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-1 Job No. I-A

Title of Job: Cataloging the Waters of the Project Area

Comparison of Five Clearwater Lakes

Abstract:

Past management on the Clearwater Lakes has consisted of planting various species of fish and of rough fish removal by trapping. Rough fish removal has ceased, and planting continued. Previous plantings, while varying as to size and species in different years, did not, in general, vary from lake to lake on any plan, and there was no provision for checking their effectiveness. The planting program has been revised to concentrate the effort on cutthroat yearlings in one lake and on cutthroat fry in another. One sportsmen's club now proposes to do rough fish control on their own in a third lake. In order to evaluate the effectiveness of these measures, it is desirable that the best possible indices of relative abundance of the various species in these lakes be obtained at the present time.

Three overnight gill net sets were made in Lakes Placid, Seeley and Inez, and four were made in Lakes Salmon and Alva. The results of this netting are presented as total catch, catch per net night, and percent of total catch. Further comparison of the lakes is made by 1953 anglers' catch, percent game fish and percent rough fish, and times of survey. Because of manpower and equipment limitations, the netting done last year was not adequate for detailed population comparisons, and the time of survey varied widely in different lakes. The data presented are not tested for significance, but are analyzed chiefly from the aspect of setting up a netting plan for next year to minimize the limitations in the present data as much as possible. To eliminate the effect of seasonal and weather variations on catch rate, it is proposed to net all five of these lakes at the same time. Five netting crews will be used, and a number of requirements are proposed to insure uniformity of data collected.

The main value of the information gained will be as a basis for evaluating various management measures when the project is repeated in the future.

Objectives:

To catalog the waters of the project area from the standpoint of physical and chamical characteristics and from the standpoint of fish response to the environment. Specifically in this case, to gather indices of relative abundance of the various species in the fish populations of the five main Clearwater Lakes and to compare these lakes.

Techniques Used:

Because manpower and equipment adequate for gill netting was not continuously available in this new district last year, the netting was done on the following schedule. On June 7-11, 1954, the project assistant and the lake survey equipment were borrowed from the Northwest District and the three larger lakes (Salmon, Placid and Seeley) were netted. One overnight set was made with four nets in Salmon on June 8; with three nets in Placid on June 9; and with three nets in Seeley on June 10. In July, a boat was borrowed from the Wildlife Restoration Division, a boat trailer from the Somers hatchery, and on July 8 and 9, 1954 the land survey crew assisted in netting the two smaller lakes (Alva and Inez). One overnight set was made with three nets in each lake, in Inez on July 8 and in Alva on July 9. One other overnight set was made in Alva on November 14, 1954.

All fish captured were counted, weighed, and measured and scale samples were taken from all trout, salmon, whitefish, perch and sunfish. Scale samples were sent to the Department's fishery laboratory for age and growth analysis. Time of set, time of lift and depth of set were noted and recorded along with information on catch on standard gill netting forms. Nets used were all 125-foot, experimental mesh, nylon gill nets, which are made up of five 25-foot sections of $1\frac{1}{2}$, 2, $2\frac{1}{2}$, 3 and 4 inch stretch measure mesh.

Other available information on the lakes was assembled from U. S. Forest Service maps, aerial photos, previous surveys and past planting records.

Findings:

A short, general description of the Clearwater drainage is given in the first section of this report. These five lakes, which contain over 90 percent of the lake acreage in this drainage, are in the mountainous terrain of the Lolo National Forest. Their drainage areas consist largely of lodgepole pine with considerable larch and less Douglas fir. Their shorelines are mostly brush and gravel with some weedy and silty areas. They range in depth from Salmon at 61 feet to Seeley at 119 feet, and in size from Inez at 293 acres to Placid at 1,143 acres. While the trout fishing has been considered poor on them for some time, they rank high in sportsmen interest and constitute perhaps the best potential lake fishery in this section of the district. The Department has been under pressure for some time to institute various management measures on them and many have been tried in the past. These have consisted mainly of planting various species of fish and of rough fish removal by trapping. Because of the extremely limited success of partial rough fish control in general, and further because there was no provision for evaluating its success here, trapping was stopped several years ago. However, perhaps because rough fish control is a measure which is readily observed and the general idea is appealing, the sportsmen are overwhelmingly convinced of its value and the Department is under constant pressure to re-institute it. So far this has been avoided, and the sportsmen on Placid Lake now propose to carry it out on that lake on their own.

