MONTANA FISH AND GAME DEPARTMENT

FISHERIES DIVISION

JOB PROGRESS REPORT

State: Montana Title: Southwestern Montana Fisheries Study

Project No.: F-9-R-21 Title: Inventory of Waters of the Project Area

Job No.: I-c

Project Period: July 1, 1972 - June 30, 1973

Report Period: January 1, 1972 - December 31, 1972

ABSTRACT

Trout populations were investigated in the Reichle Section of the Big Hole River, Poindexter and Alber's Slough and Pintlar Creek.

An intensive creel survey was conducted in the Sportsman Park section of the Big Hole River. Estimates of return to the creel of the annual plant of hatchery rainbow trout and the yield of game fish during the study period and a comparison of two methods used to estimate yield were the main resultant parameters.

Water temperature data were recorded at Reichle on the Big Hole River.

Staff gage measurements from March 26 to October 13 in Poindexter Slough were recorded.

The populations of eight high mountain lakes were investigated using gill nets.

BACKGROUND

Over 350,000 Montana fishing licenses were sold in 1972. The importance of proper fisheries management with increasing fishing pressure and decreasing fish habitat is paramount. Proper fisheries management can only result when adequate information of the resource is available to decision makers.

Inventory of waters is the best way to furnish data upon which management decisions can be made. In addition, inventories and surveys provide needed information for more properly placing values upon our fisheries resource. Proper management decisions and proper resource values are needed if future generations are to have quality sport fishing.

OBJECTIVES

The purpose of this job was to determine basic parameters of the surveyed waters so that better management decisions could be made.

PROCEDURES

Electrofishing gear with an output of 0-500 volts variable D.C. was utilized in censusing stream populations. The gear was fished from a fiberglas boat with a mobile positive electrode and a stationary negative electrode attached to the bottom of the boat. The captured fish were anethetized, measured, marked and released near their capture site.

Population estimates were computed using five computer programs and calculations were made using modifications of River Electrofishing and Fish Population Estimates (Vincent, 1971).

Experimental gill nets 125 feet long with graduated mesh sizes were used to sample lake populations.

Fishing intensity in the Sportsman Park Creel Census Study Area were estimated using "fishing intensity curves" (Peterson, 1970) and Neuhold and Lu's Creel Census Method (1957).

A Taylor seven-day recording thermograph was operated on the Big Hole River. The recording sheets were changed weekly and temperatures were recorded in Fahrenheit degrees.

FINDINGS

Streams

Spring and fall, 1972, trout populations were estimated for the 23,760 feet Reichle Section of the Big Hole River. Multiple mark and recovery runs were necessary for both periods. Floy anchor T-tags were placed in trout 9.0 inches and longer.

Water temperatures were recorded at Reichle from mid-March through late October, 1972.

An intensive creel survey was conducted in the 19 mile Sportsman Park study section from July 1, through August 31, 1972.

Trout populations in Alber's Slough, Pintlar Creek and Poindexter Slough were surveyed during 1972.

Flows in Poindexter Slough were measured using a staff gage from March 27 to October 13, 1972.

Big Hole River

Reichle Section: The Reichle Section was established in 1971 to obtain baseline trout population information downstream from the site of the proposed Reichle Dam. The section begins one and one-half miles downstream from the proposed dam site and about 20 miles downstream from the town of Melrose. The section is four and one-half miles in length and includes a variety of hydrologically different zones. The average width of the section, as determined from aerial photographs taken on July 19, 1968, was 148 feet.

The total estimated number of brown trout during March, 1972 sampling was 129.0/1000 feet (Table 1). The rainbow trout estimate for that period was 17.2/1000 feet

(Table 1). The weight estimates for brown and rainbow were 117.2 and 13.6 pounds/1000 feet, respectively (Table 1). Mean condition factors for brown and rainbow were 34.17 and 36.22, respectively (Table 1).

TABLE 1. Wild brown and rainbow trout population estimates per 1000 feet and condition factors for the Reichle Section (4½ miles) of the Big Hole River, March and Sept.-Oct., 1972. (80% confidence intervals in parentheses).

Period	Species of Trout	Length Interval (Inches)	Estimated Population /1000 feet	Estimated Weight /1000 feet	Condition Factor
March	Brown	6.7-12.2	61.0 (±16.5)	22.2 (±6.0)	33.53 (±4.42)
		12.3-15.1	28.5 (±5.4)	26.9 (±5.1)	35.16 (±4.08)
		15.2-18.4	32.4 (±5.2)	50.6 (±8.1)	34.13 (±3.42)
		18.5-25.9	7.1 (±3.3)	17.5 (±8.3)	33.04 (±3.80)
		Totals	129.0 (±18.4)	117.2 (±14.0)	34.17 (±3.95) 1/
March	Rainbow	8.0-19.9	17.2 (±8.5)	13.6 (±6.7)	36.22 (±4.83)
Sept.-Oct.	Brown	6.7-11.2	22.8 (±4.6)	7.5 (±1.4)	37.09 (±3.99)
		11.3-15.4	53.3 (±20.6)	51.7 (±20.0)	37.25 (±3.67)
		15.5-18.8	37.2 (±14.4)	69.5 (±26.8)	37.52 (±4.08)
		18.9-22.9	3.5 (±1.9)	10.7 (±5.6)	36.72 (±4.83)
		Totals	117.8 (±25.6)	139.4 (±34.0)	37.23 (±3.96)
Sept.-Oct.	Rainbow	7.1-18.0	14.8 (±7.2)	8.5 (±4.2)	38.50 (±3.97)

1/ Mean condition factor and its confidence interval.

The estimated number and weight of brown trout for the Sept.-Oct. sampling period was 117.8 and 139.4 pounds/1000 feet, respectively (Table 1). These compare to number and weight estimates of 120.3 and 112.4 pounds/1000 feet, respectively during a similar sampling period in 1971 (Peterson, 1973). A determination of significant differences between years will be made for next year's report.

The rainbow population number and weight estimates for the fall sampling period (Sept.-Oct.) were 14.8 and 8.5 pounds/1000 feet, respectively (Table 1). The mean condition factor for rainbow during that period was 38.50 (Table 1).

Brown trout length group intervals (Table 1) were based on length frequency distribution analyses. Scales were taken but "aging" was difficult to impossible due to the many "check marks" on the scales. A good length frequency "break" occurred at 12.2-12.3 inches for the March sampling distribution. Comparison of a few "good" scales and the length frequency distribution indicates that brown trout from 6.7-12.2 inches in the March sample were for the greater part age group II. Similar techniques and reasoning placed brown trout between 6.7-11.2 inches from the Sept.-Oct. samples in age group I.

The fishermen tag return rate from the 760 brown trout tagged in March was 3 percent (26 tag returns). The tag return rate from 36 tagged rainbow was 8 percent

(3 tag returns). The brown trout return rate was considerably below the return rates of brown trout in the Melrose section of the Big Hole River. The 1970 return rate from the 487 brown trout tagged in the Melrose Section during April, 1970, was 14 percent (Elser and Marcoux, 1972). This may indicate a much higher fishing intensity in the Melrose Section than in the Reichle Section.

Figure 1 shows the average five-day maximum and minimum temperatures from mid-March through late October, 1972, as recorded at the proposed Reichle Dam site. The highest temperature was recorded on August 8 and was 72° F. The lowest temperature (32° F) was recorded on two days, March 27 and 28.

The five-day average temperatures ending on May 17 through June 11 (Figure 1) were much higher than during the same period in 1971 (Peterson, 1973). These dates correspond to the period of the 1972 Big Hole River flood.

Sportsman Park Creel Census Study: This study was instituted for the primary purpose of evaluating the return to the creel of the annual plant of hatchery rainbow trout and the yield of game fish within the study section during the study period.

The study section contained 19 miles of the Big Hole River. The upper boundary of the section was the confluence of Mudd Creek, one-half mile upstream from the State Highway 43 bridge over the Big Hole. The lower boundary was the Dicky Bridge located 6 highway miles northwest of the town of Wise River.

Fishermen were censused two days per week beginning on July 1 and continuing through August 31. One weekday and one weekend-holiday were randomly selected for each week as census days.

The daily distribution of fishing intensity was determined by counting fishermen at 8 and 11 A.M. and 2, 5 and 8 P.M. The highway paralleled the stream at no greater distance than one-half mile making fishermen counts accurate and not greatly time consuming.

As many fishermen as practicable were interviewed each census day. Information collected from interviews included length of time fished, total number in the fishing party, methods of fishing and species, number, weight and total length of fish caught. All fish in the creel were measured to the nearest 0.1 inches, weighed to the nearest 0.01 pounds and checked for presence of anchor tags.

In June, 4989 hatchery rainbow trout were tagged in the Washoe Park Trout Hatchery at Anaconda. The total tagged represented 26.3 percent of the 18,978 planted in the study section during the study period. Numbered Floy anchor T-tags were used. A high rate of tag return was encouraged by placing tag return depositories at convenient car turnoffs along the highway. The depositories were located at the two ends of the study section and at Sportsman Park in the center of the study section.

Hatchery personnel began planting trout in the study section on July 3 and continued at intervals of about once a week through August 8. There was a total of eight planting sites in the study section and the majority were concentrated in high fishermen use areas.

Fishing intensity and total yield figures were calculated using two methods: 1) Total fisherman-hours during the study period was estimated by constructing "fishing intensity curves" as described in Peterson (1970). Total yield estimate was the product of total fisherman-hours thus estimated and the mean catch rate

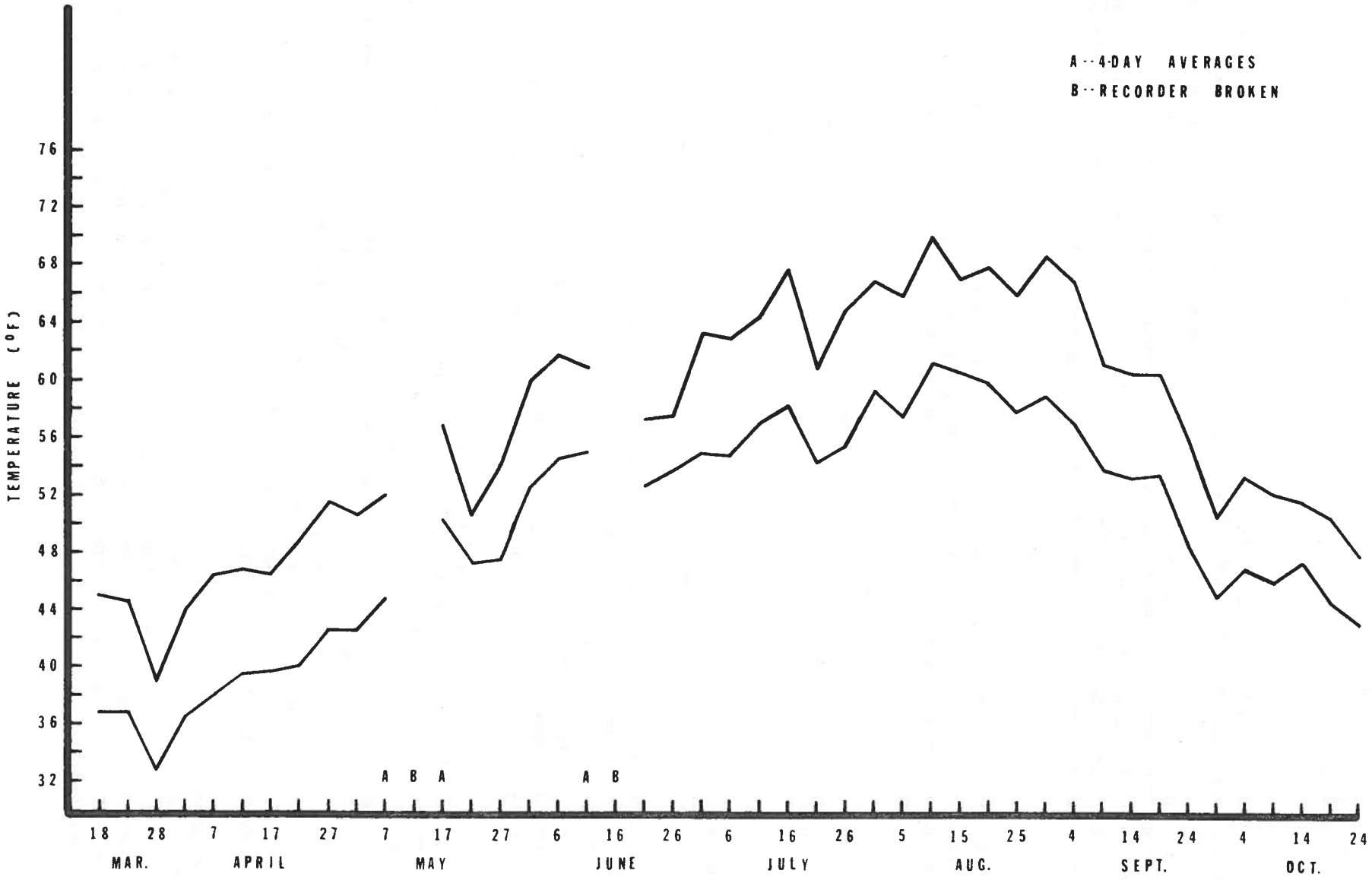

FIGURE 1. Average five-day maximum and minimum temperatures recorded at Reichle on the Big Hole River, 1972.

per hours. 2) Total fisherman-hours, rate of success (catch rate per hour) and total yield were estimated from 8:00 A.M. to 9:00 P.M. using Neuhold and Lu's Creel Census Method (1957). Total fisherman-hours prior to 8:00 A.M. were computed using fishing intensity curves.

Total game fish yields based on the use of fishing intensity curves and Neuhold and Lu's method vary by only 4.1 percent or the difference between 9,193 (Table 2) and 8,817 (Table 3). The difference is due to differences in estimations of fisherman-hours. Since the mean time of sundown during the study period was 9:06 P.M. and obviously fishing occurred for a short period after sundown, a small negative error would have been introduced into the estimate of fisherman-hours using the Creel Census Method after the last fishermen count at 9:00 P.M. Extrapolation for the period after 9:00 P.M. might have reduced or eliminated the 4.1 percent difference between the two methods.

TABLE 2. Estimates of total fisherman-hours, rates of success (in fish per hour) and yield in the creel census study section, July and August, 1972, using "fishing intensity curves" (Peterson, 1970).

	Fisherman-Hours	Rate of Success	Yield of Game Fish
Weekends-holidays	5,954	0.802	4,775
Weekdays	6,486	0.629	4,080
Weekends and weekdays combined	12,440	0.739	9,193

Compilation of data is much simpler and much less time consuming when using fishing pressure curves than when using Neuhold and Lu's Creel Census Method. However, the former is adequate only for elementary surveys where statistical refinements such as confidence limits are not required. For most management purposes, statistical refinements are needed and these require a method such as Neuhold and Lu's. The feasibility of using a computer to make the more involved analyses should be explored.

A comparison of 95 percent confidence intervals (Table 4) from estimates using Neuhold and Lu's method show 1) that a larger variance and, therefore, larger confidence intervals are associated with estimated rates of success than with estimated fisherman-hours and 2) that by combining weekend-holiday and weekday data, thereby increasing the weekly census day size to two, the confidence intervals are decreased dramatically. I feel the reasons for the larger variance in the rates of success are twofold: 1) the variance in fish per fisherman was high due to the multiple fishing limits (three) which increased the range in fish per fisherman and 2) the total number of fishermen interviewed was not sufficiently high enough for a multiple limit investigation and, therefore, for this study.

The confidence intervals of total fisherman-hours were small enough to indicate that five fishermen counts per day were sufficient. Of course, with greater fishing pressures and, therefore, larger variances during each count the confidence intervals would increase. Therefore, investigations with greater variances in fishermen counts may have to increase either the number of daily counts or the number of census days per week.

TABLE 3. Estimates of total fisherman-hours, rates of success (in fish per hour) and yield in the creel census study area. Estimates and 95 percent confidence intervals (in parentheses) for the period 8:00 A.M.-9:00 P.M. were computed using Neuhold and Lu's Creel Census Method (1957). "Fishing intensity curves" were used in estimates for the period 5:30-8:00 A.M.

