MONTANA FISH AND GAME DEPARTMENT
FISHERIES DIVISION
HELENA, MONTANA

JOB COMPLETION REPORT
RESEARCH PROJECT SEGMENT

State of Montana

Project No. F-5-R-13 Name Central Montana Fisheries Study

Job No. I Title Inventory of Waters of the Project Area

Period Covered: July 1, 1963 - June 30, 1964

Abstract:

Experimental gill nets, electrofishing apparatus and hook and line were employed to sample fish populations. Areas sampled were Lebo Reservoir, Bean Lake, Tenderfoot Creek, Middle Fork Dearborn River, Sheep Creek, Missouri River and some of its tributaries.

In Lebo Reservoir few trout were obtained, but black crappie and white suckers appeared to be abundant. Gill net catches in Bean Lake produced only longnose suckers; none under 14 inches in length. In the Middle Fork Dearborn River and Tenderfoot Creek, large numbers of trout and whitefish were taken by electrofishing 300-foot sections of stream. Few suckers were collected in either stream in relation to the numbers of trout. The stream improvement section in Sheep Creek was shocked, and the results compared to those obtained in 1960 and 1962. Rainbow trout over 5 inches in length showed an upward trend in numbers since 1960, but the average weight dropped in 1963. Mountain whitefish and suckers 5 inches in length or over increased in number since 1960. Scale collections were made for age and growth studies of sauger and goldeye.

Recommendations:

Only through a continual study of an area's resources, whether physical or biological, can man attain a sound management program, therefore, it is recommended this inventory of waters be continued.

Objectives:

The purpose of this investigation is to determine the physical, chemical and biological characteristics of the waters of highest importance to the recreational fisheries of the project area.

Techniques Used:

Fish populations were sampled with nylon, graduated-mesh, gill nets 125-150 feet in length, or electrofishing gear consisting of a 110-220-volt alternating-current generator and block nets. The block nets were affixed at each end of a 300-foot section of stream prior to shocking. All fish except Cottus sp. were weighed and measured. Fish taken by electrofishing were anesthetized with a solution of MS-222 and then released following weighing, measuring and scale collecting. Some fish were collected with hook and line.

Findings:

Lebo Reservoir

Lebo Reservoir, located in Wheatland County, contains approximately 215 surface acres. Prior to chemical treatment in October 25, 1963, two experimental gill nets were set August 25, 1963. Each net was set for four hours. At the end of this period 2 rainbow trout, 1 bluegill, 14 black crappie and 45 white suckers were taken. While the nets were set 6 black crappie were caught with hook and line. The average length and weight of these fish are given in Table 1.

Table 1. Experimental gill net catches from Lebo Reservoir August 25, 1963

Species	Number	Average total length	Average weight
Rainbow trout	2	17.1	1.76
Bluegill	1	9.0	.55
Black crappie	20 a/	7.0	.21
White sucker	45	12.3	.89

a/ Six were caught with hook and line.

Bean Lake

Bean Lake is located approximately 15 miles south of Augusta in Lewis and Clark County. It is a natural lake containing 200 surface acres. February 6, 1964, 15-17 acres of access were acquired by the Montana Fish and Game Department.

Bean Lake was last planted in 1957, and according to Mr. Wallace Bean a ditch had broken a few years ago and suckers had entered the lake. Two gill nets were set February 13-14, 1964 for 24 hours (Table 2). Only 15 longnose suckers were netted; none under 14 inches in length. Two gill nets were set February 18-20, 1964 for 48 hours, but only two longnose suckers about 16 inches in length were obtained. Through holes cut through the ice one could observe numerous corixids, Cyclops with egg sacs and Daphnia.

Table 2. Experimental gill net catches in Bean Lake February 13-14, 1964

Species	Total length	Weight	Age [a]
Longnose sucker	14.2	1.26	5
	14.3	1.43	5
	15.1	1.51	5
	15.3	1.92	5
	15.8	1.85	4
	15.8	1.89	6
	16.0	1.73	8
	16.0	1.84	8
	16.0	1.90	6
	16.1	1.96	6
	16.5	2.08	5
	16.7	1.98	5
	17.4	2.29	6
	18.6	3.14	9
Average	16.0	1.91	
Number	14	14	

a/ Fish scales were first read by Ed Nevala and then by Steve Swedberg.

Tenderfoot Creek

Tenderfoot Creek is a tributary to Smith River located in Meagher County. A 300-foot section, located about 100 yards above the mouth of Miners Creek, was electrofished August 15, 1963. Fish were numerous in this 300-foot section, as revealed by Table 3. A total of 157 trout, 32 mountain whitefish and 30 suckers were collected.

Table 3. Electrofishing results from a 300-foot section of Tenderfoot Creek, August 15, 1963

Species	Number	Combined weight	Length range	Average length	Number 7 inches and longer
Rainbow trout (grand total)	153	-	1.8-11.5	6.8	41
Rainbow trout (random sample)	30	5.63	3.3-11.5	7.6	21
Brook trout	4	-	5.3-10.1	7.2	2
Mountain whitefish (grand total)	32	-	9.5-12.6	11.2	32
Mountain whitefish (random sample)	19	9.82	9.5-12.6	11.3	19
Mountain sucker	26	-	5.1- 8.4	6.8	10
White sucker	4	-	10.9-15.8	12.6	4

Middle Fork Dearborn River

The Middle Fork of the Dearborn River is a small stream, about 15-foot in width, located in Lewis and Clark County. Two 300-foot sections were electrofished August 21, 1963, near the Ingersall Ranch west of Bowman's Corner. The stream in this area has excellent brush cover above and in the water, with good holes and undercut banks. The results of electrofishing the two sections are presented in Table 4. A total of 286 trout and one longnose sucker were collected.

Table 4. Electrofishing results from two-300-foot sections (combined) of the Middle Fork Dearborn River, near Ingersall Ranch, August 21, 1963

Species	Number	Combined weight	Length range	Average length	Number 7 inches and longer
Rainbow trout	133	21.62	1.7-12.8	6.9	73
Brook trout	153	16.16	2.6-12.0	6.1	40
Longnose sucker	1	.02	-	3.4	-

Sheep Creek

Sheep Creek is a tributary to Smith River located in Meagher County. In cooperation with the U. S. Forest Service the Montana Fish and Game Department maintains a stream improvement area on Sheep Creek. The stream improvements were completed about August 22, 1961. This area is about two miles upstream from the mouth of Moose Creek. Small log dams have been installed diagonally the full width of the stream. These dams were spaced at 100-foot intervals. The dams cause turbulence between pools and runs, and also provide some cover for fish. Large boulders were placed between the dams to provide additional cover for trout. Willows were planted along the stream bank. This study is an assessment of these structures' ability to increase numbers and sizes of desirable fish. Table 5 shows the results of electrofishing this section in 1960, 1962 and 1963, although the collection dates are not the same. Briefly, numbers of rainbow trout 5 inches and longer increased since 1960, but their average weight decreased in 1963. Numbers of brook trout collected during these periods fluctuated little in number but their combined weight did fluctuate. Mountain whitefish and suckers 5 inches and longer increased in numbers since 1960.

Missouri River and Tributaries

Scale samples collected from sauger and goldeye have been mounted on acetate strips, prepartory to age and growth analysis. Bill Hill, graduate student in fisheries at Montana State College, Bozeman, is collecting goldeye for an age and growth study. Mr. Hill is concentrating his collections in the Teton River and Fort Peck areas, although, some investigations have been conducted in the Missouri River between Loma and Robinson Bridge, in the vicinity of Malta.

Prepared by: Steve E. Swedberg

Approved by: George D. Holton

Date: June 12, 1964

Table 5. Electrofishing results from the stream improvement section on Sheep Creek, Meagher County [a/]

Species	September 30, 1960				July 17, 1962				November 8, 1963			
	No.	Average length	Average weight	Combined weight	No.	Average length	Average weight	Combined weight	No.	Average length	Average weight	Combined weight
Rainbow trout	41	7.7	.19	7.83	62	7.7	.23	14.04	83	7.0	.14	12.00
Cutthroat trout	2	6.8	.10	.20	-	-	-	-	-	-	-	-
Brook trout	13	6.5	.11	1.41	12	7.1	.17	2.09	10	6.7	.10	1.01
Mountain whitefish	16	8.2	.19	3.10	153	8.7	.25	37.50	83	9.6	.27	22.11
Longnose sucker	0	-	-	0	40	8.8	.27	10.89	70	9.5	.33	23.13
White sucker	0	-	-	0	20	9.2	.33	6.69	13	10.4	.48	6.26

[a/] Fish under 5 inches long were not used in totals.

