MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS
FISHERIES DIVISION
JOB PROGRESS REPORT

State: Montana Title: Northcentral Montana Fisheries Study

Project No.: F-38-R4 Title: Middle Missouri River Basin -

Job No.: II Instream Flow Studies

Title: Planning Inventory, Fisheries

Period Covered: July 1, 1988 through June 30, 1989

ABSTRACT

Assessment of instream flow requirements for the fisheries of 19 streams in the middle Missouri River basin was completed during the report period. Instream flow recommendations ranged from 3 cfs for Yogo Creek to a high of 560 cfs for the lower Marias River. Trout populations were surveyed in the Sun River. Rainbow trout were most numerous in the Gibson Dam section and brown trout were largest and most numerous in the Simms Bridge section. The Tiber Dam tailwaters trout fishery was evaluated for population improvements since 1985 when the Bureau of Reclamation began meeting recommended instream flows. The trout standing crop was estimated at 105 fish/mile. Numbers of trout did not improve from the previous year, however they remain considerably better than 1982, when minimum flow conditions and water temperatures were not always adequate.

OBJECTIVES AND DEGREE OF ATTAINMENT

The overall objectives are to inventory sport and nonsport fish populations, to determine important factors upon which sport fish depend, locate critical river habitat or tributary streams for the various sport species and formulate instream flow recommendations which would protect sport fish populations.

Specific objectives include the following:

1. **To continue with instream flow analysis on approximately 30 streams.** Data collection and analysis have been completed on 19 streams. Six coldwater streams were transferred to Job I and 3 streams were deleted because of poor habitat conditions and low fishery values.

2. **To survey fish populations in streams within the study area and make fish standing crop estimates where feasible.** Fish populations were surveyed or estimated in 4 streams.

3. **To continue monitoring spawning migration runs in streams within the study area.** Spawning migrations were monitored in 2 streams.

4. **To begin instream flow write-ups on individual stream reaches for the reservation application.** Instream flow write-ups have been completed on all 25 reaches.

5. **To evaluate the status of, and continue to monitor, fish populations in the Marias River in relation to flow releases from Tiber Dam.** A trout standing crop estimate was completed in the tailwaters zone along with evaluation of the trout young-of-the-year rearing success.

PROCEDURES

The wetted perimeter (WETP) hydraulic simulation computer program was employed to evaluate the instream flow necessary for maintenance of important fish habitat areas in streams. This program was described in detail by Nelson (1984). Using standard surveying techniques, water surface elevations at three discharges (high, intermediate and low) were measured with a level and rod. Channel profiles were measured at low flow.

The electroshocking system used was adapted from the system described by Novotny and Priegal (1976). The electroshocking apparatus was a boom-type and mounted on a 14-foot aluminum McKenzie style driftboat powered by a 10 hp outboard motor. Power was supplied by a 3,500-watt AC generator. The alternating current was delivered to a Coffelt Model VVP-10 rectifying unit which changes the alternating current to pulsed or continuous direct current. The positive electrode consisted of two circular hoops with twelve 16-inch stainless steel droppers fastened on each hoop. These electrodes were supported by fiberglass booms and were positioned about six feet in front of the boat. The hull of the boat served as the negative. The unit was typically operated at 2-7 amps, 100-215 volts, 50% pulse width and a pulse frequency of 100 pulses per second. The boom electrofishing unit was utilized on the Marias River. A mobile-type electrofishing unit was used on streams between 20-300 cfs. The unit consisted of a boat (canoe or flat bottom boat) containing a hand-held mobile positive electrode, a negative electrode and a portable 1,500-watt, 115-volt AC generator. A Coffelt Model VVP-2C rectifying unit was used to change the alternating current to various forms of pulsed direct current.

Fish captured by electroshocking were measured to the nearest 0.1 inch and weighed to the nearest 0.01 pound. A catch per unit effort was used as a measure of relative abundance. (CPUE is the number of fish caught per electroshocking hour.)

The mark/recapture technique as described by Vincent (1971 and 1974) was used to estimate the trout populations in larger streams. The following formula as modified by Chapman (1951) was used:

$$N = \frac{(M+1)\ (C+1)}{(R-1)}$$

Where:

N = population estimate
M = number of marked fish
C = number of fish in the recapture sample
R = number of marked fish in the recapture sample

FINDINGS

Introduction

The Montana Water Use Act of 1973 provides that stream flow can be reserved for fish and wildlife resources. The reservation process involves submitting an application for documented instream flow needs to the Department of Natural Resources. This application is the minimum instream flow necessary to maintain a stream's fish and wildlife resources at acceptable levels. The applications and documentation for all streams with important fishery resources in the Missouri River Basin must be submitted by July 1, 1989. This study was involved with collecting pertinent fisheries field information which describes the value of a stream's resource and quantifying and recommending instream flows which would maintain these resources.

Description of Study Area

The study area includes seven tributary drainages in the middle Missouri River basin. The streams vary in size with average annual flows of about 20 cfs for Cow Creek to 947 cfs for the Marias River (USGS 1982). These seven tributaries are labeled in Figure 1.

The Sun and Marias Rivers are 106 and 170 miles in length, respectively, and drain a major portion of the East Front of the Continental Divide and Glacier National Park in northern Montana. Both drainages have a large run-off in spring and early summer and low base flows during the Summer. Substantial irrigation withdrawals act to further reduce the base flows.

Belt, Highwood, Shonkin and Cow Creeks are 83, 29, 40, and 58 miles in length, respectively, and drain interior mountain ranges. They generally maintain adequate flows in their coldwater reach throughout the summer. The Judith River is 130 miles in length and drains interior mountain ranges. The upper half of this drainage usually becomes dewatered during the summer. The lower portion maintains a good base flow because of the contributions from Big Spring and Warm Spring Creeks. Both springs have base flows of about 125 cfs.

Instream Flow Analysis of Basin Tributaries

Eighteen coldwater streams and 2 warmwater streams were surveyed for instream flow determination. The instream flow for each stream is given in Table 1. These streams have been included in the Department

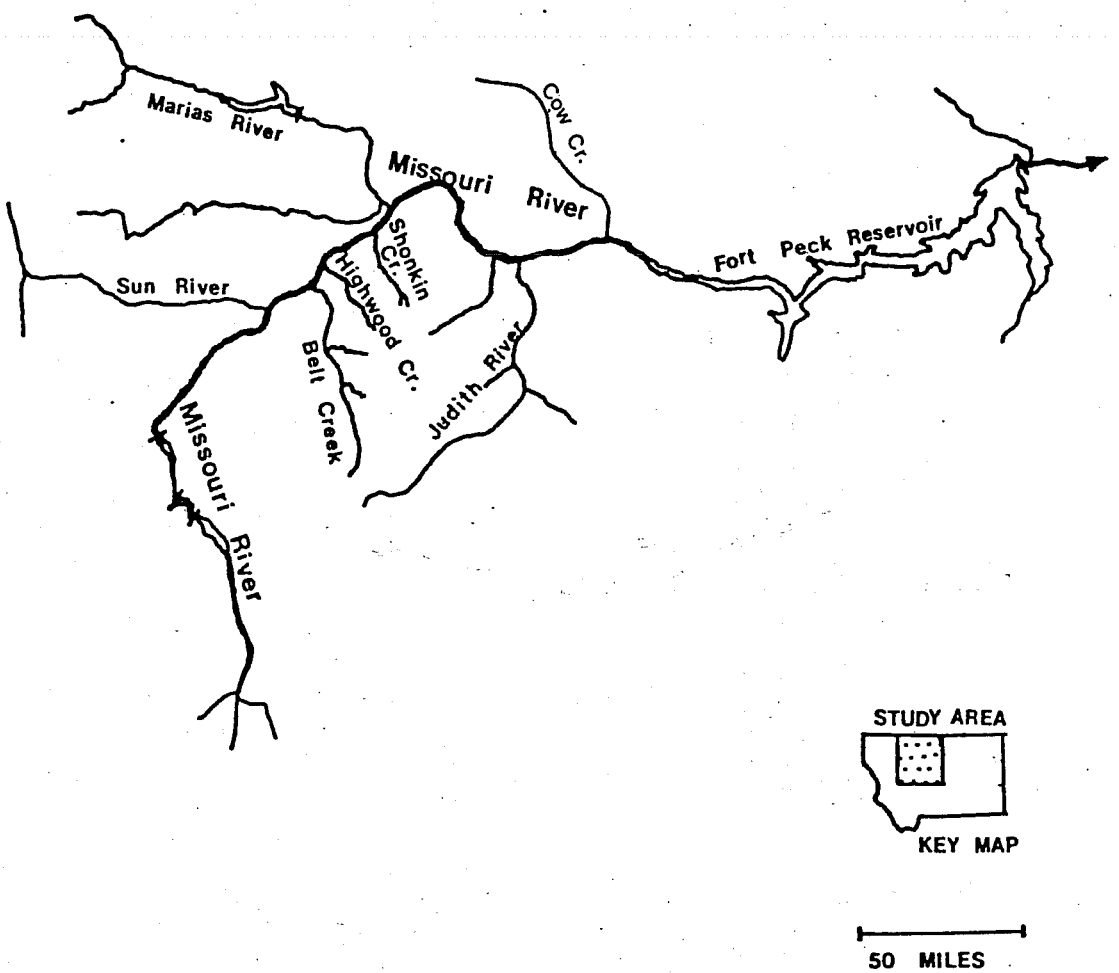

Figure 1. Map of the Study Area

Table 1. A list of study streams and instream flow water reservation.

STREAM	REACH DESCRIPTION	DATES REQUESTED	AMOUNT REQUESTED cfs	af/yr
Sun River #1	Diversion Dam to Elk Creek	Jan 1-Dec 31	100	72,397
Sun River #2	Elk Creek to Mouth	Jan 1-Dec 31	130	94,116
Belt Creek #1	Headwaters to Big Otter Creek	Jan 1-Dec 31	90	65,157
Dry Fk. Belt Cr.	Galena and Oti Park Creeks to Belt Creek	Jan 1-Dec 31	7	5,068
Tillinghast Creek	Headwaters to Belt Creek	Jan 1-Dec 31	5.5	3,982
Pilgrim Creek	Headwaters to Belt Creek	Jan 1-Dec 31	8	5,792
Logging Creek	Headwaters to Belt Creek	Jan 1-Dec 31	6	4,344
Big Otter Creek	Whiskey Springs Coulee to Belt Creek	Jan 1-Dec 31	5	3,620
Highwood Creek	Headwaters to Hwy 228 Bridge at Highwood		10	7,240
Shonkin Creek	Forest Boundary to Town of Shonkin	Jan 1-Dec 31	7	5,068
Marias River #3	Circle Bridge (Hwy 223) to mouth	Jan 1-Dec 31	560	405,421
Judith River #1	South and Middle Forks to Big Spring Creek	Jan 1-Dec 31	25	18,099
Judith River #2	Big Spring Creek to Missouri Riv	Jan 1-Dec 31	160	115,835
South Fork Judith River	Headwaters to Middle Fork, South and West Fork Creeks	Jan 1-Dec 31	3.5	2,534
Lost Fork Judith River	To Middle Fork Judith River	Jan 1-Dec 31	14	10,136
Middle Fk. Judith River	Headwaters to South Fork	Jan 1-Dec 31	22	15,928
Yogo Creek	Headwaters to Middle Fork Judith River	Jan 1-Dec 31	3	2,172
East Fork Big Creek	Headwaters to Big Spring Creek	Jan 1-Dec 31	7.5	5,430
Beaver Creek	West Fork to Cottonwood Creek	Jan 1-Dec 31	5	3,620
Cottonwood Creek	Spring Branch of Cottonwood Creek to Big Spring Creek	Jan 1-Dec 31	4.5	3,258
Cow Creek	North and South Forks to County Bdg.	Jan 1-Dec 31	4.5	3,258

of Fish, Wildlife and Parks water reservation application for the Missouri River Basin.

Fish Populations

Sun River

Trout populations were surveyed at 4 locations along approximately 100 miles of the Sun River during the fall, 1988 (Table 2). Surveys indicated that trout populations were low throughout the river. Rainbow trout predominated in the upper sites, whereas brown trout were most common in the lower two study sites. Young-of-the-year rainbow and brown trout were found at 3 of the 4 sites indicating successful reproduction below Diversion Dam.

Sun River flows below Diversion Dam were excessively low as a result of drought conditions and heavy irrigation withdrawals during the summer, 1988. Green Fields Irrigation District stream gauging records show that flows dropped below 100 cfs 37 days out of a total of 92 days for the months of June, July and August. Instream flow analysis has determined that a flow of 100 cfs is needed in the upper Sun River for maintenance of at least a low fishery value (Table 1).

A total of 43 brown and 3 rainbow trout were tagged during 1988. Only 2 tags had been recovered by anglers. Both these were brown trout and were taken in the area where the tagged fish were released.

Marias River - Tiber Dam Tailwaters

A coldwater fishery exists in a 21 mile reach of river below Tiber Dam. This condition is maintained by bottom coldwater releases from Tiber Dam. Prior to 1985 the coldwater fishery was maintained far below its potential because of inadequate instream flows and periodic surface warmwater releases from the dam (Gardner and Berg 1983). Flows in the Marias below Tiber have been 500 cfs or greater for the period June 1985 through August 1988. However, since August, flows below the dam had to be reduced to approximately 300 cfs for the following 8 months as a result of the severe drought that had occurred during summer, 1988. Since 1985 summertime water releases from Tiber have been from the bottom, thereby maintaining the coldwater conditions.

Several brown and rainbow trout and mountain whitefish were sampled during August, 1988. Length-frequency distributions for these species for 3 years are presented in Figure 2. The years 1987 and 1988 represent years when minimum instream flows were maintained along with summertime coldwater releases. The year 1982 represents the years when river conditions below Tiber were sometimes below the minimum instream flow, with occasional periods of warmwater releases.

The brown trout length-frequency distributions appear to be similar for 1987 and 1988, whereas, the 1982 population exhibits a weak representation of trout in the 5-9 inch size groups. This is probably the result of poor spawning and rearing success. The population is also well represented with fish in the larger length

Table 2. Size statistics for game fish sampled electroshocking the Sun River, fall 1988.

LOCATION	NUMBER 1/ SAMPLED	AVERAGE 1/ LENGTH (in.)	RANGE	AVERAGE 1/ WEIGHT (lb.)	RANGE
Gibson Dam					
(0.3 mi. section)					
Rainbow	13	9.9	(2.9-14.4)	0.38	(0.01-1.16)
Brook Trout	2	8.5	(7.3-9.7)	0.22	(0.10-0.34)
Alkali Flats					
(2.5 mi. section)					
Rainbow	20	7.1	(2.6-16.6)	0.20	(0.01-1.58)
Brown	14	13.9	(3.9-23.0)	1.24	(0.01-3.40)
Mountain Whitefish	36	11.4	(3.6-18.0)	0.50	(0.01-1.66)
Simms Bridge					
(2.6 mi. section)					
(Sampled twice)					
Rainbow	4	12.8	(3.1-17.2)	1.08	(0.01-2.30)
Brown	44	15.4	(3.1-23.1)	1.64	(0.01-4.32)
Mountain Whitefish	9	9.9	(3.3-12.3)	0.37	(0.01-0.60)
Burbot	2	13.2	(13.0-13.5)	0.57	(0.52-0.62)
Fort Shaw Bridge					
(1.5 mi. section)					
Rainbow	3	12.2	(10.2-14.5)	0.74	(0.53-1.04)
Brown	15	12.0	(3.2-20.2)	0.88	(0.01-2.90)
Mountain Whitefish	40	10.2	(4.0-16.6)	0.46	(0.05-1.54)

1/ Fish less than 5.0 inches were not included in averages or total numbers.

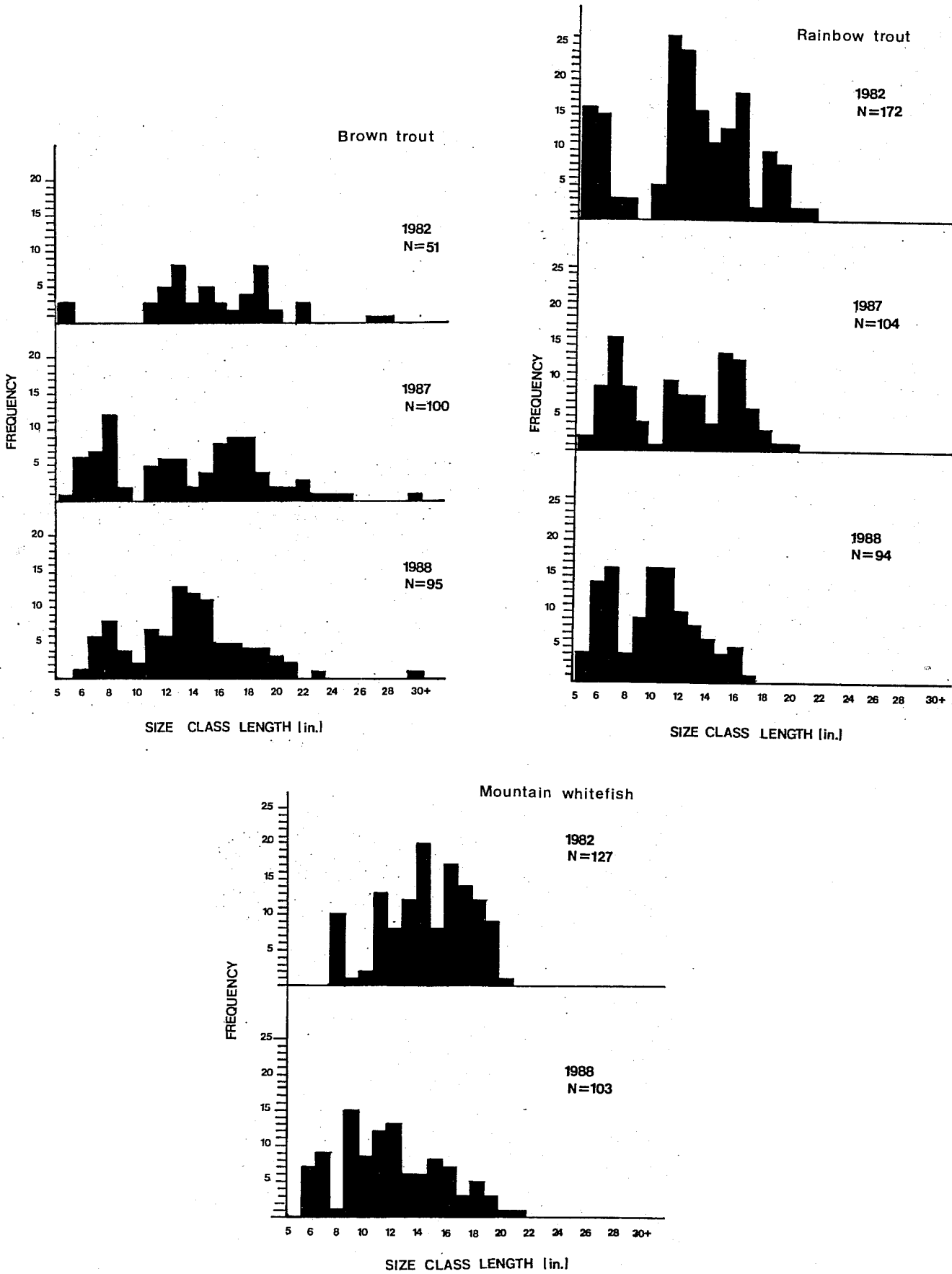

Figure 2. Length-frequency distributions of brown trout, rainbow trout and mountain whitefish caught by electroshocking in the Marias River, Tiber Section. (During 1987 and 1988 fish were sampled during August. The 1982 fish were sampled throughout the year.)

groups for all sample years. It appears the present operations of Tiber Dam are more favorable for a diversified brown trout size structure.

The rainbow trout distributions indicate that the larger size groups have diminished only recently. For the years 1982 and 1987 24% and 22% of the fish sampled were 16 inches or larger compared with only 6% for the 1988 sample. It should be noted that large rainbows greater than 18 inches were absent in the 1988 sample. No explanation for these changes can be given at this time. Another apparent difference is the shift to larger sizes for the yearling age class. Yearlings are represented by the 5 to 8 inch groups. The yearling age class for the 1982 sample was dominated by 5 and 6 inch groups, compared to 1987 and 1988, where 6 and 7 inch groups dominated this age class. This increase in size for the yearling age class is probably a reflection of the improved temperature and flow conditions in the river below Tiber Dam.

The mountain whitefish size structure was sampled to assess the effects on the population with the changed operations at Tiber Dam. These two distributions indicate that the proportion of larger size groups have diminished since 1982. Fish 14 inches or longer comprised 63% of the sample in 1982 compared to only 32% of the whitefish sampled in 1988. It should be noted that larger whitefish, greater than 18 inches, were still present in the 1988 sample. This data indicates there is probably better survival of young whitefish in the more recent years, most likely attributable to the more favorable conditions below the dam.

A trout standing crop estimate and early life history investigations were conducted during 1988 to evaluate the effects of the improved water releases from Tiber. Trout standing crop estimates are given in Table 3. The population was estimated at 105 fish per mile, compared to 141 fish per mile estimated in 1987 (Gardner 1988). These two estimates have considerably wide confidence intervals (not given) because of the small sample size and low recapture rate. Comparisons between the two estimates reveal that the confidence intervals overlap for all size groups. Therefore, there may be no real difference in trout standing crop estimates between years.

The population estimate of 105 fish per mile is considered low when compared to other trout rivers in the region such as the Missouri River at Craig, with 4,000 trout per mile, Smith River with 900 trout per mile, and Big Spring Creek with 3,500 trout per mile (Leathe and Hill, 1987). Despite the lack of a continued increase in trout numbers, the trout populations found in 1988 are a considerable improvement over what existed prior to the maintenance of minimum instream flows and coldwater temperature releases.

Young-of-the-year (YOY) brown and rainbow trout were sampled at established study sites on the Marias River to monitor spawning success. Results indicate that numbers of YOY trout sampled in 1988 were similar to that of 1987 (Table 4). One difference noted is the increased catch rate of trout in the lower section (Pugsley Bridge). The presence of YOY trout were also noted further downstream at Moffat

Table 3. Standing crop estimates for a 4.5 mile reach of the Marias River below Tiber Dam, Summer 1988.

SPECIES	SIZE CLASS (in.)	AVERAGE LENGTH (in.)	AVERAGE WEIGHT (in.)	M	C	R	ESTIMATE	NO./MILE
Brown Trout	6.0-10.9	8.4	0.25	5	18	2	38	8
	11.0-31.0	15.5	1.50	48	40	14	134	30
Rainbow Trout	6.0-10.9	8.5	0.25	17	34	4	126	28
	11.0-18.0	13.6	0.90	35	38	7	176	39
							TOTAL	105 trout/mile

Table 4. Numbers, sizes and catch rates of young-of-the-year trout sampled in the Marias River during late August, 1987 and 1988.

	Year	Species	Number Sampled	Average Length (in.)	No.Fish/ Min	Section Length
Campground (Right) (River Mile 1.0)[1/]						
	1987	Brown trout	52	2.7	1.7	100 yds
		Rainbow trout	13	1.9	0.4	100 yds
	1988	Brown trout	32	3.0	0.6	150 yds
		Rainbow trout	19	2.4	0.4	150 yds
Campground (Left) (River Mile 1.2)						
	1987	Brown trout	26	2.9	1.3	50 yds
		Rainbow trout	13	1.9	0.6	50 yds
	1988	Brown trout	36	3.0	0.9	75 yds
		Rainbow trout	39	2.2	1.0	75 yds
Pugsley Bridge Side Channel (River Mile 5.3)						
	1987	Brown trout	7	3.0	0.1	200 yds
		Rainbow trout	16	1.9	0.3	200 yds
	1988	Brown trout	27	3.3	0.7	200 yds
		Rainbow trout	32	2.5	0.8	200 yds
Moffat Bridge (River Mile 12.2)						
	1988	Brown trout	18	3.4	0.5	100 yds
		Rainbow trout	6	2.4	0.2	100 yds

1/ River mile 0 located at Tiber Dam.

Bridge, about 12 miles below the dam. Young-of-the-year trout were rarely sampled below rivermile 7 during the 1982 season (Gardner and Berg 1983). Another obvious change that has occurred since the 1982 study is the increase in YOY brown trout numbers. It appears that trout spawning success and rearing have improved over the past 6 years.

Judith River - Lower Reach

Fisheries inventory studies continued in the lower Judith River. During 1987 and 1988 the adult fish populations were sampled and the results have been previously reported (Gardner 1988). Table 5 lists the forage fish found in the lower Judith River along with relative catch rates. The forage fish community was represented by 8 species, all of which are found in the middle Missouri River near the Judith confluence. The moderate average catch rate of 65 fish/haul compares lower than averages of other warmwater streams such as the upper Marias - 462 fish/haul, and middle Missouri - 322 fish/haul (Gardner 1987 and Drewes and Gilge 1986). Seine catches were dominated by flathead chubs, longnose dace and longnose sucker.

RECOMMENDATIONS

1. Continue with the fish studies in the Sun River. This should include standing crop estimates, spawning movement and habitat studies. A Sun River water management plan should be developed with the major water users in the drainage.

2. Monitor trout population trends in the Tiber Dam tailwater section by conducting biennial standing crop estimates. Trout cover habitat, especially for young-of-the-year and yearling fish should be improved in the Marias. A water temperature model should be developed with the Bureau of Reclamation providing the tailwater trout fishery below the dam with near optimal temperature conditions for spawning, forage production and growth.

Table 5. Catch rates of forage fish species (number of fish per seine haul) sampled in the lower Judith River, August 1988. (50 x 4 ft. seine)

Species	Total Number	Average CPUE/haul
Flathead chub	180	30
Fathead minnow	5	0.8
Western		
Silvery minnow	22	3.7
Longnose dace	79	13.2
Shorthead redhorse	9	1.5
River carpsucker	17	2.8
Mountain sucker	9	1.5
Longnose sucker	23	3.8
Sucker (YOY)	48	8.0

Average CPUE = 65.3 fish/haul

Total number hauls - 6

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Prepared by: William A. Gardner

Date: July, 1988
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Code numbers of waters referred to in this report are:

l4-3240	Marias River Sec 1 - reaches 000 & 001
l6-0200	Beaver Creek - reach 001
l6-0900	Cottonwood Creek - reach 001
l6-0940	Cow Creek - reach 001
l6-1340	E. Fork - Big Spring Creek - reach 001
l6-1800	Judith River Sec 1 - reach 000
l6-1820	Judith River Sec 2 - reach 003
l6-2140	Lost Fork - Judith River - reach 001
]6-2360	Middle Fork - Judith River - reach 000
l6-3520	South Fork - Judith River - reach 001
l6-4260	Yogo Creek - reach 001
l7-0544	Belt Creek - reach 003
l7-0608	Big Otter Creek - reach 001
l7-2352	Dry Fork - Belt Creek - reach 002
l7-3456	Highwood Creek - reach 002
l7-4304	Logging Creek - reach 000
l7-5888	Pilgrim Creek - reach 000
l7-6656	Shonkin Creek - reach 001
l7-7680	Tillinghast Creek - reach 000
20-6100	Sun River sec 1 -reaches 001 & 002

MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS
FISHERIES DIVISION
JOB PROGRESS REPORT

STATE: Montana Project No: F-46-R-2
PROJECT TITLE: Statewide Fisheries Investigations Job No: III-a
STUDY TITLE: Survey and Inventory of Warmwater Streams
JOB TITLE: Northcentral Montana Warmwater Streams Investigations
PERIOD COVERED: July 1, 1988 through June 30, 1989

ABSTRACT

Warmwater fisheries investigations were conducted on the Missouri River below Morony Dam. The advisory group formed last year met to ensure adequate flows for resident and migratory fish in the Marias River below Tiber Reservoir. Stream preservation activities were conducted on 15 projects.

OBJECTIVES AND DEGREE OF ATTAINMENT

1. **To maintain a minimum flow of 500 cfs in the lower Marias River for habitat enhancement.** Progress made and summarized in this report.

2. **To ensure, within hydrologic constraints, that flows in streams supporting cool/warm water gamefish do not fall below past ten year averages.** Progress made for Marias River and summarized in this report.

3. **To maintain the Regions streambanks and channels in their present or improved condition. (State funded).** Progress made and summarized in this report.

4. **Maintain water quality at or above 1983 levels as measured at USGS water quality monitoring stations.** No discharge permit applications or pollution complaints were received for warmwater streams during the report period.

5. **To assess existing sauger, walleye and freshwater drum populations to determine population densities in the Missouri River between Morony Dam and the Marias River.** During the reporting period, we acquired an 18-foot jet boat, a 115-HP

outboard, a 3500-watt 220-volt generator, and a Coffelt VVP-15 rectifying unit. This allowed us to sample the Missouri River below Morony Dam; a summary of this work is included in the report.

6. **To maintain sauger populations in the Missouri River to provide 10,000 angler days use annually.** See Objective 5 above.

7. **To determine angler use and harvest of fish species and maintain at least the existing quality of fishery in the lower Marias River.** No work scheduled until FY90.

8. **To increase and diversify angling opportunity in the upper 50 miles of the Marias River and lower 10 miles of Cut Bank Creek. (State funded).** Planned stocking of smallmouth bass and/or sauger was not attempted. No smallmouth bass have been planted in these waters in the past so a Preliminary Environmental Review must be prepared before the introduction proceeds. Transplanting of sauger from the Missouri and lower Marias Rivers was not performed to prevent the introduction of an additional predator into Lake Elwell.

9. **To determine walleye distribution and angler harvest in the Missouri River between Holter Dam and Great Falls.** Work completed and summarized last year displayed low angling pressures and a low walleye population density between Holter Dam and Great Falls. Additional data acquisition did not appear necessary to provide management of this resource.

10. **To evaluate need and develop fishing access sites on the Missouri River downstream from Morony Dam. (State funded).** Through cooperation with Parks Division and Great Falls chapter of Walleyes Unlimited a permanent access at Carter Ferry was donated to MDFW&P.

11. **To acquire public fishing access sites on the lower Marias River. (State funded).** The Montana Department of Highways has created a permanent public access at Loma Bridge in cooperation with MDFW&P.

PROCEDURES

Evaluation of plans for water manipulation in Tiber Reservoir and the Marias River below Tiber Dam were made by the advisory board established during the last reporting period. Board menmbers include representatives from the Bureau of Reclamation, sportsman's clubs, county commissioners, landowners and the Department of Fish, Wildlife and Parks. Instream flow recommendations were developed using the wetted perimeter method (Nelson 1984). Recommendations and alternatives for projects involving stream banks and channels were made through participation in the Stream Protection Acts. Fish populations in the Missouri River were surveyed by electrofishing. Walleye and sauger were tagged to determine angler harvest and movement.

FINDINGS

Lower Marias River minimum flow

Past studies have determined that 500 cfs is necessary in the lower Marias River to attract spawning sauger (Gardner, 1987). To meet this goal, an advisory group of irrigators, sportsmen and FWP representatives worked in cooperation with the Bureau of Reclamation to develop operating guidelines. However, due to drought conditions, discharge from Tiber Dam had to be reduced to 300 cfs for 8 months beginning in August 1988 (Gardner 1988).

Stream Preservation

A total of 15 applications involving hydraulic projects on warmwater streams were reviewed and commented upon. All these projects were reviewed through the provisions of the 1975 Natural Streambed and Land Preservation Act.

Missouri River between Morony Dam and the Marias River

We electrofished the Portage Coulee Section on two dates in September 1988 to determine the relative abundance of various fish species in the Missouri River between Morony Dam and the Marias River. A total of 8 fish species were captured during the September sampling (Table 1). On both days, we collected more sauger than all other fish species combined. Mean length of the sauger was over 15 inches and the average weight exceeded 1 pound. Rainbow trout, brown trout, and walleye comprised most of the other sport fish sampled. The greatest mean weight observed from the September catch was for freshwater drum. We tagged 93 sauger and 12 walleye in the section. To date, 1 tagged sauger has been reported caught by anglers. Goldeye numbers in the catch are not representative of their actual abundance in the river.

Table 1. Catch statistics from electrofishing surveys of the Portage Coulee Section on the Missouri River, MT in 1988.

Date	Species	Number	Mean length (range) (inches)	Mean Weight (range) (pounds)
9/8	Freshwater drum	6	17.4(15.3-20.5)	3.43(1.92-6.50)
	Ling	1	20.7 -	1.28 -
	Goldeye	1	15.5 -	1.44 -
	Rainbow trout	3	18.0(14.5-20.4)	2.03(1.18-2.90)
	Brown trout	12	14.2 (9.5-20.6)	1.35(0.34-3.18)
	Mountain whitefish	1	16.5 -	1.66 -
	Walleye	8	15.5(10.5-19.4)	1.38(0.40-2.66)
	Sauger	52	15.1(12.1-18.7)	1.07(0.53-2.00)
9/9	Freshwater drum	2	17.5(17.0-17.9)	3.35(2.70-4.00)
	Goldeye	2	14.8(14.5-15.1)	1.19(1.17-1.20)
	Rainbow trout	5	13.8 (8.4-19.0)	1.13(0.26-2.08)
	Brown trout	4	11.9 (8.9-18.6)	0.91(0.26-2.43)
	Mountain whitefish	1	18.7 -	2.45 -
	Walleye	6	14.8 (8.0-17.0)	1.21(0.26-1.46)
	Sauger	42	15.9(13.2-19.1)	1.30(0.76-2.61)
11/4	Rainbow trout	6	19.8(15.6-25.5)	3.45(1.42-6.60)
	Brown trout	15	18.7(14.8-25.2)	2.71(1.42-6.75)
	Walleye	2	15.9(15.2-16.5)	1.32(1.14-1.50)
	Sauger	2	16.5(16.4-16.5)	1.44(1.38-1.50)

Sampling in the section occurred once again in November; however, the purpose of this electrofishing trip was obtaining samples of fish tissue for analysis in the National Contaminant Biomonitoring Program. Catch statistics from November sampling suggest a greater proportion of trout in the section than we observed in September. This may be due to brown trout moving into the section later in the fall during spawning migrations and the target species to be collected was trout.

DISCUSSION AND RECOMMENDATIONS

The advisory group formed to develop operating guidelines for maintaining sufficient flows in the Marias River below Tiber Dam should continue to function to ensure adequate flows for spawning sauger and shovelnose sturgeon from the Missouri River. Although no discharge permit applications or pollution complaints were received during the report period, these will be handled on a case by case basis as they arise.

ACKNOWLEDGEMENTS

The authors thank Paul Hamlin and Les Everts for performing the electrofishing surveys on the Portage Coulee Section of the Missouri River downstream from Morony Dam.

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Nelson, Fred A. 1984. Guidelines for using the wetted-perimeter (WETP) computer program of the Montana Department of Fish, Wildlife and Parks. Montana Department of Fish, Wildlife and Parks, Bozeman, Montana. 58 pp.

Prepared By: William J. Hill, George A. Liknes, and Stephen A.Leathe

Date: August,1989.

Principal Fish Species Involved:

Sauger, walleye, shovelnose sturgeon, channel catfish, smallmouth bass, burbot, northern pike and freshwater drum.

Code Numbers Of Waters Referred To In Report:

14-1080 Cut Bank Creek Sec. 01
14-3240 Marias River Sec. 01
14-3280 Marias River Sec. 02
17-4880 Missouri River Sec. 07
17-4896 Missouri River Sec. 08

MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS
FISHERIES DIVISION
JOB PROGRESS REPORT

STATE: Montana PROJECT NO. F-46-R-2
PROJECT TITLE: Statewide Fisheries Investigations JOB NO. I-g
STUDY TITLE: Survey and Inventory of Coldwater Streams
JOB TITLE: Northcentral Montana Trout Stream Investigations
PERIOD COVERED: July 1, 1988 through June 30, 1989

ABSTRACT

Electrofishing surveys were conducted on 11 streams to update management files. Data for population estimates were gathered on 2 sections of both the Missouri River and Big Springs Creek and on one section of Tenderfoot Creek. Approximately 65 projects under the Natural Streambed and Land Preservation Act were reviewed along with 22 projects under the Stream Protection Act.

OBJECTIVES AND DEGREE OF ATTAINMENT

1. To establish viable trout fisheries in Marias River below Tiber Dam and in the Sun River below Diversion Dam for recreational fishing.

2. To ensure within hydrologic constraints, that flows in streams supporting trout populations do not fall below 1976-86 averages.

3. To maintain summer survival flow of at least 50 cfs in the Smith River at Camp Baker.

4. To maintain streambanks and channels in as natural a condition as possible. **(State funded).**

5. To maintain undisturbed riparian zones where they currently exist on Smith and Missouri Rivers. **(State funded).**

6. To maintain water quality at or above 1975-85 average levels as monitored at USGS stations.

7. To maintain habitat and species of special concern at present levels or better in streams affected by resource development activities. **(State funded).**

8. To ensure that mid-Missouri reservoir operations maintain a minimum flow of 4100 cfs 8 years out 10 in the Missouri River from Holter Dam to Ulm.

9. To evaluate contribution and influence of hatchery rainbow trout flushed from upstream reservoirs on wild trout fishery in Missouri River downstream of Holter Dam.

10. To increase rainbow and brown trout spawning habitat in three tributaries to the Missouri River from Holter Dam to Cascade. **(State funded).**

11. To maintain trout populations at or above 1984 levels in Tresch Section and 1978 levels in Burleigh Section of Big Spring Creek near Lewistown.

12. To provide 80,000 angler-days annually and average catch rate of 0.4 trout/hour in Missouri River between Holter Dam and Cascade.

13. To evaluate special slot-limit for trout on Smith River and modify regulations to balance angler harvest with population structure if warranted.

14. To maintain trout populations in Regional streams at present levels or higher.

15. To allow harvest of one trout over 12" in USFS streams along Rocky Mountain Front if compatible with stream fishery resources. **(State funded).**

16. To obtain at least two fishing access sites on the Sun River between the towns of Augusta and Sun River, and one each on the lower Dearborn River and upper Smith River. **(State funded).**

Progress was made on all federally funded objectives during the report period and is summarized in this report. Data for some state objectives is included to provide current information for regional streams.

PROCEDURES

An advisory board consisting of personnel from the Bureau of Reclamation, Sportsman's Clubs, County Commissioners, landowners and Department of Fish, Wildlife and Parks evaluated plans for water manipulation in the Marias River below Tiber Dam. Trout populations in Big Springs Creek were surveyed using a fiberglass drift boat equipped with a mobile electrode powered by a 120 volt generator with a rated capacity of 2000 watts. A Fisher Shocker (Model FS 101) was used to convert AC electricity from the generator to straight DC. The Missouri River was electrofished at night using an 18-foot aluminum jet boat and a fiberglass drift

boat powered by a small outboard motor. Both boats were equipped with headlights and fixed booms with stainless steel droppers suspended in front of the bow. Electricity from 120 or 240 volt portable generators was converted to pulsed DC using Coffelt VVP-2C or VVP-15 rectifying units. Rainbow and brown trout populations from Big Springs Creek and the Missouri River were estimated by a mark-recapture method described by Vincent (1971). We analyzed the data with a computer program developed by MDFWP for use on an IBM-PC compatible microcomputer. Trout populations in other regional streams were surveyed by electrofishing, snorkeling and hook and line. Periodic creel interviews on the Missouri River were obtained by a roving clerk. A two-pass population estimate was performed on Tenderfoot Creek.

FINDINGS

Electrofishing Surveys

Eleven streams were electrofished in the western portion of Region 4 to determine the species present, size range of the fish, and relative abundance (Table 1). Most of the streams surveyed contained fish identified as cutthroat trout based on morphological characteristics; cutthroat trout were the only fish captured in four streams. We found brook trout in six streams and mountain whitefish were captured in three of the waters. Deep Creek was the only stream where brown trout were collected while both Deep and Falls creeks contained rainbow trout.

Tenderfoot Creek

A two-pass population estimate was performed in a 500 foot section of Tenderfoot Creek in late August 1988. Presentation of the data will occur in the next annual report.

Habitat Protection

Approximately 65 proposed projects that would alter streambeds or banks in nine different counties were reviewed during this report period under provisions of the Natural Streambed and Land Preservation Act of 1975 (SB 310). Seventy-five percent of these were in Cascade and Lewis and Clark counties. In addition, approximately 22 projects were reviewed by regional and Helena staff pursuant to the Stream Preservation Act (SPA). Site inspections were made on many but not all of the "310" and SPA projects. No significant water discharge permit applications or renewals were received and no significant pollution complaints were received during the report period.

Table 1. Catch statistics from electrofishing operations on selected streams in Region 4 during 1988.

Stream (Date surveyed)	Legal Description	Species	Number of Fish	Range Length (in)	Range Weight (lbs)
Deep Ck (7/11/88)	T23N,R7W,S24	rainbow trout	13	5.0-11.0	-
		brown trout	9	6.0-17.5	-
Falls Ck (10/20/88)	T17N,R7W,S3	rainbow trout	23	2.6-8.3	-
		brook trout	14	3.6-9.8	-
		mountain whitefish	4	7.0-10.0	-
Muddy Ck (8/11/88)	T26N,R6W,S29	brook trout	12	5.2-10.5	-
N. Fk. Dupuyer Ck (7/13/88)	T27N,R9W,S22	cutthroat trout	13	4.3-11.9	0.07-0.72
		brook trout	21	4.0-11.5	0.04-0.66
N. Fk. Teton River (8/10/88)	T25N,R9W,S16	cutthroat trout	6	3.7-15.0	-
		brook trout	3	4.0-8.0	-
		mountain whitefish	2	5.4-16.1	-
S. Fk. Teton River (8/10/88)	T24N,R9W,S1	cutthroat trout	9	2.3-9.0	-
		brook trout	13	3.8-9.4	-
		mountain whitefish	15	5.1-9.2	-
W. Fk. Teton River (8/8/88)	T25N,R9W,S6	cutthroat trout	7	2.0-6.1	-
N. Fk. Waldron Ck (8/8/88)	T25N,R9W,S17	cutthroat trout	24	2.7-8.2	-
Waldron Ck (8/10/88)	T25N,R9W,S16	cutthroat trout	16	3.0-10.5	-
N. Fk. Willow Ck (7/25/88)	T24N,R8W,S9	cutthroat trout	17	3.7-8.1	-
Swamp Ck (8/9/88)	T24N,R7W,S18	brook trout	39	2.9-14.4	-

Big Springs Creek

Mark-recapture population estimates were made by electrofishing two sections of Big Springs Creek as scheduled in fall 1988. Data analysis and ageing of trout scales was not completed in time for inclusion in this report so results will appear in the next annual report.

Missouri River

Trout population estimates were conducted in the Craig and Cascade sections during fall 1988 as scheduled and brown trout estimates were obtained in the same sections in spring 1989. Data analysis and ageing of trout scales was not completed in time for inclusion in this report so results will appear in the next annual report.

ACKNOWLEDGEMENTS

Paul Hamlin, Les Evarts and Ken Sinay were fisheries fieldworkers who conducted or assisted on nearly all of the field activities conducted on this project during the report period. They also assisted in compiling and summarizing data presented and their dedicated efforts are appreciated.

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Vincent, E.R. 1971. River electrofishing and fish population estimates. Progressive Fish Culturist 33(3):163-169.

Prepared By: Stephen A. Leathe, William J. Hill, and George A. Liknes

Date: August 1989

Principal Fish Species Involved:

Rainbow trout, brown trout, cutthroat trout, brook trout, and mountain whitefish.

Code Numbers Of Waters Referred To In Report:

14-0800	Muddy Creek
14-1280	Deep Creek
14-3840	N. Fk. Dupuyer Creek
14-4000	N. Fk. Teton River
14-	N. Fk. Waldron Creek
14-4040	N. Fk. Willow Creek
14-5640	S. Fk. Teton River
14-	Swamp Creek
14-6360	Waldron Creek
14-6480	W. Fk. Teton River
17-2688	Falls Creek
17-4896	Missouri River Sec 09
17-6832	Smith River Sec 02
17-7532	Tenderfoot Creek

MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS
FISHERIES DIVISION

JOB PROGRESS REPORT

STATE: Montana
PROJECT NO: F-46-R-1
JOB NO: II-f

TITLE: STATEWIDE FISHERIES INVESTIGATIONS
TITLE: SURVEY AND INVENTORY OF COLDWATER LAKES
TITLE: MID-MISSOURI RESERVOIRS STUDY

PROJECT PERIOD: JULY 1, 1988 THROUGH JUNE 30, 1989

OBJECTIVES

1. To maintain densities of rainbow trout in Canyon Ferry and Holter reservoirs and densities of rainbow trout and/or kokanee in Hauser Reservoir based on an index of abundance of an average of 15 yearling or older fish captured per 125 feet of experimental gill net set during the spring.

2. To quantify downstream escapement of hatchery reared rainbow trout from the three reservoirs.

3. To monitor distribution and food supply of sport fishes in the three reservoirs.

4. To identify extent of natural reproduction occurring in the reservoir complex and identify areas where reproduction could be enhanced.

5. To provide for a stable salmonid fisheries with an average catch rate of 0.30 fish/hour in Canyon Ferry Reservoir and 0.40 fish/hour in Hauser and Holter reservoirs.

6. To provide for an average winter catch rate of 2.0 yellow perch/hour with an average size of 8.5 inches and an annual harvest of 300,000 in Canyon Ferry Reservoir.

7. To determine status of walleye populations in Hauser and Holter reservoirs.

8. To maintain requested instream flows in the Missouri River and minimize the loss of fish over mid-Missouri River dams during spill periods.

9. Develop a comprehensive five year management plan for the mid-Missouri Reservoir complex.

DEGREE OF ATTAINMENT

Objective 1

A total of approximately 1,000,000; 200,000; and 325,000 rainbow trout fingerlings (3-5 inches) were stocked into Canyon Ferry, Hauser and Holter reservoirs, respectively, during 1988. As part of an ongoing strain evaluation program, Canyon Ferry Reservoir received about 750,000 Arlee, 125,000 Eagle Lake and 125,000 Desmet rainbow trout. Hauser and Holter reservoirs received only Arlee rainbow trout. Rainbow trout in the three reservoirs were sampled with floating and sinking 6 X 125 foot experimental gill nets (3/4 to 2 inch mesh) set at standardized locations during the spring and the fall. All gill net data has been entered into computer files. Because efforts have been primarily directed toward the development of comprehensive five year management plans for the reservoir complex, summarization of gill net data has not been completed. These data will be included in a future annual progress report.

Objective 2

All rainbow trout stocked into the reservoir complex during 1988 were marked with either fluorescent pigment or a fin clip. In addition, all spray marked fish were marked with tetracycline to evaluate retention of fluorescent pigment marks. Rainbow trout collected from gill netting, electrofishing and creel census activities were examined for these various marks. All marking data has been entered into computer files and will be included in a future annual progress report when analyses are completed.

Objective 3

Areal distribution of reservoir fishes were monitored with floating and sinking 6 X 125 foot experimental gill nets (3/4 to 2 inch mesh) set at standardized locations during the spring and the fall. Distribution of fish species by depth was determined by using a bank of four vertical gill nets set monthly from May through October at permanent sampling stations located in the lower end of each reservoir. These data have been entered into computer files and will be included in a future annual progress report when summaries are completed. Zooplankton densities were determined in each reservoir by making vertical plankton net tows biweekly at permanent sampling stations from mid-April through late November. Zooplankton collections have not been analyzed. Collections will be stored and analyses will be undertaken only if the data is determined to be needed to further understand the fish population dynamics in the reservoir complex.

Objective 4

Two tributaries to Canyon Ferry Reservoir and two tributaries to Hauser Reservoir were electrofished during the spring and the

fall to monitor spawning runs and to identify barriers to migration. Drift nets were installed weekly from mid-June through late July in four tributaries to Canyon Ferry Reservoir and one tributary to Hauser Reservoir to monitor emigration of rainbow trout fry. These data will be included in a future annual progress report when analyses are completed.

Objective 5

A partial creel census was conducted on the three reservoirs from late April through late November. A total of 6,387 anglers were interviewed. A more comprehensive creel census was conducted on the Canyon Ferry tailrace from mid-September through late November. A total of 350 anglers were interviewed. These data have been entered into computer files and will be included in a future annual progress report when analyses are completed.

Objective 6

A partial creel census was conducted on the three reservoirs from early January through late March. A total of 1,317 anglers were interviewed. These data have been entered into computer files and will be included in a future annual report when analyses are completed.

Objective 7

Tagging kits were distributed to interested anglers and members of the local walleye club for use on Hauser and Holter reservoirs. In addition, walleye were tagged in Holter Reservoir during "tagging parties" conducted by the local walleye club. Approximately 120 walleye in Holter Reservoir have been tagged to date. Tags are being distributed to evaluate growth, movement and angler harvest. Indices of abundance for walleye were monitored using experimental gill nets set at standardized locations during the spring and the fall. Results will be presented in a future annual progress report.

Objective 8

The annual meeting of the Upper Missouri Advisory Committee was attended to discuss projected reservoir operations for the year and to review relicensing plans for Hauser and Holter dams by the Montana Power Company. Study proposals were submitted to the Montana Power Company as part of the relicensing process by the Federal Energy Regulatory Commission.

Objective 9

Considerable project effort was expended on the development of comprehensive five year management plans for the mid-Missouri Reservoir complex. Public scoping meetings were held in Great Falls, Helena and Bozeman during November to determine what were the issues and problems associated with the management of the

mid-Missouri Reservoir Complex. Based on public comment received at these meetings, preliminary documents presenting a series of management alternatives for Canyon Ferry, Hauser and Holter reservoirs were completed. Because of the complexity of the management issues on Hauser Reservoir and the attention shown by various special interest groups, priority has been placed on first completing the final management plan for Hauser Reservoir. The preliminary document for Hauser Reservoir was submitted to a committee representing diverse interest groups for review. Revisions to the document following this review have been made. A questionnaire that addresses all of the major issues presented in the revised document has been distributed to approximately 1,300 interested parties. This questionnaire was developed to help select the preferred courses of action for the management of Hauser Reservoir. The final management plan for Hauser Reservoir will be considered for adoption by the Fish and Game Commission in mid-September, 1989. The next management plan scheduled to be completed will be for Canyon Ferry Reservoir.

Prepared by: Mark Lere

Date: July, 1989

Waters Referred to:		
	Canyon Ferry Reservoir	17-8832
	Hauser Reservoir	17-9056
	Holter Reservoir	17-9136

MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS
FISHERIES DIVISION
JOB PROGRESS REPORT

STATE: Montana PROJECT NO. F-46-R-2
PROJECT TITLE: Statewide Fisheries Investigations JOB NO: IV-b
STUDY TITLE: Survey and Inventory of Warmwater Lakes
JOB TITLE: Northcentral Montana Warmwater Lakes Investigations

PERIOD COVERED: July 1, 1988 through June 30, 1989

ABSTRACT

A total of eight waters were sampled during the report period. Walleye eggs totaling 3.6 million were collected from Lake Elwell and the resulting fry were stocked into Bynum Reservoir. Yellow perch and spottail shiner were also planted in Bynum reservoir to further develop the warm water fishery. Tagging studies involving northern pike and walleye continued in Lake Elwell and Lake Frances. First year angler harvest for northern pike ranged from 10.0 percent in Lake Elwell to 15.4 percent in Lake Frances while walleye ranged from 14.4 percent in Lake Elwell to 19.0 percent in Lake Frances. Forage fish numbers varied from fair to good in waters surveyed. Yellow perch are doing well with numbers increasing in Pishkun Reservoir and Lake Frances, while we observed no change in Lake Elwell. Larger sizes of perch used as forage are lacking in Lake Elwell. We observed substantial increases in spottail shiner numbers in Lake Frances and Lake Elwell over previous years. In Bynum Reservoir, yellow perch and spottail shiner numbers tripled when compared to last year. Stomach analysis indicates that walleye and northern pike prefer yellow perch, shrimp, and crayfish. Black crappie and largemouth bass survival in Eyraud Lakes and Little Pishkun Pond is discussed.

OBJECTIVES AND DEGREE OF ATTAINMENT

1. To find a source of walleye eggs that can be used to satisfy management demand.

2. To improve spawning habitat to maintain natural sport fish and forage fish populations. **(State funded).**

3. To enhance over-winter survival in Split Rock Lake for yellow perch and northern pike. **(State funded).**

4. To provide 2,000 angler days use for yellow perch and 3 to 6 pound northern pike in Pishkun Reservoir.

5. To provide a walleye fishery in Bynum and Morony Reservoirs to provide 6,000 angler days for two pound fish.

6. To provide 25,000 angler days for 2-4 pound walleye and 4-8 pound northern pike in Tiber Reservoir and Lake Frances.

7. To maintain current population level of walleye in Holter and Hauser Reservoirs. **(State funded).**

8. To develop a largemouth or smallmouth bass fishery in Lake Helena to provide 1,000 angler days of use. **(State funded).**

9. To develop fishable populations of largemouth bass, crappie and yellow perch in 20 farm ponds to provide 5,000 angler days use.

10. To maintain forage fish species to sustain game fish populations.

11. To evaluate need for new introductions of forage fish. **(State funded).**

12. To involve sportsman groups and general fishing public in management and planning process. **(State funded).**

Progress was made on all federally funded objectives and data are included in this report. Data for some state funded objectives were included for Regional purposes.

PROCEDURES

Fish populations were sampled with 125 x 6 foot experimental gill nets with 25 foot sections of 0.75, 1.0, 1.25, 1.5, and 2.0 inch square mesh; 300 x 8 foot gill nets with 100 foot sections of 2.5, 3.0, and 3.5 inch square mesh; 3x4 foot frame trap nets (0.25 inch mesh) and 4 x 6 foot frame trap nets (1 inch mesh) and a 100 x 10 foot seine (1/4 inch mesh). Captured fish were measured to the nearest tenth of an inch and weighed to the nearest hundredth of a pound. Stomach and scale samples were collected from some fish for food habit and age and growth studies.

Trap nets captured northern pike, walleye, and yellow perch in Lake Elwell, Lake Frances, and Eyraud Lakes. In Lake Elwell and Lake Francis, northern pike were tagged with T-tags while cinch-up tags provided a means of individual identification of walleye to determine survival, growth, movement and angler harvest. Gill nets sampled fall fish populations in Pishkun, Bynum, and Petrolia reservoirs as well as in Lake Frances and Lake Elwell to determine year class strength, species composition, and growth of game and sport fish. Some stomach samples were collected for food habit analysis. Periodic seining sampled forage species in designated areas. Unscheduled creel checks by area wardens were conducted on Lake Frances and Lake Elwell.

FINDINGS

Walleye Egg Source

Efforts continued in 1988 to collect walleye eggs to ensure adequate numbers for stocking in Bynum Reservoir. A total of 3.6 million eggs were taken on April 18 in the Willow Creek Arm of Lake Elwell. These eggs were once again hatched at the Giant Springs Trout Hatchery. Walleye fry were then stocked directly into Bynum Reservoir and three rearing ponds on May 3. Fingerling production from rearing ponds was zero. Two of the ponds completely dried up due to drought conditions. Fry apparently did not survive in the other pond.

Bynum Reservoir

Development of a fishery in Bynum Reservoir continued with a total of 950,000 walleye fry stocked on May 3, 1988. In addition, 550 adult yellow perch and 700 adult spottail shiner, were planted on May 31 and June 8, respectively.

Forage fish populations continue to increase. Surveys conducted on August 12 (Appendix I) indicate that yellow perch and spottail shiner numbers tripled since 1987 (Hill, et. al. 1988). Water levels have been low since converting this reservoir to warmwater management in 1985. Forage fish numbers should dramatically increase if reservoir levels return to near normal conditions.

Three gill nets fished in September caught an average of 7.0 walleye per net (Table 1). These walleye represent fish stocked in 1985, 1986 and 1987. Twelve walleye stomachs were examined for food contents. Yellow perch and unidentified fish remains occurred most often (Appendix II).

