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MICHIGAN DEPARTMENT OF CONSERVATION
Research and Development Report No. 19*

November 16, 1964

THE NINETEENTH ANNUAL REPORT ON THE RIFLE RIVER RECREATION AREA, OGEMAW COUNTY, 1963[1]

By Mercer H. Patriarche and Howard Gowing

*Institute for Fisheries Report No. 1699.

[1] Contribution from Dingell-Johnson Project F-27-R-2, Work Plan No. 6, Michigan.

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The Rifle River Recreation Area, site of the Rifle River Research Station, is a 4,318-acre tract of wooded land in northeastern Ogemaw County (Fig. 1). Six lakes, several ponds, and 9.5 miles of trout streams are within its fenced boundary. Free permits are given to visitors at the entrance, which they return upon leaving. Pertinent information on fish and game taken from the Area is recorded at the checking station.

In 1963, nearly 35,000 permits (34,929) were issued to visitors, the largest number ever issued. Of these permits, 21,857 (62.6%) were for sightseeing, 5,802 (16.6%) for fishing, 4,094 (11.7%) for hunting, 3,136 (9.0%) for camping, and 40 (0.1%) for trapping. This was the first full year of camping activity. Camping was permitted for the first time on July 25, 1962, but no charge was made until June 26, 1963. Thereafter the standard State Park fee of $1.50 was charged.[2] A total of 815 camps (determined from the number of camps present per night) were

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* Institute for Fisheries Research Report No. 1699.

1 Contribution from Dingell-Johnson Project F-27-R-2, Work Plan No. 6, Michigan.

2 The 1963 camp summary information compiled for this Area by the Parks Division does not include the free camping which occurred before June 26.

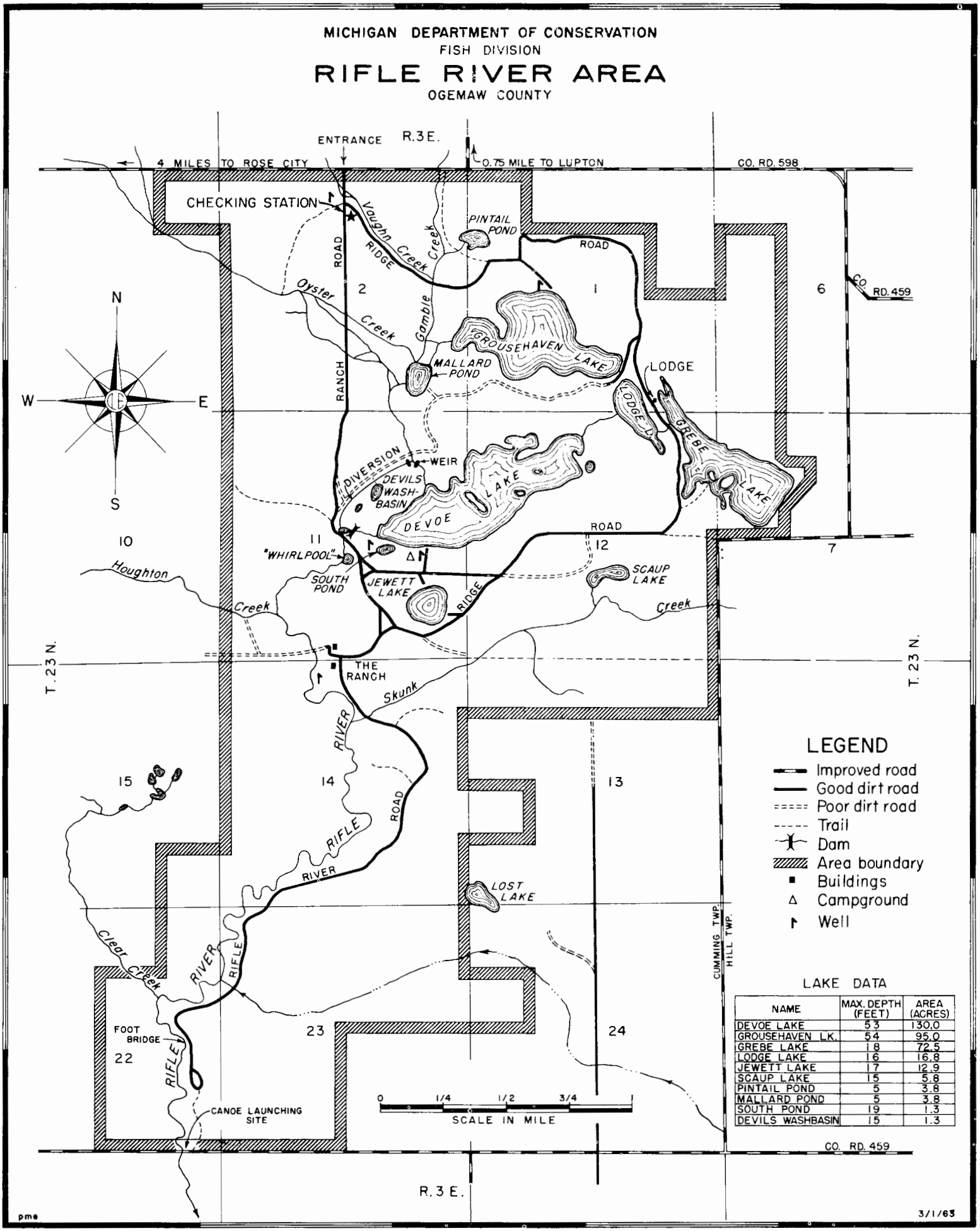
MICHIGAN DEPARTMENT OF CONSERVATION
FISH DIVISION
RIFLE RIVER AREA
OGEMAW COUNTY
ENTRANCE
R.3E.
4 MILES TO ROSE CITY
0.75 MILE TO LUPTON
CO. RD. 598
CHECKING STATION
Vaughn Creek Ridge Road
PINTAIL POND
Oyster Creek
Gamble Creek
CO. RD. 459
GROUSEHAVEN LAKE
MALLARD POND
RANCH ROAD
LODGE
LODGE LAKE
GREBE LAKE
DIVERSION
WEIR
DEVILS WASH-BASIN
DEVOE LAKE
"WHIRLPOOL"
SOUTH POND
JEWETT LAKE
RIDGE ROAD
SCAUP LAKE
Houghton Creek
THE RANCH
Skunk River
RIFLE RIVER ROAD
LOST LAKE
Clear Creek
FOOT BRIDGE
CANOE LAUNCHING SITE
CUMMING TWP.
HILL TWP.
T. 23 N.
R. 3 E.
N
S
E
W
1
2
6
7
10
11
12
13
14
15
22
23
24
0 1/4 1/2 3/4 1
SCALE IN MILE
LEGEND
Improved road
Good dirt road
Poor dirt road
Trail
Dam
Area boundary
Buildings
Campground
Well
LAKE DATA
NAME | MAX. DEPTH (FEET) | AREA (ACRES)
DEVOE LAKE | 53 | 130.0
GROUSEHAVEN LK. | 54 | 95.0
GREBE LAKE | 18 | 72.5
LODGE LAKE | 16 | 16.8
JEWETT LAKE | 17 | 12.9
SCAUP LAKE | 15 | 5.8
PINTAIL POND | 5 | 3.8
MALLARD POND | 5 | 3.8
SOUTH POND | 19 | 1.3
DEVILS WASHBASIN | 15 | 1.3
pme
3/1/63

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 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 each day before closing time. Fish and game must be checked by the clerk. General seasons for fishing, hunting, and trapping apply, except as posted. Camps may be established only at the designated campsites on the south shore of Devoe Lake. A special camping permit may be obtained at the Checking Station. Permits for fishing and hunting must be renewed each day. Permission to build cooking fires at designated sites other than in the campground must be obtained from the clerk on duty. It is unlawful to enter or leave the Area other than through the main entrance in front of 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
1959	17,150	4,722	3,471	37	25,380
1960	17,511	4,495	3,050	66	25,122
1961	17,726	5,075	3,288	33	26,122
1962	19,898	5,639	3,720	64	30,755*

*Includes 1,434 campers.

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) conditions beneath ice-covered lakes, (8) establishment of a flock of Canada geese to encourage local nesting, (9) grouse studies, (10) investigations on other game populations and their habitats, and (11) developing new techniques in fish and game research.

established on the 24 sites. Only on the opening weekend of the deer season were all of the sites occupied at one time. Campers who fished or hunted on the Area were required to conform to the Area rules for the daily reporting of fishing and hunting activities.

As in previous reports of the series, the major portion of this report concerns fishery research. This section, which immediately follows, will provide Job Completion reports that are required annually for Federal Aid (Dingell-Johnson) projects, as well as furnish a continuing record of the work done at the station for the information of the Department of Conservation. A section at the end deals with hunting and trapping done on the Area in 1963.

Major improvements on the Area in 1963 consisted of the reconstruction of the dam at Devoe Lake (Work Plan No. 16) which was completed in November under the supervision of R. C. Barber, and the improvement of access sites on South Pond, Grebe Lake, Lodge Lake, and the north side of Jewett Lake.

Job No. 1. --Station correspondence, record keeping, and library maintenance

Records were maintained for the various research projects, station activities, and personnel. Station and personal library systems were kept current.

Job No. 2.--Construction and maintenance of equipment

Trap nets and other fishing gear were kept in repair. No new equipment was constructed during the year.

Job No. 3.--Study of relationship between trout populations, exploitation rates and fishing pressure

This job is broken down into two parts, namely, (a) stream creel census and (b) trout population studies.

(a) Stream creel census

The six trout streams in the Area, which have a combined length of 9.5 miles and an area of approximately 34 acres, provided 6,584 hours of fishing for 2,815 anglers (Table 1). Fishing effort was at the rate of 194.2 hours per acre, and the average trip lasted 2.3 hours.

About 78% of the fishermen were licensed males and 13% were unlicensed minor males. Wives of licensed males comprised 7.2% and unlicensed minor females 1.4% of the total anglers. Less than 1% were licensed females.

Anglers harvested 868 fish that weighed 534.1 pounds. The yield amounted to 25.6 fish, or 15.8 pounds, per acre. The catch consisted of 773 wild trout (443.59 pounds), 34 hatchery trout (23.75 pounds), and 61 "other" fish (66.76 pounds). Wild trout, which included 754 brown and 19 brook trout, were caught at the rate of 22.8 fish, or 13.1 pounds, per acre.

Table 1.--A summary of angling on the trout streams of the Rifle River Recreation Area in 1963

Stream	Area (acres)	Number of anglers	Hours of fishing	Fish caught							
				Hatchery-reared trout		Native fish					
						Wild trout		Others		Total	
				Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds
Rifle River	22.8	2,382	5,767.5	19	16.24	641	401.40	61	66.76	702	468.16
Gamble Creek	5.9	170	309.0	5	2.68	50	16.62	...	...	50	16.62
Houghton Creek	0.9	105	188.5	2	1.03	25	11.52	...	...	25	11.52
Vaughn Creek	0.9	87	193.5	5	1.32	53	12.72	...	...	53	12.72
Diversion	0.8	63	117.0	3	2.48	3	0.99	...	...	3	0.99
Oyster Creek	2.6	8	8.5	...	...	1	0.34	...	...	1	0.34
Totals	33.9	2,815	6,584.0	34	23.75	773	443.59	61	66.76	834	510.35

Approximately 11% of the fishermen were successful in catching at least one wild trout. Rifle River fishermen were successful on 10.7% of their trips. For other Area streams, the percentage of success varied from 3.2 on the Diversion to 18.4% on Vaughn Creek. Angling quality for all fish was 0.10 fish per hour per angler. Wild trout were caught at the rate of 0.08 fish per hour per angler. Angling quality for wild trout on the individual streams ranged from 0.01 on the Diversion to 0.18 fish per hour per angler on Vaughn Creek.

