MONTANA FISH AND GAME DEPARTMENT
FISHERIES DIVISION

JOB PROGRESS REPORT

State of Montana Name Central Montana Fisheries Study

Project No. F-5-R-19 Title Inventory of Waters of Project Area

Job No. I-a

Period Covered July 1, 1969 to June 30, 1970

ABSTRACT

Waters investigated in the project area include Eureka Reservoir, Priest Butte Lake, Pishkun Reservoir and Lake Francis. A gill net survey of Eureka Reservoir indicated a need for rehabilitation. A fish survival experiment in relation to water chemistry and temperature was conducted in Priest Butte Lake. Possibilities of improving northern pike spawning habitat in Pishkun Reservoir were investigated. Data are presented on the spawning run of kokanee at Lake Francis. Little Prickly Pear Creek was electrofished and the population of trout compared to the population found in 1966.

BACKGROUND

Eureka Reservoir is a 423 acre irrigation reservoir in Teton County. The reservoir, fed by a canal from the Teton River, supports a population of rainbow trout, a few brown trout and numerous longnose and white suckers. It is necessary to rehabilitate the reservoir every few years because of rough fish entering the reservoir from the Teton River.

Priest Butte Lake in Teton County is approximately 300 surface acres. The lake receives irrigation return water from the Greenfields Irrigation Project and the Freezout Lake system overflow. The water is extremely high in sulfates and total dissolved solids. A few white suckers presently inhabit the lake.

Another irrigation storage reservoir, Pishkun Reservoir in Teton County, is approximately 1,500 surface acres. Water is supplied by canal from the Sun River. Fish species found in the reservoir include northern pike, yellow perch, white sucker and a few rainbow trout. Spawning areas for northern pike are limited.

Lake Francis in Pondera County is a 5,000 surface acre irrigation storage reservoir and receives water from Dupuyer Creek and Birch Creek. Fish present in the lake include northern pike, yellow perch, kokanee, white sucker, burbot and a few rainbow trout.

OBJECTIVES

This job is established to cover fisheries work more detailed than that covered by routine inventory-type surveys and yet not sufficiently involved to require individual jobs for each problem. The objective is to obtain information needed for fisheries management and information on the success of various management procedures.

PROCEDURES

Fish were collected using a 300-volt DC shocker and standard 125-foot nylon sampling gill nets. Measurements include total length to the nearest tenth of an inch and weights to the nearest hundredth of a pound. Rotenone was used in the rehabilitation project.

FINDINGS

Eureka Reservoir. - A gill net survey of Eureka Reservoir in September produced 123 white sucker, 34 longnose sucker, 10 rainbow trout and 1 brown trout. Rainbow trout averaged 9.0 inches (range 7.1 - 19.1) and 0.44 pounds (range 0.16 - 2.52). The percentage of suckers in the gill net catch has increased in past years: 1966 - 8%; 1967 - 33%; 1968 - 50%; and 1969 - 93.5%. Due to the high proportion of non-game fish, Eureka Reservoir was rehabilitated in October, 1969. Cooperation with the Teton Cooperative Canal Company is acknowledged in drawing down the reservoir to facilitate more economical rehabilitation.

Priest Butte Lake. - Gill net surveys during the winter of 1966 and the summer of 1969 show that white sucker are able to live in Priest Butte Lake. To determine if rainbow trout could survive under the existing water chemistry conditions, an experiment was conducted placing sample fish in holding cages in the lake. Rainbow trout placed in the lake in February of 1969 died within 48 hours. Since these fish were placed at the bottom 1 foot of the lake, it is thought there may have been an oxygen deficiency at that depth. Similar trials were undertaken with rainbow trout in July and September of 1969 (Tables I and II). Two trials were conducted on each of these dates: 1) Fish were placed in the holding cages immediately (adjusted to water temperature only); 2) Fish were held in tanks on the hatchery truck for approximately 3½ hours to adjust to water chemistry as well as temperature. Approximately 20 gallons of lake water was mixed with the tank