MONTANA FISH AND GAME DEPARTMENT
FISHERIES DIVISION
HELENA, MONTANA

JOB COMPLETION REPORT
RESEARCH PROJECT SEGMENT

State of Montana

Project No. F-5-R-13 Name Central Montana Fisheries Study

Job No. II Title Evaluation of Fish Habitat Destruction in Little Prickly Pear Creek due to Construction of Interstate Highway 15

Period Covered: July 1, 1963 to June 30, 1964

Abstract:

Preconstruction measurements of trout habitat characteristics were completed. Temperature, water quality and quantity, bottom fauna and fish were sampled at several stations on Little Prickly Pear Creek. Analysis of data consisted of presenting material by tabular, graphic and other methods. The U. S. Geological Survey collected and analyzed the water quality and quantity information, other data were collected and presented by fisheries personnel. Similar analyses will be performed in 1965.

Recommendations:

It is recommended this study be continued. Construction of Interstate Highway 15 has not been completed within the study area.

Objectives:

The purpose of this investigation is to determine the extent of trout habitat destruction caused by construction of Interstate Highway 15 along Little Prickly Pear Creek and obtain information concerning its effect on the fish and aquatic insect populations.

Techniques Used:

Measurements of trout habitat characteristics consisted of obtaining the following stream data: Average width and depth, length of pools, runs and riffles, number, size and type of pools, shade cover above surface of water, number of stream channel alterations, and extent of rip-rapping and diking. From some of these measurements, totals, per cents, and averages were derived; thereby, classifying the characteristics of Little Prickly Pear Creek prior to construction of Interstate Highway 15.

Measurements were begun at the railroad bridge (near railroad tunnel) located approximately 1½-road miles below Sieben Ranch. Measurements terminated 350 feet below Turtle Rock, located approximately 3/4-road miles below the town of Wolf Creek. Each railroad bridge, or similar structure, was designated A, B, C, etc., beginning with the railroad bridge previously mentioned, below Sieben Ranch. These structures were, and will be, used as reference points during measurement.

Temperature, water quality and quantity, bottom fauna and fish were collected by the following methods: Temperatures were recorded with two Minicorders. One recorder was installed above construction activities at Sieben Ranch, and the other beneath State Highway Bridge 287 at Wolf Creek (Figure 1). Water quality and quantity samples were collected and analyzed by personnel from the U. S. Geological Survey-Water Resources Division. Water analysis consisted of determining:

(A) Mean discharge (cfs)

(B) Suspended sediment:
   a. Mean concentration (ppm)
   b. Tons per day, but totaled for each month

The U. S. Geological Survey collected water data at 5 stations located from Sieben Ranch downstream to the town of Wolf Creek. Bottom fauna were collected with a Surber sampler utilizing a 1-square foot frame. Three 4-square foot samples were taken at each of 5 stations (A, B, C, D, E, Figure 1). Organisms were identified to order. Fish were collected at 5 stations (2-4 and 6, Figure 1) with a 110-220-volt alternating-current generator. Due to highway construction fish collecting sections 1 and 5 became, or were, turbid during the period of electrofishing the other sections; therefore, section 1 was only partially sampled and section 5 was not sampled. Section 2a is not an annual sampling station and was not sampled.

Each station was divided into a, b, c, and d, subdivisions, with each subdivision 150 feet in length. Blocknets were affixed at each end of a section just prior to electrofishing. Numbers, weights, lengths, and scale samples were taken from fish that had been anesthetized with MS-222 (Cottus sp. were not accounted for, although abundant).

Data is presented in tabular and graphic forms. Comparisons or detailed analysis will not be made at this time because highway construction along Little Prickly Pear Creek is not completed. A similar survey is planned for 1965.

Findings:

Stream Measurements

A total of 10.95 miles of stream were measured along Little Prickly Pear Creek. The average width and depth of the stream was 31.5 feet and 11.7 inches, respectively. The average width is based on three measurements equally spaced in each 100 feet of stream. Three depths were measured across the stream each time the width was measured as a basis for average depth. Linear measurements were divided into length of pools, runs and riffles. There were approximately 2.2 miles of pool, 4 miles of run and 4.7 miles of riffle (Table 1). Pools were classified according to their number, size and type (Table 1). The actual number of pools enumerated were 341. The number of runs and riffles were not counted, but were measured in the same manner as pools. Size of pools (not shown in Table 1) were described as:

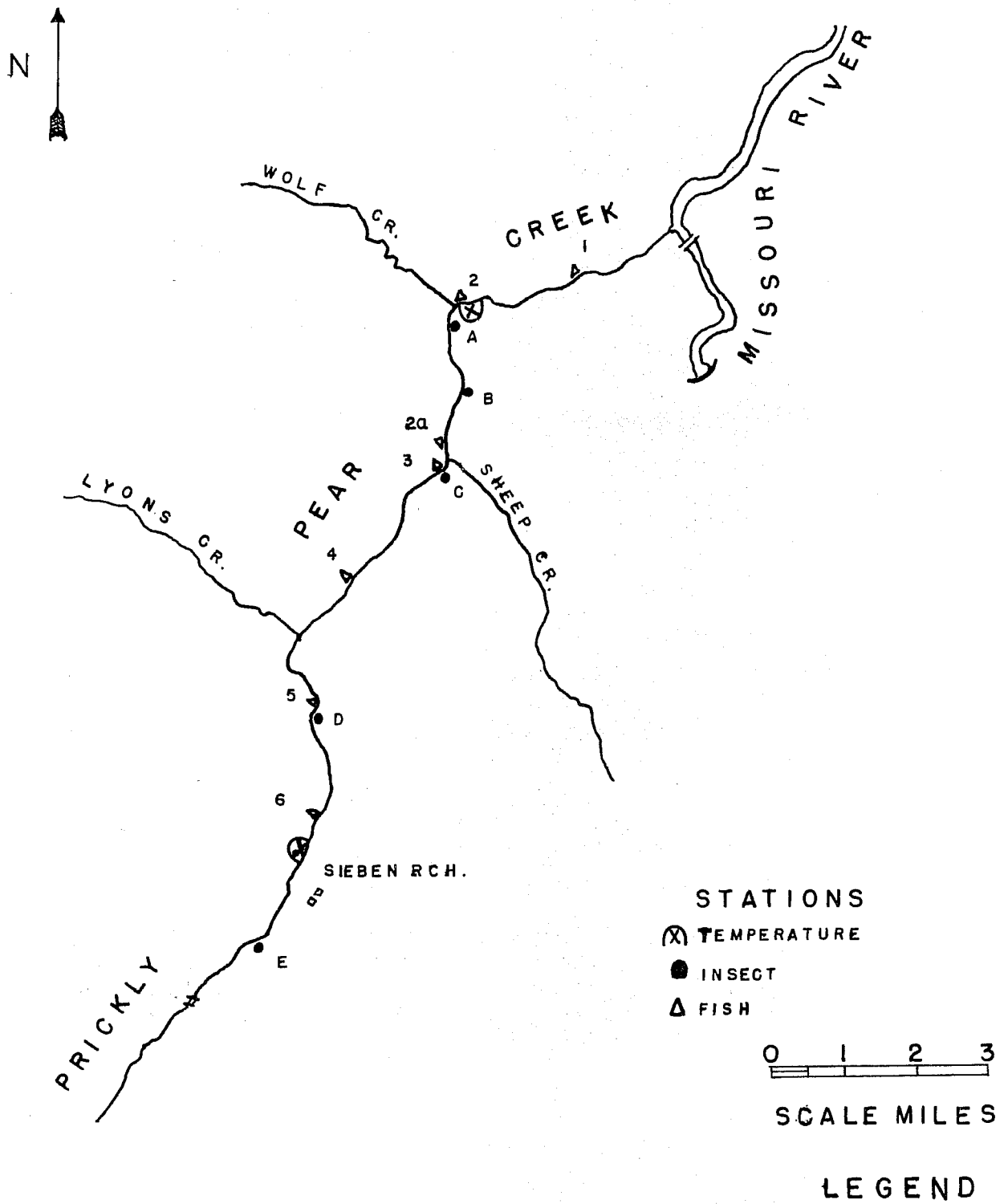

N
WOLF CR.
CREEK
MISSOURI RIVER
1
2
A
B
2a
3
C
LYONS CR.
PEAR
SHEEP CR.
4
5
D
6
SIEBEN RCH.
E
PRICKLY
STATIONS
TEMPERATURE
INSECT
FISH
0 1 2 3
SCALE MILES
LEGEND

Figure 1. Map

(1) Pools having an average width or length much greater than the width of the stream; there were 38 pools in this group.