	Fisherman Hours	Rate of Success	Yield of Game Fish
	8:00 A.M.-9:00 P.M.		
Weekends-holidays	5,434 (±961)	0.802 (±0.343)	4,358 (±2,010)
Weekdays	6,233 (±1,163)	0.629 (±0.235)	3,920 (±1,635)
Weekends and Weekdays combined	11,667 (±1,484)	0.739 (±0.188)	8,622 (±2,446)
	5:30 A.M.-8:00 A.M.		
Weekends and Weekdays combined	264 2/	0.739 3/	195
Totals	11,931	0.739	8,817

1/ Confidence intervals could not be estimated for the period 5:30-8:00 A.M. because no fishermen counts were made then. However, only 2.2 percent of fishing intensity was estimated for this period based on fishing intensity curve information. Therefore, the error introduced for this period prior to 8:00 A.M. would not appreciably affect overall estimates.

2/ Estimates of fisherman-hours were obtained using fishing intensity curves. I assumed that fishing pressure began at the mean sunrise time of 5:30 A.M. then increased curves in linear increments until the time of first fishermen count or 8:00 A.M.

3/ The catch rate was assumed to be the same before 8:00 A.M. as after since much of the creel census information includes data from dawn until 8:00 A.M.

TABLE 4. A comparison of 95 percent confidence intervals from Table 3 by percentages

	Fisherman Hours	Rate of Success	Yield of Game Fish
	8:00 A.M.-9:00 P.M.		
Weekends-holidays	± 17.7%	± 42.8%	± 46.1%
Weekdays	± 18.7%	± 37.4%	± 41.7%
Weekends and Weekdays combined	± 12.7%	± 25.4%	± 24.5%

Weekday and weekend data could be combined to decrease the confidence interval in this study because there was no significant difference between weekday and weekend catch rates.

In other investigations with multiple bag limits and similar fishing intensity, I recommend 1) that a sufficiently large enough number of fishermen be interviewed to decrease the variance in fish per fisherman and 2) that at least two days per week be censused and that weekday and weekend data be combined if this decreases the variances being computed.

For the purposes of this report, all estimates from this point on will be based on estimates using the Creel Census Method.

Based on creel interviews, an estimated 6,930 hatchery rainbow trout were taken during the study period and they comprised 78.6 percent of the game fish caught (Table 5). Hatchery trout were identified by the configuration of their fins and fin rays.

A total of 1,213 tags were returned to roadside depositories from hatchery fish caught during the study period. In other words, each returned tag equalled 5.71 hatchery fish creeled. A total of 99 tags were returned to roadside despositories from hatchery trout caught between the end of the study period (midnight August 31) and November 30, the end of the fishing season. Assuming that, as before, each of these tags represented 5.71 hatchery fish, the 99 tags represented an additional 565 hatchery fish. This added to 6,930 gives an estimated total of 7,495 hatchery fish caught from the time they were planted to the end of the fishing season. Which means that 39.5 percent of the 18,978 hatchery fish planted in the study area was creeled.

An additional 78 tags were returned via method other than roadside depositories making the tag return total during the entire fishing season 1,390 (27.9 percent of the 4,989 tagged in the hatchery in June). Tags were returned as follows: 94.4 percent to roadside depositories, 1.8 percent to the Washoe Park Trout Hatchery, 0.9 percent to sporting goods stores and 2.9 percent by mail to the Department field office in Dillon.

TABLE 5. Estimated yields of game fish by species[1/] in the creel census study area and during the study period. (Percents of catch in parentheses).

Rb-H	Rb-W	Eb	Gr	Ct	Wf
6,930 (78.6)	35 (0.4)	935 (10.6)	300 (3.4)	35 (0.4)	582 (6.6)

1/ Abbreviations: Rb-H = hatchery rainbow trout; Rb-W = wild rainbow trout; Eb = brook trout; Gr - Arctic grayling; Ct = cutthroat trout; Wf = mountain whitefish.

Poindexter Slough

Poindexter Slough is a meandering spring-fed stream located about three miles southwest of Dillon, Montana and totals about four miles in length. Fishing pressure is relatively high because of its reputation as an excellent fishing spot for brown and rainbow trout. Flows vary from about 30 to 100 cfs (Wipperman and Elser, 1968). A headgate, constructed in 1932 or 1933 (Peter W. Rebish, personal communication) by the Dillon Canal Company, regulates the major water supplier, the Beaverhead River, during the irrigation season (about May 1 to November 1, annually).

