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MONTANA STATE DEPARTMENT OF FISH AND GAME
FEDERAL AID IN FISH RESTORATION SECTION
HELENA, MONTANA

JOB COMPLETION REPORT
INVESTIGATIONS PROJECTS

State of Montana

Project No. F-12-R-4 Name Western Montana Fishery Study

Job No. I Title Comparisons of Fish Populations of Six Clearwater Lakes

Period Covered: May 1, 1957 to April 30, 1958

Abstract: The six main Clearwater Lakes were netted simultaneously for the third season. Average catch per net set has been computed by species, for each season's sample from each lake. These average catch figures are compared by their fiducial limits at the 95% confidence level.

No significant changes in catch are indicated for cutthroat trout. It is recommended that the special cutthroat management measures which have been in use on these waters during the past three years be discontinued. A new management plan for the Clearwater drainage is given.

Objectives: The object of this job was to collect comparative netting data on the six Clearwater lakes for the third successive year. This data was collected for the purpose of evaluating different management measures used on these six lakes during the years 1955, 1956 and 1957.

Techniques Used: On June 2, six two-man crews assembled in the Seeley Lake area with netting equipment, and the first net sets were made before dark. Nets were lifted and reset on June 3, 4, 5, and 6 and were lifted and removed on June 7. Pertinent data on each set was recorded on Montana's standard netting forms. Each crew was furnished with a map of its respective lake, upon which the locations of the 1955 and 1956 net sets had been marked. In 1957, each individual net set was made at the location shown for that particular set in 1955 and 1956. In 1957, the crew for each lake was composed of at least one of the individuals who had worked on that same lake in either 1955 or 1956. All nets used were 125-foot, nylon, experimental gill nets. These nets consist of five equal sections of one and one-half, two, two and one-half, three and four inch, stretch measure mesh. The following number of nets were used in each lake: Salmon - 4, Seeley - 5, Placid - 5, Inez - 4, Alva - 4, and Rainy - 2.

The following daily schedule was used by all crews: Nets were lifted, all fish were worked, nets were mended when necessary and nets were reset. All fish captured were weighed, measured and recorded. Scale samples were taken from squawfish and Columbia River chub for use in the life history study of these species (Job No. II) and from trout, salmon and a few other species to fill in short or missing size groups in the previous years' collections.

During the week of July 28 - August 3; one, three-man crew repeated the netting on Inez and Rainy Lakes. This was done in order to ascertain if any cutthroat spawning run out of the lake during the spring netting, was affecting the catch ratios for this species.

Maximum-minimum thermometer stations were established at four points in the Clearwater Drainage. These were: (1) In the Clearwater River between lakes Alva and Inez. (2) In the Clearwater River at the outlet of Seeley Lake. (3) In Owl Creek at the outlet of Placid Lake. and (4) In the Clearwater River at the outlet of Salmon Lake. All stations were located under bridges, to eliminate the effect of direct sunlight on the instruments. Readings were recorded on May 9, and every second day following, through July 1.

Findings:

Following is a list of abbreviations used on the tables in this report, common names and scientific names of the species of fish taken during the netting project:

Abbreviation	Common Name	Scientific Name
CT	Cutthroat trout	Salmo clarkii
EB	Eastern Brook trout	Salvelinus fontinalis
RB	Rainbow trout	Salmo gardnerii
DV	Dolly Varden trout	Salvelinus malma
LL	Brown trout	Salmo trutta
KOK	Kokanee	Oncorhynchus nerka
WF	Mountain whitefish	Prosopium williamsoni
SQ	Squawfish	Ptychocheilus oregonensis
CRC	Columbia River chub	Mylocheilus caurinus
FSu	Fine-scaled sucker	Catostomus catostomus
CSu	Coarse-scaled sucker	Catostomus macrocheilus
YP	Yellow perch	Perca flavescens
PS	Pumpkinseed sunfish	Lepomis gibbosus
RSh	Redside shiner	Richardsonius balteatus
LMB	Largemouth bass	Micropterus salmoides

The age and growth analysis has not been completed for the 1956 and 1957 additions to the 1955 collections. Therefore, age and growth data are not included in this report.