Previous plantings have followed no general plan, nor has there been any basis for evaluating them other than fishermen's ideas of their relative success, admittedly a very poor criterion for comparison. Although plantings have differed from year to year, they have in general not differed greatly from lake to lake. Since, plantings of some sort must continue, due to public pressure, until their value is known, it was decided to vary the available plants in different lakes so

that there would be some basis for their evaluation. The program which was in operation at the time of this decision consisted of planting approximately twenty per acre cutthroat trout yearlings in all of the lakes except Salmon. This lake had been excluded because it was generally assumed that it had a much higher rough fish population than any of the rest.

The present plan calls for experimental plants of 200 per acre cutthroat yearling in Inez and 500 per acre cutthroat fry in Alva for comparison. The other three lakes are to receive from 100 to 200 per acre cutthroat fry, depending upon the availability of cutthroat eggs at the spawning stations. None will be planted at less than 100 per acre and should the supply of fry fall below that required for this figure on these three lakes, one or more of them will not be planted.

In order to evaluate these measures, the best possible figures of population indices for these lakesshould be taken at the present time. Because the netting done in 1954 was not extensive enough for a detailed comparison, it was analyzed mainly from the standpoint of setting up a more extensive program next season.

The netting results are presented three ways: total catch by numbers and weights in Tables No. 1 and 2, catch per net night by numbers and weights in Tables No. 3 and 4, and percent of total catch by numbers and weights in Tables No. 5 and 6. These data are furthur summarized as percent of rough and percent of game fish by weight and are presented along with number of sets, date of survey, and anglers' catch per hour of game fish in Table No. 7.

Table 1.
Total Catch by Numbers

Lake	Squaw Fish	Col. R. Chub	Sucker	Yellow Perch	Sun-fish	White-fish	Trout	Total
Salmon	44	32	27	35	0	14	5	157
Seeley	30	37	10	46	1	10	16	150
Placid	13	94	13	0	10	17	8	155
Inez	14	3	7	56	0	20	5	105
Alva	23	1	8	3	0	29	6	70

Table 2.
Total Catch by Weights

Lake	Squaw Fish	Col. R. Chub	Sucker	Yellow Perch	Sun-fish	White-fish	Trout	Total
Salmon	11.39	12.75	21.86	3.34	0.00	4.26	5.26	58.86
Seeley	11.39	18.31	13.79	5.96	0.38	3.24	6.12	59.19
Placid	7.91	46.85	18.62	0.00	2.01	4.80	8.30	88.49
Inez	5.26	2.58	4.88	5.34	0.00	10.82	4.00	32.98
Alva	10.63	0.26	5.67	0.88	0.00	10.55	6.32	34.31

Table 3.
Catch Per Net Night by Numbers

Lake	Squaw Fish	Col. R. Chub	Sucker	Yellow Perch	Sun-fish	White-fish	Trout	Total
Salmon	11.0	8.0	6.8	8.8	0.0	3.5	1.3	39.3
Seeley	12.3	10.0	3.3	15.3	0.3	3.3	5.3	50.0
Placid	4.3	31.3	4.3	0.0	3.3	5.7	2.7	51.6
Inez	4.7	1.0	2.3	18.6	0.0	6.7	1.7	35.0
Alva	5.8	0.3	2.0	0.8	0.0	7.3	1.5	17.5

Table 4.
Catch Per Net Night by Weights

Lake	Squaw Fish	Col. R. Chub	Sucker	Yellow Perch	Sun-fish	White-fish	Trout	Total
Salmon	2.8	3.2	5.5	0.8	0.0	1.1	1.3	14.7
Seeley	3.8	6.1	4.6	2.0	0.1	1.1	2.0	19.7
Placid	2.6	15.6	6.2	0.0	0.7	1.6	2.8	29.5
Inez	1.8	0.9	1.7	1.8	0.0	3.6	1.3	11.0
Alva	2.7	0.1	1.4	0.2	0.0	2.6	1.6	8.6