A "closed tile drainage system" was constructed in the headwater area during 1971 through a contract funded by the Bureau of Reclamation (described in Peterson, 1973). A resultant change in flow patterns and probably fish populations is expected.

Estimates of brown and rainbow trout populations for late April and early May, 1972, were made. The data are filed for inclusion in a future completion report.

Thirty-five staff gage measurements for the period March 26 to October 13, 1972, are shown in Figure 2. They ranged from 0.35 on March 26 and 30 to 2.46 on August 28. A calibration of the staff gage, located downstream from the old highway bridge, will be done during 1973 and 1974.

I recommend that trout populations and flows continue being monitored periodically to determine long-range effects of the "closed tile drain" upon these two parameters.

Alber's Slough

A 2,250 foot section of the stream was electrofished on May 8, 1972. A total of 11 brown and 6 brook trout as well as 139 mountain whitefish were taken. Because of low numbers of trout, an electrofishing recovery run was negated.

This stream had a reputation as an excellent trout fishing stream. The section electrofished appeared to have adequate overhanging streambank cover, good flows and good pool depths to support a much better trout population than was present. However, depth of silt on the bottom in pools ranged up to about 2 feet and would obviously depress trout production. Annual spring "flushing" of the silt from the stream during spring runoff no longer occurs and perhaps contributes to an unknown degree to the silt deposits. The landowner (Carl J. Meine, personal communication) stated that the populations of trout were excellent and that annual flushing did occur prior to construction of Clark Canyon Dam.

Pintlar Creek

A 1,200 foot section of this stream was electrofished for survey information on July 25. Nine brook and one rainbow trout were taken. A limited creel check upstream from Pintlar Falls and in Pintlar Wilderness indicated that rainbow and cutthroat-rainbow hybrids predominate in that section of stream.

Lakes

Experimental gill nets 125 feet long with graduated mesh sizes were set in eight high mountain lakes during 1972. The list of lakes and summarized data are presented in Table 6. These data give base-line information and future periodic checks of these lakes on a comparison basis should be made to aid future management decisions. No immediate changes in management of the lakes appear necessary.

RECOMMENDATIONS

In general, stream and lake inventories should be continued. The information collected is the basis for sport fisheries management in Montana and is a valuable aid in determining resource values when dealing with land and water development projects.

Specific recommendations, if any, are in the text under the headings of each water studied.