water every ½ hour. After this short period of acclimatization, fish were placed in the holding cages. About 50 percent survival after 168 hours was noted in the July experiment. Extremely high air and water temperatures were experienced and no doubt had an effect on survival. Three sizes of test fish were used: Fingerlings 2 - 4 inch, 5-7 inch and 7 - 9 inch. The experiment in September was conducted under more favorable air and water temperature conditions. Fingerlings were used as test fish and 80 percent survival was noted after 336 hours. All surviving test fish in both trials were released into the lake upon termination of the experiments.

TABLE I. Fish survival experiment - Priest Butte Lake

Experiment No. 1. July 24 - 31, 1969. 168 hours.
Lake temperature: 75° F. (surface).
Air temperature : 90° F.
Water temperature in tanks on truck: 56° F.

Size of test fish	No. of fish put in cages	No. and percent survival	
Fingerling 3-4"[a]	27	16	59.3%
Sub-catchable 6-7"[b]	27	12	44.4%
Catchable 9-10"[a]	10	4	40.0%
Totals	64	32	50.0%

a Fish adjusted to water chemistry and temperature (held in tanks for 3½ hours.

b Fish adjusted to water temperature only (placed in cages immediately).

Mortality:

Time	Number and size of fish
24 hours	11 fingerlings, 13 sub-catchables 2 catchables
96 hours	2 sub-catchables, 4 catchables
168 hours	No further mortality

TABLE II. Fish survival experiment - Priest Butte Lake

Experiment No. 2. September 25 - October 9, 1969. 336 hours.
Lake temperature: 56° F. (surface).
Air temperature : 50° F.
Water Temperature in tanks on truck: 56° F.

Size of test fish	No. of fish put in cages	No. and percent survival	
Fingerling 3-4"	10[a]	9	90.0%
	15[b]	11	73.3%
Totals	25	20	80.0%

a Marked fish, placed in cages immediately.

b Unmarked fish, adjusted to water chemistry for 3 hours.

Mortality:

Time	Number of fish
29 hours	0
93 hours	1 marked, 3 unmarked
173 hours	1 unmarked
336 hours	no further mortality

Approximately 14,000 rainbow trout were stocked in Priest Butte Lake in October. Gill nets placed under the ice in January and February of 1970 failed to capture any of these fish, possibly because they were too small to be caught in the smallest mesh (3/4"). However, three rainbow trout were taken and are presumably fish released from the previous experiments.

Water samples were collected during the winter from Priest Butte Lake and analyzed for dissolved oxygen, pH and total dissolved solids. Oxygen concentrations ranged from a high of 10.0 ppm to a low of 7.5 ppm. pH ranged from 8.6 - 8.9 and total dissolved solids from 4,050 to 5,625 micromhos/cm.

Pishkun Reservoir. - Reproduction of northern pike in Pishkun Reservoir is limited due to a lack of suitable spawning sites. Potential spawning areas do occur around the lake but livestock graze the vegetation to a very low level. Hydrographs for the past five years show water levels to be adequate during northern pike spawning. Throughout the summer, water levels are lowered and some vegetation could come back, provided livestock were removed. Tentative agreement has been reached with the Bureau of Reclamation and the Greenfields Irrigation District to fence off two areas to keep livestock out and allow revegetation of potential spawning areas. Approximately 80 acres will be fenced, of which 35 will be flooded during northern pike spawning.

Lake Francis. - Limited information was collected on spawning kokanee at Lake Francis. A total of 55 male kokanee averaged 16.4 inches and 1.33 pounds, while 37 female averaged 15.9 inches and 1.23 pounds. No estimates were made on total numbers taken.

Walleye fry were planted in Lake Francis in the spring of 1969. No attempts have been made to measure the success of this introduction.