Worms were used by nearly 68% of the 2,815 anglers, and accounted for about 62% of the total catch of wild trout. About 9% of the fishermen used artificial flies and caught 10.5% of the wild trout. Artificial lures other than flies (5.5%) accounted for about 13% of the trout.

Rifle River. --About 88% of the stream fishing and nearly 83% of the capture of wild trout on the Area occurred here. Angling effort on the river amounted to 253 hours per acre, about 19% below that of 1962. The catch consisted of 641 wild trout, 19 hatchery trout, and 61 "other" fish, which combined weighed 484.40 pounds (Table 2). The yield of wild trout, which included 637 brown and 4 brook trout, amounted to 28.1 fish, or 17.6 pounds, per acre. This yield was similar to that for 1962 when 27.2 fish per acre (18.6 pounds per acre) were caught. The length-frequency distribution of the catch of 637 brown trout in 1963 was generally similar to that for 614 trout caught in 1962. The mean length

Table 2.--Number of fish of different species caught in six streams of the Rifle River Recreation Area in 1963

(tr = less than 0.5%)

Kind of fish	Stream						Total number of fish	Percentage of total catch
	Rifle River	Gamble Creek	Houghton Creek	Vaughn Creek	Diver-sion	Oyster Creek		
Brown trout								
Native	637	46	25	42	3	1	754	86.9
Hatchery	7	4	1	4	...	...	16	1.8
Rainbow trout								
Hatchery	12	1	1	1	3	...	18	2.1
Brook trout								
Native	4	4	...	11	...	...	19	2.2
White sucker	41	...	...	...	...	...	41	4.7
Pumpkinseed	7	...	...	...	...	...	7	0.8
Perch	4	...	...	...	...	...	4	0.5
Northern pike	3	...	...	...	...	...	3	tr
Rock bass	3	...	...	...	...	...	3	tr
Bullhead	2	...	...	...	...	...	2	tr
Carp	1	...	...	...	...	...	1	tr
Total	721	55	27	58	6	1	868	...
Percentage of total Area catch	83.1	6.3	3.1	6.7	0.7	tr	...	...

of brown trout caught in 1963 was 11.4 inches, not significantly different from 11.6 inches for the 1962 catch.

About 11% of the anglers were successful in catching at least one wild trout; 10% had been successful in 1962. Angling quality for wild trout was 0.08 fish per hour per angler in 1963, somewhat higher than in 1962 (0.06).

Age groups I through VI were represented in the catch of wild brown trout from the Rifle River. The largest segment of the catch was composed of Age-II fish (52.6%); Age-III fish (32.1%) were next in importance (Table 3). Fish of Age-IV and older constituted about 11% of the total catch, and Age-I, 4.1%. The age distribution of the 1963 catch differed but slightly from that of 1962.

Hatchery trout contributed little to the catch from the Rifle River in 1963. The origins of those caught were as follows:

Locality of release	Year released	Species	Number caught
Devoe Lake	1962	Rainbow	5
Devoe Lake	1962	Rainbow	4
Devoe Lake	1961	Rainbow	2
Rifle River, below Area	1960	Rainbow	1
Rifle River, below Area	1962	Brown	1
Rifle River, in Area	1961	Brown	2
Rifle River, below Area	1960	Brown	1
Gamble Creek	1961	Brown	1
Unknown		Brown	2

Table 3.--Number (N) and percentage (P) of native brown trout of different age groups caught in streams of the Rifle River Recreation Area in 1963

Age-group	Stream											
	Rifle River		Gamble Creek		Houghton Creek		Vaughn Creek		Diversion		Oyster Creek	
	N	P	N	P	N	P	N	P	N	P	N	P
I	25	4.1	...	...	6	24.0	2	4.9	...	...	...	...
II	324	52.6	16	38.1	11	44.0	21	51.2	2	100.0	...	...
III	198	32.1	21	50.0	6	24.0	18	43.9	...	...	1	100.0
IV	58	9.4	5	11.9	2	8.0	...	...	...	...	...	...
V	10	1.6	...	...	...	...	...	...	...	...	...	...
VI	1	0.2	...	...	...	...	...	...	...	...	...	...
Totals	616		42		25		41		2		1	
Total catch[1]	637		46		25		42		3		1	

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

The catch of hatchery trout was much larger in 1962 (total of 403 fish) when plantings of rainbow trout were made in the Rifle River and Devoe Lake. The stream was not stocked in 1963.

The catch from the Rifle River included 61 fish of 7 other species: white suckers (41), pumpkinseeds, yellow perch, northern pike, rock bass, bullheads, and carp (20).

Gamble Creek. --In the past, "lower" Gamble Creek (Section C) consisted of that portion of the stream from Ridgeroad bridge to the mouth, and "upper" Gamble Creek (Section D) extended from the north boundary of the Area to Ridgeroad bridge. Because Mallard Pond divides these combined portions of Gamble Creek into two sections that are distinctly different ecologically, the section boundaries were changed in 1963. The stream below Mallard Pond was termed "lower" Gamble Creek (Section C) and the water above Mallard Pond was called "upper" Gamble Creek (Section D).

Angling pressure rose slightly from 45.8 hours per acre in 1962 to 52.4 in 1963 (14.4%). However, the yield decreased in 1963 to about the same extent that fishing pressure increased. The 1963 yield of wild trout was 8.5 fish per acre (10.2 in 1962). The catch in 1963 consisted of 46 brown and 4 brook trout for a yield of 2.8 pounds per acre. In the previous year, 55 brown and 5 brook trout were caught (3.8 pounds per acre). About 11% of the anglers were successful in catching at least one wild trout, and angling quality was 0.11 fish per

hour per angler (Table 4). In 1962, angling quality was 0.15 fish per hour per angler. Two- and 3-year-old fish comprised about 88% of the catch of wild brown trout.

In 1963, as in the preceding year, hatchery trout contributed very little to the total catch. Of the 4 hatchery brown trout caught, 3 originated from a 1961 fall planting of 1,000 fingerlings in Gamble Creek. To date, 0.9% of the fish from this planting have been captured in Area streams. The fourth hatchery trout came from a 1959 fall planting of 998 fingerlings in Gamble Creek. Recovery to date from this planting amounts to 1.6%. The only rainbow trout caught in Gamble Creek came from a planting of 400 legal-length fish in Devoe Lake in 1962.

Houghton Creek. --Fishing on the short stretch of this stream (about 1/4 mile) on which records are collected was much like that of the previous year. In 1963, 105 anglers fished 188.5 hours and caught 25 wild brown trout, 1 hatchery brown trout, and 1 hatchery rainbow trout. In 1962, 102 anglers spent 232.5 hours on the stream and harvested 28 wild brown, 1 brook trout, and 7 hatchery rainbow trout. Angling quality for wild trout was 0.11 fish per hour per angler in 1963 and 0.12 in 1962. Age groups I through IV were represented in the 1963 catch of brown trout (Table 3). Of the two hatchery fish caught, 1 brown trout came from the fingerling planting in Gamble Creek in 1961, and 1 rainbow trout originated from a planting in Devoe Lake in 1962.

Table 4.--A summary of angling quality for native trout on the trout streams of the Rifle River Recreation Area in 1963

Stream	Trout caught per acre of stream		Catch per hour per angler	Percentage fishermen successful
	Number	Pounds		
Rifle River	28.1	17.6	0.08	10.7
Gamble Creek	8.5	2.8	0.11	11.2
Houghton Creek	27.8	12.8	0.11	10.5
Vaughn Creek	58.9	14.1	0.18	18.4
Diversion	3.8	1.2	0.01	3.2
Oyster Creek	0.4	0.1	0.12	12.5
Average	22.8	13.1	0.08	10.8

Vaughn Creek. --Angling pressure fell off slightly and the catch declined markedly in 1963 from the previous year. Anglers spent 193.5 hours fishing this stream and caught 53 wild trout (42 brown and 11 brook), the poorest catch since 1959. The brown trout consisted primarily of 2- and 3-year-old fish (Table 3). In 1962, 87 anglers fished 235 hours and caught 151 wild trout--134 brown and 17 brook trout. About 18% of the anglers were successful in 1963, whereas 40% were successful in 1962. Angling quality for wild trout declined from 0.42 fish per hour per angler in 1962 to 0.18 in 1963. Of the 5 hatchery fish caught in 1963, 4 were brown trout that survived from the fall planting of fingerlings in Gamble Creek in 1961, and 1 was a rainbow trout that came from a planting in Devoe Lake in 1962.

Diversion. --Sixty-three anglers fished the Diversion 117 hours and caught 3 wild brown trout and 3 hatchery rainbow trout. Comparable effort in the previous year produced 8 wild brown trout and 5 hatchery rainbow trout. Angling quality was poor both years: 0.06 fish per hour per angler in 1962 and 0.01 in 1963. The 3 hatchery rainbow trout caught in 1963 were survivors from plantings in Devoe Lake in 1962 (2 fish) and 1960 (1 fish).

Oyster Creek. --In 1963, as in the past, this small stream held little interest for anglers. Eight of them spent 8.5 hours on this stream, and one wild brown trout was caught.

All Streams. --The number of anglers fishing the Area streams was 11.5% smaller than the number for 1962, and the time spent fishing declined about 17%. Angling pressure in 1963 was 194.2 hours per acre, and 234.2 in 1962.

The harvest of 773 wild trout in 1963 represented a 11.2% reduction from the harvest of the previous year (871 fish). Wild trout were caught at the rate of 22.8 fish per acre in 1963, and 25.7 in 1962. Few 1-year-old brown trout (4.5%) entered the catch. Most of the brown trout were 2-year-old fish, and these plus 3-year-olds constituted about 85% of the total catch. The quality of angling for wild trout in 1963 was 0.08 fish per hour per angler, the same as in 1962.

No trout were stocked in Area streams in 1963. Of the total catch in the Area of 807 trout, 34 or 4.2% were of hatchery origin. In contrast, 422 hatchery trout were caught in 1962, amounting to about 33% of the total catch of trout (1,293). A planting of 400 legal-length rainbow trout in the Rifle River in 1962 was largely responsible for the larger catch in 1962.

Whirlpool. --The Whirlpool is a shallow pond of about 0.6 acre that adjoins the Rifle River, a short distance below Devoe Lake. During the open-water season, 141 anglers spent 276 hours here and caught 51 fish that weighed 219.28 pounds. The catch consisted of 35 carp (187.62 pounds), 14 northern pike (28.28 pounds), and 2 suckers (2.88 pounds). During the period of ice cover, 21 anglers spent 37.5 hours on the pond

and caught 3 northern pike, 1 white sucker, and 1 carp. The fishing here in 1963 is summarized as follows:

Number of anglers	Hours	Northern pike	Carp	White sucker
162	313.5	17 (37.22)[1]	36 (192.62)	3 (4.63)

[1] Weight in pounds.