Total effort, by lakes, and total catch, by species, for the 1957 sampling are shown on Table 1. These same data for the 1955 and 1956 seasons are shown on Tables 2 and 3. Effort was increased 10% between 1955 and 1956 and remained the same from 1956 to 1957. Total catch has increased each year. It is probable that this increase in total catch is due to a more advanced season (with warmer water temperatures) during 1956 and 1957 than in 1955. Unfortunately, the only temperatures recorded during the 1955 and 1956 seasons were the surface temperatures at each net set. Although these indicate warmer temperatures during each successive year's sample (for example, on Salmon Lake the average of the net temperatures was 52° F. in 1955, 60° F. in 1956 and 65° F. in 1957) they vary so widely that their true meaning cannot be determined. Maximum-minimum thermometer readings for May 15 through July 16, 1957 are shown on Table 4. The four thermometers used for these readings were all checked in July, 1957 against a thermometer which was certified by the U. S. Bureau of Standards and were found to be accurate within 0.5° F. This same type of temperature data will be taken during any future sampling periods.

Tables 5 through 8 show the average catch per net set for all three years' samples, and the fiducial limits of these average catches at the 95% level. Descriptions of the methods used to obtain these figures are given in last year's completion report for Job No. II, Project F-12-R-3. Table 9 is a summarization of the significance of the changes in ratio from 1955 to 1956, 1956 to 1957 and 1955 to 1957. Increases are recorded as a (+), decreases as a (-), and no significant change as a (o). The criterion for significance was no overlap of the limits of the ranges between the two ratios which are being compared. Further reviews of statistical methods and conferences with other workers in fishery statistics have convinced the writer that this criterion of significance is more logical than that used in last year's report.

Note that significant changes are indicated for only nine comparisons. All of these are either between the years 55-56, or 55-57. No significant changes are indicated between the years 56-57. It is believed that this is due to seasonal differences at time of sampling. In other words, the 1955 sampling was done when the season was less advanced than it was when the 1956 and 1957 samplings took place.

Table 10 shows a comparison of spring to summer netting on Inez and Rainy Lakes. Single figures are catch ratio means, and the figures in brackets are their fiducial intervals. Computation was by the same methods used for the data on Tables 5 through 8. No significant difference is indicated for cutthroat trout from either lake between spring and summer sampling periods.

Recommendations:

Following is a list of the special management practices which have been in effect on these six Clearwater Lakes since 1955.

Salmon Lake - planted yearly with 200/acre cutthroat fry.

Seeley Lake - planted yearly with 200/acre cutthroat fry.

Placid Lake - planted yearly with 200/acre cutthroat fry. Rough fish removed each year by trapping at inlet and outlet. This was done by a local sportsman's club and no records of numbers or pounds taken was kept.

Inez Lake - planted yearly with 200/acre cutthroat yearlings (2-5" fish).

Alva Lake - planted yearly with 500/acre cutthroat fry.

Rainy Lake - No special management.

All of these lakes were in the general Montana fishing season which runs from the last Sunday in May through November 30. The streams in the Clearwater drainage have been under a special late season opening (last Sunday in June) for the past three years. This late opening date has been used in several Montana cutthroat areas to prevent excessive pressure on lake cutthroat populations when they are concentrated in streams on their spawning run. It was done here merely to do everything possible for the management of the Clearwater drainage for cutthroat trout. The only indication we had of any trout concentrations in the streams was angler reports of good stream fishing in the drainage, only during the early part of the season.

No significant changes in the cutthroat catch ratio have occurred in any of the lakes during the three years of sampling. Neither does the statewide creel census indicate any increase in angler success on any of the six lakes during these three years. It is, therefore, recommended that the special management measures listed above be discontinued.

The following management plan is recommended for the Clearwater Drainage.

1. That portion of the drainage above Rainy Lake outlet, should be separated from the rest of the drainage by the construction of a barrier to upstream fish movement.

