MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS

FISHERIES DIVISION

JOB PROGRESS REPORT

State: Montana

Project No.: F-5-R-29 Title: Northcentral Montana Fisheries Study

Job No.: I-a Title: Inventory and Survey of Waters in the Western Half of Region Four

Period Covered: July 1, 1979 through June 30, 1980

ABSTRACT

A total of 19 waters were surveyed and inventoried during the report period. These waters include 8 lakes and reservoirs, 5 small lakes and farm ponds and 6 streams. Stocking rates and growth rates of hatchery rainbow trout are discussed for Bean Lake, Bynum, Eureka, Nilan, Willow Creek and Holter Reservoirs. In Lake Frances, fair to good survival of recent walleye introductions were documented along with some natural reproduction from earlier introductions. A northern pike population estimate for Pishkun Reservoir was made and compares to the low number estimated in 1978. Rainbow trout survival and growth in Pishkun Reservoir appears good with little pike predation observed. Natural reproduction of kokanee salmon in Pishkun Reservoir was documented. Tagging studies of northern pike and walleye were continued in Tiber Reservoir. Cutthroat trout introduced into the South Fork of Birch Creek in 1974 have established a natural reproducing population. Trout were sampled in the North and South Forks of the Sun River in relation to a two fish limit initiated in 1975. Brook trout population estimates were made for two sections of the Teton River in respect to debris removal projects. Trout populations were estimated in the Smith River in relation to evaluating creel limits and habitat conditions. Stocking of catchable sized hatchery reared rainbow trout was evaluated in Sheep Creek.

OBJECTIVES AND DEGREE OF ATTAINMENT

1.) To determine stocking densities, growth rates and angler success for rainbow trout in five reservoirs and lakes. Information was collected in six waters and is included in this report.

2.) To estimate the northern pike population and to determine the survival and growth of rainbow trout and natural reproduction of kokanee salmon in Pishkun Reservoir. This work was done and is included in this report.

3.) To determine population trends, fishermen harvest and food habits of northern pike, walleye and burbot in Tiber Reservoir. Also to determine composition and abundance of indigenous forage species. Data is presented

in this report on these subjects. Information was also gathered on walleye and northern pike in Lake Frances and is included in this report.

4.) To determine the effects of a two fish creel limit on rainbow and cutthroat trout populations in the North and South Forks of the Sun River. This work is included in this report.

5.) To monitor stability of stream habitat on the Teton River where flood debris was mechanically removed and where it was not removed and to estimate brook trout populations in these areas. This is a continuing project. Information was gathered and appears in this report.

6.) To evaluate management of four small ponds and lakes with rainbow and cutthroat trout. Also to determine fishery potential in new ponds. This information was collected and is presented in this report.

7.) To determine and recommend minimum flow requirements for maintaining aquatic life in at least one stream in the project area. This was not done because statewide procedure was not completed.

8.) To inventory trout populations in study sections on Belt Creek and Smith River. Information was gathered on the Smith River and is included in this report. No work was conducted on Belt Creek.

PROCEDURES

Fish were sampled with 3 x 4 foot and 4 x 6 foot frame net traps (¼, ½ and 1 inch mesh), 6 x 125 foot experimental gill nets (3/4 to 2 inch mesh), a 50 foot seine (½ inch mesh), a 300 volt DC electro-fish shocker and by hook and line. Measurements on fish include total lengths to the nearest tenth of an inch and weights to the nearest hundredth of a pound. Scale and otolith samples were collected for age and growth studies. Northern pike and walleye were tagged with T-tags and the right pelvic fin removed to help determine tag loss. Harvest determinations were made through voluntary angler tag returns. Stomach samples of northern pike and walleye were taken for food habit studies. Population estimates were made by mark and recapture techniques. Trout were examined for fluorescent markings with the aid of a black light. Hatchery trout were jaw-tagged before they were stocked in Sheep Creek. Voluntary tag return boxes were installed along the stream.

ACCOMPLISHMENTS

Lakes and Reservoirs

Gill net summaries for the lakes inventoried are presented in Table 1. Individual discussion of various waters follows.

Bean Lake

Sampling of the trout population in the fall of 1979 revealed high survival of fingerling rainbow trout planted late in the spring of 1979. Results of gill

net sampling is presented in Table 1. The high survival of fingerling trout appears to have slowed growth rates when compared to data collected in the fall of previous years. It was recommended that the plant be cut to 40,000 fish yearly.

Monitoring of water quality in 1978 revealed that pH increased in the winter but gradually decreased in the summer. The pH was monitored in February and early May, 1980 and values on both dates were 9.4. Fish were again tempered in the hatchery truck for several hours before they were stocked in the lake.

Table 1. Summary of gill netting of lakes and reservoirs, 1979

Area (Date Sampled)	Surface Acres*	No. of Nets	Species**	No. of Fish	Length Range (Average)	Weight Range (Average)
Bean Lake			Rb	45	10.4-13.0(11.4)	.38- .85(.60)
(May 2)	200	3	Rb	20	11.3-16.2(13.8)	.59-1.70(1.05)
			Rb	94	8.3-11.4(10.2)	.21- .56(.40)
(Oct. 24)		3	Rb	14	13.6-16.8(14.9)	.94-1.98(1.32)
Bynum Res.	3,000	4	Rb	33	8.7-10.2(9.4)	.26- .40(.33)
(Sept. 19)				9	13.4-15.9(14.4)	.82-1.50(1.13)
				1	(17.2)	(2.15)
			KOK	1	(11.5)	(.57)
				17	13.8-16.3(15.3)	.97-1.42(1.19)
			Wf	13	10.2-16.4(13.3)	.39-1.58(1.00)
			WSu	148		
Eureka Res.	275	3	Rb	58	7.7-10.8(9.1)	.18- .41(.27)
(Oct. 10)				8	15.0-17.5(15.7)	1.21-1.85(1.46)
			LNSu	1	(10.5)	(.34)
			WSu	63	9.0-17.1	.27-2.42
Lake Frances	4,200	6	WE	2	7.9- 8.5(8.2)	.14- .18(.16)
(Sept. 25)				36	11.0-16.9(13.6)	.41-1.67(.89)
				2	21.6-22.4(22.0)	3.80-4.28(4.04)
			NP	2	8.6- 9.0(8.8)	.14- .15(.14)
				18	11.1-19.2(15.2)	.27-1.60(.83)
				14	20.3-24.5(22.5)	1.94-3.56(2.70)
				3	26.0-28.5(27.3)	3.94-7#+
			YP	3	4.7- 5.1(4.9)	.05- .06(.05)
				1	(9.5)	(.40)
			LNSu	2	18.6-20.1(19.4)	2.66-3.67(3.17)
			WSu	1	(17.6)	(2.57)
Nilan Res.	100	3	Rb	90	8.8-11.0(10.1)	.24- .54(.41)
(Oct. 24)				46	13.9-16.5(15.1)	1.02-1.74(1.28)
			WSu	1		

Table 1. (cont.)

Area (Date Sampled)	Surface Acres*	No. of Nets	Species**	No. of Fish	Length Range (Average)	Weight Range (Average)
Pishkun Res. (July 12)	1,400	4	Rb	3	15.5-17.8(16.6)	1.55-2.46(2.04)
			KOK	8	10.7-11.8(11.0)	.44- .60(.50)
				27	12.6-15.3(13.4)	.75-1.32(.94)
			NP	2	8.8-12.4(10.6)	.18- .51(.35)
				7	15.6-26.8(21.3)	1.15-5.54(3.31)
			YP	1	(6.1)	(.11)
			WSu	36	6.2-19.0	.10-3.18
Tiber Res. (Sept. 26, 27)	11,800	18	WE	21	7.6-10.7(8.8)	.11- .36(.20)
				29	11.2-16.6(12.9)	.38-1.35(.65)
				27	17.4-21.9(19.4)	1.56-3.41(2.36)
			NP	16	14.2-19.8(17.0)	.57-1.55(1.03)
				6	24.8-26.5(25.8)	3.30-4.75(4.23)
				2	30.0-33.2(31.6)	@ 6# - 12#
			Rb	3	12.8-13.9(13.2)	.87-1.03(.93)
				3	17.2-20.7(18.7)	2.16-2.54(2.34)
			YP	39	5.2- 8.7(6.7)	.10- .20(.14)
				9	9.6-11.1(10.3)	.38- .62(.50)
			Ling	1	(18.0)	(1.20)
			WSu	64	8.4-17.5	
			LNSu	10	7.4-11.3	
			Carp	1		
Willow Creek Res. (Oct. 16)	1,350	4	Rb	108	9.4-11.1(10.3)	.30- .54(.42)
				20	12.9-13.7(13.4)	.76-1.13(.89)
				1	(16.9)	(1.94)
			WSu	43		

* Approximate surface acres at time of survey.

** Species abbreviations: Rb-rainbow trout; KOK-kokanee salmon; Wf-mountain whitefish; WSu-white sucker; LNSu-longnose sucker; WE-walleye; NP-northern pike; YP-yellow perch; Ling-burbot.

Growth Rates of Rainbow Trout in Four Reservoirs

Past progress reports (Hill and Wipperman, 1979) have indicated that rainbow trout have experienced better survival when planted approximately one month after ice-out. Table 2 presents rainbow trout gain/month and corresponding C factor in relation to stocking rates for Bynum, Eureka, Nilan and Willow Creek Reservoirs. Since survival rates have improved, stocking rates will be adjusted to achieve more desirable growth rates. Therefore, stocking rates for Eureka, Nilan and Willow Creek Reservoirs will be lowered while the rate for Bynum Reservoir will remain the same. All of these reservoirs contain

large populations of suckers. Because chemical rehabilitation is no longer economically feasible, proper adjustment of stocking rates will be necessary to achieve desired growth rates.