Little Prickly Pear Creek. - Little Prickly Pear Creek, in Wolf Creek Canyon, was electrofished during 1969 to determine if there had been any change in the fish population since 1966. Highway construction had altered much of the canyon area prior to 1966 (Swedberg, 1967). Rock jetties and bank riprap provide most of the trout habitat in the canyon area of the stream.

The section shocked during 1969 was one of the sections shocked by Elser (1968). The trout population estimate made in 1969 is compared to the population found by Elser in 1966 (Table 3). Only trout four inches or larger were used in the estimates. The method of estimating the fish population in 1969 was the same as the one used by Elser in 1966.

TABLE III. Little Prickly Pear Creek - Wolf Creek section

	1966		1969	
	No. fish/acre	lbs./acre	No. fish/acre	lbs./acre
Rainbow	298	36	340	66.6
Brown	64	14	65	46.7
Total	362	50	405	113.3

The trout population increased 11.9 percent in numbers and 126.6 percent in weight between 1966 and 1969. The number of fish did not increase greatly, but the increase in weight was quite significant. The pounds per acre of brown trout increased from 14 pounds to 46.7 pounds, an increase of over 200 percent. A sample of young-of-the-year trout in 1969 showed 84 percent rainbow and 16 percent brown trout.

The streambed in the canyon section of Little Prickly Pear Creek seems to be stabilizing. Islands are forming below the jetties and willow and other vegetation is growing where gravel and silt has deposited.

The most noticeable change has been in the submerged aquatic vegetation that is growing in the pool areas below the rock jetties. The larger brown trout are using this vegetation for cover. This increase in cover is probably the reason for the increase in size of brown trout.

It is suspected that the trout population is stabilizing and that the streams carrying capacity will range between 100 and 130 pounds per acre.

RECOMMENDATIONS

1. Eureka Reservoir - Plant fingerling rainbow trout in the spring of 1970. Continue gill net sampling to moniter changes in species composition and growth of trout.

2. Priest Butte Lake - Check survival of rainbow trout planted in October of 1969. Analyze water for dissolved oxygen, pH and total dissolved solids. Record temperature extremes in summer.

3. Pishkun Reservoir - Fence potential northern pike spawning areas. Determine species composition and relative abundance. Mark northern pike for harvest estimates. Determine reproductive success of northern pike before and after fencing.

4. Lake Francis - Check survival of 1969 walleye fry introduction. Determine approximate harvest of kokanee by using sign roster or card questionnaire. Locate kokanee concentrations in summer.

5. Little Prickly Pear Creek - Make a trout population estimate of the section again in 1972 to check any change in the population. Check for any noticeable changes in habitat.

LITERATURE CITED

Swedberg, Steve E. 1967. Evaluation of Fish Habitat Destruction in Little Prickly Pear Creek due to Construction of Interstate Highway 15. Job Completion Report, Federal Aid in Fish and Wildlife Restoration Acts, Montana Project No. F-5-R-15 and 16, Job No. II. 32 pp.

Elser, Allen A. 1968. Fish Populations of a Trout Stream in Relation to Major Habitat Zones and Channel Alterations. Trans. Am. Fish. Soc., Vol. 97, No. 4, pp 389-397.

Prepared by William J. Hill

Date 1971 ?

WATERS REFERRED TO:

14-7320

14-7440

14-8540

17-4224

20-7950

MONTANA FISH AND GAME DEPARTMENT
FISHERIES DIVISION

JOB PROGRESS REPORT

State of Montana Name Central Montana Fisheries Study

Project No. F-5-R-19 Title Inventory of Waters of Project Area

Job No. I-b

Period Covered July 1, 1969 to June 30, 1970

ABSTRACT

The Big Spring Creek watershed loan funds were approved and preliminary engineering for the mill ditch was conducted. An injunction was filed by the Big Spring Creek Trout Unlimited Chapter against the mayor and city of Lewistown. Sources of raw sewage pollution from private homes along Spring Creek were located.