2. All squawfish, Columbia River chub, and yellow perch should be removed from this sub-drainage, by toxicants. This drainage section should then be replanted with rainbow trout.

3. A special creel census project should be operated on Rainy Lake for two years after it is restocked.

4. Fish populations should be sampled each year, in Rainy, Alva and Inez Lakes until two years after the upper drainage has been restocked. This sampling should be by the same method as used in the previous Clearwater netting jobs.

5. If, after rehabilitation, Rainy Lake shows a significantly higher trout catch ratio (by netting) and good fishing success (by angling) then the rest of the Clearwater Drainage should also be rehabilitated.

6. Rehabilitation of the rest of the drainage should proceed by sections - that is; by constructing barriers wherever they are feasible and rehabilitating the sub-drainages above them. this procedure is recommended for the following reasons:

a. The cost of rehabilitating the entire drainage would be too great for Montana's fishery budget in any one year.

b. A more thorough job can be done on a small section of a drainage than can be done on an entire, large drainage.

c. Rehabilitating the entire drainage at once would remove all angling from a large area. Rehabilitating by sections would insure some fishing in the area each year.

The barrier below Rainy Lake was constructed in the fall of 1957, and the toxification of the area above it is planned for the fall of 1958. As this season will be the last chance for obtaining pre-rehabilitation data, it is recommended that the standard netting be repeated on Rainy, Alva, and Inez Lakes this summer.

Prepared by A. N. Whitney and R. C. Averett Approved by George D. Holton

Date April 17, 1958

TABLE I

125-FOOT OVERNIGHT NET SETS
CLEARWATER LAKES, JUNE 3-7, 1957

TOTAL CATCHES BY NUMBERS OF SPECIES

Lake	No. of Sets	CT	EB	RB	DV	KOK	WF	SQ	CRC	FSu	CSu	YP	PS	RSh	LMB	TOTAL
Salmon	20	0	0	0	7	0	119	145	102	79	53	644	5	0	0	1154
Seeley	25	34	0	1	35	5	146	167	76	85	89	257	56	0	0	951
Placid	25	6	32	0	12	4	320	73	155	103	19	0	578	0	5	1307
Inez	20	1	0	0	15	3	172	156	26	21	48	193	1	1	0	637
Alva	20	12	0	1	28	6	120	143	36	75	25	28	0	0	0	474
Rainy	10	8	0	0	14	0	164	47	43	32	32	21	0	0	0	361
TOTAL	120	61	32	2	111	18	1041	731	438	395	266	1143	640	1	5	4884

TABLE II

125-FOOT OVERNIGHT NET SETS
CLEARWATER LAKES, JUNE 17-22, 1956

TOTAL CATCHES BY NUMBERS OF SPECIES

Lake	No. of Sets	CT	EB	RB	DV	LL	KOK	WF	SQ	CRC	SQ X CRC	FSu	CSu	YP	PS	RSH	LMB	TOTAL
Salmon	20	4	0	1	3	2	2	81	164	71	0	96	86	760	15	0	1	1286
Seeley	25	19	0	0	30	0	1	148	174	71	0	92	101	415	59	0	2	1112
Placid	25	19	5	0	9	0	4	181	34	151	0	69	24	0	237	0	0	73[illegible]
Inez	20	0	0	0	13	0	3	146	83	28	0	23	49	190	2	0	0	[illegible]
Alva	20	2	0	0	17	0	0	100	197	28	0	91	51	31	0	0	0	[illegible]
Rainy	10	5	0	0	12	0	0	106	52	49	1	45	27	56	0	1	0	354
TOTAL	120	49	5	1	84	2	10	762	704	398	1	416	338	1452	313	1	3	4539