Table 2. Rainbow trout gain/month and condition factor (C) in four reservoirs, 1979

Lake	Gain/Month		C	Stocking Rate No./Acre	Months in Lake*
	Length (inches)	Weight (lbs.)			
Bynum Res.	1.57	.089	40.1	16	2.8
Eureka Res.	1.00	.043	35.7	245	4.6
Nilan Res.	1.22	.072	39.4	200	5
Willow Creek Res.	1.06	.068	38.3	83	5

* Months in Lake = From date planted to date sampled.

Bynum Reservoir

Kokanee salmon plants were discontinued in 1978 in hopes of improving trout growth. Gill nets were fished in September (Table 1) and the data indicates that rainbow trout growth has improved when a comparison is made of the condition factor (C) for recent years. The C factor for rainbow trout averaged 31-34 during the years when kokanee were planted and increased to 39-40 after the plants were discontinued. Future surveys will monitor further changes in growth and condition.

Eureka Reservoir

Exmaination of Tables 1 and 2 indicate poor growth for rainbow trout. This was caused by excellent survival of stocked trout, overstocking, and competition with an increasing sucker population. The 1979 plant of 100,000 trout will be reduced to 50,000 for 1980.

During the 1979-80 winter fishing season, a leech infestation on rainbow trout was reported. Approximately 20 percent of the population observed was affected. The leech is small, approximately ½ inch in length. Occurrence ranged from 1-2 leeches per fish to as many as 45-50. No explanation can be given for the infestation.

A periodic creel census (running several years) will be initiated in April, 1980. Information will be gathered to determine fishing pressure, catch rates, growth rates and longevity of hatchery fish.

Nilan Reservoir

Growth of rainbow trout in Nilan Reservoir is somwhat better than

Eureka Reservoir, however, if stocking rates are adjusted, growth could improve. We recommended the 1980 plant be reduced from 100,000 to 75,000 fish.

The October 24 gill net survey (Table 1) collected 136 rainbow trout of which 46 were planted in 1978. In 1978, 44% of the hatchery trout were marked with fluorescent dye and stocked about a month after ice-out. Of the 46 trout taken in the fall of 1979, 56.5% were marked. In the fall of 1978, survey netting callected 124 trout, of which 75.8% were marked. This indicates a tendency of the mark being sloughed with time.

The summer and fall of 1979 were quite dry resulting in heavy demands for irrigation water. Nilan Reservoir was drawn to dead storage of approximately 900 acre feet by mid-summer (10,000 acre feet at full pool).

Only one white sucker was collected in the gill net survey because all nets were surface nets. Bottom sets would have collected more suckers.

Willow Creek Reservoir

Growth of rainbow trout in Willow Creek Reservoir falls between growth found in Eureka and Nilan Reservoirs (Table 2). Growth rates should improve if numbers stocked are reduced. The 1980 plant will consist of 75,000 trout, cut 50,000 from the 1979 plant.

Lake Frances

A gill net survey was conducted in September (Table 1) to check survival of stocked walleye and possible reproduction along with information on northern pike. Walleye have been planted periodically since 1969 with little to fair survival and little or no reproduction. In 1976, 200,000 two-inch walleye were planted and in 1977, 1,600,000 fry were planted. Survival of these two plants appears good. Scale analysis indicates the 1976 plant (age III) ranges from 15.3 - 16.3 inches while the 1977 plant ranges from 11.0 - 13.1 inches. In addition, two walleye (7.9 - 8.5 inches) were age I and represent natural reproduction from an earlier plant. From the apparent good survival of the last two plants and some reproduction, it is hopeful that walleye will establish a self-sustaining population.

Northern pike numbers still remain high with adequate reproduction. Scale analysis indicates young-of-the-year range from 8.6 - 11.1 inches and age I fish from 11.6 - 17.2 inches.

During June of 1979, approximately 40,000 (2 - 3 inch) kokanee salmon were planted in Lake Frances because they were surplus in the hatchery system. Lake Frances provides marginal habitat for kokanee on dry years because of irrigation draw down. It was anticipated that water levels would be adequate for a few years since the lake was full at the time the kokanee were planted. However, 1979 was exceptionally hot and dry and irrigation demand caused severe drawdown of the lake. It is doubtful that many kokanee survived because of warm water temperatures and possible severe predation by northern pike. Future kokanee plants will not be recommended unless water levels are

maintained at adequate levels and northern pike numbers are very low.

Pishkun Reservoir

Surveys conducted during 1979 focused on northern pike, rainbow trout and kokanee salmon. From April 26 to May 2, 1979, five trap nets were fished a total of 29 trap days and collected 290 northern pike, 45 white sucker, 23 yellow perch, 2 kokanee salmon and 1 rainbow trout.

A population estimate for northern pike was made using the Schnabel Method as described by Rounsefell and Everhart (1960) in which fish are marked and recaptured intensively for a short period of time. Of the 290 pike taken during trap netting, 179 were captured one time, 81 were recaptures and 30 were small fish and not included in the estimate. A population estimate of 272 pike (Table 3) was calculated for 1979 which included only fish larger than 16 inches in Length. The 1979 estimate compares to 289 pike for 1978. Estimates conducted in 1970, 1971 and 1972 were 1,645, 2,086 and 1,232 northern pike, respectively.

Table 3. Northern pike population estimate for Pishkun Reservoir, 1979

Time Interval (t)	Marked Fish at Large M(t)	Fish Captured C(t)	Marked Fish Recaptured R(t)	M(t-1) C(t)	$\frac{M(t-1)\ C(t)}{R(t)}$	Cumulative E	Cumulative D	$\frac{G}{H}$
A	B	C	D	E	F	G	H	I
1	81							
2	118	57	20	4,617	231	4,617	20	23
3	136	31	13	3,658	281	8,275	33	25
4	163	47	20	6,392	320	14,667	53	27
5	171	19	11	3,097	282	17,764	64	27
6	-	25	17	4,275	251	22,039	81	27
			81	22,039	272			

Number of recaptures is 81 ± 9
1.96 standard error or probability of 0.05 is ± 17.64
Population at P of 0.05 is 272 (confidence limits of 196 to 348)

Length measurements were taken on 163 mature pike and they averaged 24.0 inches. This is the largest average since surveys were initiated in 1970. The average length has been increasing steadily and may have reached the maximum. It is anticipated that more and smaller individuals will make up the bulk of the population in the next few years.

In addition to the pike survey, information was gathered on rainbow trout survival and growth as well as data on kokanee salmon populations. This data was gathered from a gill net survey (Table 1) and periodic creel census. Trout survival appears good as determined by checking fish under a black light for fluorescent dye markings. Over 80% of the trout checked were dye marked. The percent marked is probably higher due to the difficulty of detecting the mark under field conditions. A portion of the unmarked fish are presumed to be wild fish from the Sun River. A total of 13 pike stomachs were checked for predation on trout, with none found. Of stomachs checked, eight were empty, two contained leeches and shrimp, two contained leeches and one stomach had earthworms. Trout growth is considered excellent with fish living in the reservoir three years approaching five to six pounds. Those living in the reservoir two years weigh approximately three to four pounds.

Kokanee salmon were not planted in 1978 to ascertain whether or not natural reproduction is occurring. Fishermen reported catching several small kokanee but scale samples were procurred from only one individual. A 7.9 inch kokanee taken in August was aged as 1+ (1978 year class) and represents natural reproduction. This analysis as well as reports of other small kokanee being caught indicates there is a certain amount of natural reproduction. The extent will be determined during the 1980 field season by gill netting and angler catches. Good numbers of mature salmon were taken during the snagging season. Approximately 17 percent of the males and 2 percent of the females were aged as II+ while the remainder were III+ as determined by otoliths. The average size of 48 males was 15.6 inches (13.5-18.5) and 1.30 pounds (0.84- 2.00) while 52 females averaged 14.8 inches (13.1-16.6) and 1.05 pounds (0.80-1.55).

A limited creel census from Memorial Day to Labor Day was run for five weekend days and three week days. In addition to data already presented, information was obtained on number and species caught and catch rates (Table 4).

Table 4. Creel Census results, Pishkun Reservoir, 1978-79
(Memorial Day to Labor Day)

	1978 (25 Days Sampled)			1979 (8 days Sampled)		
	Rb*	KOK*	NP	Rb*	KOK*	NP
No. of Fish	171	1,680	117	64	748	43
Hours Fished	2,716		487	1,562		134
No. Fishermen	743		149	402		50
Fish/Hour	68		.24	.52		.32
Fish/Man	2.5		.8	2.0		.9
Hours/Man	3.7		3.3	3.9		2.7

* Rainbow and kokanee fishermen, hours, etc. combined because both species were fished for and caught by same methods.

Catch per hour for rainbow and kokanee is down slightly from 1978 while it increased slightly for pike. Overall fishing pressure increased slightly during 1979. A total of 451 resident fishermen were checked representing 24 towns. Only one non-resident fishermen was checked. During the survey 217 boats were observed on the water and 340 cars were counted. The majority of the fishermen (47.3%) came from Great Falls, followed by Choteau (13.1%), Missoula (12.2%) and Conrad (6.6%).

Tiber Reservoir

Surveys were conducted throughout 1979 to follow trends of the northern pike, walleye and burbot populations, as well as determining the forage base in the reservoir.

Trap nets were fished during the spring in the Willow Creek Arm and west of the Bootlegger Trail (Figure 1) to monitor trends in the northern pike, walleye and burbot populations. Pike and walleye were tagged and length measurements taken (Table 5). During the spring spawning runs, larger pike were taken in the Bootlegger Trail area while larger walleye were taken in the Willow Creek Arm. This pattern has been noticed for the past several years. Eight walleye and four pike tagged in April in the Willow Creek Arm were recaptured in the Bootlegger Trail area 14-18 days later.