A survey of the Judith River was made from the vicinity of Dry Pole Canyon on South Fork to 4½ miles below the town of Hobson. An inventory of fishes was made. A thermograph was located in the upper Judith River and another in the area below Hobson. Condition of habitat was determined in the different areas. Five hundred catchable rainbow were tagged and released in the Judith River near Hobson.

Ackley Lake, Martinsdale, Harris and Yellow Water Reservoirs were gill netted. Information on species composition, average lengths and weights are given.

RECOMMENDATIONS

Streams

Big Spring Creek could be opened to fishing the entire year. If opened year around, a creel census survey should be run to determine the amount of fishing pressure at different times of the year. Fish population estimates should be made following the all-year season. Estimates on numbers of young-of-the-year trout should continue to be made. Fewer hatchery catchable fish should be planted in the stream both above and below the city of

Lewistown. Plants should be made as often as possible and in areas of highest use. Planting in low use areas and during high turbid water should be avoided.

Sources of pollution should continue to be located and efforts made to prevent it. Storm drains contribute large amounts of pollution to the stream, and a way to alleviate this source should be devised. Turbidity measurements and invertebrate samples should continue to be taken to use as a comparison once the flood control dams on tributaries are built.

Brown trout should be planted in areas of the Judith River near Utica and above Hobson. Irrigators along the Judith River should be contacted to emphasize the importance of leaving the water in the river once the irrigating season is passed. At times the irrigation ditches carry more water than the river. One thousand catchable rainbow should be planted in the river near Hobson. The fish should come from plants now being made on the South Fork and upper Judith River.

Reservoirs

Gill-net sampling should be continued to moniter the condition of fish and abundance of rough fish in Ackley Lake. Kokanee salmon spawning runs should be watched and numbers noted. Creel census should continue to determine success of fishermen on both kokanee and rainbow. White and longnose suckers are increasing to the point that rehabilitation will be necessary in the near future.

Commercial fishermen should be encouraged to continue fishing for black bullheads, white suckers, and carp in War Horse Reservoir in Petroleum County. Creel checks should be continued to check success of fishermen on both black bullheads and largemouth bass.

The size of rainbows being planted in Yellow Water Reservoir should be increased to six inches. Commercial fishing of the reservoir for black bullheads should continue.

The size of rainbow trout planted in Martinsdale Reservoir should be increased to six inches. Gill-net sampling and creel checks should be continued to evaluate increasing the size of fish planted.

Farm Ponds

Small reservoirs should continue to be gill-netted and creel checks made to determine fish growth, abundance and success of fishermen.

OBJECTIVES

This job is established to cover fisheries work more detailed than that covered by routine inventory-type surveys and yet not sufficiently involved to require individual jobs for each problem. The objective is to obtain information needed for fisheries management and information on the success of various management procedures.

TECHNIQUES USED

Fish were collected using a 300-volt DC shocker, 125 foot nylon and monofilament experimental gill nets. Fish were measured to the nearest tenth of an inch total length and weighed to a hundredth of a pound. Electrofishing was limited to one pass through each stream section, and no attempt was made to collect all fish in the section.

FINDINGS

Streams

Big Spring Creek. - The Agriculture Department has approved a loan of $250,000. for the Big Spring Creek watershed project. This represents a loan to the Farm Home Administration to purchase the bonds for the city's share of the $2.5 million project. The Bureau of Outdoor Recreation has approved $13,284. for the purchase of recreation lands at Castle and Hanson Creek Reservoirs. A recreational reservoir is also planned at the East Fork site, which will be the largest of the five reservoirs built under the watershed plan.

The city of Lewistown continues to pollute Big Spring Creek by dumping snow from city streets into the stream. The local Trout Unlimited group filed a temporary restraining order against the city for dumping foreign material into the stream. However, the State Board of Health issued the city a permit which now allows them to dump into the creek.

Sewage pollution from private homes along Big Spring Creek was investigated in December and January, 1970. