MONTANA FISH AND GAME DEPARTMENT
FISHERIES DIVISION
HELENA, MONTANA

JOB COMPLETION REPORT
RESEARCH PROJECT SEGMENT

State of: Montana

Project No: F-5-R-11 Name: Central Montana Fisheries Study

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

Period Covered: May 1, 1961 to June 30, 1962

ABSTRACT:

Four lakes were inventoried in the project area during the report period. The work done consisted primarily of sampling the fish population, mapping, and, in the case of two lakes, obtaining bottom samples. The lakes inventoried were Flattop, Goose, Cooper, and Kiyo Lakes. Flattop Lake appeared to be able to support but not sustain a trout population. Goose Lake was found to have indications of high productivity, however the possibility of a winter kill is present. Cooper Lake was unable to support trout introduced in 1961. The possibility of winter kill was very apparent in this body of water. Kiyo Lake was found to be sustaining a population of cutthroat trout. It was the only lake surveyed that possessed adequate spawning facilities for trout.

RECOMMENDATIONS:

It is recommended that compilation of a file of information on all waters in the project area be continued in order to formulate fishery management procedures and to recommend investigations on pertinent problem areas.

OBJECTIVES:

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

TECHNIQUES USED:

Lakes surveyed were fished with 125 foot experimental gill nets, and bottom samples taken with a 36 square inch Ekman dredge. Lake maps were obtained by tracing the shoreline from Soil Conservation Service aerial photos and soundings were made to

determine maximum depth and approximate contour intervals. All data and information collected have been transferred to the permanent file cards used by the Fisheries Division.

FINDINGS:

Four lakes were inventoried in the project area during the report period, Flattop, Goose, Cooper, and Kiyo Lakes. The findings on each lake will be considered separately.

Flattop Lake, located on the Blackfoot Indian Reservation, has an estimated surface area of approximately 10 acres and a maximum depth of 24 feet. An experimental gill net set in the lake for three hours caught no fish, however small minnows were observed to be numerous along most of the shoreline. A small inlet near the south end of the lake apparently did not provide spawning facilities for a cutthroat trout population that was formerly present in the lake. Four Ekman dredge samples produced 63 Tendipidae larvae. It was concluded that this lake can support but not sustain a trout population.

Goose Lake, also located on the Blackfoot Indian Reservation has an estimated surface area of approximately 300 acres and a maximum depth of 20 feet. An overnight gill net set resulted in the capture of one lake chub, approximately six inches long. The lake has no inlet or outlet. The lake basin is relatively flat bottomed with approximately 70 per cent of the lake lying between the 10 and 12 foot contour intervals. Submerged aquatic vegetation and large amounts of dead organic matter in the dredge samples suggested the possibility of an oxygen depletion over an extended period of ice and snow cover.

Cooper Lake, also located on the Blackfoot Indian Reservation has an estimated surface area of approximately 20 acres and a maximum depth of 15 feet. A two-hour gill net set failed to capture any fish, although trout were planted in this lake in 1960. The lake contained dense stands of aquatic vegetation over most of its area, suggesting the possibility of a partial or complete winter kill.

Kiyo Lake, lying just outside the southern boundary of the Blackfoot Indian Reservation has an estimated surface area of six acres and a maximum depth of 13 feet. A two-hour gill net set captured 15 cutthroat trout. These trout ranged from 7.4 to 14.6 inches in total length and appeared to represent several age groups. Scale samples taken from these fish will be analysed to determine the number of age groups present. Spawning in a small inlet stream is apparently sufficient to sustain the fish population in this small lake. A beaver dam across the outlet of this lake is responsible for the top four feet of water in the lake.

Prepared by: James A. Posewitz Approved by: George D. Holton

Date: June 30, 1962

MONTANA FISH AND GAME DEPARTMENT
FISHERIES DIVISION
HELENA, MONTANA

JOB COMPLETION REPORT
RESEARCH PROJECT SEGMENT

State of: Montana

Project No: F-5-R-11 Name: Central Montana Fisheries Study

Job No: II a Title: A Fish Population Investigation in the Marias River Below Tiber Dam

Period Covered: May 1, 1961 - June 30, 1962

ABSTRACT:

The fish population in the Marias River below Tiber Dam was sampled twice during the report period. In August, electrofishing and dynamite blasts yielded good catches of trout and a few whitefish in the upper portions of the river, along with sauger, ling, catfish, and various species of rough fish throughout the entire river. Fish trapping from April 3 to June 11, resulted in the capture of 10 rainbow trout, 384 sauger, 9 ling, 12 catfish, 1 northern pike, and various rough fish. All sauger captured were tagged and released. Sauger catch trends and tag returns failed to demonstrate a run of fish up the river but rather indicated an increased activity of a population of sauger present throughout the river. Bottom samples taken above and below the reservoir showed little difference in the total standing crop of insects, however changes in the species composition of the samples were noted. The improved fish habitat below the reservoir is attracting anglers primarily for trout and sauger in the upper portion of the river below the dam, and sauger, ling and catfish in the lower portions of the river.

RECOMMENDATIONS:

It is recommended that management efforts in the Tiber-Marias area be directed at the river below Tiber Dam. Reduction of the fluctuation in releases from Tiber Dam, and an increase in the minimum flow should be a primary consideration. The extent of the area below Tiber Dam suitable for successful trout spawning should be determined to aid in future management policies in this area.

OBJECTIVES:

The purpose of this investigation is to determine the species composition of fish present and their relative abundance, to determine the occurrence and extent of fish migrations and to obtain as much fisherman success information as possible. Information will also be collected on the presence and relative abundance of fish food organisms in the river.

TECHNIQUES USED:

Fish collections were made twice during the report period. In August when the river was at its minimum, portions of the stream were sampled by electro-fishing and dynamiting. The fish populations were also sampled in the spring from April 3 to June 11 by means of wire fish traps. A series of bottom samples was taken from the river twice during the summer and examined for fish food organisms. Three square yard bottom samples were collected at each station on each collection date. Fisherman use and success information was obtained primarily from warden creel census reports and personal observation.

FINDINGS:

The fish population in the Marias River below Tiber Dam was sampled twice during the report period. The first sample was taken in August of 1961 when the river was at its minimum flow of the season, 122 c.f.s.. For purposes of collecting, the river was divided into three sections to be sampled, Upper, Middle and Lower. The first five river miles below the Tiber Dam were considered as the Upper section of the river. The Middle section was that portion of the river between 5 and 24 miles below Tiber Dam, and the Lower section was that portion of the river lying between 24 miles below Tiber Dam and its mouth at the Missouri River. Portions of the stream that could be waded were sampled with a 220 volt A.C. shocker. In some areas of the river dynamite blasts were detonated in an attempt to collect fish, however this method was relatively unsuccessful. Fish captured in the August collection are shown in Table 1.

Table 1. Number of Fish Taken Electro-fishing and Dynamiting in the Marias River Below Tiber Dam, August, 1961

Section	Species										
	Rb	Wf	Saug	Ling	C Cat	CSu	FSu	RH Su	Carp	DRUM	GE
Upper	31	11	5	2	-	13	17	4	21	-	2
Middle	19	3	-	-	-	1	17	1	26	2	14
Lower	-	-	2	-	1	3	15	17	11	1	3
Totals	50	14	7	2	1	17	49	22	58	3	19

Rb is the abbreviation for Rainbow trout, Wf--mountain whitefish, Saug--sauger, Ling--burbot, C Cat--channel catfish, CSu--white sucker, FSu--longnose sucker, RH Su--red horse sucker, and GE--goldeye.

The river was sampled for the second time in the spring of 1962. This sample was collected using four wire fish traps. These traps, approximately three feet high and four feet long, were placed in the stream with the open throat facing directly away from the current. Two "wings" also of wire and from 10 to 30 feet long were stretched at various angles downstream from the trap, the angle depending on the force of the current at the trap site. Trap and wings were held in place by steel fence posts driven into the river bottom. One trap was placed in the Missouri River, approximately one mile below the mouth of the Marias River. The other three traps were located in the Marias River, one near Loma approximately 78 miles below Tiber Dam, one near the Bessette Ranch approximately 54 miles below Tiber Dam, and one near the "Middle Bridge" approximately 11 miles below Tiber Dam. Fish captured in these traps are shown in Table 2.