Table 5. Numbers of northern pike and walleye tagged and corresponding length range by area, Tiber Reservoir, April-May, 1979

	Northern Pike		Walleye	
	No. Tagged	Length Range (Avg.)	No. Tagged	Length Range (Avg.)
Male:				
Willow Creek Arm	69	19.4-29.9(22.9)	119	15.2-20.4(18.3)
Bootlegger Trail	84	19.3-33.8(23.5)	201	15.4-20.4(18.1)
Female:				
Willow Creek Arm	44	21.3-35.4(26.5)	131	17.0-23.0(20.2)
Bootlegger Trail	103	19.2-36.5(27.3)	49	17.8-21.5(19.6)

From April 20-25, 1979, a total of 30 trap days were expended in the Willow Creek Arm and caught 157 pike, 324 walleye, 26 burbot, 7 yellow perch, 367 white and longnose sucker and 12 carp. In the Bootlegger Trail area, a total of 35 trap days from May 4-10, 1979, captured 215 pike, 382 walleye, 27 burbot, 7 rainbow trout, 12 yellow perch, 29 white and longnose sucker and 36 carp.

A total of 300 pike were tagged in Tiber Reservoir during 1979 bringing the total tagged to 1,928 since tagging studies began in 1976. Table 6 presents percentage return on an accumulative basis for the years 1976 through 1979.

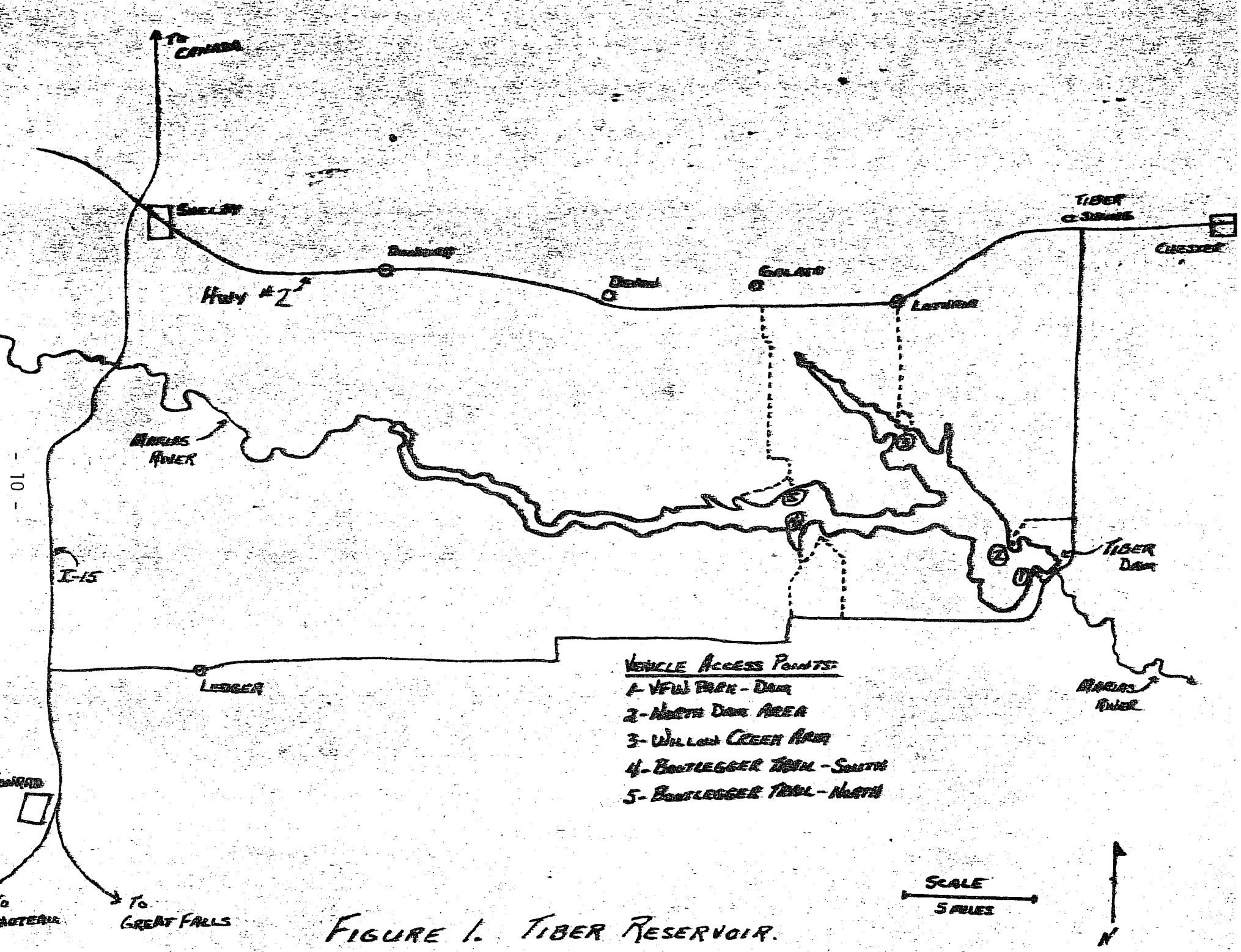

FIGURE 1. TIBER RESERVOIR.

Table 6. Accumulative tag returns for northern pike, Tiber Reservoir, 1976-79

Year Tagged	Year Returned	a Number Tagged	b Angler Returns	c a-b	d Percent Tag Loss	e Tags Lost	f c-e	g b+f	h Angler Harvest Annual(%)	i Angler Harvest Accum.(%)	j Total Tags Removed Annual(%)	k Total Tags Removed Accum.(%)
1976	1976	628	79						79(12.6)	79(12.6)		
	1977	549	15	. . .	Data Not Available	. . .			15(2.7)	94(15.0)		
	1978	534	8						8(1.5)	102(16.2)		
	1979	526	5						5(1.0)	107(17.0)		
1977	1977	595	56	539	4.4	24	515	571	56(9.8)	56(9.8)	80(13.4)	80(13.4)
	1978	515	28	487	7.4	36	451	479	28(5.8)	84(15.7)	64(12.4)	144(24.2)
	1979	451	13	438	16.7	73	365	378	13(3.4)	97(21.0)	86(19.1)	230(38.7)
1978	1978	405	36	369	4.7	17	352	388	36(9.3)	36(9.3)	53(13.1)	53(13.1)
	1979	352	15	337	0.0	0	337	352	15(4.3)	51(13.1)	15(4.3)	68(16.8)
1979	1979	300	27	273	3.7	10	263	290	27(9.3)	27(9.3)	37(12.3)	37(12.3)

Explanation of lower case letters a to k:

a = Number of fish tagged at start of any one year.
b = Annual angler returns.
c = Number tagged fish - angler returns. c = a - b
d = Percent tag loss (annual) determined by spring trapping of following year.
e = Number tags lost. e = c x d
f = Number fish theoretically tagged at end of any one year. f = c - e
g = Number tagged throughout year. g = b + f or g = a - e
h = Annual angler harvest. $h = \frac{b}{g}$
i = Accumulative angler harvest = accumulative angler return $\frac{o}{o}$ original number tagged - annual tag loss. $i = \frac{b_{1\ldots n}}{a_1 - e_{1\ldots n}}$
j = Number (%) tags removed annually. $j = \frac{b + e}{a}$
k = Number (%) tags accumulatively removed from original population. $k = \frac{b_{1\ldots n} + e_{1\ldots n}}{a_1}$

Tagged pike and walleye killed in netting surveys are included with angler returns (refer to bottom of Table 8 for number of netting mortalities). Accumulative angler returns for individual years range from 9.3 percent for 1979 to 21.0 percent for 1977. This accumulative return is calculated after numbers of fish losing tags have been removed from the original tagged population. Tag loss is determined by the absence of the tag or a scar in the location of tag insertion and the removal of a fin when each fish was tagged. Tag loss could not be determined for 1976 because tagged fish were not fin clipped, therefore, the accumulative return for 1976 is somewhat lower than it should be. To determine tag loss, fish are tagged and fin clipped one spring, and the next spring fish are checked for presence or absence of tags along with fin clips. Using this procedure, tag loss for fish tagged in 1977 was determined to be 4.4 percent by the spring of 1978 (out of 45 fin clipped fish, 2 had lost tags), and by the spring of 1979, tag loss was calculated to be 7.4 percent (out of 27 fin clipped fish, 2 had lost tags). By the spring of 1980, tag loss was determined to be 16.7 percent (out of 18 fin clipped fish, 3 had lost tags). Similarly, for fish tagged in 1978, tag loss by the spring of 1979 was 4.7 percent (out of 43 fin clipped fish, 2 had lost tags). By the spring of 1980, no further tag loss was observed. Fish tagged in 1979 had experienced a 3.7% tag loss by the spring of 1980 (out of 27 fin clipped fish, 1 had lost the tag). These tag loss percentages have been used in Table 6 to calculate the total number of fish losing tags, (for example: For 1979 tagged fish minus 4.4% of 539 tagged fish equals 24 fish losing tags).

During 1979, a total of 500 walleye were tagged. This brings the total tagged to 1,880 since 1976. Accumulative percent angler return for walleye for the years 1976-79 is presented in Table 7 and ranges from 2.5% for 1976 (a year in which tag loss was not determined) to 100% for 1978. The 100% accumulative angler return for 1978 tagged fish and 77.1% for 1977 tagged fish reflects the unusually high tag loss ratio experienced.

Walleye tag loss for 1977 tagged fish is as follows: Spring of 1978, 45.5% (5 of 11 losing tags); Spring of 1979, 75.0% (6 of 8 losing tags); Spring of 1980, 80.0% (8 of 10 losing tags). Tag loss for 1978 tagged fish is as follows: Spring of 1979, 85.0% (17 of 20 losing tags); Spring of 1980, 100.0% (12 of 12 losing tags). Fish tagged in 1979 had experienced a 51.9% tag loss by the spring of 1980 (out of 54 fin clipped fish, 28 had lost tags). Table 8 shows when most of the tagged fish are caught throughout the year. June and July account for the majority of the tagged fish caught by fishermen. Pike are taken throughout the year but walleye apparently are much harder to catch throughout late fall, winter and early spring.