Table 5.
Percent Composition of Catch by Numbers

Lake	Squaw Fish	Col. R. Chub	Sucker	Yellow Perch	Sun-fish	White-fish	Trout	Total
Salmon	28.0	20.4	17.2	22.3	0.0	8.9	3.2	100.0
Seeley	20.0	24.7	6.7	30.7	0.7	6.7	10.7	100.2
Placid	8.4	60.6	8.4	0.0	6.5	11.0	5.2	100.1
Inez	13.3	2.9	6.7	53.3	0.0	19.0	4.8	100.0
Alva	32.8	1.4	11.4	4.3	0.0	41.4	9.6	99.9

Table 6.
Percent Composition of Catch by Weights

Lake	Squaw Fish	Col. R. Chub	Sucker	Yellow Perch	Sun-fish	White-fish	Trout	Total
Salmon	19.4	21.7	37.1	5.7	0.0	7.2	8.9	100.0
Seeley	19.3	30.9	23.3	10.1	0.6	5.5	10.3	100.0
Placid	8.9	52.9	21.0	0.0	2.3	5.4	9.4	99.9
Inez	15.9	7.8	14.8	16.2	0.0	33.2	12.1	100.0
Alva	31.0	0.8	16.5	2.6	0.0	30.7	18.4	100.0

Table 7.
Comparison of Anglers' Catch per Hour of Game Fish, Gill Net Catch, Percent Rough and Game Fish by Weight, and Time of Survey

	1953 CREEL CENSUS		1954 GILL NETTING				
Lake	No. of Fish Recorded	Catch/Hour of Trout	No. of Sets	Total Weight of Catch-lbs.	% Rough Fish	% Game Fish	Date of Survey
Salmon	87	1.0	4	58.86	83.8	16.2	6-8&9
Seeley	11	1.6	3	59.19	84.2	15.8	6-10&11
Placid	27	1.3	3	88.49	85.2	14.8	6-9&10
Inez	27	0.9	3	32.98	54.8	45.2	7-8&9
Alva	29	0.8	4	34.31	50.8	49.2	7-9&10-3sets 11-14&15-1set

Recommendations:

Significance tests were not applied to these data because it was not felt that the original netting was extensive enough to warrant such application. However, statistical analysis is not needed to note that although catches of individual species varied greatly in all the lakes, there is a remarkable similarity in the percent game and percent rough fish in the catches from the three larger lakes, Salmon, Seeley and Placid. This is an interesting comparison and seems to refute the prevailing opinion that Salmon Lake is more heavily infested with rough fish than any of the others. This same similarity can be noted by a comparison of the two smaller lakes, Alva and Inez. It is also quite apparent that there is a great dissimilarity between the two groupings of lakes, the three larger and the two smaller in this same respect. However, due somewhat to the small amount of netting on which these data are based, and more so to the different times of year that the two lakes were sampled, it cannot be said that this dissimilarity represents any great difference between the percent rough and percent game fish in the two groups of lakes. It is much more likely that it is merely a reflection of two of the limitations to the use of gill nets for obtaining indices of relative populations in different lakes, namely that gill nets are passive fishing gear which depend on fish movement for their catch and this movement can vary with the season and with the weather.

It would not be possible to completely remove these two limitations even by a very extensive netting on these lakes with only one survey crew. If, as is the standard practice, these lakes were netted consecutively, it is certain that the last lake would be netted during a different season than the first and therefore quite probably during a different catch rate period. With only one crew, the alternative to consecutive netting would be to net the whole series alternatly in rotation. That is, lift one one lake and set in another the same day, going from one lake to the next, until the required number of sets had been made in all. While this would greatly reduce the limitation due to seasonal variations, it would mean an appreciably increased amount of work for the crew; and it is still probable that differences in weather and their possible effect on fish movement would impair the validity of the data collected.

Therefore, it is recommended, in order to obtain the best possible population indices for comparison of these lakes, that they be netted simultaneously by five crews. Because it will be imperative that uniform methods be used on all the lakes, the following recommendations are made for the project:

1. To insure the crews being familiar with all phases of lake survey and sampling procedures, the present biological personnel in the fisheries division should be used, and not temporary help.