Lake Elwell (Tiber Reservoir)

Trap nets fished a total of 90 trap days from April 9 - 18, 1988 in the Willow Creek Arm (WCA). Approximately 700 walleye, 500 northern pike and 435 yellow perch were captured. Other species taken in order of abundance were white sucker, burbot, carp, rainbow trout and black crappie. Walleye and northern pike populations appear stable when compared to 1987 data. Yellow perch numbers have decreased and burbot are building rapidly. As discussed earlier, eggs were collected from walleye during spring trapping operations. Water temperatures ranged from 44 - 50^0 F. in the lower portions of the Arm to 45 - 54 F. in the upper portions.

To determine movement and harvest, 299 walleye were tagged with Cinch-up tags. These fish averaged 18.2 inches (range 14.0 - 26.5 inches). Approximately 83 percent of these spawning fish were 16 inches or larger. Likewise, 249 northern pike averaging 20.2 inches (range 16.5 - 28.4) were tagged with T-tags. About 25 percent of these were larger than 20 inches. Anglers returned

Table 1. Gill netting results from five reservoirs in Region 4 during 1988.

Lake (Date)	Surface Acres[1]	No. of Nets[2]	Species[3]	No of Fish	Length Range (Average)	Weight Range (Average)
Bynum Res. (9/13/88)	1200	3-S	WE	6	7.6- 8.4(8.1)	0.14-0.18(0.16)
				2	12.3-12.9(12.6)	0.57-0.73(0.65)
				13	14.0-15.8(14.8)	0.83-1.34(1.06)
			Wf	1	(13.0)	(1.10)
			Eb	2	12.9-15.5(14.2)	1.00-1.84(1.42)
			WSu	101	8.7- 9.5(8.7)	0.33-0.48(0.36)
				80	11.9-15.0(13.8)	0.73-1.50(1.31)
				2	16.3-18.2(17.3)	1.90-2.40(2.15)
L. Elwell (9/20-22/88)	13,900	22-S	WE	59	7.7-12.9(11.7)	0.11-0.71(0.48)
				79	13.0-15.9(14.2)	0.60-1.30(0.92)
				25	16.2-19.9(17.7)	1.36-2.84(1.88)
				6	20.3-23.6(21.6)	2.43-4.18(3.24)
			NP	7	8.2-15.7(10.6)	0.14-0.81(0.30)
				49	16.1-19.7(18.1)	0.87-1.65(1.29)
				18	20.0-26.5(21.8)	1.50-5.70(2.29)
			YP	3	5.0- 5.9(5.5)	0.09-0.12(0.10)
				16	9.2-10.9(10.3)	0.32-0.72(0.54)
				18	11.0-12.7(11.4)	0.59-1.04(0.72)
			Rb	6	14.3-20.3(17.4)	1.11-3.02(1.91)
			LT	1	(24.5)	(4.20)
			SNS	3	35.0-38.5(37.1)	--
			Wf	1	(11.8)	(0.54)
			Ling	1	(15.3)	(0.76)
			WSu	9	12.7-15.0(14.1)	0.94-1.50(1.27)
				70	15.9-19.6(17.1)	1.82-3.40(2.25)
			LnSu	1	(8.2)	(0.19)
				10	17.3-20.5(18.8)	2.35-3.15(2.81)
			Carp	4	25.0-31.0(27.4)	--

1 - Approximate surface acres at time of survey.
2 - Type of net: S = sinking.
3 - Species abbreviations: WE=walleye; Wf=mountain whitefish; Eb=brook trout; WSu=white sucker; NP=northern pike; LnSu= longnose sucker; YP=yellow perch; Rb=rainbow trout; SNS=shovelnose sturgeon; Ling=burbot; KOK=kokanee salmon; LT=lake trout.

Table 1. (continued).

Lake (Date)	Surface Acres[1]	No. of Nets[2]	Species[3]	No of Fish	Length Range (Average)	Weight Range (Average)
L. Frances (9/16/88)	4000	3-S	WE	23	7.8-12.9(11.1)	0.13-0.67(0.42)
				3	13.0-13.4(13.2)	0.65-0.80(0.72)
				2	18.2-19.3(18.8)	2.20-2.43(2.32)
			NP	1	(9.4)	(0.18)
				1	(18.1)	(1.32)
				3	22.6-25.2(23.8)	3.00-3.83(3.31)
			YP	57	5.7- 8.7(7.7)	0.09-0.35(0.24)
				8	9.4-10.4(9.6)	0.48-0.72(0.53)
				1	(11.3)	(1.00)
			WSu	3	14.0-15.7(14.6)	1.40-2.00(1.60)
Pishkun Res.	1500	5-S	Rb	1	(22.0)	(3.83)
			KOK	1	(15.2)	(1.17)
			NP	2	14.9-15.5(15.2)	0.73-0.90(0.82)
				8	16.1-19.5(18.1)	0.98-1.84(1.45)
				6	20.0-25.0(21.5)	1.85-4.23(2.68)
			YP	94	5.5- 8.8(7.2)	0.08-0.39(0.21)
				24	9.4-10.4(9.9)	0.40-0.60(0.47)
				1	(11.3)	(0.66)
Petrolia Res. (9/21/88)	5	1-F, 1-S	WE	44	8.1-17.3(12.8)	0.13-1.92(0.69)
			NP	15	17.7-24.1(21.0)	1.14-2.97(2.11)
			YP	3	6.7-9.7 (8.5)	0.10-0.40(0.27)
			WSu	13	14.2-15.8(15.0)	1.22-1.52(1.37)
			Carp	11	9.0-20.7(16.8)	-
			YP	94	5.5- 8.8(7.2)	0.08-0.39(0.21)

1 - Approximate surface acres at time of survey.
2 - Type of net: S = sinking.
3 - Species abbreviations: WE=walleye; Wf=mountain whitefish; Eb=brook trout; WSu=white sucker; NP=northern pike; LnSu= longnose sucker; YP=yellow perch; Rb=rainbow trout; SNS=shovelnose sturgeon; Ling=burbot; KOK=kokanee salmon; LT=lake trout.

91 tags from walleye and 32 tags from northern pike during 1988 (Table 2). First-year returns for walleye range from 9.1 percent in 1986 to 15.1 percent in 1988. Northern pike harvest of tagged fish ranges from 10.0 percent (1988) to 18.8 percent (1985) for first-year returns. For fish tagged in the WCA in 1988, 78 percent of the walleye taken by anglers were caught in the WCA and 20 percent in the Dam area. Approximately 63 percent of angler caught northern pike were also taken in the WCA and 18 percent were take near the Dam area. Tag returns for 1988 indicate that the best months to fish for walleye are May, June and July (Table 3) and for northern pike are May and June.

To improve yellow perch spawning habitat, approximately 15 acres covering 3.3 miles of shoreline were seeded on May 21, 1988. Yellow-blossom sweet clover, wheat and barley were spread by electric broadcast seeders mounted on 4-wheel ATV's. Seeds were worked into the soil by dragging harrow sections behind ATV's. Due to poor soil moisture and lack of rainfall during the growing season, few of the seeds sprouted. A total of 8 areas were seeded in the WCA, Miller Slough and Dike area.

Spottail shiner were collected by trapping and seining on June 7 - 8. A total of 700 adult spottail captured in the WCA were transplanted into Bynum Reservoir on June 8. Water temperatures ranged from 60 - 70^0 F. in the collection areas.

A total of 12,301 forage fish were collected in 71 seine hauls in 5 areas of Lake Elwell from August 15 - 18. In addition, 84 walleye and 6 northern pike young-of-the-year fish and 191 crayfish were taken. Yellow perch numbers in 1988 are stable when compared to 1987 (87.6 fish/haul vs. 86.3 fish/haul) but much lower than 1986 of 139.9 fish/haul. Spottail shiner are increasing rapidly. This species increased from 3.6 fish/haul in 1986 to 13.8 fish/haul in 1987, and to 63.1 fish/haul in 1988. Several other forage species occur with fairly stable numbers. Results of 1988 forage surveys are found in Appendix I.

Twenty-two experimental gill nets were fished in Lake Elwell from September 20 - 22 to monitor trends. A total of 11 species were taken from four areas of the reservoir (Table 1). Walleye and northern pike were taken in good numbers representing several age classes. Yellow perch numbers are somewhat depressed, suggesting a downward trend as noted in an earlier report (Hill, et. al. 1988). Three shovelnose sturgeon were taken during the sampling. These are presumably fish that were trapped in the reservoir when the dam gates were closed in 1955. Most of the fish taken in the fall netting were in the WCA and Dam areas. Individual gill net summaries for the four areas surveyed are presented in Appendix III. Stomach analysis from fish caught in gill nets indicate that walleye prefer yellow perch and that northern pike feed heavily on crayfish. Occurrence of other items are listed in Appendix II.

Walleye condition factors have fluctuated throughout the years since walleye were first introduced. Table 4 presents average

Table 2. Angler harvest of walleye and northern pike, 1955-88.

Area	Species	Year Tagged	Number Tagged	Number Returns (%)				
				1985	1986	1987	1988	cumulative
L. Elwell	WE	1985	294	33(11.2)	14(4.8)	3(1.0)	9(3.1)	59(20.0)
		1986	416		38(9.1)	19(4.6)	9(2.2)	66(15.9)
		1987	444			50(11.3)	28(6.3)	78)17.6)
		1988	299				45(15.1)	45(15.1)
	NP	1985	194	17(18.8)	6(3.1)	2(1.0)	0(0.0)	25(12.9)
		1986	279		34(12.2)	8(2.9)	0(0.0)	42(15.1)
		1987	495			55(11.1)	7(1.4)	62(12.5)
		1988	249				25(10.0)	25(10.0)
L. Frances	WE	1985	125	18(4.4)	6(4.8)	9(7.2)	1(0.8)	34(27.2)
		1986	114		10(8.8)	8(7.0)	2(1.8)	20(17.5)
		1988	21				4(19.0)	4(19.0)
	NP	1985	137	29(21.1)	6(4.4)	2(1.4)	0(0.0)	37(27.0)
		1986	212		36(17.0)	19(8.9)	3(1.4)	58(27.4)
		1988	13				2(15.4)	2(15.4)

Table 3. The percentage of walleye and northern pike tag returns reported in each month of 1988 by anglers fishing Lake Elwell.

Month(s)	Walleye	Northern Pike
Spring/Summer/Fall		
April	11.5	9.1
May	23.1	27.3
June	20.5	21.2
July	19.2	9.1
August	7.7	6.1
September	12.8	15.2
Winter		
October-March	5.1	12.1

Table 4. The average condition factor for various length groups of walleye collected in Lake Elwell from 1973-1988. Sample size (N) is in parentheses.

	Length group (inches)				All fish
Year	12.9	13.0-15.9	16.0-19.9	20.0	12.9-20.0
1973	26.7(26)	32.4(5)	-	-	27.6(31)
1974	33.2(88)	33.3(5)	34.3(4)	-	33.3(97)
1975	-	38.7(36)	39.9(18)	-	39.1(54)
1976	-	34.4(6)	35.3(146)	40.5(1)	35.3(153)
1977	29.2(6)	34.5(3)	34.8(214)	36.4(5)	34.7(228)
1978	30.5(45)	32.0(7)	33.3(77)	33.8(17)	32.8(146)
1979	28.9(38)	29.6(11)	31.1(18)	32.1(8)	29.9(75)
1980	30.4(80)	32.0(41)	32.9(20)	34.3(13)	31.5(154)
1981	27.1(30)	27.9(11)	32.5(4)	29.0(5)	27.9(50)
1982	32.2(58)	35.1(61)	37.7(12)	33.6(1)	34.1(132)
1983	32.2(28)	33.3(57)	35.8(21)	36.6(2)	33.6(108)
1984	29.6(33)	32.7(12)	35.8(21)	35.0(3)	32.2(69)
1985	31.9(12)	34.4(12)	35.8(8)	-	33.8(32)
1986	35.1(58)	35.0(44)	37.4(60)	37.3(5)	36.0(167)
1987	30.5(67)	32.9(38)	35.3(44)	36.3(4)	32.6(153)
1988	29.2(59)	31.8(79)	33.4(25)	31.9(6)	31.1(169)

condition factors by various size groups. It is apparent from this table that larger fish generally have higher condition factors. Measurements from 1,818 walleye collected from 1973 - 88 indicate condition factors range from 27.6 to 39.1 when size groups are combined. Condition factor also closely follows the number of yellow perch available as forage. Fluctuations in walleye condition factor is plotted against numbers of yellow perch taken per gill net (Figure 1).

The maximum elevation of Lake Elwell attained during 1988 was 2,981.8 feet msl and occurred on June 18. Negotiations are continuing with the Bureau of Reclamation and other interested groups to manipulate water levels in 1989 or 1990 to improve yellow perch spawning potential. Spawning habitat is available above the 1988 peak level.

Limited creel census was conducted by project personnel and area wardens from May 11 through July 9. A total of 157 anglers caught 251 walleye, 93 northern pike, 57 yellow perch and 14 rainbow trout (Table 5). Of fish kept by anglers, walleye averaged 14.8 inches, northern pike 18.9 inches, yellow perch 11.2 inches and rainbow trout 19.2 inches. People fishing Lake Elwell came from 23 Montana communities from as far away as Miles City, Missoula and Kalispell. Non-resident anglers from Iowa and Minnesota were also contacted.

Lake Frances

A total of 23 trap days were fished in Lake Frances from April 4 - 10 and April 18 - 20, 1988. Few fish were caught as nets were hampered by wind and were tampered with. Only 18 northern pike and 21 walleye were taken. In addition, 23 burbot and no yellow perch were captured. Water temperatures varied from 40 - 41 F. on the earlier trapping dates and 46 - 49° F. on the latter.

Although few northern pike and walleye were taken, all mature fish were tagged to help determine harvest. During 1988, anglers returned tags from 7 walleye and 5 northern pike (Table 2). Nineteen percent of the walleye and 15.4 percent of the northern pike tagged in 1988 were harvested. Accumulative returns for both species tagged in previous years is slightly over 27 percent.

A total of 20 seine hauls were made on August 22 to sample forage fish and game fish reproduction (Appendix I). The main prey species have increased significantly over the last two years. Yellow perch averaged 50.3 fish/seine haul in 1988 compared to 38.7 (1987) and 7.4 (1986). Spottail shiner averaged 12.4 fish/haul in 1988 with 2.7 (1987) and 3.8 (1986). Reproduction of northern pike and walleye is comparable to past years. Young-of-the-year burbot were taken for the first time by seining during 1988.

The September gill net survey (Table 1) caught 28 walleye, 5 northern pike and 66 yellow perch. The 1988 sample of yellow

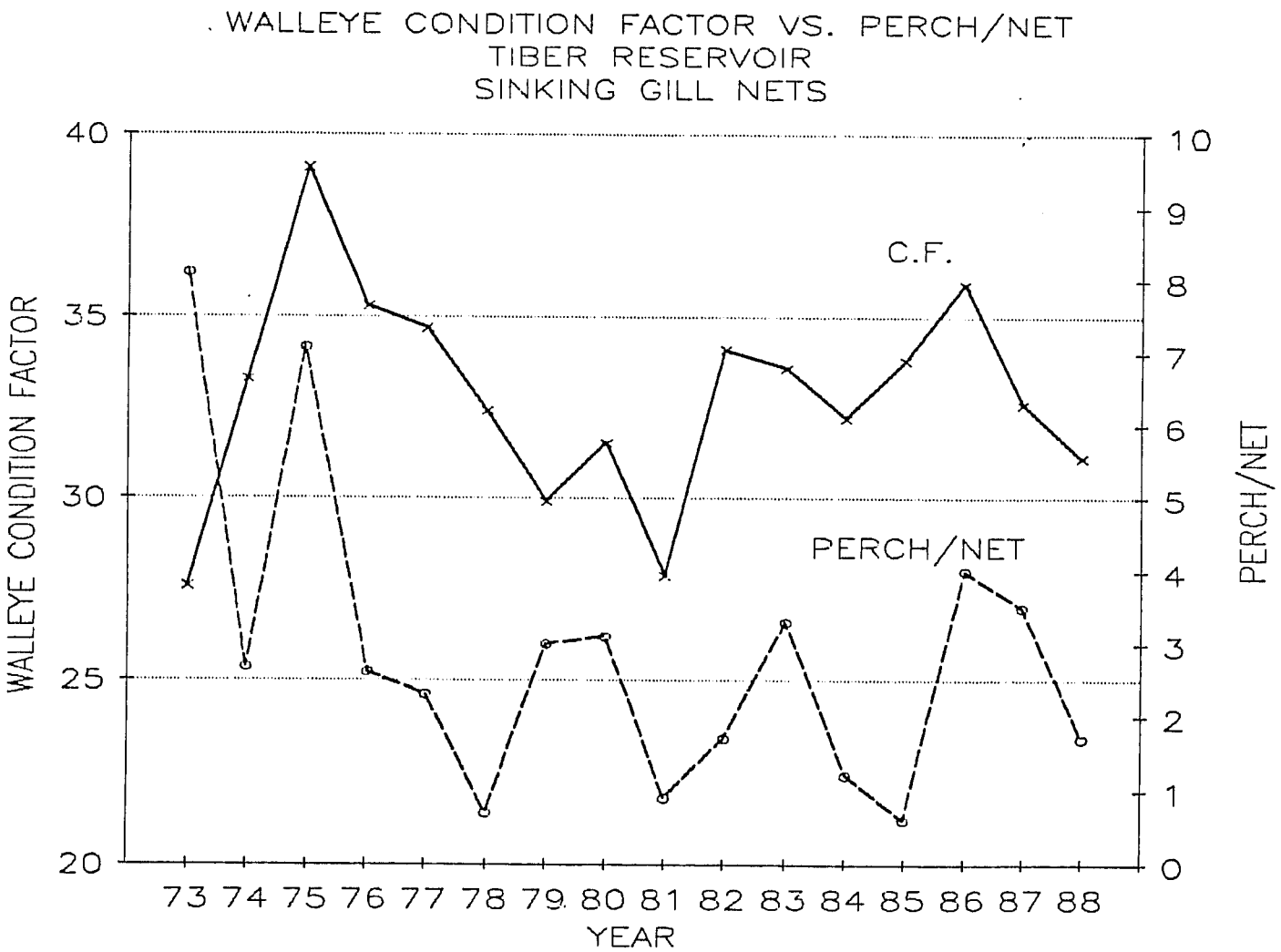

Figure 1. Variation in walleye condition factor and catch of yellow perch / gill net in Lake Elwell Reservoir), Mt from 1973-1988.

Table 5. Lake Elwell creel census, 1988.

Species	No. of Fish Kept	No. of Fish Released	Fish/Hour	
WE	173	78	0.306	
NP	45	48	0.114	Total Anglers - 157
YP	51	6	0.070	Total hrs. fished - 819
Rb	13	1	0.017	Fish/hr. (species combined - 0.507

perch (22 fish/net) is the highest recorded since their presence was first documented in 1961. A previous high of 13 fish/net was recorded in 1970 but numbers have averaged less than 1 fish/net from 1985 to 1987. The increase in yellow perch numbers will benefit northern pike and walleye populations in years to come. Based on analysis of stomach contents, walleye preferred to feed on shrimp even though yellow perch were abundant (Appendix II). Items found in northern pike stomachs include yellow perch, fish remains, and shrimp.

Although we observed flucuations from year to year in the average condition factor of walleye from Lake Francis, a general decline appears evident from 1976-1988 (Table 6). Based on the increased number of forage fish available we expect condition factors to improve.

Pishkun Reservoir

Forage fish abundance was sampled on August 23. A total of 1,392 yellow perch and 1,427 white sucker were taken in 16 seine hauls (Appendix I). These species were taken in greater proportions in 1988 than in 1987 but comparable to 1986 surveys. Crayfish numbers appeared adequate in 1988, averaging 11.0/seine haul. Spottail shiners introduced previously (Hill, et al., 1988) were not captured during the August survey, but several mature fish were taken in spot checks on June 9.

Five sinking gill nets were fished in July to continue monitoring longterm trends (Table 1). Nearly 24 yellow perch were taken per net; this is the highest abundance observed in recent years. The density of this forage fish should improve overall condition of the northern pike population in future years. Spottail shiner should establish a population and hopefully increase in numbers since predation will probably be directed at the more abundant yellow perch. Yellow perch densities have historically fluctuated at Pishkun Reservoir. Hopefully, spottail shiner will become abundant before perch numbers crash. A total of 16 northern pike stomachs were analyzed for food contents (Appendix II). Yellow perch are preferred but kokanee salmon appeared in two stomachs.

Petriola Reservoir

Fall netting activities at Petriola Reservoir occurred after irrigation demands for water had resulted in a large drawdown. The reservoir was approximately 5 acres in size and water elevations were 30-40 feet below full pool. The most common game fish was walleye, which averaged 12.8 inches in total length and 0.69 pounds (Table 1). A substantial number of northern pike were also captured in the gill nets. Yellow perch were also present. On 7 April 1988, we planted 150,000 walleye fry in Petriola Reservoir.

Table 6. The average condition factor for various length groups of walleye collected in Lake Francis from 1976-1988. Sample size (N) is in parentheses.

	Length group (inches)				All fish
Year	12.9	13.0-15.9	16.0-19.9	20.0	12.9-20.0
1976	-	-	32.8(1)	39.9(1)	36.4(2)
1979	31.8(21)	34.0(12)	34.3(5)	37.9(2)	33.1(40)
1980	31.5(3)	36.1(2)	36.3(4)	35.4(1)	34.7(10)
1981	30.6(7)	32.2(2)	34.1(8)	33.8(1)	32.5(18)
1982	29.2(33)	33.1(7)	34.9(11)	31.6(1)	31.0(52)
1983	29.1(35)	31.9(10)	35.1(13)	-	30.9(58)
1984	30.3(19)	31.7(1)	33.9(1)	-	30.5(21)
1985	31.6(2)	31.2(4)	-	-	31.3(6)
1986	29.6(34)	34.4(32)	35.5(11)	-	32.4(77)
1987	29.6(40)	31.6(12)	33.7(14)	-	30.8(66)
1988	29.2(23)	31.3(3)	35.2(2)	-	29.9(28)

Table 7. Gill netting results for small ponds and reservoirs in 1988.

Pond (Date)	No. of Nets	Species	No. of Fish	Length Range (Average)	Weight Range (Average)
Little Pishkun (6/29/88)	1-S	NP	3	17.1-17.2(17.2)	1.33-1.56(1.46)
			4	20.7-24.5(23.1)	2.50-4.10(3.42)
		YP	4	7.2- 9.5(8.6)	0.20-0.60(0.44)
			2	10.2-10.7(10.5)	0.73-0.75(0.74)
		WSu	8	9.8-11.8(10.8)	0.45-0.73(0.59)
			5	(18.6)	(2.36)
Split Rock Lake	2-S	NP	1	(12.8)	(0.50)
			7	16.2-19.8(17.9)	1.00-1.70(1.30)
			5	20.0-21.7(20.7)	1.76-2.25(2.02)
		YP	30	5.4- 8.9(7.3)	0.10-0.45(0.23)
			23	9.2-10.8(10.3)	0.44-0.80(0.63)
			20	11.0-12.2(11.6)	0.74-1.40(0.99)
		WSu	4	16.8-20.0(17.9)	1.95-2.93(2.40)

Type of net: S = sinking
Species: NP = northern pike,
YP = yellow perch,
WSu = white sucker.

Morony Reservoir

Survey work on Morony Reservoir performed late in the last reporting period provided adequate information for management decisions from 6/88-6/89.

Small Ponds and Reservoirs

Choteau area

Attempts to increase diversification of warmwater fisheries in the Choteau area continued. Black crappie and largemouth bass were introduced into Eyraud Lakes in 1986 and an additional 60,000 one inch largemouth were stocked in 1988. We captured two large crappie during trapping operations in May while August sein-hauls provided four largemouth bass which had been stocked in June.

A gill net survey of little Pishkun Pond produced northern pike, yellow perch, and white sucker (Table 7). Largemouth bass introduced in 1986 were not taken. A total of 20,000 one inch largemouth bass were stocked on June 14, 1988. Several young bass were seen inside yellow perch schools in shoreline areas.

Trends in the warmwater fish populations of Split Rock Lake were again monitored on June 17. Two gill nets caught 73 yellow perch and 13 northern pike (Table 7). This Lake produces large yellow perch and is popular with fisherman. Attempts have been made for several years to cooperate with landowners to repair the dam and thereby increase water storage. The landowners accomplished the project and the lake now has a maximum depth of 11.5 feet.

Helena, Great Falls, and Lewistown areas

Efforts continued to establish a largemouth bass fishery in Lake Helena. Although no plants were possible in 1986 and 1987, we were able to plant 20,000 fry during the last reporting period in addition to 20,000 fingerling planted in July, 1988. Size of the largemouth bass varied from 0.5-1.0 inch in total length.

Wadsworth Pond was not planted with bass since the city of Great Falls still prohibits trespass in the area. Angling groups continue to express interest in the pond; we will attempt the development of a warmwater fishery in Wadsworth Pond immediately after public access is secured.

Three farm ponds north of Great Falls were surveyed during May 1989. All three appear barren of fish. Silvan Reservoir, south of Big Sandy, and Boyle Coulee Reservoir, between Fort Benton and Geraldine, had been previously planted with trout by the landowners. Schoonover Reservoir #1, located north of Loma, contained a yellow perch population until it dried up in 1988. This population had been introduced by the MDFWP. All three

reservoirs are scheduled for largemouth bass plants during July or August 1988. Yellow Perch introductions may also be attempted in Schoonover and Silvan Reservoirs.

We did not survey warmwater ponds in the Lewistown area during the reporting period. However, we did sample ponds in the eastern portion of Region Four in May-June 1988 and July 1989. Additional largemouth bass plants in Drag Creek, South Fork Dry Blood, and Upper Wolf Coulee Reservoirs were made in June 1988 in a continuing effort to maintain warmwater fishing opportunities in the region.

DISCUSSIONS AND RECOMMENDATIONS

Walleye eggs were taken again from the WCA of Lake Elwell with the resulting fry stocked in Bynum Reservoir. Walleye will be stocked into Bynum Reservoir until 1989 but eggs will not be collected from Region Four waters. Walleye, yellow perch, and spottail shiner have been planted annually in Bynum Reservoir since 1985. Walleye in Bynum Reservoir should spawn for the first time in spring 1989. Forage species have reproduced each year since being introduced. Improved water levels are anticipated in 1989 which should benefit forage fish production.

Forage fish, particularly yellow perch, are essential in maintaining warmwater fisheries. Currently, perch numbers are good in Lake Frances and Pishkun Reservoir but declining in Lake Elwell. Negotiations should continue with the Bureau of Reclamation through the Marias Management committee to improve spawning conditions in Lake Elwell. In addition, selected shoreline areas should be seeded to establish vegetation for spawning. We plan to place experimental spawning structures in the WCA and monitor perch utilization. Spottail shiner are increasing in Lake Elwell and Lake Frances. Additional spottail plants should be made in Pishkun Reservoir to supplement yellow perch.

Three irrigation storage reservoirs in Region Four are providing anglers with good walleye and/or northern pike fisheries. Northern pike in Pishkun Reservoir are thought to be increasing and there is a greater abundance of yellow perch. A population estimate of northern pike should be made in 1989. Walleye and northern pike numbers are presently good in both Lake Frances and Lake Elwell. A fourth water, Bynum Reservoir, is scheduled to open to fishing on May 20,1989, but several more years will be needed to develop a good walleye fishery.

Black crappie and largemouth bass were introduced into Eyraud Lakes and Little Piskun Pond in 1986 and 1988. Future surveys should be directed at determining their survival and the potential of establishing a bass fishery in these waters.

Although data suggests that Petrolia Reservoir has the capability to produce larger walleye, irrigation demands result in very low water levels. The continuation of bass plants in Lake Helena, Lewistown area ponds, and the introduction of bass in small

reservoirs in the Fort Benton - Big Sandy area should increase the diversity of fishing opportunities throughout much of Region 4 at a time when greater interest in warmwater fisheries has developed among anglers.

ACKNOWLEDGEMENTS

Several individuals or groups should be given recognition for their assistance on this project. Ken Sinay helped in all aspects of field data collection and office assistance. Bob Hughes and Bruce Chaney collected walleye eggs and helped with gill net surveys. Bill Gardner and Ron Pierce assisted in egg collection, trap netting, and forage surveys. The Hi-Line Sportsmen's Club assisted in egg collection and work on area rearing ponds. Creel census data was gathered by Tom Bivens and Craig Jourdonnais. Paul Hamlin and Les Everts helped interpret data and netted Petriola Reservoir. Steve Giannini typed substantial portions of the report.

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PREPARED BY: William J. Hill, Stephen A. Leathe, and George A. Liknes

DATE: August, 1989

PRINCIPAL FISH SPECIES INVOLVED:
Walleye, northern pike, largemouth bass, black crappie, yellow perch, spottail shiner

CODE NUMBERS OF WATERS REFERRED TO IN REPORT:

14-7080 Bynum Reservoir
14-6840 Eyraud Lake
14-7440 Lake Frances
14-9240 Lake Elwell
16-8275 Silvan Reservoir
17-8773 Boyle Creek Reservoir
17-9072 Lake Helena
17-9509 Schoonover Reservoir #1
18-7560 Drag Creek Reservoir
18-8750 Petriola Reservoir
18-9150 S. Fork Dry Blood Reservoir
18-8985 Upper Wolf Coulee Reservoir
20-7730 Little Pishkun Pond
20-7950 Pishkun Reservoir
20-8200 Split Rock Lake
20-8470 Wadsworth Reservoir

Appendix I. Forage fish/reproduction surveys, 1988 (100' x 10'seine)

Water	Date	Water Temp.	No. of pulls	Number of fish/pull 1/												
				WE	NP	YP	Cr	SpS	EmS	WSu	Carp	Burbot	Cray fish	Lake Chub	Sculpin	FH chub	LN dace
Bynum Res.	8/12/88	65°	16	0.1	N/A	19.6	N/A	21.7	N/A	0.8	N/A	N/A	0.2	N/A	0.6	N/A	N/A
Lake Elwell																	
Devon	8/15/88	73°	11	2.7	--	10.4	--	117.5	6.2	0.1	--	--	0.5	8.1	--	--	--
So. Bt.	8/16/88	70°	12	2.2	--	4.3	--	46.9	49.2	0.3	0.1	--	0.9	0.8	--	1.1	0.1
No. Bt.	8/15/88	72°	10	0.9	0.2	61.5	--	50.8	0.1	4.9	1.5	--	5.9	0.2	0.1	0.2	0.1
Dam	8/17/88	70°	19	0.3	--	96.3	--	61.2	8.3	4.1	0.8	--	1.2	--	0.1	0.1	--
WCA	8/18/88	69°	19	0.7	0.2	189.9	--	50.2	9.1	0.4	16.9	--	4.8	0.1	--	--	--
Areas Combined			71	1.2	0.1	87.6	--	63.1	13.9	2.0	5.0	--	2.7	1.4	Tr.	0.2	Tr.
L. Frances	8/22/88	66°	20	0.5	0.9	50.3	N/A	12.4	N/A	1.2	N/A	0.4	1.2	N/A	0.4	N/A	--
Pishkun R.	8/23/88	64°	16	N/A	0.6	87.0	N/A	--	N/A	89.2	N/A	N/A	11.0	N/A	0.1	N/A	--

1/ Species abbreviation: WE-walleye; NP-northern pike; YP-yellow perch; CR-black crappie; SpS-spottail shiner; EmS-emerald shiner; WSu-white sucker; FH Chub-flathead chub; LN dace-longnose dace.

Appendix II. Food preference of northern pike and walleye, Stomach analysis, 1988

Water	Species	No. stomachs	No. empty	Number of stomachs with food item									
				YP	WSu	Fish Remains	KOK	Shrimp	Cray-fish	insects	vegetation	Fish hooks	leeches
Lake Elwell	N. pike	24	8	3	--	6	--	--	12	--	1	1	--
L. Frances	N. pike	4	1	1	--	1	--	1	--	--	--	--	--
Pishkun Res.	N. pike	16	8	6	--	--	2	--	--	--	--	--	--
Lake Elwell	walleye	50	14	10	--	25	--	--	1	1	13	--	--
L. Frances	walleye	15	2	1	--	--	--	13	--	1	--	--	3
Bynum Res.	walleye	12	1	4	1	5	--	1	--	1	1	--	--

APPENDIX III. Gill net summaries by area, Lake Ellwell, 1988.

Area (Date)	No. of Nets	Species	No. of Fish	Length Range (Avg.)	Weight Range (Avg.)
Devon	4	WE	6	7.7-11.7 (10.0)	0.11-0.44 (0.28)
(9/20/88)			1	(18.6)	(2.00)
		NP	1	(18.4)	(1.30)
			5	21.5-23.7 (22.4)	2.00-3.19 (2.43)
		YP	1	(5.9)	(0.09)
			8	9.5-10.8 (10.2)	0.39-0.72 (0.51)
			7	11.2-11.6 (11.4)	0.59-0.74 (0.68)
		Rb	1	(18.3)	(2.40)
		SNStur.	2	37.8-38.5 (38.2)	--
		WF	1	(11.8)	(0.54)
		Carp	1	(26.5)	--
		WSu	7	15.0-19.6 (16.3)	1.50-3.40 (2.04)
		LnSu	1	(8.2)	(0.19)
			6	(18.2)	(2.71)
Bootlegger	6	WE	8	9.5-12.0 (10.8)	0.17-0.55 (0.34)
9/21/88			3	13.1-15.0 (14.3)	0.60-1.10 (0.84)
		NP	3	16.3-17.9 (17.0)	0.90-1.12 (1.01)
			2	21.7-26.5 (24.1)	2.20-5.70 (3.95)
		YP	1	(5.0)	(0.12)
		WSu	4	16.6-19.4 (17.5)	2.10-3.30 (2.50)
Dam	3	WE	9	12.0-12.9 (12.6)	0.50-0.65 (0.58)
9/21/88			16	13.0-15.9 (14.5)	0.64-1.17 (0.97)
			9	17.0-18.9 (17.7)	1.57-2.20 (1.84)
		NP	1	(9.1)	(0.19)
			6	17.9-19.5 (18.9)	1.21-1.64 (1.37)
			3	20.2-21.5 (20.7)	1.50-2.11 (1.80)
		YP	1	(5.7)	(0.09)
			3	10.4-10.6 (10.5)	0.56-0.70 (0.61)
		Rb	2	16.5-20.3 (18.4)	1.64-2.10 (1.87)
		SNStur.	1	(35.0)	--
		Ling	1	(15.3)	(0.76)
		WSu	1	(13.5)	(1.10)
			9	(15.9)	(1.82)
WCA	9	WE	36	9.0-12.9 (12.0)	0.20-0.72 (0.53)
9/22/88			60	13.0-15.5 (14.1)	0.64-1.30 (0.91)
			15	16.2-19.9 (17.7)	1.36-2.84 (1.90)
			6	20.3-23.6 (21.6)	2.43-4.18 (3.24)
		NP	6	8.2-15.7 (10.8)	0.14-0.81 (0.31)
			39	16.1-19.7 (18.0)	0.87-1.65 (1.30)
			8	20.0-22.8 (21.2)	1.58-2.50 (1.97)
		YP	5	9.2-10.9 (10.4)	0.32-0.65 (0.55)
			11	11.0-12.7 (11.4)	0.60-1.04 (0.75)
		Rb	3	14.3-20.3 (16.5)	1.11-3.02 (1.77)
		Carp	3	25.0-31.0 (27.7)	--
		WSu	3	(12.7)	(0.94)
			55	16.0-19.1 (17.2)	1.85-2.98 (2.26)
		LnSu	4	17.3-20.5 (19.7)	2.35-3.15 (2.95)

MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS
FISHERIES DIVISION
JOB PROGRESS REPORT

STATE: Montana PROJECT NO. F-46-R-2
PROJECT TITLE: Statewide Fisheries Investigations JOB NO. II-e
STUDY TITLE: Survey and Inventory of Coldwater Lakes
JOB TITLE: Northcentral Montana Coldwater Lakes Investigations

PERIOD COVERED: July 1, 1988 through June 30, 1989

ABSTRACT

Evaluation of rainbow trout strains continued in several waters. AXE hybrid rainbow trout grew better in Bean lake than in Willow Creek Reservoir. Arlee rainbow trout grew better than AXE but survival was not as good. Catchability of both strains appeared good but longevity was a problem. Poor survival of the Arlee strain in Eureka Reservoir is discussed. Arlee rainbow trout in Nilan Reservoir continue to produce an excellent fishery with good survival, fair growth, but poor longevity. No response has been observed from attempts to improve the kokanee salmon population in Pishkun Reservoir. Drought conditions and low water levels forced us to cancel trout plants scheduled in many ponds and small lakes in the region. Water levels in Bair and Smith River Reservoirs dropped lower than what would allow fish to overwinter. The planting program for East Fork Spring Creek Reservoir was changed by introducing brown trout. Survival of Arlee rainbow trout appeared greater than among Eagle Lake rainbow trout also planted during 1988 in Ackley Lake.

OBJECTIVES AND DEGREE OF ATTAINMENT

1. To recommend acceptable water levels in irrigation reservoirs, within hydrologic constraints, for maintaining fishery values of last 10 years. **(State funded.)**

2. To establish a self-sustaining trout fishery in Smith River Reservoir that will support 5,000 angler days annually with a catch rate of 0.4 fish per hour.

3. To provide longer-lived, larger trout with adequate growth rates in Willow Creek, Bair, Ackley, East Fork Dam and Newlan Creek Reservoirs for 50,000 angler days annually.

4. To provide 10,000 angler days fishing in Bean Lake for 1 to 3 pound rainbow trout.

5. To provide 28,000 angler days per year for 11 to 20 inch trout in Fitzpatrick Lake and Martinsdale and Eureka Reservoirs.

6. To reduce rough fish populations for maintenance of 11 to 20 inch trout in 5 lakes and ponds. **(State funded).**

7. To maintain (within hydrologic constraints) viable trout fisheries in 60 ponds and small reservoirs. **(Partly State funded).**

8. To improve the kokanee fishery in Pishkun Reservoir to satisfy 5,000 angler days annually.

9. To provide 1,000 angler days of fishing for mature salmon in the Helena Valley Regulating Reservoir.

10. To maintain current level of fishing opportunity on Bean, Ackley and Fitzpatrick Lakes and Newlan Creek Reservoir. **(State funded).**

Progress was made on all federally funded objectives and data are included in this report. Data for some state objectives are included in this report to provide current information for regional lakes.

PROCEDURES

Netting surveys were conducted using standard 6'x 125' experimental gill nets (nylon and monofilament). Unscheduled creel census was conducted on several waters. Fin clips, tetracycline, and fluorescent pigment marks were used to identify various strains of rainbow trout where more than one strain was stocked in a water. Kokanee salmon were stocked by boat to obtain better distribution. A Humminbird 4x6 LCR was used to locate various species prior to setting nets. We utilized an electronic thermometer to obtain temperature profiles in lakes and reservoirs.

FINDINGS

Rainbow Trout Strain Evaluations

Rainbow trout strain evaluation continued in the six lakes and reservoirs (Table 1). Eagle Lake rainbows are currently being evaluated in Ackley, Bair and East Fork Spring Creek reservoirs. This strain is apparently well suited to productive waters where it typically grows to large size, displays good catchability, and will feed on chubs. All three Region 4 reservoirs have dense sucker populations and it was hoped that Eagle Lake rainbows would utilize this potential food source.

DeSmet rainbow were planted in Smith River Reservoir, also known as Lake Sutherlin, in 1986 and 1987. The reservoir was not planted in 1988. We made these plants in an attempt to establish a naturally

Table 1. Overnight gill netting results in coldwater lakes and reservoirs in Region Four during 1988.