TABLE III

125-FOOT OVERNIGHT NET SETS
CLEARWATER LAKES, JUNE 5-10, 1955

TOTAL CATCHES BY NUMBERS OF SPECIES

Lake	No. of Sets	CT	EB	RB	CT x RB	DV	KOK	WF	SQ	CRC	FSu	CSu	YP	PS	RSh	LMB	TOTAL
Salmon	20	1	0	0	0	7	0	52	170	110	56	49	323	5	2	0	775
Seeley	25	23	0	2	0	35	21	111	185	276	56	37	85	35	1	0	867
Placid	25	5	14	0	0	23	6	178	49	298	37	9	0	34	0	1	654
Inez	15	2	0	0	1	4	3	104	90	14	43	6	25	0	0	0	292
Alva	16	7	0	0	0	9	0	45	83	12	35	8	4	0	0	0	203
Rainy	9	5	0	0	0	8	1	84	49	23	33	21	8	0	0	0	232
TOTAL	110	43	14	2	1	86	31	574	626	733	260	130	445	74	3	1	3023

Maximum-minimum thermometer readings (in degrees F) from the outlets of four lakes in the Clearwater drainage; May 15 through June 16, 1957.

DATE	Salmon		Placid		Seeley		Alva	
May	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
15	52	48	54	44	54	50	53	46
17	53	48	56	44	55	49	52	48
19	54	49	60	52	57	50	54	47
21	54	48	55	48	54	46	53	48
23	52	48	58	48	54	47	58	49
25	53	47	59	51	55	48	58	49
27	53	50	57	53	59	51	60	50
29	58	50	62	52	61	51	62	50
30	56	54	68	57	61	51	62	54
June								
1	59	58	68	54	65	54	63	53
2	61	57	70	63	66	54	--	--
3	62	57	72	62	66	59	68	62
4	--	--	72	63	72	54	--	--
6	65	58	71	65	72	53	69	59
7	63	59	68	64	62	58	66	60
9	63	57	69	63	66	57	67	60
11	63	55	68	62	65	59	65	59
14	62	57	66	58	64	57	63	59
16	60	56	62	57	62	54	62	58

Notes: -- = no reading taken
All readings represent the period starting at the time of the previous reading.

TABLE IV

TABLE V

SPRING NETTING - 1955, 1956 and 1957

SALMON, SEELEY AND PLACID LAKES

AVERAGE CATCH PER NET SET AND FIDUCIAL INTERVALS AT THE 95% CONFIDENCE LEVEL

LAKE	YEAR	CT	DV	WF	YP	PS
Salmon	1955	0.1 (0.0-0.2)	0.4 (0.1-0.7)	2.6 (1.0-4.2)	16.2 (8.0-24.4)	0.3 (0.1-0.5)
	1956	0.2 (0.0-0.4)	0.2 (0.0-0.4)	4.1 (1.8-6.4)	38.0 (16.8-59.2)	0.8 (0.0-1.6)
	1957	None	0.4 (0.3-0.5)	6.0 (4.3-7.7)	32.2 (15.0-49.4)	0.3 (0.0-0.6)
Seeley	1955	0.9 (0.5-1.3)	1.4 (0.7-2.1)	4.4 (2.8-6.0)	3.4 (1.7-5.1)	1.4 (0.5-2.3)
	1956	0.8 (0.2-1.4)	1.2 (0.6-1.8)	5.9 (3.4-8.4)	16.6 (8.8-24.4)	2.4 (1.8-3.0)
	1957	1.4 (0.4-2.4)	1.4 (1.0-1.8)	5.8 (3.3-8.3)	10.3 (5.4-15.2)	2.2 (0.2-4.2)
Placid	1955	0.2 (0.0-0.4)	0.9 (0.6-2.2)	7.1 (5.0-9.4)	None	1.4 (0.4-2.4)
	1956	0.8 (0.2-1.4)	0.4 (0.2-0.6)	7.2 (5.2-9.2)	None	9.5 (2.9-16.1)
	1957	0.3 (0.2-0.4)	0.5 (0.3-0.7)	12.8 (7.1-17.7)	None	23.1 (13.1-33.1)