(2) Pools having a width or length equal to the width of the stream; there were 96 pools in this group.

(3) Pools much narrower or shorter than stream width; there were 207 pools in this group.

Type of pools and shade cover above surface of water are given in Table 1. The number of stream alterations prior to construction of Interstate Highway 15 were 56. Alterations consisted of rip-rapping and diking, and amounted to approximately 2.5 stream miles. Total alterations were broken down into:

(A) Total highway rip-rap: 26 alterations; 6,105 feet

(B) Total highway diking: 1 alteration; 400 feet

(C) Total railroad rip-rap: 28 alterations; 6,840 feet

(D) Total urban rip-rap: 1 alteration; 20 feet

Temperature

Two Minicorders were installed in Little Prickly Pear Creek in 1963; one was located at Sieben Ranch and the other at Wolf Creek. The recorders plotted temperatures for 7 to 14 day periods. When recorder sheets were changed, both air and water temperatures were taken with a thermometer. Any necessary adjustments in the operation of the Minicorder were made at this time. Daily temperatures are presented in Figures 2 and 3, with means for each monthly series included.

Water Analysis

Water quality and quantity information was collected by U. S. Geological Survey personnel at 5 stations located from Sieben Ranch downstream to the town of Wolf Creek. Suspended sediment data (tons per month) and total mean discharge (cfs) are presented in Table 2, and suspended sediment (mean concentration - ppm) is described graphically in Figure 4.

Bottom Fauna

Bottom fauna were collected with a Surber sampler having a 1-square foot frame. Three 4-square foot samples were taken at each of 5 stations. Table 3 summarizes this data by order and numbers of organisms.

Fish

Four stations were sampled completely in 1963. Section 1 was only partially sampled, due to an influx of turbid water, but data from those fish that were shocked were included in Table 4. Section 5 was not electrofished. Chart 1 presents percentage diagrams of fish collected by number and weight. Age and growth of fish collected in 1963 are depicted in Table 5 (the scales read were from a sub-sample).

Prepared by: Steve E. Swedberg and Ed Nevala

Approved by: George D. Holton

Date: December 11, 1964

Table 1. Measurement of trout habitat characteristics on 10.95 miles of Little Prickly Pear Creek, Lewis and Clark County, Montana 1962 and 1963

	Average width	Average depth	Length of pools	Length of runs	Length of riffles	Number of pools	Pools No. Type a/	Shade cover above surface of water No. Type b/	Riprapping and diking (56 alterations)
			2.164 (miles)	4.034 (miles)	4.749 (miles)	341	85-(1) 147-(2) 109-(3)	24-(1) 245-(2) 291-(3)	2.531 (miles)
			11,424 (feet)	21,299 (feet)	25,077 (feet)			18-(4)	13,365 (feet)
Per cent of total			19.8	36.8	43.4				
Average	31.5 (feet)	11.7 (inches)	40.5 (feet)	52.1 (feet)	55.6 (feet)				

a/ Type of pools, 1, 2, 3, in parentheses, were graded as:

(1)-Good-Deep (2 feet or more), exposed pools containing an abundance of aquatic plants harbouring a rich fauna; or deep pools with abundant shelter (overhanging banks, logs, roots, large boulders) much drift or detritus, shaded by forest canopy or shrubs.
(2)-Fair-Pools intermediate in depth, shelter, plant abundance, etc.
(3)-Poor-Shallow exposed pools without shelter and without plants; scouring basins.

b/ Shade cover about surface of water, 1, 2, 3, 4, in parentheses, were evaluated as:

(1)-Dense-Over-hanging brush and trees.
(2)-Medium-Partly shaded if approximately half of the water is shaded.
(3)-Light-Some shade--small clumps of bushes, logs, etc., over-hanging at waters edge.
(4)-No cover.