Water name (Date surveyed)	Surface acres	No. of[1] nets	Mean hours fished/net	Species, strain[2] & year planted	No. of fish	Length(in) Range	Length(in) Mean	Weight(pounds) Range	Weight(pounds) Mean	Condition Factor Range	Condition Factor Mean
Ackley Res. (10/4/88)	240	1F, 1S	13.4	Rb-A-1988	21	6.4-10.3	(9.2)	0.12-0.46	(0.33)	32.2-51.3	(40.97)
				Rb-I-1988	9	6.3-7.7	(7.1)	0.09-0.18	(0.13)	24.4-41.1	(35.02)
				Rb-A-1987	1	-	(13.1)	-	(0.89)	-	(39.59)
				Rb-I-1987	54	11.9-15.3	(13.9)	0.64-1.21	(0.98)	30.8-46.3	(36.73)
				Rb-A-1986	0	-	-	-	-	-	-
				Rb-I-1986	22	16.1-18.8	(17.5)	1.38-2.43	(1.96)	32.4-42.2	(36.39)
				LL	6	10.7-18.6	(16.1)	0.45-2.42	(1.73)	35.4-47.2	(38.91)
				LnSu	24	6.7-17.3	(9.8)	0.11-1.84	(0.46)	29.5-49.0	(39.52)
				WSu	46	6.5-14.1	(10.9)	0.11-1.26	(0.64)	35.0-48.0	(41.60)
Bair Reservoir	Not netted										
Bean Lake (10/7/88)	200	2S	16	Rb-AXE-1988	44	9.4-11.4	(10.3)	0.35-0.69	(0.45)	-	-
				Rb-A-1988	15	11.7-12.7	(12.1)	0.63-0.90	(0.74)	-	-
				Rb-A-1987	3	14.9-15.3	(15.1)	1.30-1.46	(1.36)	-	-
				Rb-A	1	-	(17.0)	-	(1.93)	-	-
East Fk Spring Creek Res. (9/22/88)	100	1F,1S	23.75	Rb-I-1987	32	8.7-13.2	(10.4)	0.25-0.80	(0.42)	31.3-41.6	(35.70)
				Rb-I-1986	2	-	(15.2)	1.30-1.40	(1.35)	37.0-39.9	(38.44)
				Rb-I-1985	1	-	(17.2)	-	(1.95)	-	(38.32)
				NP	3	24.0-26.2	(24.8)	3.50-5.22	(4.17)	25.3-29.0	(27.05)
				YP	1	-	(9.7)	-	(0.50)	-	(54.78)
				LnSu	2	10.0-10.7	(10.3)	0.40-0.43	(0.42)	35.1-40.0	(37.55)
				WSu	57	6.1-11.6	(8.5)	0.10-0.68	(0.28)	32.6-75.4	(42.10)
Smith River Res.	Not netted										
Willow Creek Res. (10/6/88)	1100	2F	23	Rb-AXE-1988	91	7.3-9.5	(8.7)	0.14-0.30	(0.24)	-	-
				Rb-AXE-1987	35	11.2-13.3	(12.5)	0.52-0.80	(0.67)	-	-
				Rb-AXE-1986	4	13.9-14.3	(14.1)	0.85-0.89	(0.87)	-	-
				Rb- -	1	-	(15.5)	-	(1.22)	-	-
				Wsu	4	12.6-14.8	(13.3)	0.82-1.30	(0.98)	-	-
Eureka Reservior (10/12/88)	40	2F	19	Rb-A-1988	2	11.9-13.0	(12.5)	0.78-0.94	(0.86)	-	-
				Rb- -	1	-	(17.7)	-	(2.28)	-	-
				LL	4	11.5-14.0	(12.7)	0.57-0.98	(0.76)	-	-
				LL	10	17.0-25.0	(20.2)	1.80-5.25	(3.16)	-	-
				WSu	12	-	-	-	-	-	-
Holter Reservoir	Not netted										
Martinsdale Res. (10/3/88)	1000	1F,1S	2	Rb-A-1988	15	8.9-10.8	(9.8)	0.27-0.53	(0.41)	36.0-49.6	(43.04)
				Rb-A-1987	24	11.3-13.5	(12.5)	0.50-0.84	(0.72)	32.0-44.0	(37.06)
				LL	4	8.3-20.3	(14.2)	0.21-3.20	(1.40)	34.9-40.0	(37.46)
				WSu	78	6.1-18.4	(12.0)	0.10-2.70	(0.95)	34.5-48.1	(41.95)
Nilan Reservior (10/6/88)	250	2F	23	Rb-A-1988	87	9.0-10.6	(9.7)	0.26-0.43	(0.35)	-	-
				Rb-A-1987	21	12.0-14.4	(13.6)	0.58-0.90	(0.82)	-	-
				LL	1	-	(26.5)	-	(7.00)	-	-
				WSu	2	8.2-9.7	(9.0)	0.23-0.40	(0.32)	-	-
				WSu	4	13.4-14.9	(14.1)	1.01-1.12	(1.07)	-	-
Newlan Creek Res. (9/15/88)	280	2F,1S	14	YCt	80	8.2-17.4	(11.3)	0.22-1.88	(0.58)	31.3-41.0	(36.36)
				Rb	21	7.9-17.7	(13.1)	0.19-1.80	(0.89)	31.1-50.8	(37.61)
				BT	2	11.0-11.7	(11.3)	0.52-0.70	(0.61)	39.1-43.7	(41.39)
				LnSu	134	-	-	-	-	-	-
Pishkun Reservior (7/20/88)	1300	5S	19	KOK	1	-	(15.2)	-	(1.17)	-	-
				NP	16	14.9-25.0	-	0.73-4.23	-	-	-
				YP	119	5.5-11.3	-	0.08-0.66	-	-	-
(8/4/88)	1300	2F,3SS	19	NO FISH							

1-Standard experimental gill nets (nylon and monofilament); F=Floating; S=Sinking; SS=Suspended

2-Species abbreviations: Rb=Rainbow trout; LL=Brown trout; YCt=Yellowstone cutthroat trout; BT= Brook trout; KOK=Kokanee salmon; NP=Northern pike; YP=Yellow perch; WSu=White sucker; LuSu=Longnose sucker
Strain abbreviations: A=Arlee; AXE=Arlee x Eagle Lake Hybrid; I=Eagle Lake

reproducing population in the reservoir that would use two available spawning streams. The DeSmet is a wild strain that reproduces well in some areas, has relatively slow growth and good longevity, faircatchability, and feeds on zooplankton and macroinvertebrates.

A hybrid cross between Arlee and Eagle Lake rainbow trout strains, which will be referred to in this report by the term AXE, has been planted in Willow Creek reservoir since 1984 and were introduced to Bean Lake in 1988. This hybrid reportedly displays similar or better growth and catchability than the Arlee strain and better ability to overwinter successfully.

Ackley Lake

Gill netting at Ackley Lake allowed us to continue the Arlee-Eagle Lake rainbow trout strain evaluation (Table 1). Survival of Arlee rainbow trout in 1988 appears superior to the Eagle Lake strain planted the same season and to other Arlee plants made in previous years. The Arlee rainbow trout plant occurred in mid-May rather than than mid-April and may have influenced survival.

Bair and Smith River Reservoir

Extremely low water levels in Bair and Smith River reservoirs prevented us from sampling these waters. In fact, fish were trapped and transplanted from Smith River Reservoir to nearby waters in September 1988 when water elevations dropped to critically low levels where fish could not have overwintered.

East Fork Spring Creek Reservoir

Survival of Eagle Lake rainbow trout through the second growing season appeared adequate but the average size was low (Table 1). Switching strains does not appear to have changed this from a marginal fishery for small trout. During May 1988 brown trout were planted in the reservoir. We plan on evaluating the growth of the brown trout and the utilization of the dense population of stunted suckers present in the reservoir as a food source.

Bean Lake

Bean Lake has historically been planted with Arlee rainbow trout. In addition, progeny rainbow from eggs collected in the wild were planted in 1980 and DeSmet rainbow were stocked in 1982 and 1984. The wild rainbow had fair survival initially but essentially disappeared by the second summer (Hill and Wipperman 1982 and 1983). DeSmet rainbow showed good survival and longevity superior to Arlee but did not grow as well as Arlee (Hill and Wipperman 1986).

Poor survival of Arlee rainbow trout has occasionally failed to provide a fishery in Bean Lake. However, in most years, survival is good and this strain has exhibited good growth and catchability. Longevity continues to be a factor where improvement should occur. In 1988, 20,000 Arlee were stocked on April 26, and 20,000 AXE were planted on June 22. The latter were marked with tetracycline. Gill net surveys in October indicate survival was better for AXE rainbow (Table 1) but growth was better for Arlee rainbow. Both strains appear equally catchable as determined through creel checks of ice fishermen.

Willow Creek Reservoir

Each year since 1984, we have planted 75,000 Arlee-Eagle Lake hybrid (AXE) rainbow trout in Willow Creek Reservoir. Examination of the growth histories of the Arlee and AXE strains suggests that Arlee grow faster (Table 2). The growth of AXE rainbow trout in Willow Creek Reservoir is less than the growth for the strain in Bean Lake (Table 1), which suggests a greater availability of preferred food items at Bean Lake. Survival rates are comparable but AXE may be slightly greater. Longevity is similar for both strains with few fish reaching the third growing season. Catchability of AXE rainbow has been good.

Other Large Reservoirs

Eureka Reservoir

Survival of Arlee rainbow trout in Eureka Reservoir continues to be extremely poor (Table 1). Only two fish from the 1988 plant were sampled in gill nets in October. Principal factors affecting survival include the extremely low water levels experienced during several drought years as well as escapement through the outlet works. Brown trout enter the reservoir via the Teton River and are providing the bulk of the fishery.

Nilan Reservoir

Nilan Reservoir continues to provide an excellent fishery with Arlee rainbow trout. Survival has been good and growth rates remain stable. A total of 108 rainbow trout representing two year classes were collected in gill nets in October (Table 1). A combination of high harvest and poor longevity results in few trout remaining into the third year following stocking.

Pishkun Reservoir

Gill nets were fished on two occasions to assess the kokanee salmon

Table 2. Growth comparisons of Arlee and AXE rainbow, Willow Creek Reservoir. (Based on fall gill netting).

Planting Year	Strain	1st Year Growth			2nd Year Growth		
		No. of Fish	Length Range (Avg.)	Weight Range (Avg.)	No. of Fish	Length Range (Avg.)	Weight Range (Avg.)
1977	Arlee	17	10.3-12.9(11.5)	0.42-0.86(0.61)		(No survey)	
1978	"		(No survey)		20	12.9-13.7(13.4)	0.76-1.13(0.89)
1979	"	108	9.4-11.1(10.3)	0.30-0.54(0.42)	9	12.7-13.7(13.3)	0.74-0.92(0.82)
1980	"	15	9.9-11.1(10.5)	0.30-0.50(0.41)	9	13.2-15.0(14.1)	0.74-1.19(0.98)
1981	"	14	9.4-10.2(09.8)	0.32-0.41(0.36)	15	13.4-14.7(14.0)	0.80-1.24(1.02)
1982	"	36	9.5-10.8(10.3)	0.37-0.49(0.43)		(No survey)	
1983	"		(No survey)		38	12.3-14.3(13.2)	0.68-0.92(0.78)
1984	AXE	21	6.7-08.2(07.2)	0.10-0.16(0.13)	19	12.2-13.6(12.8)	0.59-0.80(0.68)
1985	"	8	8.2-10.0(08.9)	0.12-0.40(0.26)	24	11.5-13.0(12.4)	0.55-0.71(0.64)
1986	"	21	7.3-09.2(08.3)	0.15-0.30(0.23)	14	11.2-13.8(12.2)	0.48-0.78(0.59)
1987	"	35	8.3-09.8(09.0)	0.22-0.30(0.27)	35	11.2-13.3(12.5)	0.52-0.80(0.67)
1988	"	91	7.3-09.5(08.7)	0.14-0.30(0.24)			

population in Piskun Reservoir. Only one kokanee was taken during the two sampling dates (Table 1). A fish locator was used to locate concentrations of fish prior to setting the nets. Large numbers offish were observed near the bottom at depths of 30-40 feet and also suspended around 20 feet. Sinking gill nets on July 20 indicated that fish on the bottom were yellow perch. On August 4, nets were fished on the surface and suspended but no fish of any species were caught. A total of 300,000 kokanee approximately 2 inches in total length were stocked in early May. It is possible that these were the fish suspended at 20 feet and they were too small to become entangled in the nets. Predation by northern pike on kokanee does occur. Of 16 northern pike stomachs analyzed from the July 20 survey, kokanee were found in 2 stomachs.

Holter Reservoir

Holter Reservoir was not netted during management surveys within this reporting period.

Martinsdale and Newlan Creek Reservoirs

The Arlee rainbow trout planted in Martinsdale reservoir were represented at a rate higher than even the 1988 plant in fall gill net surveys (Table 1). Although the 1987 plant did not grow as fast as in other waters, the growth displayed is adequate when low water levels in the reservoir are taken into consideration. The fall survey at Newlan Creek Reservoir showed a continuation of healthy populations of stocked McBride strain Yellowstone cutthroat trout and wild, naturally reproducing rainbow trout (Table 1).

Helena Valley Regulating Reservoir

Fishery data gathered from the Helena Valley Regulating Reservoir during 1988 will be summarized and presented in the next annual report.

Small Ponds, Lakes, and Reservoirs

Lewistown Area Ponds

We did not survey any coldwater ponds in the Lewistown area during the reporting period. However, we did sample ponds in the eastern portion of Region Four in May-June 1988 and July 1989. Data from the most recent work will be summarized in the next annual report.

Choteau Area Ponds

Most of the ponds in the area experienced very low water levels or dried up due to drought conditions. For this reason, scheduled trout stockings were canceled in the following waters: Henry, Lindseth, Myrvold, Stephens, and Stewart ponds, Cameron and Ostle reservoirs, as well as Fitzpatrick Lake and Lake Shel-oole.

DISCUSSION AND RECOMMENDATIONS

Arlee rainbow trout continue to provide a good fishery in Nilan Reservoir. Survival and catchability in 1988 was good with fair to good growth rates. Very poor survival of Arlee was experienced in Eureka Reservoir, however, growth of the survivors was excellent. Poor survival may relate to low water levels, predation by brown trout and escapement out of the reservoir. Bean Lake Arlee showed poor to fair survival with good growth and catchability. Longevity of Arlee rainbow is poor in all three waters, with few fish remaining into the third summer following stocking. High harvest rates are probably a contributing factor.

Survival and catchability of AXE rainbow is good in Bean Lake and Willow Creek Reservoir. Growth is better in Bean Lake and is attributed to large numbers of invertebrate organisms. AXE growth rates are lower than ARlee in both waters. Longevity is similar with both strains, that being short-lived.

The following recommendations will be carried out in 1989. Continue with Arlee rainbow in Nilan Reservoir. Stock Bean Lake with equal numbers of Arlee and AXE rainbow trout and monitor growth and longevity into second and third years. Convert Willow Creek Reservoir back to Arlee, which should improve growth. Plant AXE in Eureka Reservoir and change stocking location to avoid escapement through outlet. Initial survival is expected to be better than Arlee. Growth of AXE should be better in Eureka than in Willow Creek because of larger invertebrate populations.

Reestablishment of the kokanee salmon fishery in Piskun Reservoir continues to be a problem due to poor survival or other unknown causes. Annual plants of 300,000 kokanee fry will be made through 1991. Predation by northern pike will be monitored. If a fishery hasn't developed by 1991, kokanee stocking will be discontinued.

Several ponds and small lakes in the Choteau area were not planted in 1988 due to the drought. These waters will be restocked as water levels improve.

LITERATURE CITED

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Prepared By: William J. Hill, George A. Liknes, and Stephen A. Leathe

Date: August, 1989

Principal Fish Species Involved:
Rainbow trout, brown trout, Yellowstone cutthroat trout, kokanee salmon

Code Numbers of Waters Referred To In Report:

14-7120	Cameron Reservoir
14-7320	Eureka Reservoir
14-7370	Fitzpatrick Lake
14-7620	Henry Pond
14-8055	Lindseth Pond
14-8250	Myrvold Pond
14-8420	Ostle Reservoir
14-8935	Lake Shel-oole
14-9081	Stephens Pond
14-9091	Stewart Pond
16-4300	Ackley Lake
16-4950	East Fork Spring Creek Reservoir
17-9075	Helena Valley Regulating Reservoir
17-9136	Holter Reservoir
17-9330	Newlan Creek Reservoir
17-9616	Smith River Reservoir
17-8720	Bean Lake
18-7750	Bair Reservoir
18-8380	Martinsdale Reservoir
20-7900	Nilan Reservoir
20-7950	Pishkun Reservoir
20-8500	Willow Creek Reservoir