2. The Minnesota figures, given in Moyle, et. al. (1950), for the required number of gill net sets to be used in sampling lakes of various sizes should be used. The plan should be setup so that all the lakes are netted for the same number of days; that is, to obtain more sets on one lake than another, more nets should be used on the larger lake rather than netting a greater number of days with the same number of nets. Because the Minnesota set requirements are for 250-foot nets, while Montana uses mainly 125-foot nets, several 250-foot net sets should be made in addition to the required number of 125-foot sets for comparison.

3. The project leader should make several both deep and shallow water sets the week prior to the netting program to determine the advisability of using deep water sets at this time of year.

4. Net sets in the littoral zone should progress around the lake so that all parts of the littoral zone are sampled.

5. Large scale outline maps of the lakes should be prepared prior to the netting so that each crew can record the location of all sets.

6. To insure daily sets being made for approximately the same number of hours in each lake, all crews should use the daily schedule of lifting all nets, working the fish and mending the nets where necessary before any of the nets are reset.

7. Scale samples should be taken from up to 50 of each species (all rough fish as well as all game fish), and individual lengths and weights should be taken from all fish captured.

8. Lakes should be compared on the basis of gill net ratios, percent composition of the catch and growth rates of species.

While the information gained from this proposed project may prove useful in developing immediate management measures, its main value will lie in the future when this project is repeated, as a basis for evaluating the various stocking ratios, and whatever other management measures have been instituted on these lakes. It is realized that in repeating this operation in another year, both weater and time of season may well impose their limitations on the comparisons of one lake between two years. However, it is felt that the comparison of the relation of one lake to another in one year, to that same relation in another year will not be so seriously affected by these limitations.

Summary:

1. One overnight set was made with four nets in Salmon on June 8, with three nets in Placid on June 9, with three nets in Seeley on June 10, with three nets in Inez on July 8, with three nets in Alva on July 9, and with one net in Alva on November 14.

2. The netting results are presented by species and totals as total catch, catch per net night, and percent composition of the catch. The lakes are further compared on the basis of percent rough and percent game fish in the net catches, anglers' catch per hour of game fish, and dates of survey.

3. Although the catches of various species was different even in lakes netted approximately at the same time, the percent rough to percent game fish varied mainly in relation to the time of survey. The present data is not extensive enough for detailed comparisons of the fish populations.

4. The planting program has been revised to concentrate planting effort on cutthroat yearlings at 200 per acre on Inez, and on cutthroat fry at 500 per acre on Alva. The Placid Lake Sportsmen's Club proposes to do rough fish control by trapping on that lake.

5. In order to evaluate these measures it is desirable to obtain the best possible population indices of the various species in these lakes at the present time. To eliminate the effect of weather and season on the comparison figures, it is proposed to net all five lakes at the same time.

6. Five survey crews are to be used for this project and the following recommendations are made to insure further uniformity of the data collected.

a. The present biological personnel who are familiar with lake survey methods are to be used.
b. The Minnesota figures for the number of gill net sets to be made in lakes of various sizes should be used to determine the set requirements on each lake.
c. Both deep and shallow water sets should be made just prior to the main netting program to determine the ratio of these two types of sets to be used.
d. All parts of the littoral zone should be sampled.
e. Outline maps should be furnished for recording the locations of all net sets.
f. The daily schedule of lifting nets, working fish, repairing nets, and resetting nets should be used by all crews.

g. Scale samples from up to 50 fish of each species, and individual lengths and weights from all fish caught should be taken.
h. Comparisons should be made on the basis of gill net ratios, percent composition of the catch and growth rates of species.

7. It is expected that the main value of the information gained from the recommended project would be in the future when the project is repeated as a basis for the evaluation of the management measures which may have been applied. While weather and season would affect comparison of one lake in two years, they would have far less effect on the comparison of the relation of one lake to another in one year, to that same relation in another year.

Data and Reports:

The original data and reports are with the project leader at Missoula. Duplicate file cards of the survey information taken will be filed at the Helena office.

Literature Cited:

Moyle, John B., Jerome H. Kuehn, and Charles R. Burrows
1950. Fish population and catch data from Minnesota lakes. Trans. Am. Fish. Soc., Vol. 78 (1948), pp. 163-175.

Prepared by A. N. Whitney Approved by

Date April 12, 1955