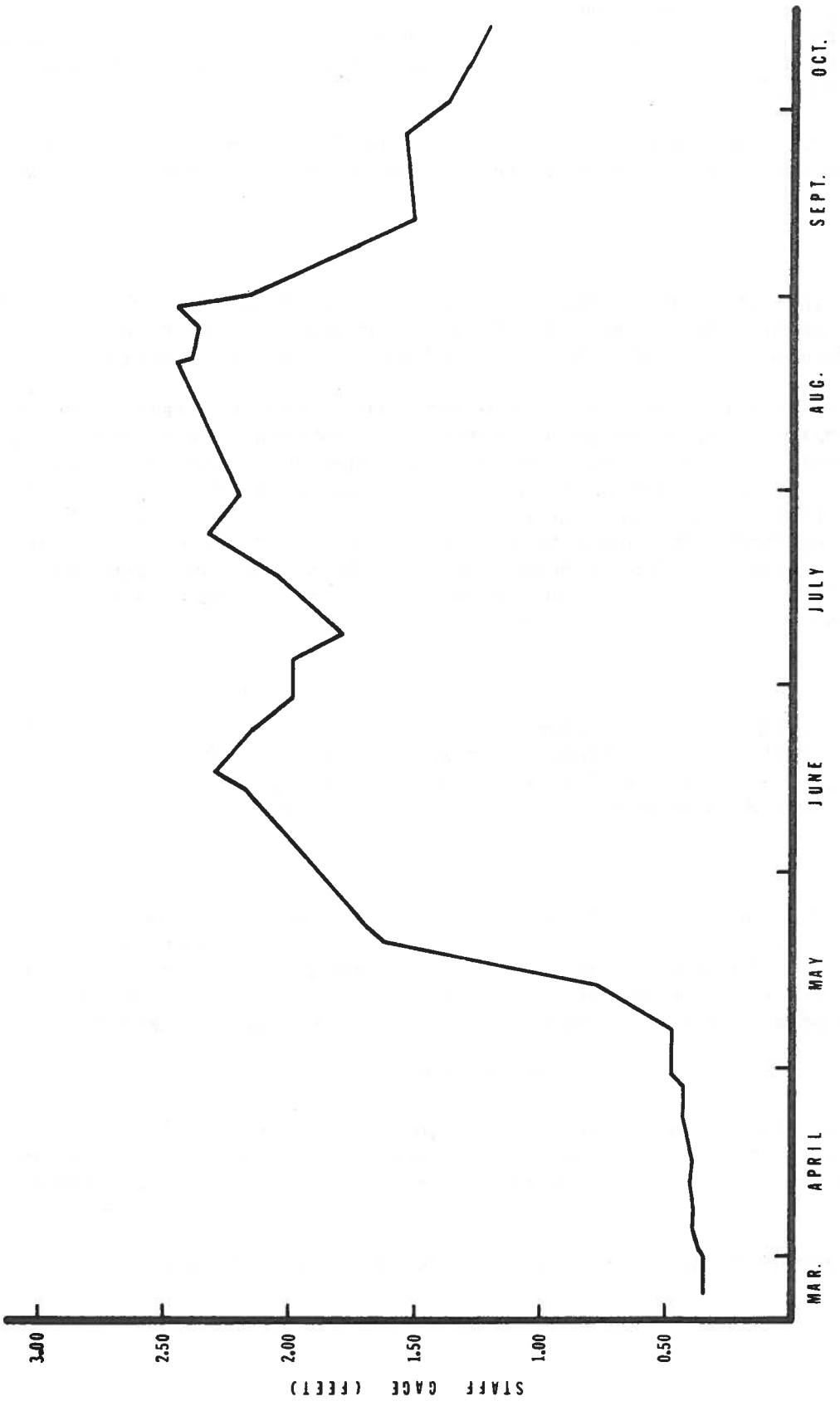

FIGURE 2. Staff gage readings on Poindexter Slough, March-October, 1972.

TABLE 6. Gill net data from lake surveys, 1972.

Lake (code number)	Type of set 1/	Number of sets	Species caught 2/	Number caught	Size range (inches)	Average length (inches	Average weight (pounds)
Elkhorn Lake (02-7760)	Floating	2	Ct	0	6.8-10.4	9.0	0.25
Hall Lake (02-8050)	Floating	2	Ct	12	8.6-9.8	9.1	0.28
Hopkins Lake (02-8175)	Floating	2	Ct	19	8.6-11.1	9.8	0.39
Rainbow Lake (02-8850)	Floating	2	Ct	3	12.6-13.5	13.0	0.82
Tahepia Lake (02-9250)	Floating	2	--	0 3/	-	-	-
Tendoy Lake (02-9275)	Floating	2	Ct	20	7.0-10.7	9.2	0.28
Torrey Lake (02-9350)	Floating	2	Ct	2	8.5-9.3	8.9	0.23
Waukena Lake (02-9625)	Floating	2	Ct	1	16.1	16.1	1.74

1/ 125-foot standard experimental gill nets consisting of five 25-foot panels of 3/4, 1, 1 1/4, 1 1/2 and 2-inch square mesh netting.

2/ Ct = cutthroat trout.

3/ No fish caught, however, a few fish were observed.

LITERATURE CITED

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Prepared by Norman W. Peterson

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Waters referred to:

Alber's Slough	01-9110
Big Hole River, Sec. 1	02-0425
Big Hole River, Sec. 2	02-0450
Pintlar Creek	02-4550
Poindexter Slough	01-9320
Elkhorn Lake	02-7760
Hall Lake	02-8050
Hopkins Lake	02-8175
Rainbow Lake	02-8850
Tahepia Lake	02-9250
Tendoy Lake	02-9275
Torrey Lake	02-9350
Waukena Lake	02-9625