Table 2. Number of Fish Taken Trapping in the Missouri River and the Marias River Below Tiber Dam, April 3 to June 11, 1962

Trap Site	Species													
	Rb	Saug	Ling	C Cat	CSu	FSu	RH Su	Carp	GE	Carp Su	Buff	N Pike	HB STUR	Chub
Missouri River	-	96	3	1	3	5	37	9	1	2	1	-	1	-
Loma	-	41	1	-	1	5	4	5	6	-	1	-	-	1
Bessette Ranch	2	144	4	11	4	27	38	-	51	-	1	-	-	2
Middle Bridge	8	103	1	-	10	6	39	1	31	-	1	1	-	-
Totals	10	384	9	12	18	43	118	15	91	2	4	1	1	3

Rb is the abbreviation for Rainbow trout, Saug--sauger, Ling--burbot, C Cat--channel catfish, CSu--white sucker, FSu--longnose sucker, RH Su--red horse sucker, GE--goldeye, Carp Su--carp sucker, Buff--buffalo fish, N Pike--northern pike, and HB STUR--shovelnose sturgeon.

Of the fourteen species of fish encountered in the sampling of the Marias River below Tiber Dam, four are actively sought after by anglers. These four are: rainbow trout, sauger, catfish and burbot. Whitefish, drum, and northern pike are also considered desirable fish but are seldom taken angling. Those species of fish taken which are considered undersirable by most anglers are the white sucker, longnose sucker, redhorse sucker, carp, goldeye, river carp sucker, black buffalo, shovelnose sturgeon, and flathead chub.

Tiber Reservoir has produced some desirable changes in the physical characteristics of the Marias River below Tiber Dam. The water released from Tiber Reservoir is generally cooler, and much less turbid than that of the Marias River above the reservoir. Trout planted into the reservoir have drifted into this improved habitat,

established themselves, and fish collections show them to be reproducing. These collections indicated that the suitable trout habitat at present extends about 20 miles downstream from Tiber Dam, although two trout were captured as far as 54 miles below the dam. The August fish samples resulted in the capture of 31 rainbow trout in the Upper section of the river and 19 in the Middle section. Trout taken in the Upper section of the river had an average total length of 10.64 inches and an average weight of 0.51 of a pound. The largest specimen was 16.0 inches long and weighed 1.30 pounds. Age groups 0 through V were represented in this sample. Trout taken in the Middle section of the river had an average total length of 9.97 inches and an average weight of 0.42 of a pound. The largest rainbow trout was 14.9 inches long and weighed 1.04 pounds. Age groups I through IV were represented in this sample. The average calculated total lengths for rainbow trout at annuli I through V were 3.06, 7.27, 11.53, 12.77, and 14.06 (Table 3). The last plant of rainbow trout made in Tiber Reservoir was made in 1958.

In addition to the rainbow trout, 11 whitefish were captured in the Upper section and 3 in the Middle section of the river. These 14 whitefish had an average total length of 9.65 inches and an average weight of 0.37 of a pound. The largest whitefish taken was 15.4 inches long and weighed 1.54 pounds. Age groups I, II, and V were represented in the collection.

The spring fish trapping resulted in the capture of 10 rainbow trout, 8 at the Middle Bridge trap site, and 2 at the Bessette site. The average size of the trout taken in the traps was considerably larger than those obtained in the August collection, undoubtedly due to the selectivity of the equipment.

Trout taken at the Middle Bridge site had an average total length of 18.89 inches and an average weight of 1.89 pounds. Those taken at the Bessette site averaged 19.6 inches in total length and 2.57 pounds in weight. The largest rainbow trout taken was a 20.7 inch 3.00 pound fish captured at the Bessette trap site. Age and growth analysis of scales from these larger fish is pending.

Although only seven sauger were taken during the August sampling, they were found to be the most numerous fish observed during the trapping operation where the 384 sauger taken comprised 54 per cent of all fish taken. This is also undoubtedly due to the selectivity of the equipment used and the season fished. All sauger captured in the trapping operation were tagged with a metal or plastic jaw tag and released. The sauger appeared to be evenly distributed throughout the Marias and the Missouri Rivers during the spring. The average daily catch of sauger at the trap sites was 2.23 at the Missouri River site, 0.69 at the Loma site, 2.36 at the Bessette site, and 1.98 at the Middle Bridge site. The throat design of the trap used at the Loma site permitted some escapement which was responsible for the low average daily catch at that site. Whether or not there is a migration of sauger up the Marias River was not definitely established. Peak daily catches at the various trap sites suggest this possibility however the four tag returns obtained fail to substantiate

this. The peak daily catch made at the Missouri River trap site, the furthest downstream, was on April 4. The peak daily catch at the Loma site was on April 6, at the Bessette site April 20, and at the Middle Bridge site on April 25 (Table 4). Of the four tag returns, two showed no movement at all, both being captured at the point of their release. One was recaptured in the trap where it was captured initially, 25 days after its tagging and release. The other was caught 16 days after its release by an angler fishing at the trap site where the sauger was originally captured. Of the two exhibiting movement, one was caught by an angler less than one mile from its point of release 15 days after it had been tagged and released. The other, tagged and released at the Middle Bridge site, was taken by an angler 30 days later at Tiber Dam, a distance of approximately 11 miles. Although definite conclusions cannot be drawn from this limited data it is felt that increased spawning activity of sauger present all year in the general vicinity of the traps was responsible for the peak catches.

Table 3. Age and Growth Determinations for Fish Taken from the Marias River Below Tiber Dam (Number of Specimens in Parenthesis)

Species	I.	II.	III.	IV.	V.	VI.	VII.
Rb	3.06 (44)	7.27 (27)	11.53 (22)	12.77 (17)	14.06 (5)	-	-
WF	4.15 (14)	6.30 (7)	11.0 (1)	12.1 (1)	14.4 (1)	-	-
Sauger	4.36 (16)	8.02 (16)	11.08 (14)	13.21 (9)	15.1 (2)	18.3 (1)	-
Goldeye	3.28 (17)	6.94 (17)	9.68 (17)	10.91 (16)	11.47 (12)	12.2 (1)	
FSu	1.44 (45)	3.65 (42)	6.71 (38)	9.18 (31)	11.39 (15)	13.44 (9)	13.75 (4)
RH Su	1.40 (15)	3.69 (15)	6.11 (10)	9.06 (5)	10.95 (2)	13.1 (1)	14.5 (1)

Very little difference was noted in the average total lengths and weights of the sauger at the various trap sites (Table 5). The largest sauger captured was 22.6 inches long, weighed 3.40 pounds and was captured at the Bessette trap site. Warden creel census reports show that occassionally anglers catch sauger up to 5 pounds. Sauger have been reported from Garrison Reservoir, North Dakota up to 30.0 inches in total length and weighing 8.2 pounds (Carufel, 1960). Average calculated total length for sauger from the Marias River below Tiber Dam at annuli I-VI were 4.36, 8.02, 11.08, 13.21, 15.1 and 18.3 (Table 3).

Table 4. Number of Sauger Present in Fish Traps in the Missouri River and in the Marias River Below Tiber Dam, 1962 (Number of days since the trap was last inspected in parenthesis)

Trap Site	Date																							
	4/4	4/6	4/9	4/11	4/13	4/16	4/18	4/20	4/23	4/25	4/27	4/30	5/4	5/7	5/11	5/16	5/18	5/22	5/25	5/29	6/1	6/6	6/11
Missouri River	15 (1)	3 (2)	22 (3)	13 (2)	11 (2)	6 (3)	2 (2)	2 (2)	12 (3)	4 (2)	- (2)	- (3)	3 (4)	1 (3)	2 (4)	- (5)	- -	- -	- -	- -	- -	- -	- -	- -
Loma	2 (1)	7 (2)	4 (3)	5 (2)	4 (2)	- (3)	2 (2)	4 (2)	1 (3)	1 (2)	1 (2)	- (3)	- (4)	1 (3)	1 (4)	2 (5)	2 (2)	- (4)	2 (3)	- (4)	2 (3)	- -	- -	
Bessette	- -	- -	14 (3)	8 (2)	3 (2)	10 (3)	7 (2)	27 (2)	14 (3)	7 (2)	8 (2)	2 (3)	14 (4)	4 (3)	1 (4)	7 (2)	3 (2)	6 (4)	1 (3)	2 (4)	3 (2)	4 (5)	- -	
Middle Bridge	- -	- -	- -	- -	- -	- -	- -	- -	10 (3)	13 (2)	5 (2)	6 (3)	3 (4)	7 (3)	5 (4)	7 (5)	7 (2)	7 (4)	16 (3)	6 (4)	4 (3)	3 (5)	4 (5)	

Table 5. Average Size of Sauger Taken in the Missouri River and the Marias River Below Tiber Dam

Trap Site	Number of Specimens	Average Length	Average Weight
Missouri River	96	13.62	0.712
Loma	41	13.86	0.808
Bessette	144	13.85	0.716
Middle Bridge	103	13.62	0.846

Growth rates of sauger from the Marias River were slower than those reported from Fort Peck Reservoir, Montana (Alvord, 1957) and the tailrace of Garrison Reservoir, North Dakota.

Although not considered a game fish in Montana fishing regulations, channel catfish and burbot are eagerly sought after as a food fish by set line fishermen. The two samplings of the river resulted in the capture of 13 channel catfish and 11 ling. However, the success of set line fishermen indicates that these species are far more abundant than the samples indicated, again probably due to selectivity of the sampling equipment and methods. The 13 channel catfish taken had an average total length of 19.68 inches and an average weight of 3.42 pounds. The largest catfish taken was 25.2 inches long and weighed 8.75 pounds and was captured at the Bessette trap site. The 11 burbot taken had an average total length of 20.6 inches and an average weight of 2.25 pounds. The largest was 29.4 inches long, weighed 6.50 pounds, and was captured at the Missouri River trap site.

Food Supply

Stober (1962) concluded that Tiber Reservoir contributed little in the form of plankton to the River below, and that plankton in the river was largely indigenous to the river. Bottom samples taken from the Marias River at nine locations, one above the reservoir and eight below, at points 1, 5, 11, 24, 42, 48, 54 and 80 miles below the dam, showed little difference in total standing aquatic insect crop between the sampling locations. However, the species composition of the insect population changed (Table 6). An increase in Diptera was noted immediately below the dam, primarily Simulidae. Ephemeroptera numbers remained high at all locations below the dam, however, Ephron sp. of the Ephemeridae, a burrowing form, present above the reservoir disappeared below the dam, and reappeared again in the samples taken 42 miles below the dam. Ephron sp. was probably eliminated below the dam by the decreased turbidity and consequently the lack of silty substrate in which to burrow. While the proportion of Ephemeroptera and Diptera increased below the dam, that of Plecoptera and Odonata decreased immediately below the dam. Plecoptera returned to a comparable per cent of the composition within five miles and Odonata at 42 miles. Tricoptera were never as abundant below the dam as they were in the river above the reservoir.

Table 6. Per Cent Composition of Organisms Sampled in The Marias River During June and July, 1961

Location	Ephemeroptera	Plecoptera	Tricoptera	Odonata	Diptera	Other
Above Tiber Res.	27	1	63	3	5	0
1 Mi. Below Tiber Res.	85	-	2	0	13	0
5 Mi. Below Tiber Res.	62	1	30	1	5	0
11 Mi. Below Tiber Res.	61	5	27	2	3	2
24 Mi. Below Tiber Res.	69	1	20	1	7	2
42 Mi. Below Tiber Res.	50	1	44	3	1	1
48 Mi. Below Tiber Res.	53	2	38	3	3	1
54 Mi. Below Tiber Res.	42	6	40	8	4	0
80 Mi. Below Tiber Res.	62	1	33	3	1	0

Forage fish appeared numerous along the entire river and were taken incidentally in the fish collections. In addition to young of the rough fish previously mentioned, forage fish collections included flathead chub, emerald shiner, fathead minnow, longnose dace, sand shiner, and silvery minnow.

River Flows

During the report period flows in the Marias River fluctuated between 3,071 and 122 c.f.s. Low flows occurred in August and again through the winter months. Flow records taken at the U.S. Geological Survey Chester gauge, which is approximately one mile below Tiber Dam, reveal a mean flow of 794 c.f.s. over six years of record (1946, and 1956 through 1961) with an average annual discharge of 574,800 acre feet.

Angling

The Marias River below Tiber Dam is receiving increased fishing pressure, since the fishing in the reservoir has begun to deteriorate. Heaviest fishing pressure found on the river exists immediately below the dam and is directed primarily at trout and sauger. Sauger fishing is pursued especially in the spring and early summer when the average catch runs as high as 2.6 sauger per fisherman at the rate of 0.72 sauger per hour. Sauger fishing is also popular in early spring in the lower Marias River near its mouth. Fishing success here however, is largely dependent on the clarity of the river, which is in turn dependent on the amount of fluctuation in the releases from Tiber Dam.

REFERENCES CITED

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Carufel, Louis H. 1960. Observations on the Life History and Toxonomy of the Sauger (Stizostedion Canadense Smith). Masters Thesis, Montana State College, 1-29.

Stober, Quentin J. 1962. Some Limnological Effects of Tiber Reservoir on the Marias River. Masters Thesis, Montana State College, 1-37.

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Date July 2, 1962

MONTANA FISH AND GAME DEPARTMENT
FISHERIES DIVISION
HELENA, MONTANA

JOB COMPLETION REPORT

RESEARCH PROJECT SEGMENT

State of Montana

Project No. F-5-R-11 Name Central Montana Fisheries Study

Job No. IIb Title A Fish Population Investigation in Tiber Reservoir

Period Covered: May 1, 1961 -- June 30, 1962

Abstract:

Gill net catches in Tiber Reservoir consisted of 29 percent rainbow trout, 67 percent common sucker, and 4 percent longnose sucker in 1960, and 15 percent, 83 percent, and 2 percent of each species respectively in 1961. Bottom fauna and zooplankton organisms were relatively scarce in the reservoir, averaging 6.6 per square foot and 13 per liter respectively. The diet of trout and suckers consisted primarily of zooplankton, however, there seemed to be a tendency for trout over 14 inches total length to utilize forage fish. The average trout growth rate was slow, nearly ceasing when the fish reached 13 inches. The low standing crop of fish-food and the poor growth of fish in the reservoir is attributed to undesirable morphometric characteristics of the reservoir basin and extreme sedimentation from bank erosion and the incoming river.

Conclusions and Recommendations:

It is evident from the data that Tiber Reservoir supports a low standing crop of fish-food, which in turn limits fish growth. This is probably due to (1) extreme siltation from bank erosion and high sediment load from the incoming river, (2) undesirable morphometry which provides a relatively small amount of littoral area and (3) apparent low productive potential of the drainage as evidenced by relatively low numbers of stream plankton above and below the reservoir.

Every effort should be made to obtain maximum utilization from that portion of the reservoir known as Willow Creek Arm, where the morphometry and normally reduced silt load are more conducive to basic productivity.

Objective:

The objective of this study was to obtain basic information on the fish population and fish-food organisms in Tiber Reservoir and to make observations on physical factors influencing fish production. This information is needed in formulating fishery management plans.

Background Information:

In 1954 and 1955 the Marias River drainage was chemically treated with "Fish-Tox" to remove the existing fish population prior to completion of Tiber Dam. The drainage above Tiber Dam covers an area of 4,927 square miles and is located in north central Montana. The primary objective was to remove the carp and goldeye, which were considered a threat to the upstream trout fishery of the drainage. Evidence indicates successful removal of the goldeye, however, carp have since been found in Tiber Reservoir.

From 1956 to 1958 nearly 10,000,000 fingerling rainbow trout were planted in Tiber Reservoir. At maximum operation the reservoir will cover 22,720 acres and contain 1,397,000 acre-feet of water. As yet, it has not reached this capacity, but has been (± 10 feet fluctuation) maintained at 750,000 acre-feet, over an area of approximately 15,000 acres. Discharge of the river ranged from 2,170 to 216 c.f.s. in 1960 and from 3,071 to 122 c.f.s. in 1961.

In 1957, one year following the initial plant, fishing in the reservoir was excellent. The catch per man-hour exceeded one trout, which averaged nearly 12 inches long. The main food item of the trout at that time was snails, which presumably thrived on extensive terrestrial vegetation which had been inundated. The following year, a slackening in the growth of the trout was evident. In 1959, fishing success began to decline and the condition of trout was obviously poor. Studies, of which this is a part, where then begun to obtain information on the reservoir and tailwater fishery.

Methods:

The fish and bottom fauna populations were sampled at the beginning and end of the 1960 and 1961 summer seasons. Three stations in the reservoir (Figure 1) were sampled during these periods. From 10 to 15 Ekman dredge (.25 square foot) samples were collected at each station twice during each of the two summers. Bottom fauna organisms were preserved in 70 percent ethanol and sorted and enumerated later. Fish were sampled with 125-foot experimental gill nets. Stomachs were collected from representative size groups of fish sampled and preserved in 70 percent ethanol. The samples were later analyzed by recording the frequency of occurrence of each food item.

Age and growth determinations were made at the Fish and Game Department Laboratory in Bozeman. Aging and growth interpretations were complicated due to variation in the size of fish when planted and the time of planting. Determination of annuli was difficult due to the presence of "planting checks". This difficulty has been encountered by others (Alvord, 1953).

Findings:

Kinds and Numbers of Fish Collected: During the present study the following fish were found to be present in the reservoir: rainbow trout, burbot, longnose sucker, white sucker, sand shiner, emerald shiner, fathead minnow, silvery minnow, and carp[1]. Information on catches in gill nets is presented in Tables 1 and 2. The proportion of trout in the catch from all stations combined, reduced from 29 percent in 1960 to 15 percent in 1961. This is to be expected since there does

1/ Common names of fishes are those given in American Fisheries Society Special Publication No. 2, 1960: A LIST OF COMMON AND SCIENTIFIC NAMES OF FISHES FROM THE UNITED STATES AND CANADA.

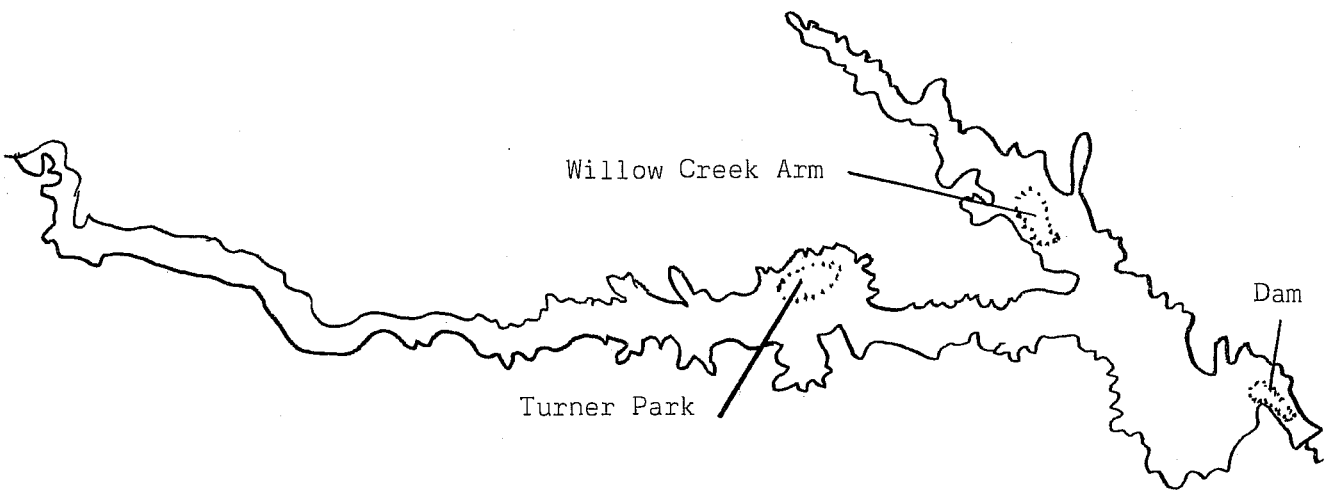


Figure I. The location of the three sampling stations in Tiber Reservoir.

Table 1. Species composition and length range of fish taken by gill net in Tiber Reservoir, 1960

Species	Length Range	Number of Fish	Date Collected	Location
Rainbow trout	11.6-14.7	13	6/9/60	Tiber Dam
"	11.8-13.7	15	6/15/60	
"	11.5-13.7	19	6/16/60	"
"	10.4-14.2	16	6/17/60	"
"	12.0-13.9	16	9/20/60	"
"	12.0-14.7	18	9/21/60	"
"	12.0-13.9	17	9/23/60	"
White sucker	6.7-14.8	46	6/9/60	"
"	6.4-15.0	41	9/20/60	"
"	11.2-14.1	10	9/21/60	"
"	6.7-15.8	30	9/23/60	"
Longnose sucker	10.6-12.7	4	6/9/60	"
"	7.1-14.5	5	9/20/60	"
"	14.0	1	9/23/60	"
Sucker unspecified	----------	65	6/15/60	"
"	----------	20	6/16/60	"
"	----------	48	6/17/60	"
Carp	4.4	1	9/20/60	"
Rainbow trout	11.3-14.5	23	6/9/60	Willow Creek Arm
"	12.0-13.5	12	6/22/60	"
"	12.3-12.9	3	6/24/60	"
"	12.0-13.2	5	9/8/60	"
"	8.2-13.8	8	9/9/60	"
"	11.5-17.0	52	9/21/60	"
White sucker	7.1-14.5	84	6/9/60	"
"	6.4-12.7	15	6/22/60	"
"	6.5-14.2	28	9/8/60	"
"	8.9-14.2	20	9/9/60	"
"	6.8-13.3	64	9/21/60	"
Longnose sucker	11.1-11.8	4	6/9/60	"
"	9.9-13.2	4	9/21/60	"
Sucker unspecified	---------	45	6/22/60	"
	---------	13	6/24/60	"

Table 1. Continued. Species composition and length range of fish taken by gill net in Tiber Reservoir, 1960

Species	Length Range	Number of Fish	Date Collected	Location
Rainbow trout	12.0-14.0	20	6/23/60	Turner Park
"	11.9-13.4	9	6/24/60	"
"	11.8-14.2	7	7/7/60	"
"	12.5	1	9/9/60	"
"	11.6-15.6	33	9/22/60	"
White sucker	7.6-13.5	23	6/23/60	"
"	6.6-10.3	12	6/24/60	"
"	9.3-13.6	9	7/7/60	"
"	7.6-14.5	24	9/9/60	"
"	7.5-14.5	30	9/22/60	"
Longnose sucker	10.8-11.2	2	7/7/60	"
"	9.7	1	9/9/60	"
"	11.4-13.1	4	9/22/60	"
Sucker unspecified	---------	2	6/24/60	"
Rainbow trout	13.0	1	9/9/60	Middle of dike
White sucker	10.7-15.1	9	9/9/60	"
Rainbow trout	$\bar{x}$ = 12.3	15	9/9/60	Near east end of dike
White sucker	$\bar{x}$ = 11.4	81	9/9/60	"
Longnose sucker	$\bar{x}$ = 11.5	6	9/9/60	"
Total number of fish		1,054	1960	

Table 2. Species composition and length range of fish taken by gill net in Tiber Reservoir, 1961

Species	Length Range	Number of Fish	Date Collected	Location
Rainbow trout	7.3-15.3	8	6/28/61	Tiber Dam
	12.6-15.4	8	9/13/61	
White sucker	6.5-14.0	87	6/28/61	"
	6.5-13.1	24	9/13/61	"
Longnose sucker	12.8	1	6/28/61	"
Carp	4.1	1	9/13/61	"
Rainbow trout	12.8-14.5	9	6/29/61	Willow Creek Arm
	13.0-14.3	13	6/13/61	
White sucker	9.1-10.2	4	6/29/61	"
	6.6-13.4	78	9/13/61	"
Longnose sucker	13.3-14.6	2	9/13/61	"
Chub	6.3	1	9/13/61	"
Ling	17.2	1	9/13/61	"
Rainbow trout	12.6-14.4	12	9/13/61	Turner Park
White sucker	6.5-12.6	79	9/13/61	"
Longnose sucker	10.5-13.1	3	9/13/61	"
Total number of fish		331	1961	

not seem to be recruitment in the reservoir. Common suckers and longnose suckers comprised 67 percent and 4 percent of the catch in 1960, and 83 percent and 2 percent in 1961 respectively. Carp and burbot were also taken, but comprised less than one percent of the catch. The total gill-net catch was 1054 fish in 1960 and 331 in 1961.

Fish Food Organisms: Stober (1962) found numbers of phytoplankton and zooplankton to be extremely low in Tiber Reservoir during both 1960 and 1961. Copepoda were the most numerous of the zooplankters with the average number per liter ranging from 6.6 at station 2 in 1961 to 17 at station 3 in 1961. Copepoda comprised 97 percent of the zooplankton sampled. Cladocera and Rotifera were the other two groups represented. Other work on Missouri drainage impoundments revealed total plankton numbers (zooplankton and phytoplankton) to be approximately 1,000 times greater than those in Tiber (Damann, 1951).

Stober (1962) concluded that plankton below the dam was produced within the benthic community of the river and not contributed by the reservoir. This further illustrates the low standing crop of plankton in the reservoir. Reservoirs in other areas have been known to add considerably to the plankton in tailwater regions (Hartman, et al., 1961 and Damann, 1951).

Bottom fauna organisms were scarce in the reservoir. The average number of organisms per square foot sampled at all stations during both years was 6.6. The majority of the organisms collected was of the family Tendipedidae. Ephemeroptera, Trichoptera, Gastropoda and Hirudinea were also represented by a few individuals.

Figure 2 illustrates the fluctuations in the bottom fauna population at each station in the reservoir during 1960 and 1961. It also illustrates the relatively greater productive potential of Willow Creek Arm.

Stomach samples were analyzed from 166 trout and 76 suckers in 1960, and 43 trout and 101 suckers in 1961. Zooplankton was the most frequently occurring food item in trout collected in the reservoir (Figure 3). It was readily apparent that zooplankton also comprised the bulk of the food for trout. The apparent dependence of the trout on plankton, together with the scarcity of plankton and slow growth of trout in the reservoir, suggests that the food supply was only sufficient for maintenance of the fish with little contribution to growth.

Forage fish occurred more frequently in trout stomachs in 1961 than in 1960, and more frequently during September than June during both years. The highest occurrence of forage fish in stomachs occurred in trout 14 inches or longer. Trout that were feeding on forage fish were in much better condition than those that were not. Similar changes in food habits of trout, after reaching a certain size, have been found by others (Boyd, 1950 and Crossman and Larkin, 1959). There was apparently insufficient food at lower trophic levels for trout to grow to a size where they would use forage fish.

A high frequency of unusual items was also found in trout stomachs, e.g. sticks, tinfoil, rocks and pieces of vegetation (included in Figure 3 under "other").

The most frequently occurring food items in sucker stomachs in the reservoir were Zooplankton (58%) and Tendipedidae (43%). Much of the bulk in sucker stomachs was made up of unidentifiable detritus.

Figure 2. Mean numbers of bottom organisms (per square foot) sampled at each station in Tiber Reservoir during 1960 and 1961.

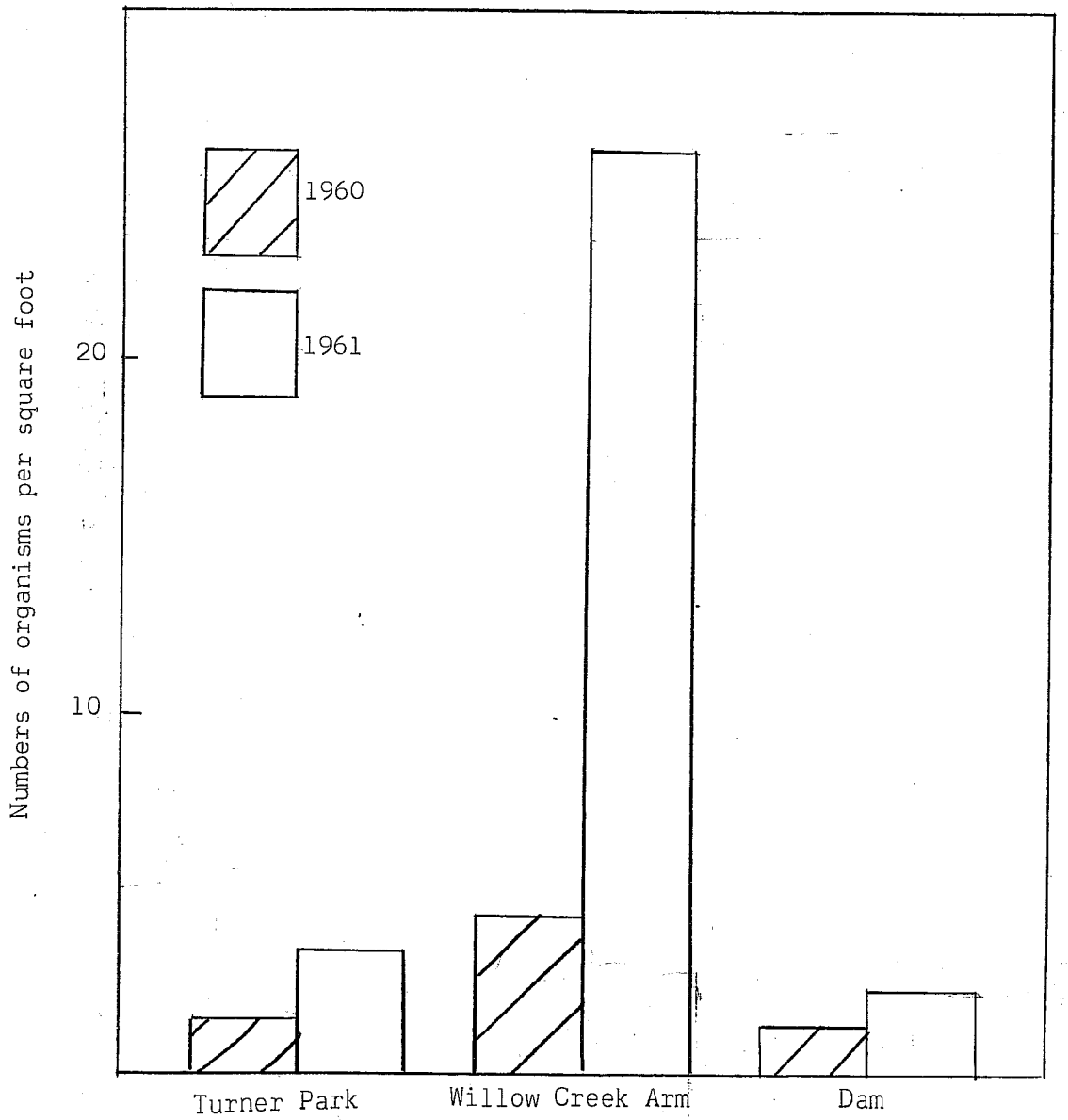
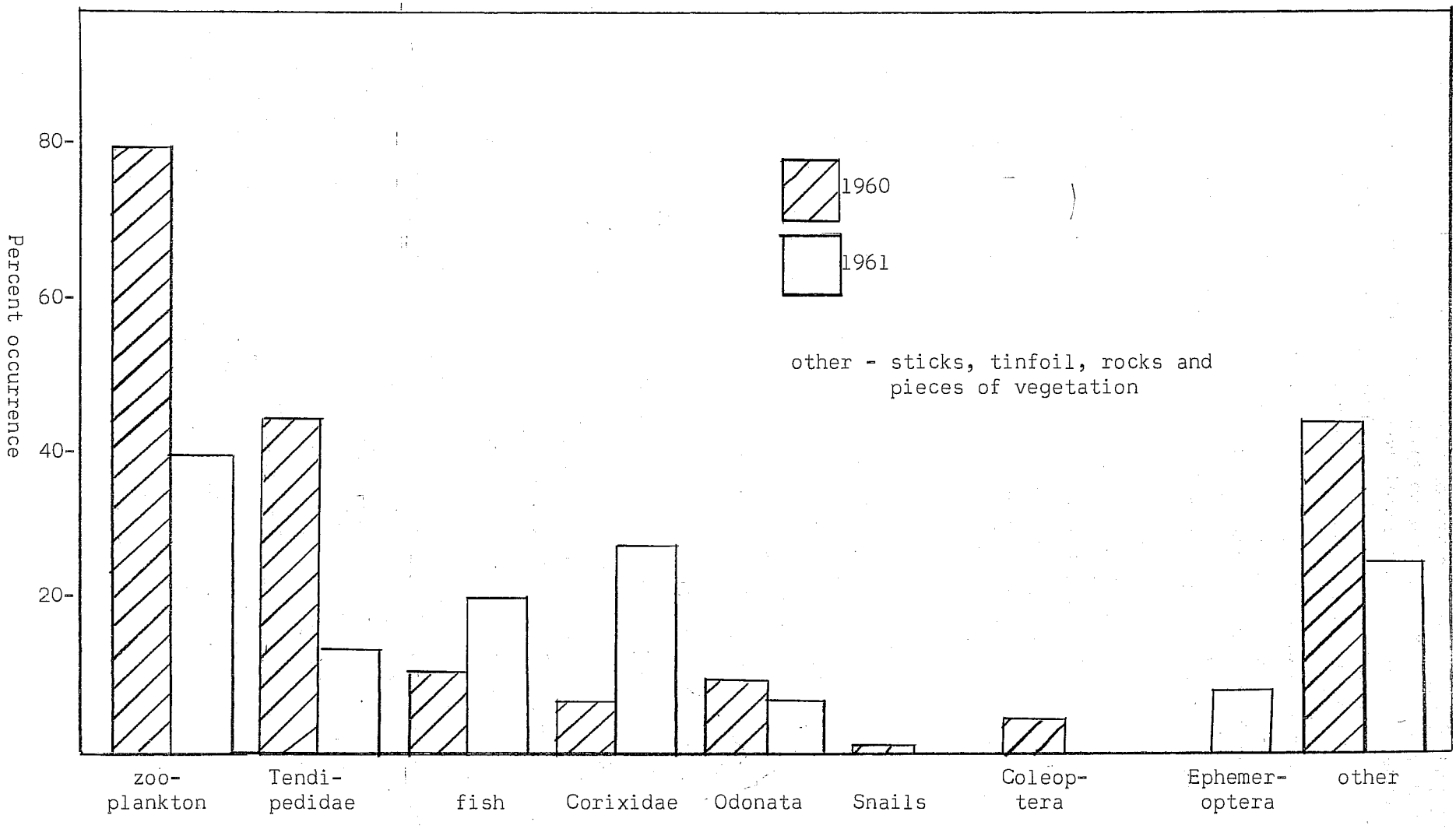


Figure 3. Percent occurrence of the various food items in trout stomachs collected during 1960 and 1961 in Tiber Reservoir. Data from all stations are combined and represent 166 fish in 1960 and 43 in 1961.



Age and Growth: The growth of rainbow trout in Tiber Reservoir is slow, and particularly so when compared to growth in other prairie reservoirs of that area. In other reservoirs in central Montana trout have reached 15.6 to 16.8 inches total length 2 years after having been planted as fingerlings (2-4 inches). In Tiber Reservoir, rainbow trout reached about 10 inches two years after planting.

Scales were difficult to read due to severe resorption and the presence of "planting checks". Limited growth studies on trout from the reservoir indicated slow growth reflecting the low standing crop of fish food. There is a slowing of growth after the fish reach 11 to 12 inches in length. In only a few instances were trout taken that weighed in excess of one pound.

Age and growth of the common sucker further illustrates the limited productivity of the reservoir. The growth rate of the 1961 sample was considerably reduced over that of the 1960 sample. The data indicate that the 1958 year class, which was dominant in 1960, continued to be dominant in 1961. Further, that the proportion of each year class in the catch was about the same in the 1961 sample as it was in the 1960 sample. The 1960 year class made little or no contribution to the catch in 1961. This reduced reproduction and growth in the sucker population undoubtedly reflects the low food supply in the reservoir.

Discussion:

The physical features of Tiber Reservoir are not conducive to the production of fish-food and, in turn, trout. The morphometry of the reservoir basin is such that littoral area is scarce. At 15,700 surface acres, 83 percent of the area exceeds 10 feet in depth and 92 percent exceeds 5 feet. Willow Creek Arm contains considerably more littoral area than do the other areas of the reservoir. Rawson (1952) has suggested the dominance of morphometric factors in determining lake productivity.

The banks along the reservoir and river are steep, soft, and subject to extreme erosion. During periods of high wind activity (which is frequent in this area) the water becomes light-brown in appearance. At times, the turbid water extends completely across narrow sections of the reservoir. Water samples collected during periods of high waves and subsequent bank erosion showed turbidities ranging from 127 to 158 p.p.m.

The extreme siltation from eroding banks and incoming flow from the river, together with the undesirable morphometric characteristics of the basin, are probably primarily responsible for the low standing crop of fish-food in the reservoir. Irwin (1959) reported smothering effects on bottom organisms and decreased photosynthetic activity of algae from turbidity and siltation in Oklahoma reservoirs. Low standing crops of benthos, due to undesirable morphometry and siltation in reservoirs have also been reported from other countries (Mordukhai-Boltovskoi, 1955 and Osipov, 1959).

Emergent vegetation was scarce in the reservoir, probably due to the aforementioned characteristics. Potamogeton pectinatus was the most abundant species observed, however, P. pusillus, P. richardsonii, Alisma gramineum, and Tolypella sp. were also present. Plant abundance has been associated with lake productivity.

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Prepared by J. A. Posewitz, E. B. Welch, N.A.Thoreson & S.E.Swedberg

Approved by George D. Holton

Date December 1962

MONTANA FISH AND GAME DEPARTMENT
FISHERIES DIVISION
HELENA, MONTANA

JOB COMPLETION REPORT
RESEARCH PROJECT SEGMENT

State of Montana

Project No. F-5-R-11 Name Central Montana Fisheries Study

Job No. II c Title A Fish Population Investigation in The Lower Marias River Drainage Above Tiber Dam

Period Covered May 1, 1961 - June 30, 1962

ABSTRACT:

Seven overnight gill net sets, along with 33 set line sets were fished in the Upper Marias River between it's mouth at Tiber Reservoir and it's beginning at the confluence of Cut Bank Creek and Two Medicine River. This fishing resulted in the capture of 67 white suckers, 31 longnose suckers, 8 burbot, and 1 rainbow trout. The 1955 rehabilitation of the Upper Marias drainage removed a sauger-catfish fishery that was utilized to a limited extent. A temporary rainbow trout fishery that followed the rehabilitation of the drainage was unable to sustain itself.

RECOMMEDNATIONS:

It is recommended that anglers be encouraged to utilize the burbot fishery that is available in this portion of the drainage and that an introduction of sauger be made into the Marias River above Tiber Dam.

OBJECTIVES:

The purpose of this investigation is to determine the species composition of fish present, their relative abundance, and to obtain as much fisherman success information as possible.

TECHNIQUES USED:

Gill nets (125-foot experimental) were set in the river wherever water of sufficient depth and moderate currents were available. Set lines with three or four hooks, each baited with small fish or cut bait were set along with the gill nets. A total of seven overnight gill net sets and 33 overnight set

line sets were fished in the Marias River above Tiber Reservoir. Fishermen use and success information was obtained through interviews with residents of the area who had fished the river.

FINDINGS:

The fish population was sampled in the Marias River from it's mouth at the head of Tiber Reservoir to it's beginning at the confluence of Cut Bank Creek and the Two Medicine River. The present species composition of this area as indicated by gill nets and set lines is predominantly burbot and suckers. The seven overnight gill nets and the 33 set line sets resulted in the capture of 67 white suckers, 31 longnose suckers, 8 burbot and 1 rainbow trout. The white suckers had an average total length of 9.6 inches and an average weight of 0.35 of a pound. The longnose suckers had an average total length of 11.96 inches and an average weight of 0.619 of a pound. The burbot taken averaged 26.57 inches in total length and 3.36 pounds in weight. The rainbow trout taken was 13.9 inches in total length and weighed 1.00 pound. At the time of the Marias River rehabilitation project in 1955, sauger, channel catfish, shovelnose sturgeon, suckers, carp, and goldeye were noted to be abundant in this area of the Marias River. Burbot and black buffalo were also present but were not noted as abundant.

Interviews with the residents of the area indicated that very little angling is being done on this section of the Marias River. They reported that prior to the rehabilitation of the Upper Marias drainage that some sauger and catfish fishing was done, but neither of these species has been reported above Tiber Dam since the rehabilitation. For several years following the rehabilitation, rainbow trout were caught readily in this section of the Marias, this fishery however was unable to sustain itself in this portion of the drainage.

Prepared by James Posewitz
Project Biologist

Approved by George D Holton

Date July 2, 1962

MONTANA FISH AND GAME DEPARTMENT
FISHERIES DIVISION
HELENA, MONTANA

JOB COMPLETION REPORT
RESEARCH PROJECT SEGMENT

State of Montana

Project No. F-5-R-11 Name Central Montana Fisheries Study

Job No. III Title Investigation of Previously Rehabilitated Waters with Regard to Fish Growth and Optimum Size to Use in Successive Plants

Period Covered May 1, 1961 - June 30, 1962

ABSTRACT:

Fish populations in three rehabilitated reservoirs were sampled with experimental gill nets, and observations were made of fish appearing in anglers' creels. The reservoirs sampled were Ackley, Eureka, and Willow Creek Reservoirs. In Ackley Reservoir, best survival of planted fish is being realized from fish planted later in the season. Fish planted in Eureka Reservoir after its second rehabilitation are again exhibiting an outstanding growth rate. Thirteen months after their introduction into the reservoir these trout have attained an average total length of 15.3 inches and an average weight of 1.56 pounds. The excellent fish growth rate observed in Willow Creek Reservoir over the first year after planting was not continued through the second season. With fishing prohibited in this impoundment prior to mid-June, when fishing is best, only a limited harvest of the fishery produced by the rehabilitation is being attained.

RECOMMENDATIONS:

It is recommended that this investigation be continued to gain information on growth rate and rate of catch of trout as it is related to stocking rates in rehabilitated reservoirs. It is further recommended that plants into some of these reservoirs be divided into early and late plants of marked fish to determine the best time of year to plant to achieve the best survival possible.

OBJECTIVES:

The purpose of this investigation is 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:

Fish samples were obtained with 125-foot experimental gill nets, and by examining the fish taken by anglers. All fish planted in Ackley Reservoir could be traced to their respective plants by the presence of all or absence of various fins.