Pike were tagged with FD-67 T-tags (2 inches long) in 1976 and 1977, with FD-68 T-tags (2 inches long) in 1978 and with FD-68BC T-tags (3/4 inches long) in 1979. The FD-68 tag has the monofilament secured on the end of the tube. The BC denotes a shorter tag. Tag loss on pike has been acceptable with the exception of the 1977 tagging year. Use of the shorter tag should result in lower tag loss.

Walleye were tagged with dart tags (2 inches long) from 1976 to 1978 and with FD-68BC T-tags (3/4 inches long) in 1979. The shorter tag with the

Table 7. Accumulative tag returns for walleye, Tiber Reservoir, 1976-79

Year Tagged	Year Returned	a Number Tagged	b Angler Returns	c a-b	d Percent Tag Loss	e Tags Lost	f c-e	g b+f	h Angler Harvest Annual(%)	i Angler Harvest Accum.(%)	j Total Tags Removed Annual(%)	k Total Tags Removed Accum.(%)
1976	1976	400	8						8(2.0)	8(2.0)		
	1977	392	2	. . .	Data Not Available	. . .			2(0.5)	10(2.5)		
	1978	390	0						0(0.0)	10(2.5)		
	1979	390	0						0(0.0)	10(2.5)		
1977	1977	472	26	446	45.5	203	243	269	26(9.7)	26(9.7)	229(48.5)	229(48.5)
	1978	243	8	235	75.0	176	59	67	8(11.9)	34(36.6)	184(75.7)	413(87.5)
	1979	59	3	56	80.0	45	11	14	3(21.4)	37(77.1)	48(81.4)	46(97.7)
1978	1978	508	45	463	85.0	394	69	114	45(39.5)	45(39.5)	439(86.4)	439(86.4)
	1979	69	6	63	100.0	63	0	6	6(100.0)	51(100.0)	69(100.0)	508(100.0
1979	1979	500	42	458	51.9	238	220	262	42(16.0)	42(16.0)	280(56.0)	280(56.0)

Refer to Table 6 for explanation of lower case letters a to k.

Table 8. Number of tagged fish caught by fishermen, by month, Tiber Reservoir, 1976-79

Month	Northern Pike				Walleye			
	1976	1977	1978	1979	1976	1977	1978	1979
January	4	3	-	1	-	-	-	-
February	6	1	1	7	-	-	-	-
March	-	1	3	3	-	-	-	-
April	-	-	1	1	-	-	-	-
May	-	13	13	4	-	7	1	4
June	3	25	16	19	-	8	19	25
July	14	17	17	8	-	-	20	11
August	27	5	5	6	1	3	4	-
September	12	3	7	2	-	1	1	4
October	4	1	5	5	1	-	2	4
November	3	-	-	-	-	-	-	-
December	2	1	-	1	-	-	-	-
Totals	75	70	68	57	2	19	47	48
Net Mortalities	4	1	4	3	6	9	6	3

monofilament secured on the end of the tube was anticipated to decrease the high tag losses. Tag loss decreased somewhat but still was very high. Tags have been inserted below the anterior dorsal fin. A new location for tag insertion should be found, possibly below the posterior dorsal fin. If tag losses continue high at this point of insertion, walleye tagging studies should be discontinued until a more suitable tag can be found.

It is unknown when tag loss occurs but is assumed to be evenly distributed throughout the year. The figures given for tag loss are probably biased due to the small sample size but do present trends. Also, angler harvest may not exhibit a true picture due to an unknown number of tags not being turned in.

A total of 76 pike tagged in previous years were recaptured in 1979. Four of these represent fish that had lost tags as discussed earlier. Six recaptures were of fish tagged in 1976, while 25 were from fish tagged in 1977 and 41 were of fish tagged in 1978. Walleye recaptures totaled 28 fish with 23 losing tags as discussed earlier. Two were from fish tagged in 1977 and 3 were of fish tagged in 1978.

The overall catch of fish in spring trap netting for 1979 is compared to past surveys (Table 9). The greatest change is noticed in the increase in the catch of suckers and a decrease in northern pike. Increases are also noticed in yellow perch and burbot. Burbot populations have been at low levels since 1976 and it is unknown whether or not they are increasing. Pike, walleye and burbot all are dependent on yellow perch and small suckers for forage. Adequate forage is necessary for these predator species to achieve maximum growth.

Table 9. Relative abundance of several species in Tiber Reservoir as determined by trap nets (spring sampling)

Year	Fish per Trap day	Total Catch	Trap Days	Percent of total catch						
				YP	Sucker*	Burbot	NP	WE	Rb	Other**
1973	20.9	418	20	2.2	27.3	64.8	4.3	-	0.2	1.2
1974	34.7	1041	30	4.5	63.4	27.1	1.3	0.6	0.8	2.3
1975	39.8	1671	42	35.9	19.2	21.5	3.7	15.6	0.5	3.7
1976	53.3	2398	45	7.3	41.7	0.2	32.9	16.5	0.2	1.3
1977	33.7	2358	70	5.9	12.8	3.8	27.2	47.6	0.9	1.8
1978	55.0	1704	31	0.6	6.3	1.6	37.6	46.9	0.2	6.8
1979	24.6	1674	65	1.1	23.7	3.2	25.0	43.8	0.4	2.9

YP-yellow perch; NP-northern pike; WE-walleye; Rb-rainbow trout.

* Suckers - white and longnose

** Others - carp, mountain whitefish

Efforts were made to determine composition and abundance of indigenous forage species. Small mesh (1/4 inch) trap nets and a 50-foot seine (1/4 inch mesh) were employed to sample forage species (Table 10) during May, July and September.

Seining was conducted at night and consisted of working a gradual sloping shoreline for one to two hours. The results in Table 10 indicate low numbers of forage fishes. Future surveys will moniter trends in the forage base. Forage fishes of questionable identity were verified by Dr. William Gould of the Montana Cooperative Fisheries Unit at Montana State University, Bozeman. Scale analysis of pike and walleye indicates that growth is below average for the first two years of life as reported earlier (Hill and Wipperman, 1979). If growth rates continue poor and forage fish numbers remain low, consideration should be given to introduction of a new forage fish.

A total of 18 gill nets were fished September 26 and 27, 1979, and caught 231 fish representing 8 species (Table 1). Fewer numbers of walleye were taken in 1979 than in past surveys. This is probably due to the walleye population being in a transition period between the years when walleye were planted annually (1971-1974) and presently when natural reproduction is

Table 10. Forage sampling in Tiber Reservoir, 1979

Dates	Methods	Forage Species*									
		YP(YOY)	YP(Yrlg)	WSu(YOY)	WSu(Yrlg)	Crappie	ES	LC	LD	Carp	Crayfish
May 4-5, 79	4 trap nets	-	-	-	9	-	-	-	-	-	14
July 9-10, 79	6 trap nets	546	4	89	-	-	50	36	-	28	8
July 10, 79	Seining (1 hr)	-	-	-	-	-	-	-	-	-	10
Sept 26-67-79	6 trap nets	9	2	2	-	14	3	1	3	-	15
Sept 26, 79	Seining (2 hrs)	35	15	-	-	-	-	-	-	-	50

* Abbreviations = YP-yellow perch; YOY-young-of-the-year; Yrlg-yearling; WSu-white sucker; ES-emerald shiner; LC-lake chub; LD-longnose dace

Table 11. Relative abundance of several species in Tiber Reservoir as determined by gill nets (Fall sampling)

Year	Fish per Net	Total Catch	No. of Nets	Percent of total catch					
				YP	Sucker*	NP	WE	Rb	Others**
1960	-	1054	?	-	71.0	-	-	29.0	-
1961	-	331	?	-	85.0	-	-	15.0	-
1968	53.7	1934	36	59.0	39.0	-	-	1.0	1.0
1971	38.0	380	10	78.2	16.3	-	-	2.4	3.2
1972	35.0	70	2	65.7	32.9	-	-	-	1.4
1973	26.2	367	14	17.7	64.9	0.5	9.8	4.6	2.5
1974	14.6	262	18	11.5	42.4	1.9	40.5	2.3	1.5
1975	31.6	284	9	17.6	31.4	22.9	20.4	4.9	2.8
1976	19.3	308	16	9.7	19.8	17.2	52.3	0.3	0.6
1977	28.7	344	12	8.1	16.2	7.0	66.9	0.3	1.5
1978	16.2	259	16	4.2	26.2	9.7	56.0	1.9	1.5
1979	13.6	231	17	20.8	32.0	10.4	33.3	2.6	0.8

YP-yellow perch; NP-northern pike; WE-ealleye; Rb-rainbow trout
* Sucker - white and longnose
** Others - Carp, mountain whitefish, burbot, lake trout, shovelnose sturgeon.

maintaining the population. Fewer walleye may also be reflected by the high accumulative angler harvest of 1977 and 1978 tagged fish (refer to Table 7). Analysis of walleye scales indicates that there is substantial reproduction. Future surveys will moniter the levels of walleye abundance. Analysis of northern pike scales reveals a fair amount of reproduction in 1978, the last year that water levels were conducive to spawning.

Table 11 presents the relative abundance of several species taken in gill nets in fall surveys. The data for 1979 indicates an increase in the numbers of yellow perch. The fall gill netting also indicates an increase in the sucker population and a decrease in walleye as discussed in the preceding paragraph.

To obtain information on northern pike and walleye food habits, stomach samples were taken in the spring and fall. Eight walleye stomachs taken in May were all empty. Of 20 walleye stomachs taken in September: 12 were empty, 6 contained 1 yellow perch each, and 2 had fish remains. Of 10 pike stomachs taken in September: 5 were empty, 1 contained 1 yellow perch, 1 contained 2 crayfish, 2 contained 1 crayfish each, and 1 had 2 crayfish and 1 yellow perch.

Approximately 400 yearling and adult black crappie were introduced into the Willow Creek Arm of Tiber Reservoir on May 25, 1979. The purpose of the introduction is to increase the fishing opportunity for a different and unique species as well as providing a forage fish for pike, walleye and burbot. Although none of the original 400 were taken in the fall surveys, 14 young-of-the-year were collected in small mesh trap nets. Future surveys will moniter the success of this introduction.

During the spring trap netting survey, approximately 100 adult walleye were removed from Tiber Reservoir and transferred to Dailey's Lake south of Livingston.

Holter Lake

Holter Lake receives the heaviest fishing pressure of all the reservoirs and lakes in Region Four. Located on the mainstem of the Missouri River between Great Falls and Helena, it is a popular fishing lake both summer and winter. The statewide fishing pressure estimates conducted in 1975 and 1976 revealed about 80,000 angler days per year are expended on Holter Lake.

Current management involves planting of 300,000 five to 7-inch rainbow trout after high river flow in mid-summer. Studies concluded in 1973 revealed significant numbers of spring planted trout moved downstream over Holter Dam during the high flow period. This occurred when river flow exceeded 6,500 cfs. The change in planting policy resulted in a solid, popular fishery in Holter Lake.

Rainbow trout were sampled with four floating gill nets on October 31, 1979 to check on growth and condition of trout planted during the summer. Data is presented in Table 12 along with netting information collected in 1974 and 1975. The trout exhibited excellent growth and good body condition. Other fish collected in gill nets in order of abundance included white sucker,

yellow perch, longnose sucker, walleye, brown trout, carp, mountain whitefish and cutthroat trout.

Table 12. Management and gill net sampling of rainbow trout in Holter Lake, 1974-79

Year	Trout Planted	Stocking Dates	Trout Sampled	Length Range (Average) In.	Weight Range (Average) Lbs.
1974	242,500	7/15 - 7/23	163	9.5-12.5(11.5)	0.42-0.89(0.70)
			24	14.5-19.7(17.3)	1.15-2.84(2.09)
1975	243,000	8/04 -10/27*	42	7.7-11.7(10.6)	0.14-0.67(0.50)
			10	13.0-16.9(15.5)	0.87-1.88(1.50)
1976	277,500	7/15 - 7/23			
1977	331,500	6/06 - 6/16			
1978	308,500	7/25 - 7/27			
1979	312,000	6/28 - 7/20	121	10.8-13.3(12.2)	0.62-1.07(0.82)
			15	14.8-20.2(16.9)	1.42-2.81(2.03)

* Most fish planted in August.

Small Lakes and Farm Ponds

Gill nets were fished in four small trout lakes and farm ponds to determine survival and growth. Another pond was gill netted to determine species composition and success of introduced fish. The results of the gill net surveys appear in Table 13. Two trout reservoirs, Violett and Kammerzell, experienced winterkill during the prolonged snow and ice cover of the 1978-79 winter. Violett Reservoir was removed from the management program.

Dickens Lake normally winterkills annually, but came through the past winter. Even though the lake experiences frequent winterkill, trout are planted each year because of the excellent growth attained and fishing success realized during late summer, fall and early winter. Ice fishing was excellent from December, 1979 through early February, 1980. A total of 42 fishermen were contacted and they caught 139 trout from the 1979 plant which ranged in size from 11.5 to 14.0 inches and up to 1 3/4 pounds. They also caught 31 trout from the 1978 plant that ranged from 18.7 to 22.0 inches in length and weighed up to 4 pounds.

Furnell Pond, located in Toole County, was first planted with rainbow trout in 1978. Trout survived the winter and showed excellent growth. However, during late August, 1979, a fish kill occurred due to low oxygen levels throughout the pond.

Table 13. Gill net summary of small lakes and farm ponds, 1979

Lake (Date)	Species*	No. of Fish	Length Range (Average)	Weight Range (Average)
Dickens Lake (6/28)	Rb	4	15.6-17.0(16.3)	1.78-2.26(2.07)
Furnell Pond (6/25)	Rb	15	12.3-15.6(14.2)	.77-1.64(1.31)
Kammerzell Res (6/26)	Winterkill			
Violett Res (6/26)	Winterkill			
Ferris Pond (6/15)	BCR	1	(10.6)	(.77)
		9	(4.7)	(.06)
	PS	2	(3.9)	(.04)
	GE	2	13.2-15.4(14.3)	.82-1.47(1.15)
	SRed	3		
	WSu	88		
	LN Su	17		
	Carp	39		

* Species Abbreviations: Rb-rainbow trout; BCR-black crappie; PS-pumpkinseed; GE-goldeye; SRed-shorthead redhorse; WSu-white sucker; LN Su-longnose sucker.

The kill was attributed to hot, dry, calm weather and a blue-green algae grew to a point where pondweed vegetation was completely devoid of sunlight, thus inhibiting oxygen production. Similar summer kills have been reported for Fitzpatrick Lake (Hill and Wipperman, 1978) and Fitzpatrick Lake and Priest Lake (Phinney and Hill, 1973). The kill in Furnell Pond was thought to be complete. This situation will probably not occur often so the lake will be kept on the management program.

A gill net survey was conducted in Ferris Pond to assess survival and natural reproduction of largemouth bass and black crappie introduced in 1976. A total of 18 bass and 122 crappie were introduced. No bass were taken in the gill net but one adult and nine smaller crappie were collected. The smaller crappie represent natural reproduction.

Streams

South Fork of Birch Creek

Approximately 170 Upper Missouri River cutthroat trout were introduced into this stream in 1974. Surveys were made during July of 1979 to check on survival and reproduction. Cutthroat trout ranging from 4 to 12 inches in length were sampled over a 4 1/2 mile reach of stream. The introduction appears to have been successful.

North and South Forks of the Sun River

Hook and line surveys were conducted on these two streams on July 31 and August 1, 1979, to gather data pertinent to the two-fish limit on rainbow and cutthroat trout. This regulation has been in effect since 1975.

Table 14 presents the length frequency of rainbow trout, ten inches and larger, that have been sampled in the forks annually since 1975. It appears that the maximum average size has been reached in both forks. A decrease in size is noted for the North Fork in 1979, whereas the South Fork decreased in 1978 and showed somewhat of an increase in the 10 and 11-inch size groups in 1979. It is possible that this is a normal pattern for rainbow trout in the forks and not at all related to the two-fish limit. However, the present regulation will remain because the fishing public has been very receptive to it.

Table 14. Length frequency of rainbow trout (10" and longer) in the North and South Forks of the Sun River, 1975079. (Expressed as a percent of the total trout sampled)

	Length Group	1975	1976	1977	1978	1979
North Fork	10" and up	70.6	74.0	80.5	92.1	67.1
	11" and up	54.4	59.4	65.9	81.7	52.1
	12" and up	29.4	41.7	51.3	68.3	37.0
	13" and up	17.6	22.9	34.2	35.7	20.5
	No. of fish in sample	68	96	41	126	73
	Avg. length (all fish)	10.9	11.3	11.5	12.2	10.7
South Fork	10" and up	71.2	80.0	91.4	80.0	86.8
	11" and up	56.0	63.3	84.3	64.2	64.7
	12" and up	40.8	50.5	78.6	49.5	44.1
	13" and up	30.6	24.8	51.4	37.9	29.4
	No. of fish in sample	59	102	70	95	68
	Avg. length (all fish)	11.4	11.8	12.7	11.8	11.6

The length range for all species taken during hook and line surveys is presented in Table 15. Age classes for rainbow trout are also presented.

Table 15. Length range and age class distribution of trout in the North and South Forks of the Sun River, July 31-August 1, 1979

Stream	Species*	No. of Fish	Length Range (Average)	Age Class	No. of Fish	Length Range
North Fork	Ct	12	7.5-12.0(9.7)			
	Eb	2	6.0- 7.0(6.5)			
	RbxCt	4	8.9-16.2(12.3)			
	Rb	73	5.3-14.5(10.7)	I	10	5.3- 8.6
				II	20	8.1-11.0
				III& older	42	9.3-14.5
South Fork	Ct	3	7.1- 9.6(8.7)			
	Eb	5	7.1- 9.0(7.8)			
	RbxCt	2	9.9-11.2(10.6)			
	Rb	68	5.7-17.5(11.6)	I	5	5.7- 8.4
				II	17	7.8-12.2
				III& older	46	10.0-17.5

* Species abbreviations: Ct-cutthroat trout; Eb-brook trout; RbxCt-rainbow-cutthroat hybrid; Rb-rainbow trout

Teton River

Population estimates for brook trout were made in two sections of the Teton River west of Choteau. Section I (6,420 feet) is an area where debris piles were removed following the 1975 flood. Section II (5,170 feet) had debris piles left intact. Greater numbers of brook trout and pounds per acre are found in Section II (Table 16).

Table 16. Physical and biological characteristics of two sections of the Teton River, May, 1979

	Section I (Debris Removed)	Section II (Debris Intact)
Length (ft.)	6,420	5,170
Avg. Width (ft.)	36.4 (range 23-49)	25.6 (range 14-43)
Area (acres)	5.4	3.0

Brook trout

Length Group (inches)	Avg. Length (inches)	Number Estimate	Weight Estimate (pounds)	Length Group (inches)	Avg. Length (inches)	Number Estimate	Weight Estimate (pounds)
3.1- 4.9	4.1	175	4	2.8-4.9	3.9	272	5
5.0- 6.9	6.1	171	13	5.0-6.9	6.1	107	8
7.0-10.3	7.9	55	9	7.0-9.7	5.2	52	9
Totals		401	26			431	22
Standing crop/1,000 feet		115	4.7			84	4.28
Standing crop/acre		74	4.81			144	7.33

Other species taken during the electrofishing runs include rainbow trout, cutthroat trout, rainbow-cutthroat hybrids, brown trout and mountain whitefish. None of these were taken in sufficient numbers to estimate the population.

Low flows were experienced during 1979 and only minor changes were noticed in channel configuration. Section I increased in length from 6,410 to 6,420 feet and Section II increased from 5,140 to 5,170 feet. The Teton River will continue to be monitered in these two sections to measure any changes in river stability and fish population in relation to whether debris was removed or not.