(b) Trout population studies

Trout population estimates, by the Petersen mark-and-recapture method, were made on streams of the Area including a special section (J) of the Rifle River. Section J is in the south part of the Area; it extends from the terminal loop in the south end of the Rifle River Road upstream to include about 1/8 mile of the river in Section 14 (See Fig. 1 for location).

A post-season population study was conducted in 1963 on the newly designated Section J and on all of the Rifle River above this site. Section J will provide a site where population estimates can be made in the spring of most years, and separate creel census records will be maintained for the section. Estimates were obtained in the spring of 1964 for the same portions of the Rifle River that were covered in the fall of 1963. Pre- and post-season population estimates were made in 1963 on Section D of Gamble Creek, and another estimate was made here in the spring of 1964.

It was estimated that 759 brown trout inhabited Section J in the fall of 1963, of which 515 were legal-length fish (at least 7.0 inches long). For Section B of the Rifle River--that portion of the stream between the mouth of Houghton Creek and Devoe Lake Bridge--the 1963 point estimate was 173 wild brown trout. Anglers harvested 5 trout per acre in Section B, and the fall estimate of residual legal-length fish was 25.5 trout per acre. In the interim between fall (1963) and spring (1964), the total population increased about 27% in Section J and decreased about 25% in Section B.

The fall study in Section J disclosed a large population of carp never before encountered. An attempt was made to estimate the number of carp in this section. A good estimate was not obtained because of the small recovery (5.7%) of marked fish and the relatively large number of unmarked fish encountered on the recovery run. These carp were highly mobile and apparently were quickly conditioned to electrical shock.

To learn something more about these carp, on January 23, 1964, a sample of them was removed from two long pools. Altogether, 88 carp that weighed 400.9 pounds were captured in 25 minutes of shocking. Stomachs were removed from 30 of these fish and the contents examined. Twenty stomachs were empty and 10 contained at least one item of food, but only one contained as much as 0.15 cc. About 98% of the items were chironomids.

In 1963, as in the past, the brown trout population in upper Gamble Creek was lightly exploited. Anglers' exploitation of the 1963

pre-season estimated population of Age-II through Age-V fish (legal length) amounted to 10.2%. The distribution of the brown trout by age groups is shown in the table which follows. The 1964 spring estimate indicated a 17.1% over-winter loss of brown trout in upper Gamble Creek.

	Age-group			
	II	III	IV	V
1963 spring estimate	105	141	35	3
1963 angler catch	10	16	3	0
1963 fall estimate	247	78	17	0
Exploitation (percent)	9.5	11.3	8.5	0.0

Job No. 4.--Fish production and its utilization in small warm-water lakes

There are three segments to Job No. 4: (1) creel census statistics, (2) calculations of production and maximum sustained yield, and (3) bottom fauna surveys.

(1) Creel census statistics

A virtually complete record of fishing activity on the individual lakes and ponds was kept again in 1963 as one means of evaluating current experiments and those planned for the future. In 9,226 hours of fishing, anglers caught 2,670 fish (944.3 pounds) from six of the Area lakes (Table 5). On the average, 28% of the anglers caught and kept at least one fish, and the average catch per hour was 0.29. Yellow perch

Table 5.--The fishing pressure, yield, and fishing quality on the lakes in the Rifle River Recreation Area in 1963

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	Percentage fishermen successful
Devoe	1,845	14.2	5,663	43.6	1,738	13.4	418.8	3.2	0.31	20
Grousehaven	536	5.6	1,501	15.8	200	2.1	122.9	1.3	0.13	13
Lodge	233	13.9	526	31.3	328	19.5	108.3	6.4	0.62	32
Grebe	578	8.0	1,475	20.3	370	5.1	284.6	3.9	0.25	21
Scaup	20	3.4	32	5.5	12	2.1	1.7	0.3	0.38	25
South Pond	11	8.5	29	22.3	22	16.9	8.0	6.2	0.76	55
Total or average	3,223	...	9,226	...	2,670	...	944.3	...	0.29	28

[1] Surface acreages for each lake are: Devoe, 130.0; Grousehaven, 95.0; Lodge, 16.8; Grebe, 72.5; Scaup, 5.8; South Pond, 1.3.

comprised 61.4% of the catch, and bluegills, 12.4%. None of the other 13 kinds of fish comprised over 5.0% of the catch. Angling in Jewett Lake was discouraged because of the introduction of a new population of bluegills following chemical treatment in 1962, and no fish were caught here (see also Job No. 8). South Pond was handled similarly, but produced a few fish. No fishing was done in 1.3-acre Devils Washbasin, that winterkilled in 1962.

Devoe Lake.--In 1,845 trips, anglers fished 5,663 hours and caught 1,738 fish (418.8 pounds). This was the largest catch from any Area lake (Table 5). The harvest amounted to 3.2 pounds per acre. Yellow perch (mean length, 6.8 inches) accounted for 71.1% of the total catch spread among 14 species (Table 6). The average length of the bluegills and rock bass was 6.1 and 6.4 inches, respectively.