TABLE VI

SPRING NETTING - 1955, 1956 and 1957

SALMON, SEELEY AND PLACID LAKES

AVERAGE CATCH PER NET SET AND FIDUCIAL INTERVALS AT THE 95% CONFIDENCE LEVEL

LAKE	YEAR	SQ	CRC	FSu	CSu
Salmon	1955	8.5 (4.7-12.3)	5.5 (2.1-8.9)	2.8 (1.4-4.8)	2.5 (0.5-4.5)
	1956	8.2 (2.6-13.8)	3.6 (1.6-5.6)	4.8 (2.0-7.6)	4.3 (2.1-6.5)
	1957	7.3 (2.9-11.7)	5.1 (1.6-8.6)	4.0 (1.4-6.6)	2.7 (0.7-4.7)
Seeley	1955	7.4 (5.6-9.2)	11.0 (8.2-13.8)	2.2 (1.3-3.1)	1.5 (0.9-2.1)
	1956	7.0 (6.1-7.9)	2.8 (1.4-4.2)	3.7 (2.7-4.7)	4.0 (3.3-4.7)
	1957	6.7 (3.2-10.2)	3.0 (1.2-4.8)	3.4 (2.2-4.6)	3.6 (2.1-5.1)
Placid	1955	2.0 (1.3-2.7)	11.9 (7.2-16.6)	1.5 (0.6-2.4)	0.4 (0.9-2.1)
	1956	1.4 (0.4-2.4)	6.0 (2.5-9.5)	2.8 (0.5-5.1)	1.0 (0.4-1.6)
	1957	2.9 (1.6-4.2)	6.2 (2.7-9.7)	4.2 (2.3-6.1)	0.8 (0.3-1.3)

TABLE VII

SPRING NETTING - 1955, 1956 and 1957

INEZ, ALVA AND RAINY LAKES

AVERAGE CATCH PER NET SET AND FIDUCIAL INTERVALS AT THE 95% CONFIDENCE LEVEL

LAKE	YEAR	CT	DV	WF	YP	PS
Inez	1955	0.1 (0.0-0.3)	0.3 (0.0-0.6)	6.9 (3.9-9.9)	1.7 (0.2-3.2)	None
	1956	None	0.7 (0.4-1.0)	7.3 (4.0-10.6)	9.5 (3.2-15.8)	0.1 (0.0-0.3)
	1957	0.1 (0.0-0.1)	0.8 (0.4-1.2)	8.6 (6.1-11.1)	9.7 (1.7-17.7)	0.1 (0.0-0.1)
Alva	1955	0.4 (0.0-0.9)	0.6 (0.2-1.0)	2.8 (1.0-4.6)	0.3 (0.0-0.7)	None
	1956	0.1 (0.0-0.3)	0.9 (0.5-1.3)	5.0 (3.3-6.7)	1.6 (0.8-2.4)	None
	1957	0.6 (0.2-1.0)	1.4 (0.5-2.3)	6.0 (3.7-8.3)	1.4 (0.0-2.8)	None
Rainy	1955	0.6 (0.0-1.3)	0.9 (0.0-1.8)	9.3 (5.2-13.4)	0.9 (0.2-1.6)	None
	1956	0.5 (0.0-1.0)	1.2 (0.1-2.3)	10.6 (8.1-13.1)	5.6 (0.0-15.6)	None
	1957	0.8 (0.0-1.7)	1.4 (0.0-2.8)	16.4 (9.6-23.2)	2.1 (0.0-4.8)	None

