. --Summary of hunting and trapping activities on the Rifle River Area in 1960

Season and game species	Number of permits	Hunting hours, or trap nights	Animals harvested
HUNTING			
Small game	688	1,937	..
Ruffed grouse	...	...	69
Woodcock	...	...	36
Ducks	...	...	28
Squirrel	...	...	20
Cottontail	...	...	2
Snowshoe	...	...	1
Raccoon	...	...	1
Deer[1]			
Gun	1,868	8,032	43
Archery	494	2,002	1
TRAPPING	66	3,198	..
Muskrat	...	...	65
Mink	...	...	4
Otter	...	...	2
Beaver	...	...	2
Raccoon	...	...	8

[1] In addition to the legal kill shown, six unclaimed deer were reported of which five were located.

with a kill of 83 in 1959 (101 in 1958). This kill represents 3.7 grouse shot per 100 hours of hunting. The woodcock kill has remained fairly stable the past 4 years (range, 30-36).

Game Division Report No. 2317 by L. C. Ruch presents a detailed account of the deer hunting results. A total of 50 deer were reported killed--less than half of the 1959 kill--these deer were heavier than those shot last year. Adult bucks and does averaged 3.5 and 8.7 pounds heavier than the weights registered last year. Mean weights of doe and buck fawns exceeded their average 1959 weights by 8.2 and 3.1 pounds, respectively. The largest deer taken in 1960 weighed 157 pounds. The 1960 legal buck kill was the smallest on record for the Rifle River Area.

Trapping

Six trappers used the 66 daily permits issued in 1960. Their results are presented in Table 13. Two otter were trapped in 1960, the same number as in 1959. Those caught in 1959 were the first trapped on the Area since 1952.

Miscellaneous Area activities in 1960

Research work on the lakes and streams of the Rifle River Area in 1960 is summarized as follows:

(1) On the first of July the fisheries research program for this station was brought under the Dingell-Johnson federal aid program.

(2) Experimentation with compressed air beneath the ice, begun in the winter of 1957-58, was continued on Loon Lake until the ice disappeared in April. A report on these experiments was presented at the annual meeting

of the Michigan Academy of Science, Arts, and Letters in March, and a paper was prepared for publication in the Journal of Wildlife Management.

(3) Oxygen levels in other Area lakes were checked frequently throughout the winter and observations made on winter mortality among the fish populations.

(4) Weir records provided data on spring movements of fish in the connecting stream between Devoe and Loon lakes.

(5) Estimates of population size were made for Dollar and Loon lakes in the spring; Teal Lake in the fall. Fall population estimates also were made for Rifle River and Gamble Creek within Area boundaries, and for portions of Houghton Creek outside the Area.

(6) Population sampling was done in Spring Lake, Devil's Wash Basin, Brown Trout Creek, and several tributaries of the Rifle River outside the Area.

(7) Shoreline seining in Devoe and North lakes was done twice in the summer to measure bass reproduction.

(8) Forty hours of experimental fishing was carried out over Hoad fish shelters in Devoe Lake.

(9) Early-winter bottom sampling was done in Devil's Wash Basin, Dollar, and Loon lakes.

(10) Age and growth studies were continued.

(11) Trout plantings were made in the fall in Devoe Lake and Gamble Creek.

(12) Miscellaneous Publication No. 13 entitled "A Twelve-Year History of Fishing in the Lakes of the Rifle River Area, Ogemaw County, Michigan, 1945-1956" was published in June.

(13) An updated version of Miscellaneous Publication No. 13 was presented at the Midwest Wildlife Conference at Toronto in December.

(14) The biennial report for 1959-60 was prepared.

Activities by Game Division personnel are summarized as follows:

(1) Twenty-one wing-clipped Canada geese were released on Spring Lake on April 20.

(2) Spring brood counts of ruffed grouse were attempted by R. J. Moran in June and grouse census lines were run in December by staff members from the Houghton Lake Wildlife Experiment Station.

(3) Mr. N. D. Mason was hired by the Game Division to work at the Checking Station during October.

(4) L. C. Ruch and Jack Cook supervised the Checking Station during the deer season.

Activities related to the management of the Area included the following:

(1) Routine maintenance of the roads, buildings and picnic sites.

(2) Loon Lake was re-mapped in March.

(3) New docks were built for Devoe and North lakes.

(4) Two of the staff were assigned to assist with law enforcement during the deer season.

(5) The third annual Rifle River canoe race on July 4, sponsored by the Midwest International Canoe Racing Association and business men in the two counties bordering the river, started near the ranch house.

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