One thousand legal-size rainbow trout from which the right pectoral fin was removed were planted in Devoe Lake on June 6, 1963. This late a planting date was selected on the supposition that there would be less migration out of the lake than if the fish were planted 3 to 5 weeks earlier as was done in the past, thereby making more of them available to lake anglers. However, the anticipated improvement in return did not materialize, as shown by the comparison below:

Planting date	Number of fish planted	Percentage recaptured
4-28-59	2,000	21
4-26-61	1,000	13
5-16-62	1,000	17
6- 6-63	1,000	8

Table 6.--Species composition by number (N) and weight (W--in pounds) of the catch from six lakes on the Rifle River Recreation Area in 1963[1]

Species	Lake												Area totals
	Devoe		Grousehaven		Lodge		Grebe		Scaup		South Pond		
	N	W	N	W	N	W	N	W	N	W	N	W	N
Yellow perch	1,237	141.0	112	13.9	43	3.6	244	82.7	6	0.8	...	...	1,642
Bluegill	138	25.6	13	3.1	156	24.6	...	...	3	0.4	21	7.7	331
Rock bass	100	16.7	28	4.0	6	2.0	...	...	...	...	...	...	134
Black crappie	57	23.3	3	2.5	2	1.2	66	36.7	...	...	...	...	128
Rainbow trout	99	59.4	...	...	...	...	...	...	...	...	...	...	99
Northern pike	14	63.9	12	48.6	2	13.1	60	165.2	...	...	...	...	88
Largemouth bass	26	22.1	4	7.1	52	54.8	...	...	...	...	...	...	82
Pumpkinseed	24	3.7	...	...	37	4.3	...	...	...	...	1	0.3	62
Smallmouth bass	26	29.9	27	42.9	...	...	...	...	...	...	...	...	53
Bullheads	2	2.0	1	0.8	23	3.2	...	...	...	...	...	...	26
Hybrid sunfish	...	...	...	...	7	1.5	...	...	3	0.5	...	...	10
Totals	1,738[2]	418.8[2]	200	122.9	328	108.3	370	284.6	12	1.7	22	8.0	2,670[2]

[1] In addition, 5 anglers fished East Pond for 26 hours and caught 17 fish that weighed 3.9 pounds (12 perch, 2 bluegills, 2 bullheads, and 1 pumpkinseed).

[2] Includes 7 white suckers, 5 brown trout, 2 carp, 2 bullheads, and 1 longear sunfish that weighed 33.2 pounds.

A special planting of 400 large, tagged rainbow trout (11.1-15.9 inches) was made on June 7, 1962. This planting consisted of 200 fish that were supposed to be of a non-migratory strain and 200 ordinary fish as a control. The 1962 catch of 223 tagged trout consisted of almost equal numbers of the two groups. Six more of these tagged trout were caught in the lake in 1963, five of which were from the "non-migratory" group.[3] Also in 1963, anglers caught 12 rainbows from the regular planting made in 1962.

Eighty percent of the trout caught were captured by trolling, mostly with a worm and spinner combination. Thirty-nine percent of the fishermen who used Devoe Lake still-fished with worms and caught two-thirds of the fish--mostly perch. Casting with artificial lures for 570 hours produced only 7 fish.

Sea lamprey scars were observed on two carp, one pike, and one rainbow trout.

Grousehaven Lake.--Two hundred fish were caught in 1,501 hours of fishing (Table 5). As usual, angling success in this marl lake was the poorest of any lake on the Area. Perch (mean length, 7.2 inches) comprised 56% of the catch of 8 species of fish (Table 6). In recent years a single year class (1957) of bluegills, believed to have entered the lake as a result of heavy flooding which occurred in 1959 in nearby

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[3] In addition, 6 tagged rainbows (three from each strain) were caught in Area streams in 1963--5 in the Rifle River and 1 in Gamble Creek.

Mallard Pond, provided a moderate fishery, but only 13 bluegills were taken in 1963. Most of the anglers still-fished with angleworms.

Lodge Lake. --Aside from the few people who fished South Pond, users of Lodge Lake enjoyed the best fishing as measured both by catch per hour (0.62) and percentage of successful fishermen (32). Anglers caught 328 fish (108.3 pounds) in 526 hours. Bluegills (6.1-inch average) comprised 48% of the catch. One of the two pike caught weighed 11 pounds.

The 52 largemouth bass caught in 1963 represented the largest harvest of bass from any Area lake, and also was the largest catch from this lake since 1955. Most of these fish (83%) were 3 years old. Artificial lures accounted for 65% of the bass taken. During a short period of netting in May (done primarily to capture bluegills for re-stocking South Pond and Jewett Lake), 15 legal-length bass and 7 sublegals were marked. Only two of the legal bass were recovered by anglers.

Grebe Lake. --Fishing activity on Grebe Lake in 1963 more than trebled that of 1962. In 578 trips that involved 1,475 hours, 370 fish were caught that weighed 284.6 pounds (Table 5). Only three species of game fish are present in this lake, and all were represented in the catch (Table 6). Perch comprised two-thirds of the catch in 1963, and the majority of them were caught with minnows. Two-thirds of the crappies were caught on minnows. The average lengths of the three species were: pike, 23.4; perch, 9.4; and crappie, 9.8 inches. All of the crappies were 2-year-olds, progeny of the original 1961 planting of 35 fish. The perch catch

consisted of 4.6% yearlings, 77.3% 2-year-olds, and 18.1% parent stock transferred from Devoe Lake in 1961. Six pike were from the 1961 year class, 29 from the 1960 year class, and 23 were 4-year-olds (1959 year class).

Due to the presence of pike, there was a considerable amount of winter fishing activity on this lake. In 185 trips, ice fishermen speared 55 of the 60 pike captured in 1963, and caught 98 perch and 10 crappies.

Since an intensive study is being made of population dynamics in this lake (see also Jobs 5 and 7), fish were marked in the spring and fall of 1963 and 1962. The percentage recovery by anglers of 1963 spring-marked perch and crappies (shown below) is indicative of the exploitation rate. For pike, the proportion between fish marked in the fall of 1962 and those that were caught through the ice in January and February of 1963 suggests the harvest rate by ice fishermen.