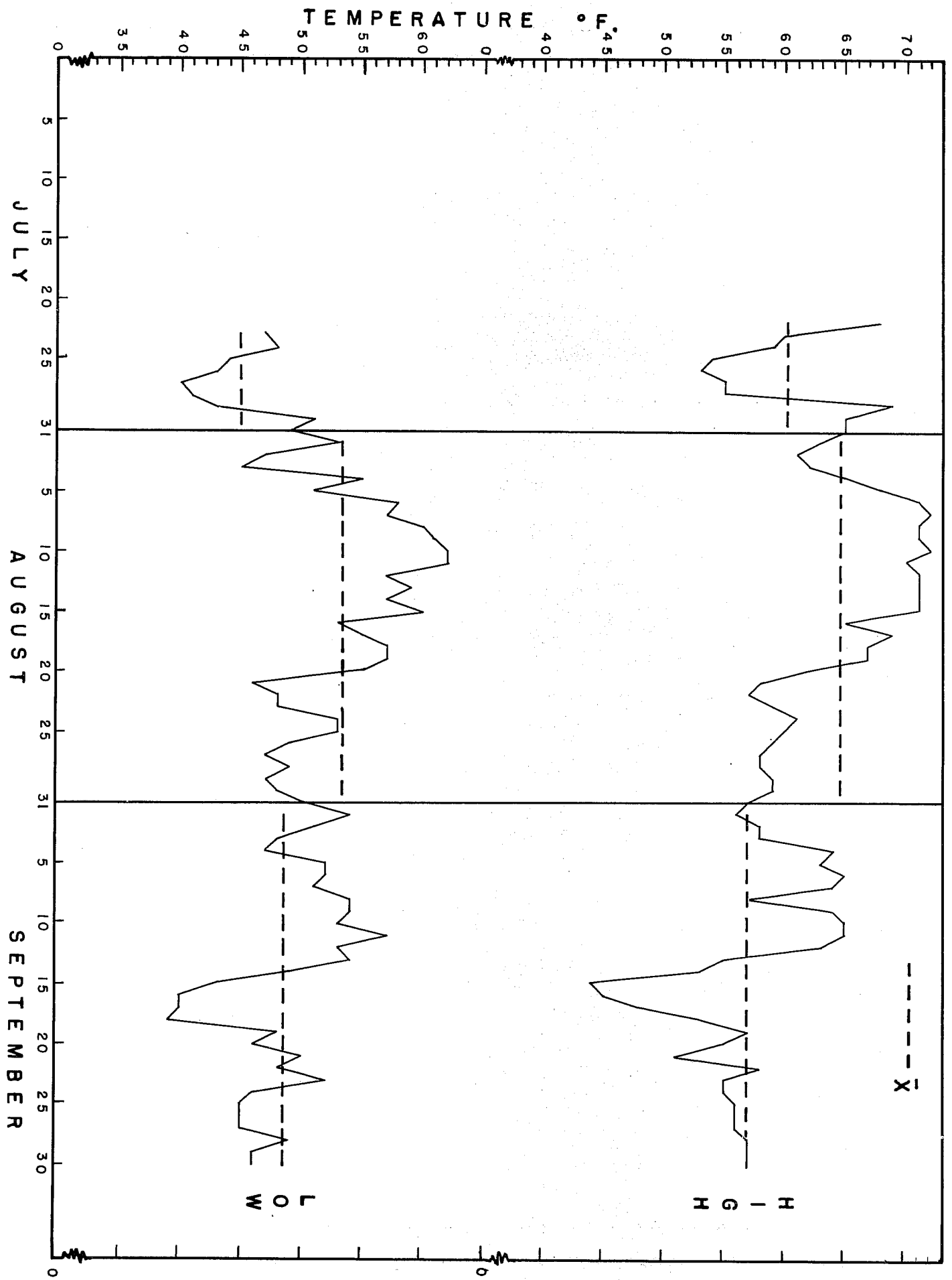


Figure 2. Temperature Sieben

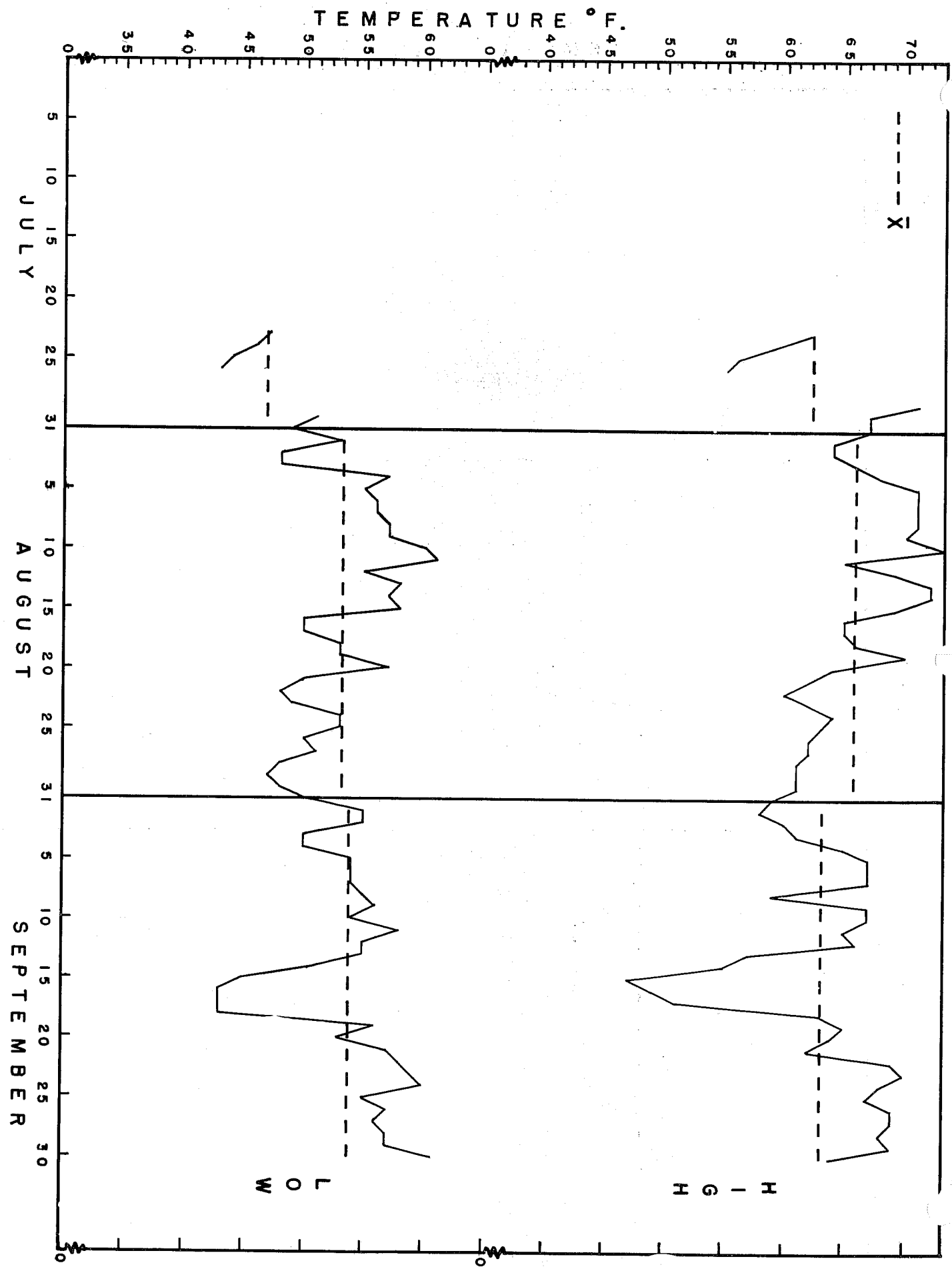


Figure 3. Temperature Wolf Creek

Table 2. Little Prickly Pear Creek at Sieben Ranch and Wolf Creek, Montana, suspended sediment, October 1962 to September 1963 1/

Station	Month	Total mean discharge (cfs)	Suspended sediment (tons per month)
Sieben Ranch	October	1,026	80.0
	November	1,078	54.0
	December	998	157.0
	January	739	100.0
	February	1,588	472.0
	March	1,271	55.0
	April	1,855	150.0
	May	2,176	216.0
	June	1,262	69.0
	July	702	22.0
	August	356.6	12.0
	September	746	32.0
Total for period		13,797.6	1,419.0
Wolf Creek	October	1,757	31.0
	November	1,869	43.0
	December	1,629	28.0
	January	1,060	29.0
	February	2,838	790.0
	March	1,835	201.0
	April	2,549	495.0
	May	3,853	806.0
	June	2,871	122.0
	July	1,639	24.0
	August	783	29.0
	September	1,067	95.0
Total for period		23,750	2,693.0

1/ Source: United States Department of Interior Geological Survey-Water Resources Division.

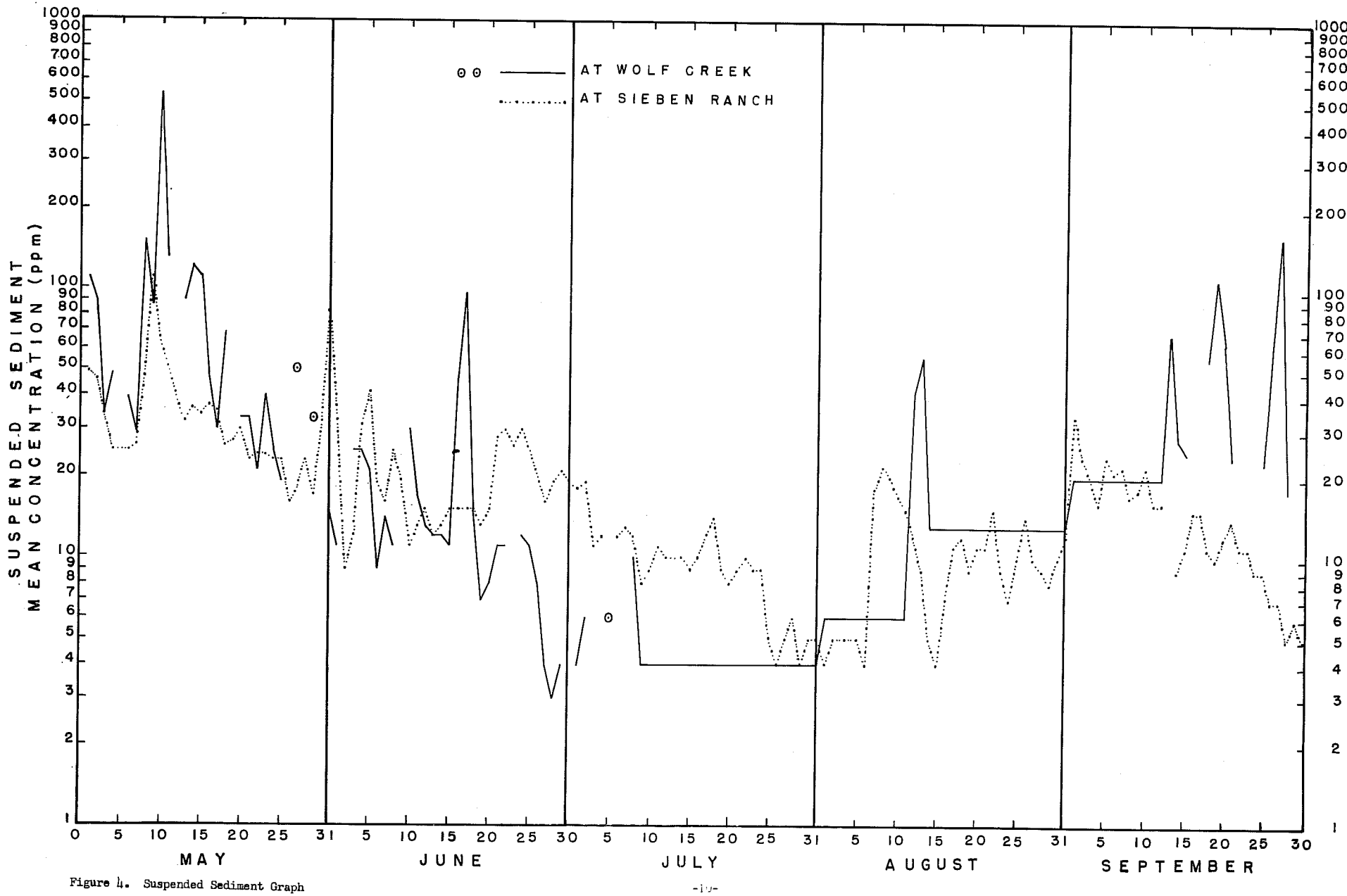


Figure 4. Suspended Sediment Graph

Table 3. Summarization of bottom fauna samples collected in 1963 in Little Prickly Pear Creek

Station	Date	Average number of organisms per square foot							
		Ephemeroptera	Plecoptera	Trichoptera	Coleoptera	Diptera	Oligochaeta	Gastropoda	Total Numbers
I	7- 1-63	27.5	1.5	37.3	11.0	3.8	1.2	-.-	82.3
I	9-19-63	15.6	4.0	241.4	22.8	3.2	.5	5.4	292.9
II	7- 1-63	36.2	2.3	25.9	7.4	3.8	.5	-.-	76.1
II	9-19-63	9.6	1.6	172.1	26.3	2.0	-.-	9.6	222.8
III	6-28-63	26.2	1.5	38.3	6.8	5.9	.3	.2	79.2
III	9-19-63	9.6	1.0	34.7	14.2	6.9	.1	7.0	73.5
IV	6-28-63	13.0	.6	6.6	7.2	4.3	.8	-.-	32.5
IV	9-18-63	25.8	4.7	55.1	21.1	.3	.1	.2	107.2
V	6-27-63	41.4	1.3	43.6	16.2	7.5	.5	.6	111.0
V	9-18-63	34.6	12.2	306.8	33.7	8.8	.8	16.8	413.7

Table 4. Electrofishing data collected at five stations in Little Prickly Pear Creek in August 9, 20, 22, 23, 1963 1/ 2/

	Species			
	Rainbow Trout		Brown Trout	
Figure	Total length	Total weight	Total length	Total weight
Total	1,441.5	31.83	1,601.5	73.82
Number	235	231	183	183
Average	6.1	.14	8.8	.40
	Brook Trout		Mountain Whitefish	
Total	142.0	3.66	79.9	5.04
Number	19	19	7	7
Average	7.5	.19	11.4	.72
	Longnose Sucker		White Sucker	
Total	438.1	24.00	41.7	1.03
Number	56	56	7	7
Average	7.8	.43	6.0	.15

1/ Does not include age class 0 + fish (rainbow trout: 173; brown trout: 38; brook trout: 1) which were not weighed or measured.

2/ Section 1 was only partially shocked, due to an influx of turbid water, but data was included in Table.

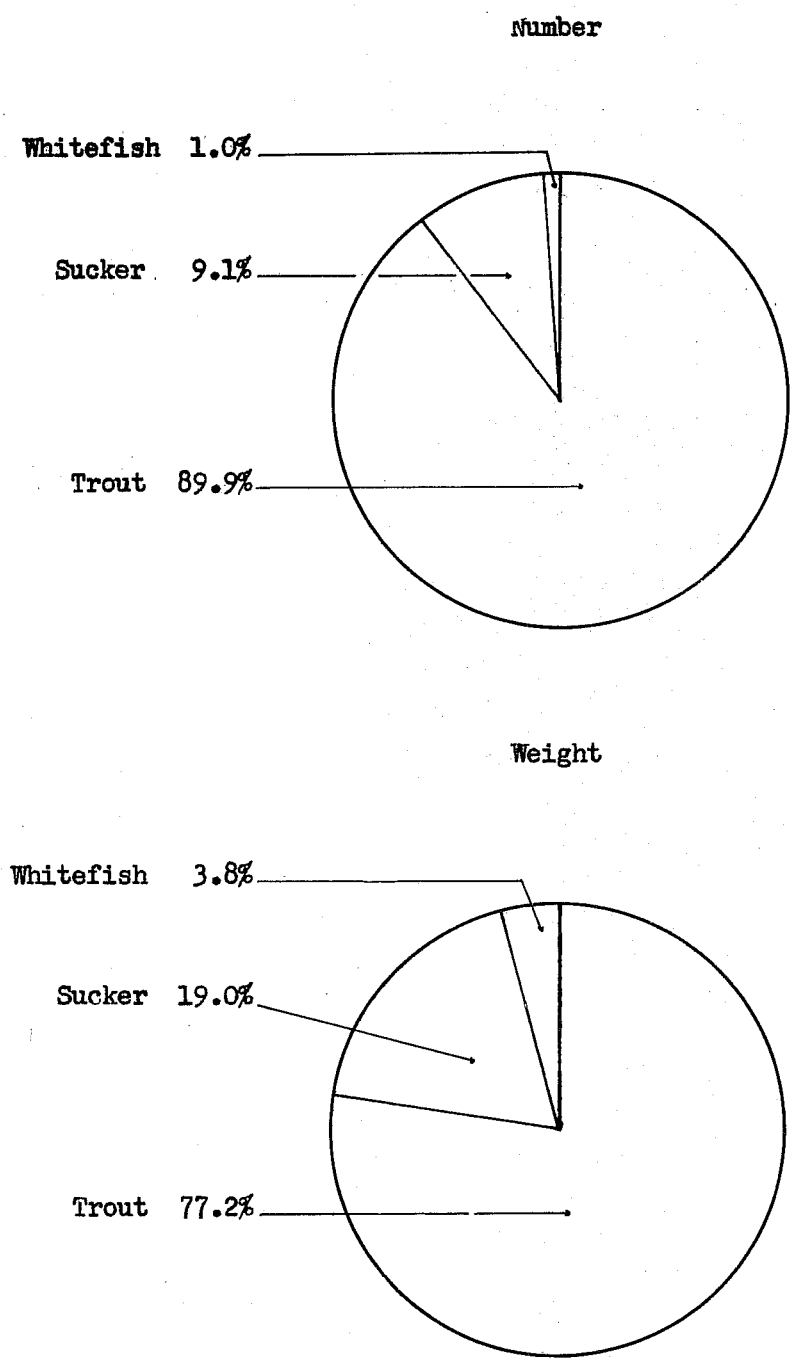


Chart 1. Percentage composition by number and weight of trout (rainbow, brown and brook), suckers (white and longnose), and mountain whitefish collected in electrofishing sections II-IV and VI of Little Prickly Pear Creek, August 1963.

Table 5. Age and growth studies. A sub-sample of fish collected in Little Prickly Pear Creek in August 9, 20, 22 and 23, 1963.

Species	I	II	III	IV	V	VI
Rainbow trout *Salmo gairdneri*	2.8(82)[1/]	6.5(26)	9.1(7)	11.7(3)		
Increment (Inches):		3.7	2.6	2.6		
Brown trout *Salmo trutta*	3.1(94)	7.7(42)	11.3(16)	13.4(12)	16.3(2)	
Increment (Inches):		4.6	3.6	2.1	2.9	
Mountain whitefish *Prosopium williamsoni*	3.4(6)	7.3(5)	10.0(4)	11.6(3)	12.3(2)	12.9(1)
Increment (Inches):		3.9	2.7	1.6	.7	.6
					VII	VIII
					14.1(1)	14.9(1)
					1.2	.8
Longnose sucker *Catostomus catostomus*	1.3(55)	3.3(35)	5.5(20)	8.1(15)	10.9(12)	13.3(10)
Increment (Inches):		2.0	2.2	2.6	2.8	2.4
			VII	VIII	IV	X
			14.7(9)	15.6(5)	16.7(3)	17.1(1)
			1.4	.9	1.1	.4
White sucker *Catostomus commersoni*	1.0(6)	3.0(4)	6.2(1)			
Increment (Inches):		2.0	3.2			

1/ Numbers in parentheses designate the number of fish used to calculate the average total length at each year class.

MONTANA FISH AND GAME DEPARTMENT
FISHERIES DIVISION
HELENA, MONTANA

JOB COMPLETION REPORT
RESEARCH PROJECT SEGMENT

State of Montana

Project No. F-5-R-13 Name Central Montana Fisheries Study

Job No. III Title Investigation of Previously Rehabilitated Waters with Regard to Fish Growth, and Optimum Planting Time and Numbers to Use in the Initial and Successive Plants

Period Covered: July 1, 1963 to June 30, 1964

Abstract:

The fish populations of Ackley, Eureka, Willow Creek, Bynum and Martinsdale Reservoirs were sampled during the report period. Rainbow trout taken by gill netting Ackley Lake were under 14 inches in total length. Large numbers of suckers and the presence of carp indicate that Ackley Lake should be rehabilitated. Growth rates of rainbow trout and angler success were good in Eureka, Willow Creek and Bynum Reservoirs. Rainbow trout taken in Martinsdale Reservoir were under 12 inches in total length. A high stocking rate, the presence of non-game species, and extreme fluctuation of water levels could have reduced the available food supply in Martinsdale Reservoir.

Recommendations:

It is recommended that this study be discontinued. Guide lines for management of these reservoirs have been presented in this report. Adherence to these guide lines should be reflected in satisfactory trout growth and catch rates.

Objectives:

The purpose of this investigation was to evaluate the success of rehabilitation projects throughout the area, with regard to fish growth and completeness of rough fish eradication. Also, to investigate the most satisfactory planting time, size, and fish numbers to use in the initial and successive plants.

Techniques Used:

Prior to this report period fish samples were obtained through the use of angler creel census, experimental gill nets 125-foot in length and with the aid of a bag seine. During this report period specimens were collected with 125-foot experimental gill nets, by hook and line, and by dip net. Bottom sets were made with experimental gill nets. A dip net was used to collect dead or dying fish from Martinsdale Reservoir. All fish planted in Ackley Lake since 1960 were fin-clipped.

Findings:

Five reservoirs, fed by irrigation waters and runoff, were sampled during the report period, they were: Ackley Lake, Eureka, Willow Creek, Bynum and Martinsdale Reservoirs. Each rehabilitated reservoir will be reported on separately.

ACKLEY LAKE

Ackley Lake, located in Judith Basin County, comprises about 247 surface acres, and was rehabilitated in 1958. Except for trout plants in April and September 1959, all plants of trout were fin-clipped. Data describing each plant were covered by Swedberg (1963). In January 1964 two gill nets were set overnight for a total of 41 hours. Three rainbow trout and 140 suckers were taken. In April 1964 two gill nets were set overnight for a total of 30 hours. Thirty-two rainbow trout, 120 suckers, 5 carp, 1 whitefish and 1 lake chub were taken. Gill net catches of rainbow trout for January and April 1964 have been combined and presented in Table 1 (all rainbow trout were under 14 inches in total length).

Table 1. Rainbow trout gill netted in Ackley Lake in January and April 1964.

Date planted	Mark	No. caught	Ave. total length (inches)	Aver. weight (hundredth of a pound)
May 1960	Right pectoral	1	11.8	0.47
June 1961	Adipose	4	13.0	0.66
May 1962	Anal	9	12.2	0.59
July 1962	Left pectoral	2	10.4	0.44
-- --	None	19	10.5	0.41

EUREKA RESERVOIR

Eureka Reservoir contains approximately 423 surface acres, and is located in Teton County. 1/ The reservoir was rehabilitated October 19, 1960, and the first plants of rainbow trout were introduced in April 1961. In February 1964 two gill nets were set overnight for a total of 47 hours. Thirty-five rainbow trout, 1 brook trout and 99 suckers were taken. The catch of rainbow trout in 1964 is included in Table 2, which shows the growth rates of rainbow trout planted from 1961 through 1963.

Table 2. Growth of rainbow trout planted in Eureka Reservoir.

Date planted and size	No. planted per surface acre	Date sampled Mo.	Yr.	No. sampled	Aver. total length (inches)	Aver. weight	Aver. gain/mo. Length	Weight
4/61-3"	452	2	62	20	12.4	0.92	0.94	0.09
		5	62	19	15.3	1.56	0.95	0.12
		3	63	21	18.6	2.36	0.68	0.10
		2	64	4	19.1	2.63	0.47	0.08
6/62-4"	252	3	63	49	9.5	0.30	0.61	0.03
		2	64	6	15.7	1.36	0.58	0.07
5/63-3"	298	2	64	25	9.8	0.34	0.76	0.04

WILLOW CREEK RESERVOIR

Willow Creek Reservoir is located in Lewis and Clark County, near the town of Augusta, and comprises 1,420 surface acres when full. 2/ The reservoir was rehabilitated in September 1959, and the first rainbow trout were planted on April 29, 1960. On January 31, 1964 two gill nets were set during the day for a total of 8½ hours. Two large rainbow trout were gill netted and two small rainbow trout were caught by hook and line. On March 20, 1964 three gill nets were set during the day for a total of 18 hours. Twelve rainbow trout were gill netted. This information is presented in Table 3, which shows the growth rates of rainbow trout planted from 1960 through 1963. Fifty-three suckers were taken in gill nets in 1964.

1/ The completion report for F-5-R-12, Job III, gave the surface acreage as 367 acres; this has been revised.

2/ The completion report for F-5-R-12, Job III, gave the surface acreage as 662 acres; this has been revised.

Table 3. Growth of rainbow trout planted in Willow Creek Reservoir.

Date planted and size	No. planted per surface acre	Date sampled Mo.	Yr.	No. sampled	Aver. total length (inches)	Aver. weight	Aver. gain/mo. Length	Weight
4&5/60-3"	167.8	2	61	9	12.8	0.87	1.03	0.09
		6	61	20	15.9	2.02	0.96	0.15
		2	62	1	17.1	1.86	0.66	0.09
		4	62	7	18.9	2.79	0.68	0.12
		11	62	1	21.7	4.75	0.60	0.15
4&5/61-3"	134.7	4	62	1	16.2	1.36	1.15	0.12
		11	62	1	17.3	2.35	0.77	0.13
		1	64	2	21.4	3.84	0.57	0.12
		3	64	1	21.2	4.30	0.53	0.12
5/63-3"	257.0	1	64	2	10.0	0.36	0.87	0.04
		3	64	11	10.0	0.36	0.70	0.03

BYNUM RESERVOIR

Bynum Reservoir is located in Teton County. When the reservoir is full it contains approximately 3,300 surface acres. Bynum was rehabilitated in October 1961. In February 1964 one gill net was set overnight for 24 hours. Thirty-five rainbow trout and three suckers were taken. The catch of rainbow trout in 1964 is presented in Table 4, which shows the growth rates of rainbow trout planted in 1962-63.

Table 4. Growth of rainbow trout planted in Bynum Reservoir.

Date planted and size	No. planted per surface acre	Date sampled Mo.	Yr.	No. sampled	Aver. total length (inches)	Aver. weight	Aver. gain/mo. Length	Weight
6/62-4"	221	11	62	14	10.2	0.87	1.03	0.09
		8	63	7	14.4	1.17	0.74	0.08
		2	64	20	16.4	1.93	0.62	0.10
5/63-3"	54.6	8	63	2	8.7	0.23	1.90	0.07
		2	64	15	12.0	0.86	1.01	0.09

MARTINSDALE RESERVOIR

Martinsdale Reservoir is located in Meagher and Wheatland Counties near the town of Martinsdale. When the reservoir is full it contains 1,005 surface acres or 23,185 acre feet. The reservoir was rehabilitated in September 1961. Plants in 1962 consisted of rainbow and cutthroat trout. Plants of rainbow were made in May, June and July, and cutthroat were planted in September. In 1963 only rainbow trout were planted, and these were planted in April, May, August and September. The number of trout planted in 1962-63 amounted to 716.8 trout per surface acre, or 31.1 trout per acre-foot. On February 28, 1963 the reservoir contained 8,693 acre feet. This represented a 62.5 per cent draw down from the level of the reservoir when full. On July 31, 1963 the reservoir contained 16,782 acre feet, and by August 31, 1963 the reservoir contained 9,371 acre feet (a drop in volume of 44.2 per cent in a period of one month!). In January 1964 the reservoir contained 8,233 acre feet. In early 1964 fishermen and local residents of Martinsdale reported that the trout were in poor condition. In March 1964 two gill nets were set overnight for a total of 50 hours. Thirty rainbow trout, 1 brown trout and 48 suckers were taken in the gill nets. The trout averaged 10.3 inches in total length and weighed 0.31 of a pound. The trout varied in total length between 8.0 and 11.5 inches. In early June 1964 a die-off was reported to be occurring. On June 15 and 16, 1964 the situation was investigated. At various locations around the margin of the reservoir 100-foot sections were paced off and the dead or dying fish enumerated. In 1,400 yards of shoreline 726 rainbow trout, two small brown trout, and 11 suckers were either dead or showed signs of distress. Some trout and suckers were badly decomposed. Eleven dead rainbow trout were weighed and measured, averaging 10.2 inches in total length and 0.32 of a pound in weight. All rainbow trout observed on June 15 and 16, 1964 were estimated to be between eight and 11½-inches in total length. On June 23, 1964 rainbow trout were still dying in the reservoir, and 30 rainbow trout were collected for laboratory analysis.

Discussion:

The completeness of rough fish eradication within the five reservoirs was considered to have been sufficient for management purposes. Since these impoundments are fed primarily by irrigation diversion, rough fish were expected to be present either when the reservoirs were refilled or soon after the impoundments detoxified. The management plan is to give the introduced trout population the benefit of rehabilitation--little competition for the available food supply.

Proper planting time is based on the abundance and availability of food organisms and management objectives. It is very difficult to follow the growth rate of each plant if several plants are made at different times during the year, and the plants are not marked.

The desirable sizes of fish to plant depends on whether the reservoir has in the past year been rehabilitated, and the sizes available at the hatchery. This study indicates that 2-5-inch rainbow trout do well in initial and successive plants, when stocking

rates are not excessive, water levels remain fairly stable and rough fish are not abundant.

The numbers of fish to plant depends on the present and predicted surface acreage, the average yearly level of draw down, available food supply and numbers available at the hatchery.

All of the factors investigated are interrelated, making the management of these waters very complex.

Rainbow trout taken in Ackley Lake were under 14 inches in total length. Large numbers of suckers and the presence of carp indicate that Ackley Lake should be rehabilitated. Growth rates of rainbow trout, and angler success (reported by wardens and fishermen), were good in Eureka, Willow Creek and Bynum Reservoirs. Rainbow trout measured and weighed from Martinsdale Reservoir were under 12 inches in total length. A high stocking rate, the presence of non-game species, and extreme fluctuation of water levels could have reduced the available food supply in Martinsdale Reservoir. Below are several suggestions for management of these reservoirs.

GUIDE LINES FOR RESERVOIR MANAGEMENT

1. For each reservoir, study the history of water draw down. Then compute an average yearly level of draw down. After rehabilitation adjust plants on the basis of average draw down.

2. Plants should be made in the following manner:

   a. In the initial plants, after rehabilitation, stock 2-5-inch trout in May and June; not spread out over the summer months.

   b. Yearly plants after the initial plant should take into consideration the fishing pressure, the growth and catch rate of initial plant, the sucker-trout ratio and numbers of other species present, and the outlook for the water year and irrigation demand.

References Cited:

Swedberg, Steve E.
1963. Investigation of previously rehabilitated waters with regard to fish growth and optimum size to use in successive plants. Central Montana Fisheries Study. Montana Fish and Game Department, Completion Report for Dingell-Johnson Project F-5-R-12, Job III, 9 p. (mimeo).

Prepared by Steve E. Swedberg Approved by George D Holton

Date May 4, 1965

MONTANA FISH AND GAME DEPARTMENT
FISHERIES DIVISION
HELENA, MONTANA

JOB COMPLETION REPORT
RESEARCH PROJECT SEGMENT

State of Montana

Project No. F-5-R-13 Name Central Montana Fisheries Study

Job No. IV Title Evaluation of Planting Catchable Sized Rainbow Trout into Waters Containing High Population Densities of Less Desirable Species of Fish

Period Covered: July 1, 1963 to June 30, 1964

Abstract:

A creel census study on Lake Francis, and the Tiber Reservoir-Marias River areas, was initiated in the summer of 1963. Both tagged and fin-clipped rainbow trout were released. Because of extremely low water and too few fishermen, the Lake Francis study was discontinued shortly after initiation. The study in the Tiber area indicated that yellow perch dominated the catch in Tiber Reservoir, with few trout being caught. The Tiber Dam to Sanford Park area, on the Marias River, was the most popular fishing area within the study complex. Of all species caught, rainbow trout provided the most fish to the creel in this area. Few fishermen were checked in the vicinity of Pugsley's Bridge, and no trout were checked in the vicinity of the Middle Bridge. A total of 1,203 fishermen were recorded as having fished in the Tiber study area between July 9, 1963 and June 30, 1964. The total catch of rainbow trout, both marked and unmarked, was 771. Of these 771 rainbow trout 83.0 per cent were marked fish.

Recommendations:

Creel census and mark-returns indicated that the area between Tiber Dam and Sanford Park was the most important fishing area. Therefore, annual plans for the Tiber area should include two plants of rainbow trout, one in May and the other in July. Two to four thousand catchable-sized fish at each planting should satisfy angler demand. Fish planted in Tiber Reservoir should be at least five inches long to minimize depredation by yellow perch.

Since project objectives were met, it is recommended that the study be discontinued as a separate project. Additional returns of marked fish could be reported under the Inventory of Waters Project, Job No. I, F-5-R-14.

Objectives:

The primary objective was to find out how many of the tagged and fin-clipped trout released would be caught by the angler. An additional objective was to see if a fishery could be provided to satisfy the demand expressed by anglers and

other interested persons in the Valier area near Lake Francis, and the Chester-Shelby areas near Tiber Reservoir. The data collected should reveal whether the continuance of such a stocking program is good economic management.

Techniques Used:

Lake Francis, near the town of Valier, Pondera County; Tiber Reservoir in Liberty and Toole Counties; and the Marias River below Tiber Dam, primarily in Liberty and Hill Counties, were stocked with "graded" rainbow trout. These waters already contained high densities of fish of several different species.

Plans for the recovery of marked fish included a summer employee, thirty-two days of warden assistance, and fishermen returns by mail. Any further checks were to be made with gill nets.

Plants of marked fish introduced into Lake Francis, Tiber Reservoir and Marias River are presented in Table 1.

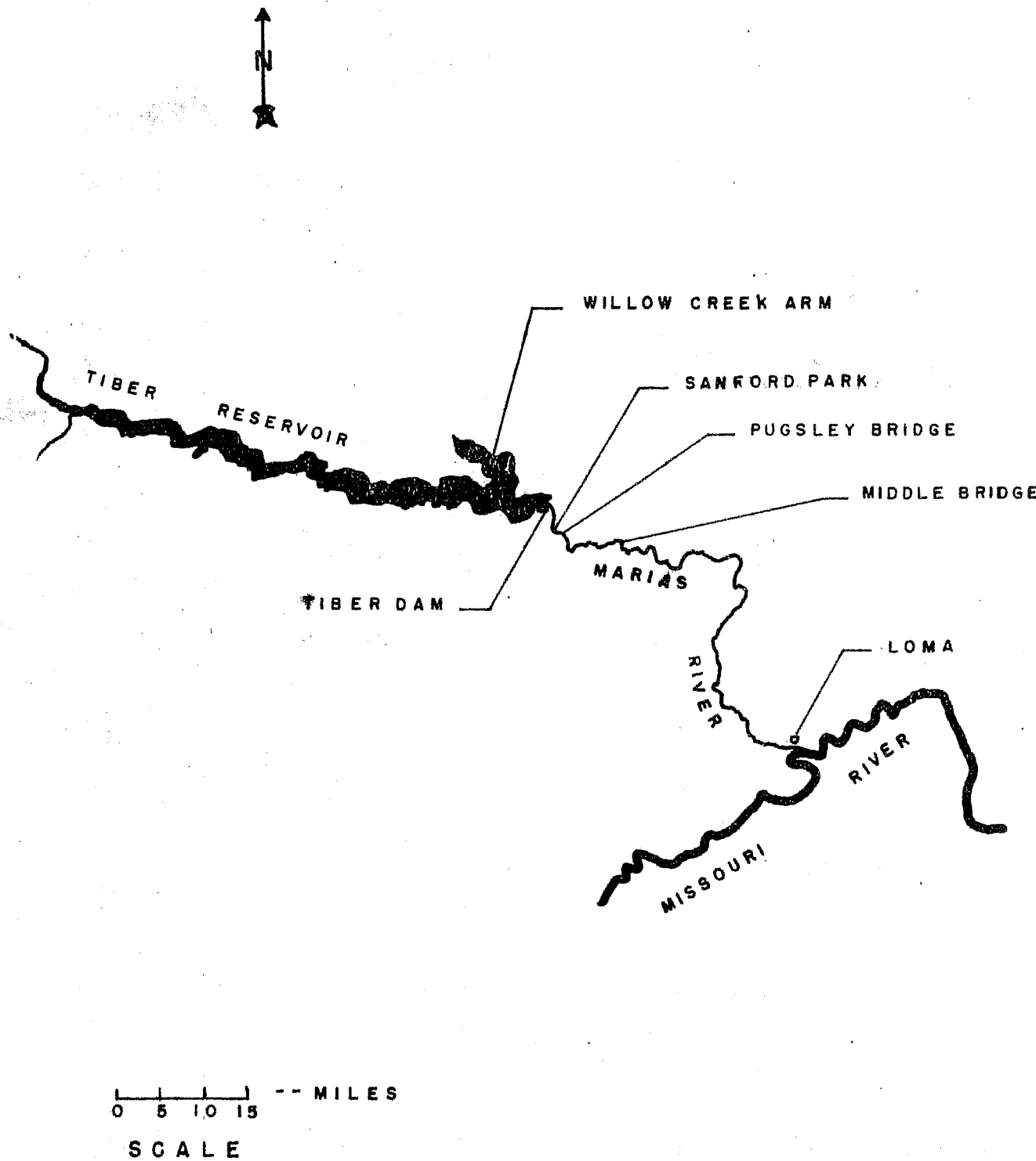
Table 1. Plants of jaw-tagged and fin-clipped rainbow trout.