TABLE VIII

SPRING NETTING - 1955, 1956 and 1957

INEZ, ALVA AND RAINY LAKES

AVERAGE CATCH PER NET SET AND FIDUCIAL INTERVALS AT THE 95% CONFIDENCE LEVEL

LAKE	YEAR	SQ	CRC	FSu	CSu
Inez	1955	6.0 (3.2-8.6)	0.9 (0.2-1.6)	2.9 (0.4-5.4)	0.4 (0.0-0.8)
	1956	4.2 (1.9-6.5)	1.4 (0.4-2.4)	1.2 (0.2-2.2)	2.5 (0.6-4.4)
	1957	7.8 (2.1-13.5)	1.3 (0.0-2.7)	1.1 (0.1-2.1)	9.7 (0.0-[illegible].0)
Alva	1955	5.2 (3.0-7.4)	0.8 (0.1-1.5)	2.2 (1.1-3.3)	0.5 (0.1-0.5)
	1956	9.9 (4.7-15.1)	1.4 (0.4-2.4)	4.6 (2.7-6.5)	2.6 (0.3-4.9)
	1957	7.2 (2.7-11.7)	1.8 (0.3-3.3)	3.8 (2.2-5.4)	1.3 (0.3-2.3)
Rainy	1955	5.4 (2.4-8.4)	2.6 (0.4-4.8)	3.7 (1.3-6.1)	2.3 (0.4-4.2)
	1956	5.2 (1.6-8.8)	4.9 (0.0-10.1)	4.5 (1.6-7.4)	2.7 (0.7-4.7)
	1957	4.7 (2.4-7.0)	4.3 (0.8-7.8)	3.2 (0.0-6.9)	3.2 (0.4-6.0)

LAKE		SPECIES								
		CT	DV	WF	YP	PS	SQ	CRC	FSU	CSU
SALMON	1955-56	o	o	o	o	o	o	o	o	o
	1955-57	o	o	+	o	o	o	o	o	o
	1956-57	o	o	o	o	o	o	o	o	o
SEELEY	1955-56	o	o	o	+	o	o	-	o	+
	1955-57	o	o	o	+	o	o	-	o	o
	1956-57	o	o	o	o	o	o	o	o	o
PLACID	1955-56	o	o	o	N	+	o	o	o	o
	1955-57	o	o	o	N	+	o	o	o	o
	1956-57	o	o	o	N	o	o	o	o	o
INEZ	1955-56	o	o	o	o	o	o	o	o	o
	1955-57	o	o	o	o	o	o	o	o	o
	1956-57	o	o	o	o	o	o	o	o	o
ALVA	1955-56	o	o	o	+	N	o	o	o	o
	1955-57	o	o	o	o	N	o	o	o	o
	1956-57	o	o	o	o	N	o	o	o	o
						N				
RAINY	1955-56	o	o	o	o	N	o	o	o	o
	1955-57	o	o	o	o	N	o	o	o	o
	1956-57	o	o	o	o	N	o	o	o	o

TABLE NO. IX

Direction of significant change in Average Catch per net from 1955-56, 1955-57 and 1956-57, from fiducial limits on Tables 5 through 8. (+) = significant increase, (-) = significant decrease, (o) = no significant change, (N) = no fish taken in either year's sample.

TABLE X

COMPARISON OF SPRING TO SUMMER NETTING OF INEZ AND RAINY LAKES, 1957

LAKE	YEAR	TIME OF NETTING	CT	DV	WF	SQ	CRC	SU	YP	PS
Inez	1957	June 3-7	0.1 (0.0-0.1)	0.8 (0.4-1.2)	8.6 (6.1-11.1)	7.8 (2.1-13.5)	1.3 (0.0-2.7)	8.9 (3.0-14.8)	9.7 (1.7-17.7)	0.1 (0.0-0.1)
		July 28-Aug. 2	0.4 (0.3-0.5)	1.8 (0.8-2.8)	11.9 (6.0-17.8)	8.8 (4.0-13.6)	0.5 (0.0-1.1)	5.2 (2.9-7.5)	10.4 (2.7-18.1)	None
Rainy	1957	June 3-7	0.8 (0.0-1.7)	1.4 (0.0-2.8)	16.4 (9.6-23.2)	4.7 (2.4-7.0)	4.3 (0.8-7.8)	6.4 (0.0-13.0)	2.1 (0.0-4.8)	None
		July 28-Aug. 2	1.1 (0.0-2.2)	0.5 (0.3-0.7)	9.0 (0.6-17.4)	9.5 (5.0-14.0)	3.0 (0.8-5.2)	5.2 (2.0-8.4)	8.1 (0.0-20.1)	None