Species	Minimum length (inches)	Number marked	Number of marked fish caught	Percentage of recovery
Perch	7.0	879	81	9.2
Crappie	7.0	883	20	2.2
Pike	20.0	56	13	23.2

(2) Calculations of production and sustained yields

Ricker's method of estimating maximum equilibrium yield by combining seasonal instantaneous mortality and growth rates with population estimates was applied to data compiled on bluegill populations in Jewett and Lodge lakes between 1957 and 1962. Angling statistics, population estimates, and growth rate data were the bases for the computations. A report on this work was nearly completed for publication during the fiscal year. One segment of the data was included in a paper delivered at the 93rd Annual Meeting of the American Fisheries Society at Minneapolis in September 1963.

On the basis of maximum equilibrium yield calculations for the recruitment levels in these lakes, the best sustained yield theoretically would be produced by exploitation rates on the order of 50%-75%, amounting to two to three times the current rate of fishing mortality. However, more information is needed on survival, growth, and recruitment at these rates. Furthermore, the interactions of the bluegills with other segments of the population were ignored. The bluegills in both lakes were under-harvested, as shown both by exploitation rates and maximum yield computations. Efficient methods of artificial cropping must be developed to supplement public angling in order to provide continuous optimum yields. An average catch of one bluegill per hour and a mean length of 7.0 inches are suggested as minimum goals, especially if no other species is present.

Data also were accumulated for similar computations for Grebe Lake. Population estimates were made in the fall of 1963 and spring of

1964 (see also Job No. 5). Measurements of growth rates were made, together with calculations of body (L) - scale (S) relationships for pike, crappies, and perch. These relationships are:

Pike: $L = 1.8 + 2.06\ S$

Crappies: $L = 1.4 + 1.02\ S$

Perch: $L = 0.54 + 1.23\ S$

Data on weights were obtained also, but these relationships have not been worked out yet.

(3) Bottom fauna surveys

Bottom samples were collected with an Ekman dredge from Jewett Lake in August 1963 and from South Pond and Grebe Lake in December. Twenty-eight samples were taken in Jewett Lake relative to the toxaphene treatment in October 1962, and the organisms will be compared with those taken in June 1963 and of the pre-treatment samples collected in June and August 1962. Sampling stations were selected on a modified random basis, the number of samples taken in each 5-foot depth zone being proportional to the area within each stratum.

In December, 10 samples were collected in South Pond and 28 from Grebe Lake to obtain information on the winter standing crops of bottom fauna as part of the over-all study of the experimental fish populations in these waters. Sampling stations were selected at random by using a grid overlay to locate the points on the maps. The samples from the three lakes were examined and the animals placed in vials, but identification and counting have not been completed.

Job No. 5. --Study of systematic errors associated with multiple-census population estimates

During 1963-64, population estimates were made in Jewett Lake in May 1964 (see also Job No. 8), in Grebe Lake in September and October 1963, and also in April and May 1964. The Schumacher method of calculation, as modified by DeLury, was used for the calculation of estimates and 95% confidence limits (shown below in parentheses).

Two trap nets and 14 small, cylindrical wire traps were fished in Jewett Lake between May 6 and June 4 to obtain estimates of the survivors of the 1963 planting of adult bluegills and their progeny. The trap nets were moved at irregular intervals but the wire traps were scattered around the lake at random and moved nearly every day. Only 16 (13-20) adults were estimated to be present, 15 of which were caught. Their average size was 8.4 inches. It was estimated that 22,827 (20,367 - 25,974) yearlings were present, whose length-range was 1.7-2.9 inches. A total of 4,242 young fish were marked by removal of the anal fin during the first week of trapping, after which no more were marked.

Sampling methods used for the Grebe Lake estimates were similar to those used previously (spring and fall 1962, and spring 1963). Seventy numbered netting sites have been located on a map of the lake by drawing coordinates at random. The sites to be used each day (the 7 or 8 trap nets were moved nearly every day when possible) were selected

from a table of random numbers. At times the trap nets were supplemented by three smaller fyke nets. An attempt to estimate small fish with 14 wire traps (same as used in Jewett Lake) proved unsuccessful this year. Detailed records were kept of the recovery of fish bearing old marks as well as the new. Catches made at the various sites also were recorded separately. In the spring, notations were made of the sex of each fish, which enabled an estimate to be made of the number of males and females. Scale samples were collected in order to convert estimates by inch groups into estimates of year class size. The estimated populations for the two periods are shown in Table 7. It is obvious that spring netting was much more effective than that done in the fall.

These estimates, by themselves, are not very meaningful. However, when converted to age groups and used in conjunction with other seasonal parameters, they provide the basis for computations of mortality, production, and maximum sustained yields. Comparable mortality rates will also be estimated from the recovery of fish marked in various years. Furthermore, creel census data, coupled with population estimates, provide information on angler exploitation.

The primary objective of this job, of course, is to detect and try to correct for systematic errors associated with this type of estimation. Sources of these errors could lie in the distribution of the fish, mortality during the netting period, seasonal factors, unequal distribution by sex, type of gear, retention of fish by the gear, etc.

Table 7.--Grebe Lake population estimates (95% confidence limits in parentheses)

Inch group	Black crappie	Inch group	Yellow perch	Inch group	Northern pike	Inch group	Black bullhead
				September 1963			
5+6	490 (195-?)	9+10	266 (182-492)	16-20.9	1,110 (826-1,692)	6	343 (?)
7+8	273 (169-716)	11	127 (87-237)	21 & over	166 (104-413)	7+8	60 (?)
9-11	2,125 (1,686-2,865)						
				April 1964			
5+6	547 (305-2,660)	4.5-6.9	14,899 (6,623-?)	<16	68 (35-894)	4+5	50,066 (43,668-58,480)
7+8 males	87 (56-200)	7+8	118 (98-149)	16-20.9	833 (774-903)	6	1,025 (792-1,451)
7+8 females	147 (109-225)	9-11.9 males	121 (110-134)	21-24.9	73 (54-111)	7+8	14 (8-40)
9-11.5 males	823 (751-911)	9-11.9 females	131 (108-167)	25 & over	25 (18-40)		
9-11.5 females	1,061 (1,000-1,129)						
April totals	2,665		15,269		999		51,105

Data from a number of population samplings on the Area lakes for estimates during the past 7 years are to be sifted and analyzed. Some of the sampling projects were designed to throw some light on the problem. A case in point is the recording of catch data by individual site in Grebe Lake. The sites are to be grouped into seven major areas of this 72.5-acre lake and a test of the differences between catches of the several species will be made to determine whether or not fish distribution is essentially random in the spring.