FINDINGS:

Rehabilitated reservoirs sampled during the report period were Ackley, Eureka, and Willow Creek Reservoirs. Table 1 summaries the history and planting of these waters since rehabilitation. In the case of Eureka Reservoir, a previous rehabilitation is also considered. The findings on each reservoir will be considered separately.

Ackley Reservoir

Ackley Reservoir was rehabilitated in 1958. All fish planted into this reservoir since its rehabilitation have been fin-clipped with the exception of the initial plant of rainbow trout and the only plant of brook trout made. The initial plant into Ackley Reservoir was made in two segments, rainbow trout planted in April and brook trout planted in September of 1959. In a November of 1961 gill net series (two overnight gill net sets) none of these rainbow trout were taken, while 17 brook trout were captured. These brook trout comprised 23 per cent of the number of trout taken. The 1960 plant of rainbow trout, made in May, was represented by 3 fish or 4 per cent of the total number of trout taken in this net series. The 1961 plant of rainbow trout was made in two segments of equal numbers, one made in March, and one in June. The March plant was represented by 13 fish or 17 per cent of the total number of trout taken, while the June plant was represented by 42 fish or 56 per cent of the total number of trout taken in the November gill net series.

These data indicated the best survival of planted fish is being attained from those fish planted later in the year. Brook trout planted in September of 1959, after providing 78 per cent of the number of trout taken angling and netting in 1960 and early 1961 (Welch, 1961) still compose 23 per cent of the trout present in the reservoir as indicated by the November gill net series. Rainbow trout planted in June of 1961 were more than three times as abundant in the gill nets as an equal number of rainbow trout planted in March of the same year.

A total of 52 longnose and 3 white suckers were also taken in the November gill net series. The longnose suckers averaged 9.8 inches total length and had an average weight of 0.35 of a pound. The white suckers had an average total length of 7.4 inches and an average weight of 0.143 of a pound. Several carp were also taken from the reservoir by anglers.

Table 1. A Summary of Fish Planted and Sampled from Rehabilitated Waters in 1961-62

Reservoir	Rehabil-itated	Fish Plants No/Acre	Date	Sp.	Size	Date Sampled	No.	Aver. Length	Aver. Weight	Average Gain/Mo. Length	Weight
Ackley	1958	365	4/59	Rb*	3	11/61	-	-	-	-	-
		175	9/59	EB*	5	11/61	17	13.0	0.80	0.31	0.03
		101	5/60	Rb	4	11/61	3	13.6	0.94	0.53	0.05
		51	3/61	Rb	3	11/61	13	9.3	0.37	0.79	0.05
		51	6/61	Rb	6	11/61	42	8.9	0.28	0.58	0.06
Eureka	1958	322	5/59	Rb	3	10/60	56	19.9	4.05	0.99	0.24
	1960	522	4/61	Rb	3	2/62	20	12.4	0.92	0.94	0.09
						5/62	19	15.3	1.56	0.95	0.12
Willow Creek	1959	170	5/60	Rb	3	2/61	9	12.9	0.89	1.04	0.09
		137	4/61	Rb	3	6/61	20	15.9	2.02	0.99	0.15
						4/62	8	18.7	2.49	0.68	0.11

* Rb is the abbreviation for rainbow trout, EB for brook trout.

Eureka Reservoir

Eureka Reservoir was rehabilitated for the second time in October of 1960. Following the first rehabilitation of this reservoir an exceptional growth rate was noted, however extremely slow fishing was experienced. In order to increase the rate of catch, the initial plant following the second rehabilitation was increased by 200 fish per acre over the initial plant following the first rehabilitation. The fish population of this reservoir was sampled twice during the report period. In February of 1962, 20 fish were captured in an overnight gill net set. These fish showed an average monthly increase in length of 0.94 of an inch and an average monthly increase in weight of 0.09 of a pound. The fish population was again sampled in May by examining fish in anglers creels. This sample showed an average monthly increase in length of 0.95 of an inch and an average monthly increase in weight of 0.12 of a pound. Both monthly increase rates were calculated from the time of planting. Although the rate of weight increase per month is slower than that of fish planted after the first rehabilitation and measured in October at the time of the second rehabilitation, it is expected that the present rate of weight increase will improve over the summer months.

On opening day of the 1962 fishing season anglers averaged 1.33 fish per fisherman taken at the rate of 0.45 fish per hour.

Willow Creek Reservoir

Rehabilitation of Willow Creek Reservoir was completed in the autumn of 1959. In May of 1960 an initial plant at the rate of 170 fish per acre was made in the reservoir. In April of 1961 a second plant was made, this one at the rate of 137 fish per acre. In February of 1961 the initial plant was growing at an average rate of 1.04 inches per month with an average weight increase of 0.09 of a pound per month. In June of 1961 when the reservoir was opened to angling, fish observed in the creel showed an average monthly growth rate of 0.99 of an inch and an average of 0.15 of a pound increase per month. At this time, 13 months after their introduction as 3-inch fish they averaged 15.9 inches in total length and had an average weight of 2.02 pounds. In April of 1962, 23 months after their introduction, these fish had an average total length of 18.7 inches and an average weight of 2.49 pounds. This represented an average length increase of 2.8 inches and an average weight increase of 0.47 of a pound over the last 10 months.

On June 18, 1961 opening day of fishing on Willow Creek Reservoir, boat fishermen caught an average of 2.25 fish per fisherman at the rate of 0.5 fish per hour. After opening day, the catch in this reservoir was reportedly extremely slow. Due to the fact that fishermen are denied fishing in this reservoir during early spring and autumn by federal regulation, the period when most reservoirs in this area produce their best fishing, it appears that the fishery developed in this reservoir is not being utilized.

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Prepared by James Posewitz
Project Biologist

Approved by George D Holton

Date July 2, 1962

MONTANA FISH AND GAME DEPARTMENT
FISHERIES DIVISION
HELENA, MONTANA

JOB COMPLETION REPORT
RESEARCH PROJECT SEGMENT

State of Montana

Project No. F-5-R-11 Name Central Montana Fisheries Study

Job No. IV Title Investigation of Fisherman Use and The Contribution to The Creel by Hatchery Trout in The Upper Teton River

Period Covered May 1, 1961 - June 30, 1962

ABSTRACT:

Two plants of catchable rainbow trout were made in the Upper Teton River drainage in 1961. A plant of 2,450 marked fish was made in the North Fork of the Teton River and a plant of 1,020 unmarked fish was made in the South Fork. The unmarked fish were later identified by certain fin deformities found on trout reared to catchable size in hatcheries. Fishing pressure was light throughout the angling season and although the catch was poor, hatchery fish made up the bulk of those taken.

Electro-fishing samples indicated that some of the planted fish remained in the stream through the angling season and over winter in sections of the stream possessing pools and cover. In sections where relatively large numbers of the catchable rainbow trout were recovered, a slight decrease in weight from time of release to the time of capture was noted.

RECOMMENDATIONS:

It is recommended that this investigation be continued in order to determine the extent of carry-over of planted catchable trout into the second fishing season and their contribution to the creel during that season.

OBJECTIVES:

The purpose of this investigation is to determine what contribution to the catch, hatchery trout are making in relation to wild trout, fisherman success, and fisherman use.

TECHNIQUES USED:

Two plants of catchable rainbow trout were made in the Upper Teton River. On June 27, 1961, 2,450 fin-clipped fish were

planted into the North Fork of the Teton River, and on July 17, 1961, 1,020 unmarked fish were planted into the South Fork of the Teton River. Although these fish were not marked they could be identified by certain fin deformities found on trout raised to catchable size in hatcheries. Fisherman contacts were made as often as time permitted, most contacts were made on week-end days due to the almost complete absence of anglers during the week. The fish population was sampled in the North Fork of the Teton River in September and in March, and in the South Fork in March by electro-fishing.

FINDINGS:

The Teton River is a scenic but relatively unproductive stream with a reputation for generally poor fishing. Although a large number of people use this area, only a few come specifically to fish. Most fishing is done incidental to other recreational pursuits, primarily picnicking.

Creel census was conducted on 17 days during the 1961 fishing season, and on opening day of the 1962 fishing season (Table 1). During the 1961 fishing season 46 anglers were contacted. These anglers fished a total of 123 hours and caught 38 trout for an average catch of 0.826 fish per fisherman day, at the rate of 0.308 fish per hour. This compares to an average catch of 2.6 fish per man day at a rate of 0.8 fish per hour on a state-wide basis for the regular 1960 fishing season (Bishop, 1961). Of the 38 fish observed in anglers creels during the 1961 fishing season, 24 fish or 64 per cent, were planted rainbow trout, identified either by a clipped or deformed fin. One, or 2.6 per cent was a rainbow trout that bore neither of these characteristics. Two, or 5.3 per cent were cutthroat trout, and 11, or 29 per cent were brook trout. Four anglers were contacted on opening day of the 1962 fishing season. These anglers fished a total of eight hours and caught 2 fish, 1 a marked rainbow trout and the other an unmarked rainbow trout.