Smith River

Trout population estimates were conducted in two river sections in late August and early September of 1979. Results are presented in Table 17. Too few brown trout were collected for population estimates, however, actual data collected is presented in the table for age and growth comparison with prior years.

Table 17. Trout population estimates from two sections of the Smith River, September, 1979

Age	Length (inches) Range	Average	Number	Weight (Lbs)
Rainbow trout - Access section				
I	7.0- 9.1	8.2	138	29.70
II	8.5-12.8	9.5	71	22.68
III & older	9.2-16.8	11.3	166	87.30
			375(± 135)	139.68(± 43)
Rainbow trout - Zieg Section				
I	4.7- 8.0	6.7	1242	136.97
II	7.1-10.4	8.4	456	101.84
III	8.1-12.8	10.6	593	248.01
IV & older	9.7-15.1	11.7	463	251.00
			2754(± 593)	737.82(± 148)
Brown trout - Access Section				
I	8.4	8.4	1	0.22
II	10.6-14.7	12.5	13	9.98
III & older	15.0-19.1	17.0	24	42.35
			38 1/	52.55
Brown trout - Zieg Section				
I	6.3- 9.2	7.7	10	1.57
II	9.3-14.7	12.7	12	10.06
III & older	14.2-18.4	16.6	21	36.92
			43 1/	48.55

1/ Actual fish collected - too few for an estimate.

The population of age II and older rainbow trout in the Access Section decreased nearly 40 percent when compared with 1978 estimates. This fairly large decrease may be due to adverse conditions in July and early August. Water temperatures recorded at the Camp Baker Bridge (6 miles downstream) exceeded 70°F. on 29 of 37 days from July 5 to August 10, 1979. The maximum water temperature recorded was 76° F. Low flow was also noted during this period, however, data was not available from the USGS at the time of this report.

Estimates collected at the Zieg Section, 10 miles downstream from the Access Section, revealed about equal numbers of Age II and older rainbow trout when compared with 1978 estimates. Reduction of habitat was not as severe in this section because of flow accretion from Sheep and Eagle Creeks. Sheep Creek is the largest tributary to the Smith River in the upper valley. A very large population of yearling fish was noted.

Prior to the start of the 1979 fishing season, rainbow trout limits were two fish per day since 1975. The daily creel limit was increased to five fish in 1979. It appears several years of data collection will be necessary to determine effects of fisherman harvest on the trout populations.

Sheep Creek

Complaints of poor fishing in Sheep Creek prompted a fish population survey in three stream sections. A 400-foot section was shocked in the heavily used Jumping Creek campground and the catch consisted of 7 brook trout, 4 rainbow trout and 2 mountain whitefish. Only 4 of the trout were greater than 7 inches in length. Another section near Forest Green yielded 9 small brook trout. The stream bottom through these sections appeared to be heavily laden with sediment. Several small tributaries run into Sheep Creek through this area where heavy clearcut logging has occurred. A 250-foot section, about a mile above the confluence of Lamb Creek, yielded 33 brook trout, 2 mountain whitefish and 1 cutthroat trout. Ten of the trout were greater than 7 inches in length.

We recommended 1,000 catchable sized rainbow trout be stocked in and near the campground. The fish were stocked in two lots 3 weeks apart. A total of 300 trout were jaw-tagged in the first lot and 285 were tagged in the second lot. Tag return boxes were installed near the stream. The first lot of fish were planted in Sheep Creek on July 6, 1979 and anglers returned 32% of the tags. The second lot was planted on July 24, 1979 and 60% of the tags were returned. Accumulative tag returns from both plants was 45.6%. Most of the tags were returned by mid-September.

Results of this study fit criteria spelled out in the Department policy for fish planting. We recommended the campground area on Sheep Creek be stocked yearly with 1,000 catchable rainbow trout in two lots.

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Date: October 28, 1980

Code numbers of waters referred to in this report are:

14-5400	South Fork Birch Creek
14-6040	Teton River
14-7080	Bynum Reservoir
14-7320	Eureka Reservoir
14-	Ferris Pond
14-7440	Lake Frances
14-7450	Furnell Pond
14-7820	Kammerzell Reservoir
14-9240	Tiber Reservoir
14-9487	Violett Reservoir
17-6544	Sheep Creek
17-6832	Smith River
17-8720	Bean Lake
17-9136	Holter Lake
20-4400	North Fork Sun River
20-5600	South Fork Sun River
20-7130	Dickens Lake
20-7900	Nilan Reservoir
20-7950	Pishkun Reservoir
20-8500	Willow Creek Reservoir

MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS

FISHERIES DIVISION

JOB PROGRESS REPORT

State: Montana

Project No.: F-5-R-29 Title: Northcentral Montana Fisheries Study

Job No.: I-b Title: Inventory and Survey of Waters in the Eastern Half of Region Four

Period Covered: July 1, 1979 through June 30, 1980

ABSTRACT

Netting surveys were conducted on 6 large reservoirs and 14 farm ponds located within the study area. Ten BLM reservoirs and 12 farm ponds were investigated for fisheries potential. Streambed stabilization projects and habitat conditions were monitered and documented along Big Spring Creek and its tributaries. Invertebrate bottom samples were collected at the nine established stations along the stream and its tributaries. A graph showing invertebrate bottom sample totals collected over eleven years of sampling (1969-1979) is included. Trout population estimates were made in three sections of Big Spring Creek. Limited sampling was done on the Missouri River, Judith River and the Lost Fork of the Judith River. Erosion transects were measured and photographed along the Lost Fork.

OBJECTIVES AND DEGREE OF ATTAINMENT

The objectives of this job were:

1. To obtain information on present management, survival and growth of rainbow trout, cutthroat trout, kokanee, yellow perch and largemouth bass in six reservoirs and twelve farm ponds. This work was done and the findings are included.

2. To survey new ponds for possible addition to our management program. This work was done and several ponds were added to our management program.

3. To moniter habitat changes and rainbow trout and brown trout populations in Big Spring Creek. This work was done for three stream sections and the findings are included.

4. To determine survival of fingerling rainbow trout stocked in a section of Big Spring Creek. This work was done and the findings are included.

5. To determine the effect of land management practices on stream habitat along the Lost Fork of the Judith River. This work was done and the findings are discussed

6. To determine flow requirements for maintaining aquatic life in Belt Creek. This work was not done because guidelines were not completed.

PROCEDURES

Fish were sampled with sinking and floating nylon gill nets 125x6-foot (with graduated mesh sizes from 3/4- to 2-inch); 4x6-foot frame trap nets (1/2- and 1-inch mesh); 3x4-foot frame trap nets (1/4-inch mesh); a 300 volt D.C. electrofish shocker; a 0-500 variable voltage D.C. electrofish shocker; and by hook and line. Fish captured were measured to the nearest tenth of an inch (total length) and weighed to the nearest hundredth of a pound. Scales were collected for growth analysis. Occasional creel census and fishermen interviews were employed to check harvest, fishing pressure, and success of trout stocking in the more important reservoirs and streams. Invertebrate bottom samples were collected with a Surber Sampler. Population estimates for Big Spring Creek were made using the mark and recapture method described by Vincent (1971 and 1974). Erosion and habitat changes were measured from established transects and photo points.

ACCOMPLISHMENTS

Large Reservoirs

Six of the seven larger Department of Natural Resources reservoirs located within the study area were sampled during 1979 and 1980. The results of this work are given in Table 1. War Horse Reservoir was not sampled because netting surveys undertaken during 1978 and 1979 failed to take any desirable fish species following the major winterkill of 1977-1978. In an attempt to re-establish a fishery in the reservoir, yellow perch were transplanted into the lake during the spring of 1980. Yellow perch present in several nearby ponds have shown good growth rates and have been well accepted by local fishermen. A short narrative summary of findings on each of the other six reservoirs follows.

Ackley Lake - Netting surveys conducted during 1980 indicate suckers are very abundant in the reservoir. Over four times as many suckers were netted this year when compared to last year, 329 to 81 respectively. Kokanee were netted for the first time since their introduction in 1978. If present growth rates continue, the kokanee should have a good average size by next year when they will be four years old. Creel checks indicate the kokanee are not yet being harvested in numbers commencerate with their abundance in the lake. The majority of fish in the creel are rainbows and the lake remains a very popular fishing site.

Table 1. Summary of netting data from large lakes and reservoirs, 1979-80

Location (Date Sampled)	Surface Acres	No. & Type of Net	Species	No. of Fish	Length Range Inches (Average)	Weight Range Pounds (Average)
Ackley Lake	247	3 Gill	Rb	35	11.2-17.2(13.0)	0.50-1.90(0.83)
May 26-27, 1980			Rb	2	1980 plant	
			Kok	46	10.2-12.8(11.4)	0.42-0.80(0.58)
			Wf	1	15.4	1.30
			FSu	20	--	--
			CSu	309	--	--
Bair Reservoir	272	2 Gill	Rb	24	7.2-21.3(10.2)	0.13-5.08(0.52)
Sept 19-20, 1979			Eb	17	7.5-12.5(9.7)	0.13-0.65(0.30)
			SCu	370	--	--
Martinsdale Res.	985	3 Gill	Rb	87	9.2-15.8(10.3)	0.33-1.61(0.44)
Sept 20-21, 1979			LL	1	14.0	0.94
			FSu	24	--	--
			CSu	161	--	--
Petrolia Res.	515	4 trap	WE	29	8.7-23.0(12.8)	0.19-4.40(0.87)
Oct. 20-23, 1979			CSu	59	--	--
			Carp	19	--	--
			Bullhead	1	9.6	0.52
			Ling	1	22.6	2.72
			YP	15	6.8-10.6(8.7)	0.13-0.53(0.34)
Apr. 22-24, 1980		5 traps	WE	28	9.8-21.5(13.8)	0.20-2.81(0.95)
			CSu	26	--	--
			Carp	27	--	--
			YP	5	6.7-10.2(8.5)	0.14-0.45(0.31)
Smith River	327	2 Gill	Rb	33	9.2-15.1(11.2)	0.30-1.15(0.57)
Sept 19-20, 1979			Eb	3	8.0-12.1(10.6)	0.16-0.59(0.43)
			Ling	4	12.4-16.1(13.8)	0.41-0.73(0.52)
			CSu	89	--	--
			FSu	54	--	--
Yellow Water Res.	600	3 Gill	Rb	5	10.7-19.8(15.5)	0.62-2.73(1.71)
Jan. 23, 1980			CSu	40	--	--
Apr. 23-24, 1980			Rb	12	12.4-19.2(14.4)	0.91-3.30(1.48)
			CSu	241	--	--
			Bullhead	2	--	--

Species abbreviations: Rb-rainbow trout; LL-brown trout; Eb-brook trout; Wf-mountain whitefish; KOK-kokanee; CSu-white sucker; FSu-longnose sucker; WE-walleye; YP-yellow perch; Ling-burbot.