Job No. 6.--Evaluation of watershed and
stream improvement practices

The first draft of a report that evaluates the Rifle River watershed program was completed. The manuscript was redrafted and is now being edited.

Job No. 7.--Study of lakes subject to
extreme oxygen depletion

Work on this job during 1963-64 consisted entirely of bi-weekly sampling for dissolved oxygen to compute winter oxygen budgets of five Area lakes. Three of the lakes (Grebe, Lodge, and Devils Washbasin) are subject to winterkill; Jewett Lake and South Pond are not. The plan was to take samples at 5-foot depth intervals (plus surface and bottom), with the first series of samples to be collected as soon as possible after the ice cover formed. Those of the final series we re to be taken just

before the break-up. Intermediate samples were collected in order to plot the nature of the depletion curve. The formula that will be used to compute actual oxygen deficits was first described by D. S. Rawson and appears in Welch's Limnological Methods (p. 212).

The first samples were taken on December 16, 1963, about 2 weeks after the lakes were first sealed by ice. Five additional series of samples were collected between December 16 and March 19 (last sampling). Although the winter of 1963-64 was one of the mildest in recent years, these data should be useful for comparison with data obtained in a severe winter.

Another segment of this job is an evaluation of the resistance of northern pike, black crappies, and yellow perch to low oxygen levels in Grebe Lake. The mild winter of 1963-64 precluded any test of their resistance.

Job No. 8. -- Development and management of bluegill populations in warm-water lakes

Jewett Lake and South Pond were treated with toxaphene in 1962, followed by stocking only with adult bluegills in May 1963. Fifty fish were planted in South Pond and 150 in Jewett Lake. In October 1963 it was discovered that the treatment of South Pond was not entirely successful. Subsequent checks made with trap nets and wire traps disclosed the presence of numerous minnows and some small

pumpkinseeds and longear sunfish. Five gallons of rotenone were sprayed over the pond (at a rate of slightly more than 1 ppm) on June 8, 1964, and at least 100 adult bluegills were to be introduced in July.

As the population estimates for Jewett Lake in the spring of 1964 (see Job 5) revealed that only about 16 adults had survived from the introduction made in 1963, 307 bluegills (mean length, 5.0 inches) were transferred from Lodge Lake between June 3 and 12 to provide a 1964 year class and some angling in 1964. Besides approximately 23,000 yearling bluegills that were estimated to be present in May 1964, the lake contained a large number of tadpoles. The accumulation of data on young fish will be useful in constructing a recruitment curve. Artificial cropping will not be started until the population is well established.

Job No. 9.-- Preparation of report on the movement of fish in Area streams and connecting lakes

No progress was made on this job since the last annual progress report.

Job No. 10.--Development of electronic fishing gear

Mr. C. H. Harris, a retired electronics engineer, voluntarily constructed a pilot model of a battery-operated, capacitor discharge,

electrofishing device for use in sampling stream populations. Station personnel assisted in the trial runs that were made on the Area in August and September 1963. Further refinements must be made, but the unit offers considerable promise. Due to other commitments, no further work was done by Mr. Harris during the current year, but we anticipate that the device will be operational after additional refinements and testing in 1964-65. Due to similar reasons, no further work was done in 1963-64 on development of a more efficient electrofishing device for lakes.

Hunting and trapping

A summary of the 1963 hunting pressure and results is presented in Table 8. Data compiled by Richard J. Moran of the Game Division indicate a pronounced decline in the ruffed grouse population. One hundred eight birds were bagged, as compared with 166 in 1962. Only 3.5 grouse were killed per 100 hours, which was similar to the low conditions of the mid-1950's. The number of hunters was the third highest on record; total hours of hunting during the small game season has been exceeded only once. The 1962 record kill of woodcock (70) was topped by the 83 birds shot in 1963.

Deer hunting results were summarized by Louis C. Ruch in Game Division Report No. 2445. The record number of hunters (2,760) spent 13,612 hours pursuing their sport in the Area in 1963.

Table 8.--Summary of hunting and trapping activities on the Rifle River Recreation Area in 1963

Season and game species	Number of permits	Hunting hours or trap nights	Number of animals harvested
HUNTING			
Small game	898	3,070	...
Ruffed grouse	...	...	108
Woodcock	...	...	83
Duck	...	...	25
Squirrel	...	...	11
Snowshoe hare	...	...	3
Cottontail	...	...	10
Deer[1]			
Gun	2,760	13,612	121
Archery	431	1,738	1
TRAPPING	40	213	...
Beaver	...	...	9
Muskrat	...	...	6

[1] In addition to the kill shown, 13 unclaimed deer were found.

A record number of daily permits (657) were issued the first Saturday. The total kill amounted to 135 animals, 13 of which were unclaimed deer found in the woods, and 1 was taken in the archery season. As in 1962, 38 bucks with antlers at least 3.0 inches long were shot. The oldest buck was 4 1/2 years old; the heaviest weighed 137 pounds.

Five trappers used the 40 daily permits issued in 1963. Their total take consisted of 9 beavers and 6 muskrats.

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