Two 300-foot sections of the North Fork (Sections I and II) were sampled with electro-fishing equipment on September 15, 1961 (Table 2). Both sections were selected in areas where fish were planted. Section I was predominantly riffle area with the exception of one pool with excellent overhanging brush cover. A total of 59 fish was captured in this section. Of these, 57 were marked rainbow trout, 1 was a cutthroat trout, and 1 was a brook trout. The marked rainbow trout had an average weight of 0.23 of a pound compared to an average weight of 0.27 of a pound at the time of planting. Section II, as Section I, was predominantly riffle with the exception of one pool. The pool in Section II was considerably larger and deeper, but was exposed, possessing no overhead cover. A total of 4 fish was captured in this section. Of these, 2 were identified as rainbow-cutthroat hybrids, 1 an unmarked rainbow, and 1 a brook trout.

Table 1. Teton River Creel Census, 1961-1962

Date	Anglers Contacted	Total Hours Fished	No. Fish Taken	Planted Rainbow	Natural Reaped Rainbow	Cutthroat	Brook
5/21/61	4	11	0	0	0	0	0
5/25/61	0	0	0	0	0	0	0
6/ 1/61	0						
6/15/61	0						
6/27/61	0						
7/ 1/61	8	33	9	9	0	0	0
7/ 4/61	11	31	17	11	1	0	5
7/ 8/61	7	16	4	4	0	0	0
7/14/61	0						
7/29/61	0						
7/30/61	6	8	0				
8/ 5/61	2	6	0				
8/ 9/61	2	3	0				
8/27/61	3	7	4	0	0	0	4
8/28/61	1	2	2	0	0	2	0
9/ 4/61	2	6	2	0	0	0	2
9/15/61	0						
5/20/62	4	8	2	1	1	0	0

Table II. Electro-fishing Results from the Upper Teton River, 1961-1962

Section	Date	Species	Number	Average Length	Average Weight
North Fork I.	9/15/61	Marked Rainbow	57	8.57	0.236
		Cutthroat	1	3.5	0.01
		Brook	1	9.0	0.31
II.	9/15/61	Rainbow	1	3.2	0.01
		Rb and Ct.	2	8.55	0.25
		Brook	1	10.1	0.44
III.	3/26/62	Marked Rainbow	1	11.1	0.52
		Rb and Ct.	6	7.62	0.185
		Whitefish	5	5.60	0.06
IV.	3/26/62	Marked Rainbow	5	9.84	0.314
		Rainbow	1	5.7	0.07
		Brook	37	4.15	0.04
V.	3/26/62	No fish taken			
South Fork	3/26/62	Planted rainbow	24	9.14	0.256
		Brook	1	6.8	0.08
		Whitefish	1	5.9	0.06

* Rb is the abbreviation for rainbow trout, Ct. for cutthroat trout.

The Teton River was again sampled with electro-fishing equipment on March 22, 1962 prior to spring runoff. Three sections (Sections III, IV, and V) were sampled in the North Fork of the Teton River and one section was sampled in the South Fork of the Teton River. All sections were again selected in areas where fish were planted. Section III consisted of an equal amount of pool and riffle area with some brush cover present in the pools. A total of twelve fish was captured in this section. Of these, one was a marked rainbow trout, six were identified as rainbow-cutthroat hybrids, and five were mountain whitefish. Section IV consisted of a single shallow beaver dam pond with some cover in the form of sunken logs and a beaver cache. A total of 43 fish was captured in this section. Of these, five were marked rainbow trout, one was an unmarked rainbow trout, and 37 were brook trout. Of the 37 brook trout, 27 had a total length of less than 5 inches. Section V was predominantly riffle area with one large deep pool. The entire area was exposed and scoured. No fish were captured in this section.

One 300-foot section was sampled on the South Fork of the Teton River on March 26, 1962. This section consisted of an equal amount of pool and riffle area with some brush cover and a few large undercut boulders. A total of 26 fish was captured in this section. Of these, 24 were rainbow trout with deformed fins, one was a brook trout, and one was a mountain whitefish. The rainbow trout had an average weight of 0.256 of a pound compared to an average weight of 0.294 of a pound at the time of their planting.

REFERENCES CITED

Bishop, Clinton G. 1961. Census of Fisherman's Creels and Analysis of Creel Census Data. Montana State Department of Fish and Game. Dingell-Johnson Project F-4-R-10, 3pp. (mimeo.).

Prepared by James Posewitz
Project Biologist

Aproved by George D Holton

Date July 2, 1962

MONTANA FISH AND GAME DEPARTMENT
FISHERIES DIVISION
HELENA, MONTANA

JOB COMPLETION REPORT
INVESTIGATIONS PROJECTS

STATE OF Montana

PROJECT NO. F-28-R-2 NAME Sun River Fisheries Study

JOB NO. I TITLE Inventory of Waters of the Sun River Drainage Upstream from Diversion Dam

PERIOD COVERED May 1, 1961 to June 30, 1962

ABSTRACT:

Seven streams were included in survey work accomplished during the summer of 1961. Stream flows, bottom samples and water quality data were collected. This information was added to that collected in 1960 from streams in the same general area. Cutthroat trout planted in 1960 in Rock Creek were not found during 1961. A second experimental plant of cutthroat trout was made in the South Fork of the Sun River upstream from the mouth of Hoadley Creek.

OBJECTIVES:

To determine the physical, chemical and biological characteristics of the waters of the Sun River drainage and obtain estimates of existing or potential fisherman use. This information will be used in forming a fish management plan for this area.

TECHNIQUES USED:

Seven streams of the Sun River drainage were surveyed during the summer of 1961. More work on this project was planned but due to personnel transfers it could not be accomplished. Fish populations were sampled by fishing with hook and line and by use of dynamite. Water samples were collected and analyzed at the State Board of Health Laboratory. Two square-foot bottom samples were collected at each station. Stream flow data were taken with the floating chip method. Field data and other information collected on this project have been transferred to permanent file cards.

FINDINGS:

The data obtained from these surveys is presented in Tables 1 and 2. Total dissolved solids was checked on seven streams in addition to those reported in Completion Report F-28-R-1.

An effort was made to find some of the 20,000 cutthroat trout which were planted in Rock Creek on September 9, 1960. None of these fish could be found.

Another plant of 20,748 cutthroat trout was made on August 29, 1961 in the South Fork of the Sun River above the mouth of Hoadley Creek where a natural barrier occurs. Prior to this plant there were no trout in this area.

Table 1. Data collected in survey of the Sun River Drainage, Teton and Lewis and Clark Counties, Montana, 1961.

Stream	Location	Date	Time	Temperature Air	Temperature Water	Vol. Cu. Ft./ Sec.	Total dissolved solids PPM
So. Fork Sun Riv.	Mouth Hoadley	7/6/61	1100	70°F.	48°F.		105
Open Creek	4 mi. from mouth	7/11/61	1445	66	50	15	90
Wrong Creek	2 mi. above Rge. S.	7/10/61	1420	69	42	10	125
Lick Creek	Below forks	7/12/61	1140	60	46	24	110
Route Creek	Trail Crossing	7/13/61	0950	55	43		160
Rock Creek	At Ranger Sta.	7/9/61	1350	64	48		40
Rock Cr. Spring	At Ranger Sta.	7/9/61	1400	64	48		20

Table 2. Summary of bottom fauna sampling in the Sun River Drainage, 1961.

Stream	No. Stations	Average No. insects Per Sq. Ft.	Percent Composition Eph.*	Ple.*	Tri.*	Col.*	Dip.*
Open Creek	2	98	63	23	7		7
Wrong Creek	2	40	72	23	5		
Lick Creek	2	45	67	20	13		

* Eph. - Ephemeroptera
Ple.- Plecoptera
Tri. - Tricoptera
Col. - Coleoptera
Dip. - Diptera

RECOMMENDATIONS:

Some data has been collected from most of the more important trout streams in the Upper Sun River drainage. Several high mountain lakes in the area should be surveyed and it is recommended that this be done. A follow-up survey should be made in the South Fork of the Sun River in order to evaluate the success of the cutthroat trout plants made in 1961.

DATA AND REPORTS:

The original data and reports are in the Fisheries Office of the Montana Fish and Game Department Headquarters at Great Falls, Montana.

Prepared by: Nels A. Thoreson

Approved by: George D. Holton

Date: December 30, 1962