Bair Reservoir - Netting surveys show white sucker populations continuing to increase at an alarming rate. Nearly three times as many suckers were sampled this year when compared to last year, 370 to 130 respectively. The lack of a predator fish capable of feeding on suckers contributes to the problem. With the exception of one five pound rainbow trout, the rainbow from the lake are small and growth rates are below average. Wild brook trout made up 41% of the trout sampled.

Martinsdale Reservoir - Following the resolution of access problems to the reservoir fishing pressure and harvest have increased considerably. Netting surveys show stocked rainbows continuing to exhibit good growth and survival. Brown trout, which enter the lake through the inlet canal, are not very abundant but they do grow to large size and they appear to help hold sucker populations in check.

Petrolia Reservoir - Walleyes taken in Petrolia during 1979 and 1980 were tagged with individually numbered T-tags to gather additional information on population structure, size and longevity. Of the walleyes taken in 1980, two of eleven fish over fourteen inches in length were tag returns from 1979 which indicates a relatively small population. Additional tagging information should help confirm the population size. It appears that the yellow perch introduced in 1975 have established a reproducing population as each year we sample more young of the year and adults.

Smith River Reservoir - Netting surveys conducted in the reservoir indicate good growth and survival of stocked rainbow trout. Fishing success and harvest has reportedly been good. Sucker populations have been increasing but not nearly as fast as in reservoirs where no predator species exist. Burbot introduced into the reservoir are not only helping control sucker populations but are also being sought by local fishermen.

Yellow Water Reservoir - Yellow Water continues to be one of the most heavily used waters in this area. People from Billings and Roundup dominate creel information gathered over the past several years. Growth of trout in the lake has declined slightly from last years average which is probably attributable to reduced water levels. The reservoir is down about 65% or 75% of its storage capacity because of local drouth conditions. An added attraction is provided by the 5-10 pound trout that are occasionally taken.

Farm Ponds

Fourteen farm ponds and small reservoirs stocked by the State were netted during the report period and the results are given in Table 2. Ten BLM reservoirs and twelve private ponds were checked to determine their fisheries potential. Many local reservoirs were low on water going into the winter because of a dry summer and fall. People were concerned over the potential for winter kills in many ponds but sampling has shown winter losses to be minimal because of the mild weather and scarcity of snow. Lack of winter run-off and a dry spring have contributed to severe water shortages particularly in the northern and eastern portions of the project area. Many small ponds have dried up and some of the larger ones are extremely short of water.

Table 2. Results of sampling ponds and reservoirs, 1979-1980

Pond	Year	No. of Nets	Species	No. of Fish	Length Range Inches (Average)	Weight Range Pounds (Average)
Breaks	1980	2 trap	YP	±2000	--	--
C-1	1979	1	Rb	5	14.0-15.0(14.5)	1.28-1.50(1.41)
Carters	1980	1	Rb	32	10.1-18.4(15.8)	0.36-3.33(2.10)
East Fork	1980	2	Rb	9	9.9-12.0(10.7)	0.30-0.60(0.39)
			CSu	167	--	--
			FSu	5	--	--
Hanson Cr.	1980	1	Rb	13	10.8-13.8(12.2)	0.45-0.92(0.66)
			Rb	24	1980 plants	--
Hassler	1979	1	Rb	28	10.5-12.8(12.0)	0.48-0.88(0.73)
Jakes	1980	2 trap	YP	±1500	--	--
Norman #1	1980	1	Rb	22	12.5-18.2(14.4)	0.82-2.65(1.40)
Norman #2	1980	1	Bass	0	--	--
			Golden Shiner	1	--	--
Peck	1979	1	Rb	20	9.9-14.5(11.6)	0.32-1.13(0.59)
			CSu	1	14.0	1.23
Peterson	1979	1	Rb	1	14.9	1.56
			Rb	1	1980 plant	--
Senef	1980	1	Rb	22	9.1-12.0(10.7)	0.36-0.79(0.56)
Urs	1980	1	Rb	1	15.7	2.60
			Rb	24	1980 plants	--
Volf	1980	1	Rb	24	11.0-14.8(12.0)	0.45-1.23(0.65)

Species abbreviations: Rb-rainbow trout; Eb-brook trout; CSu-white sucker; YP-yellow perch; FSu-longnose sucker.

Streams

Big Spring Creek - Flows in Big Spring Creek during the report period were about normal in 1979 but below normal during 1980 primarily because of a reduced mountain snow pack and less than average spring rain. Erosion rates and habitat destruction within the watershed have been reduced when compared to the two previous years. The low stream flow has allowed vegetation in the riparian zone to be re-established in some areas. Erosion and siltation have been somewhat reduced as a result of a number of 216 watershed protection projects which are now completed on the stream and its tributaries. Overgrazing, streambank encroachment and past land abuses still cause problems at a number of locations along the watershed.

Erosion and other naturally occurring stream channel stabilization processes are still very evident throughout much of the Tresch-County Farm properties in spite of the extensive 216 projects completed in 1977. These processes are very evident even at normal and below normal stream flows. Habitat changes were monitered and documented with photos and measurements. The photos are used to update our erosion slide series which documents the effects of stream channelization.

Invertebrate bottom samples were collected at the nine established stations located along Big Spring Creek and its tributaries and the results are given in Table 3. The total number of invertebrates collected from all the sampling sites in 1979 (7,843) was over three times the number collected in 1978 (2,465). Invertebrate numbers collected in 1979 nearly equaled the highest figure of 7,939 for the eleven years during which the bottom samples have been collected. The recovery of bottom invertebrate populations from the low of 1,978 to the relatively high figure for 1979 was much faster than it was following the devastating flooding of 1975 when it took two years for bottom invertebrates to reach pre-flood numbers. Aquatic invertebrate numbers collected over eleven sampling years are summarized in Figure 1.

Trout population estimates were made in three sections of Big Spring Creek during the fall of 1979. The results of population estimates for 1978 and 1979 are given in Table 4.

Because of a gradual decline in rainbow trout population in section B, a study was started in 1979 to determine if the problem was related to spawning success and recruitment. Twenty thousand 4-6-inch rainbow trout were marked with fluorescent dye and planted in and around the section in mid-June. Most of the fish from age group I were these marked fish. It appears that mark retention is a problem. At the time of dye marking, random sampling indicated about 95% of the fish were marked but when these fish were handled in late August during the electrofishing runs, a significant number of fish judged to be of hatchery origin showed no sign of fluorescent dye. Apparently, the erosive action of flowing water tends to wash away the dye. This might make it difficult to follow these "marked" fish through several years of sampling. Population estimates planned for 1980 should furnish additional data to better evaluate the problem.

Table 3. Number and families of organisms collected in two one-square foot bottom samples from nine stations on Big Spring Creek and East Fork on August 3 and 6

Organism	Hatchery	East Fork	Burleigh's	Montana Power	St. Leo's School	Above Sewer	Below Sewer	Trestle	Spring Cr. Colony
Trichoptera									
Brachycentridae	782	5	224	147	381	81	15	8	5
Leptoceridae	119	1	454	47	55	28	6	1	
Rhyacophilidae	183	1	164	259	166	37	24	121	4
Hydropsychidae		1		3	3	94	7	171	386
Hydroptilidae		154	1	72	130	194	9	79	5
Psychomyildae					1	1			
Limniphilidae								15	4
Helicopsychidae								1	
Gastropoda									
Physidae	5	2	2	2	2	8		2	
Planorbidae	1	1	2					1	
Diptera									
Tipulidae	29	11	17	79	131	106	9	127	31
Tendipedidae	33	39	27	26	34	39	41	265	76
Rhagionidae		7	1					1	2
Empididae	2		5	3	5		1		1
Simuliidae	24	3	2	73	23	10	4	11	
Tabanidae				1			2	3	
Tricladida									
Planariidae	3					3	2		
Ephemeroptera									
Baetidae	55	149	49	126	108	148	150	305	405
Heptageniidae	3	10	5	24	7	26	20	19	5
Plecoptera									
Perlodidae		1	4	11	1	2	5	17	10
Perlidae	2								
Nemouridae	1								

Table 3. Continued.

Organism	Hatchery	East Fork	Burleigh's	Montana Power	St. Leo's School	Above Sewer	Below Sewer	Trestle	Spring Cr. Colony
Annelidae									
Oligochaeta	2								
Pelecypoda									
Sphaeriidae									
Coleoptera									
Elmidae	1	1	3	21	42	2	1	21	5
Hydracarina		8	5	16	12	25	4	13	3
Station Totals	1246	394	965	910	1101	804	300	1181	942
Org. No./Sq. Foot	623	197	482	455	550	402	150	590	471
No. of Families	16	16	16	16	16	16	16	19	14

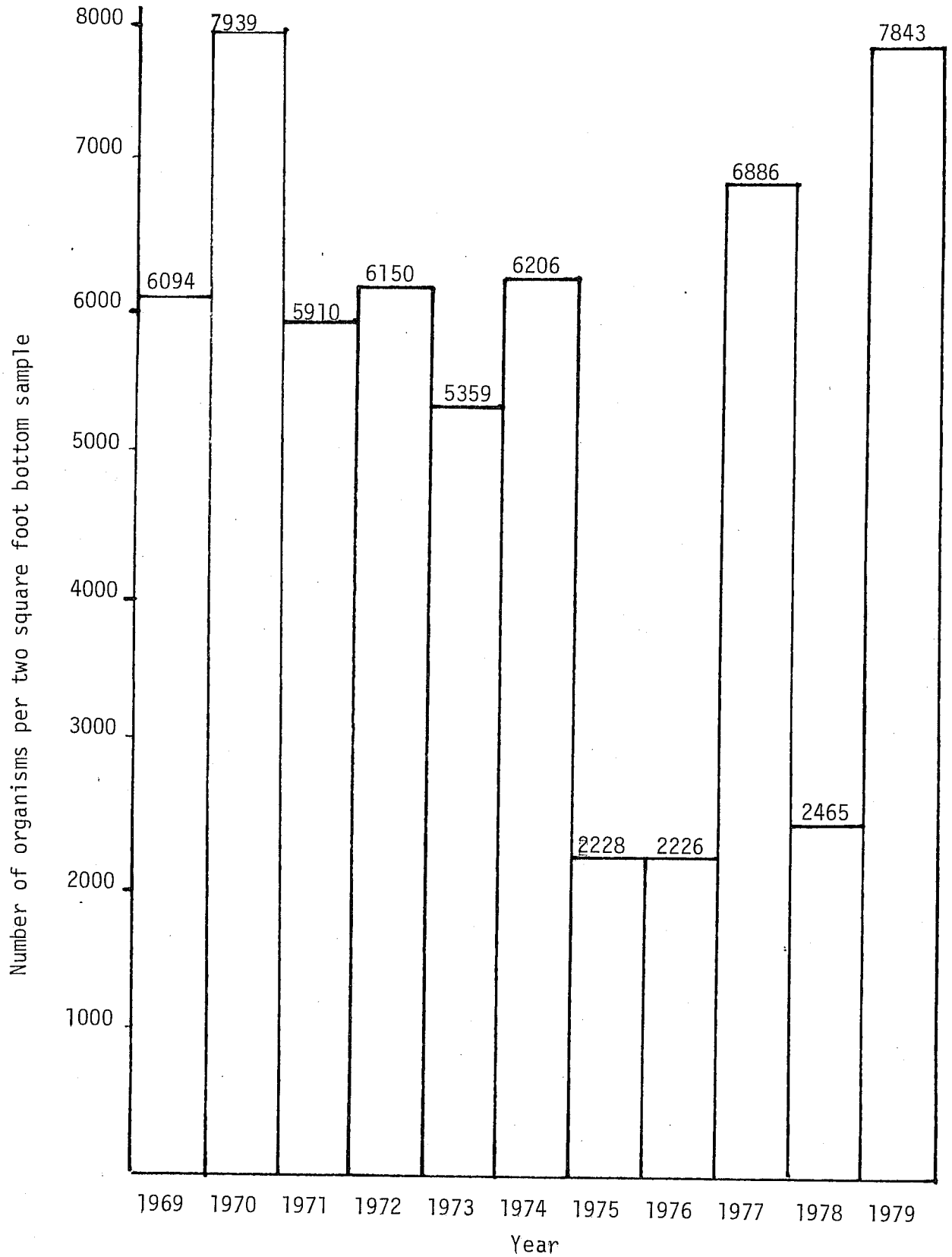

Figure 1. Summary of invertebrate bottom samples collected from nine stations along Big Spring Creek and its tributaries, 1969 - 1979

Table 4. Summary of trout population estimates for Big Spring Creek made in 1978 and 1979

Section	Year	Rainbow Trout		Brown Trout	
		No.	Weight (Lbs.)	No.	Weight (Lbs.)
B	1978	563	284	60	93
B	1979	1782	329	55	110
D	1978	1550	526	381	215
D	1979	909	497	386	211
F	1979	323	289	200	170

Section (Year)	Age Group	Rainbow Trout	Age Group	Brown Trout
B (1978)	I	222	II	8
	II	195	III	7
	III	122	IV	25
	IV + Older	24		
D (1978)	I	999	I	176
	II	474	II	135
	III	50	III	45
	IV	21	IV	19
	V + Older	6	V + Older	5
B (1979)	I	1567	II	8
	II	86	III	12
	III	67	IV	35
	IV + Older	61		
D (1979)	I	438	I	219
	II	214	II	90
	III	181	III	33
	IV +Older	66	IV + Older	30
F (1979)	II	65	I	18
	III	156	II	65
	IV + Older	102	III	117
		323		200

Predation by brown trout appeared to be a significant cause of mortality to the planted fish. The condition of a number of larger brown trout improved noticeably from 1978 to 1979. The average weight of brown trout sampled in 1979 was a half pound heavier than those from 1978. Estimated brown trout numbers within the section remained about the same for both years while rainbow trout in age groups II and III decreased.

Rainbow trout estimates were down 41% in section D when compared to 1978 estimates. The decline was in age group I and II, both of which were less than half the 1978 estimates. Only about 20% of the estimated number of yearling fish in 1978 showed up in the 1979 estimate for age group II. In spite of the big decline in numbers of rainbow trout, the total estimated weight of fish in the section was only down 5% which indicated a substantial increase in the average size of fish sampled. Brown trout estimates for section D were about the same for both years.

Trout population estimates were done for an additional section of stream, section F. Section F extends from about two miles upstream from the confluence of Big Spring Creek and the Judith River down to near the confluence. The stream through the area is relatively unstable with eroded banks and extensive channel alterations and migrations. Population estimates for both species are based on relatively small numbers of fish and the bare miminum number of recaptures. Although no estimate was actually made, whitefish were more abundant throughout this section than in any other section of Big Spring Creek. It appeared that they were probably more abundant than both species of trout combined.

Missouri River - Limited sampling was done on the Missouri River immediately upstream from Fort Peck Reservoir. This work is part of a continuing study to inventory and sample waters located within the project area. Game fish taken were tagged with individually numbered tags and the data collected was transferred to the Middle Missouri River Planning Project (Berg, 1975).

Judith River - Two short sections of the Judith River were electrofished in conjunction with our inventory surveys. The area surveyed was between Utica and Hobson. Table 5 summarizes the findings of these surveys. Surveys were done during low water by making one trip through each section without the use of blocking nets. Brown trout were planted in this part of the river during the late sixties and our survey confirms that they are well established in the river. Young of the year brown trout and brook trout were abundant but rainbow reproduction was very scarce.

Lost Fork - Erosion transects were measured along the Lost Fork of the Judith River during the spring of 1979 and 1980 and photos were taken at established photo points. Bank erosion at the two original transects established in 1968 was negligible for both years. In 1978 the area was grazed from 7/16 to 8/21 and deferred from grazing during 1979. At the new transect established in 1978 approximately twelve cubic yards of material had

eroded away by 1980. The pasture where this transect is located was deferred from grazing in 1978 and grazed from 7/1 to 8/6 during 1979.

Rainbow and cutthroat trout populations were sampled with hook and line in the Lost Fork and several of its tributaries. From the confluence of the South Fork of the Lost Fork and the West Fork and on downstream the majority of fish sampled were rainbows. A few relatively pure Upper Missouri cutthroat were taken near the confluence. Several rainbow trout were taken within the first quarter mile in both the West Fork and South Fork but the majority of fish sampled in the lower reaches of both streams were cutthroat. All the fish sampled in the headwaters of both tributaries appeared to be pure cutthroat.

Table 5. Summary of electrofishing results from two sections of the Judith River, October 5, 1979 (Only fish larger than 5 inches in length)

Myron Campbell's Section (3/8 mile)

Salmonid Species	Number	Length Range (Average)	Weight Range (Average)
Eb	45	5.9-14.3 (8.47)	0.06-1.16 (0.29)
Rb	15	6.9-12.8 (10.2)	0.11-0.79 (0.41)
LL	32	7.8-18.8 (12.3)	0.19-2.50 (0.88)

Charley Ojas Section (1/2 mile)

Eb	27	6.6-13.4 (9.2)	0.10-1.07 (0.35)
Rb	28	6.4-13.9 (10.4)	0.09-0.98 (0.44)
LL	27	7.6-19.1 (12.9)	0.16-3.00 (1.02)
Ct	2	9.6- 9.9 (9.7)	0.26-0.32 (0.29)
Wf	1	6.3	0.08

Literature Cited

Berg, Rod. 1975. Middle Missouri River Planning Project, Montana Department of Fish and Game. Job Progress Report, Federal Aid in Fish and Wildlife Restoration Acts. Montana Project No. FW-3-R-4 Job I-a.

Vincent, Richard. 1971. River Electrofishing and Fish Population Estimates. Progressive Fish-Culturist, Volume 33, No. 3. pp. 163-169.

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Date: July 15, 1980

Code Numbers of waters referred to in this report are:

16-0300	Big Spring Creek Sec. 01
16-0310	Big Spring Creek Sec. 02
16-1820	Judith River Sec. 02
16-2140	Lost Fork Judith River
16-2520	Missouri River Sec. 06
16-4300	Ackley Lake
16-4620	Carters Pond Upper
16-4590	C-1
16-4950	East Fork Spring Creek Reservoir
16-5535	Hanson Creek Reservoir
16-5700	Hassler Pond
16-7286	Norman Pond #1
16-7287	Norman Pond #2
16-7520	Peck Pond
16-8208	Senef Pond
16-8660	Urs Pond
16-8703	Volf Reservoir
17-9616	Smith River Reservoir
18-7750	Bair Reservoir
18-8380	Martinsdale Reservoir
18-8720	Petrolia Reservoir
18-8745	Peterson Reservoir
18-9440	War Horse Reservoir
18-9500	Yellow Water Reservoir