		Rainbow trout		
Date released	Location	Number	Average length in inches	Mark
July 9, 1963	Lake Francis	3,060	10	Plastic jaw tag
July 8, 10, 12, 1963	Tiber Reservoir (Willow Creek Arm)	9,636	10	Plastic jaw tag
July 12, 1963	Tiber Reservoir (Willow Creek Arm)	10,000	5	Right pelvic fin clipped
July 12, and 15, 1963	Marias River below Tiber Dam a/	4,640	10	Left pelvic fin clipped

a/ The loads were split, approximately 3,190 were planted just below the outlet down to Sanford Park. The other 1,450 were placed just above Pugsley's Bridge.

For the purpose of creel census Willow Creek Arm was treated separately from the main body of Tiber Reservoir. This arm had heavy angler use in the past years, and had received most of the marked fish (Figure 1). Area two included the remainder of Tiber Reservoir. The Marias River from Tiber Dam downstream to Sanford Park was the third area. Area four included the Marias River in the vicinity of the first bridge, or Pugsley's Bridge, located about 4-miles below Tiber Dam. The fifth area of creel census covered that area in the vicinity of the second bridge, or the Middle Bridge, located about 12 miles below Tiber Dam on the Marias River.

Not all of the fish checked were weighed and measured by the census taker. The data from fish that were weighed and measured are presented in Table 8. In this table, fish from Willow Creek Arm and the remainder of Tiber Reservoir were combined. Other parts of Table 8 include only those areas and species of fish where samples were taken in sufficient quantity to be meaningful.


N
WILLOW CREEK ARM
SANFORD PARK
PUGSLEY BRIDGE
MIDDLE BRIDGE
TIBER RESERVOIR
TIBER DAM
MARIAS
RIVER
LOMA
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0 5 10 15
-- MILES
SCALE

Findings:

Lake Francis

Due to a very low water level in Lake Francis only 3,060 jaw-tagged rainbow trout were released. From July 9, 1963 through June 30, 1964 only 38 tags had been returned by 15 anglers; with two anglers taking 20 of the 38 tags on one trip. Limited creel census indicated that even on week-ends the fishing pressure was low. Therefore this phase of the study was discontinued.

The Tiber Area

Information from other areas of creel census have been accumulated in tabular form. Tables 2 through 6 cover the individual areas, and this information is summarized in Table 7.

Table 2. Creel census--Willow Creek Arm of Tiber Reservoir, July 9-September 2, 1963.

Angler data		Fish data		
		Species	Number	Catch-per-hour
Number of fishermen:	240	Rainbow (unmarked)	34	.04
Hours of creel check:	77.5	Rainbow (marked)	5	.01
Fishermen hours:	943	Yellow perch	1,443	1.53
Total fish caught:	1,824	White sucker	85	.09
Total catch-per-hour:	1.9	Chub	256	.27
		Mountain whitefish	1	.001

Table 3. Creel census--Tiber Reservoir (Exclusive of Willow Creek Arm), July 12-September 2, 1963.

Angler data		Fish data		
		Species	Number	Catch-per-hour
Number of fishermen:	183	Rainbow (unmarked)	24	.07
Hours of creel check:	37.5	Rainbow (marked)	14	.04
Fishermen hours:	333	Yellow perch	197	.59
Total fish caught:	421	White sucker	13	.04
Total catch-per-hour:	1.3	Chub	173	.52

Table 4. Creel census--Marias River (Tiber Dam to Sanford Park), July 12-September 2, 1963.

Angler data		Fish data		
		Species	Number	Catch-per-hour
Number of Fishermen:	636	Rainbow (unmarked)	11	.01
Hours of creel check:	134.5	Rainbow (marked)	463	.31
Fishermen hours:	1,473	White sucker	26	.02
Total fish caught:	1,008	Sauger	127	.09
Total catch-per-hour:	.68	Goldeye	339	.23
		Carp	39	.03
		Northern pike	1	.001
		Buffalo	2	.001

Table 5. Creel census--Marias River (Vicinity of Pugsley Bridge), July 13-September 2, 1963.

Angler data		Fish data		
		Species	Number	Catch-per-hour
Number of fishermen:	28	Rainbow (unmarked)	6	.08
Hours of creel check:	20	Rainbow (marked)	33	.45
Fishermen hours:	74	Sauger	1	.01
Total fish caught:	48	Goldeye	1	.01
Total catch-per-hour:	.65	Carp	7	.09

Table 6. Creel census--Marias River (Vicinity of Middle Bridge), July 13-September 2, 1963.

Angler data		Fish data		
		Species	Number	Catch-per-hour
Number of fishermen:	44	Rainbow trout	0	0
Hours of creel check:	59.5	Sauger	11	.16
Fishermen hours:	69	Goldeye	440	6.38
Total fish caught:	456	Carp	3	.04
Total catch-per-hour:	6.61	Shovelnose sturgeon	2	.03

Table 7. Creel census--All areas within the Tiber study area combined, July 9-September 2, 1963.

Angler data		Fish data			
		Species	Number	Per cent of total catch	Catch-per-hour
Number of fishermen:	1,131	Rainbow (unmarked)	75	2.0	.03
Hours of creel check:	329	Rainbow (marked)	515	13.7	.18
Fishermen hours:	2,892	Yellow perch	1,640	43.7	.57
Total fish caught:	3,757	White sucker	124	3.3	.04
Total catch-per-hour:	1.3	Chub	429	11.4	.15
		Sauger	139	3.7	.05
		Goldeye	780	20.8	.27
		Carp	49	1.3	.02
		Northern pike	1	.03	.0003
		Buffalo	2	.05	.001
		Mountain whitefish	1	.03	.0003
		Shovelnose sturgeon	2	.05	.001

The total number of marked rainbow trout checked from July 9, through September 2, 1963 was 515. This number of marked trout amounted to 13.7 per cent of the total catch. The catch-per-hour for marked rainbow trout was .18 (Table 7). Yellow perch made up the largest percentage of fish checked, 43.7 per cent; with 1,640 perch caught at a catch-per-hour of .57. The number and per cent composition of catch for goldeye was 780 fish and 20.8 per cent. Other species of fish checked are presented in Table 7.

The creel census taker weighed, measured and took scale samples from several species of fish censused in the Tiber area (Table 8). He also recorded the following marked rainbow trout: 15 jaw-tagged; 331 fin-clipped; and 169 marked, but undifferentiated as to the type of mark.

Returns from fishermen by mail indicated that an additional 72 fishermen fished between July 9, 1963 and June 30, 1964. These anglers returned 123 jaw-tags, and reported that 2-fin-clipped and 56 unmarked rainbow trout were taken.

The overall catch of marked and unmarked rainbow trout is given in Table 9. A total of 1,203 fishermen were recorded as having fished in the Tiber study area between July 9, 1963 and June 30, 1964. Of a total catch of 771 rainbow trout (marked and unmarked), 83.0 per cent were marked fish.

Table 8. Length and weight of some fish collected during creel census, July 9-September 2, 1963.

Location	Species	Number	Length-range total length in inches	Average length	Total weight in hundredths of a pound	Average weight
Above Tiber Dam	Rainbow trout	65	8.3-23.5	14.1	43.37 a/	.79
	Yellow perch	1,008	2.5-11.8	7.7	205.15	.20
	White sucker	25	7.7-16.1	10.6	10.48	.42
Marias River between Tiber Dam and Sanford Park	Rainbow trout	312	7.4-21.2	10.1	122.54	.39
	Sauger b/	107 c/	10.8-23.6	14.0	69.87	.65
Marias River-vicinity of Pugsley Bridge	Rainbow trout	25	9.8-15.5	11.1	13.10	.52

a/ Total of 55 rainbow weighed.
b/ Small numbers of other species sampled but not shown were: Buffalo; white sucker; carp; and shovel-nose sturgeon.
c/ Two of these sauger were caught at the Middle Bridge.

Table 9. Returns from fishermen, who fished in the Tiber study area between July 9, 1963 and June 30, 1964.

Rainbow trout	No. returned	No. planted	Per cent returned
Jaw-tagged	138	9,636	1.4
Fin-clipped	333	14,640	2.3
Marked (Undifferentiated)	169	---	---
Sub-total	640	24,276	2.6
Unmarked	131	---	---
Total	771	---	---

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Approved by George D Holton

Date March 22, 1965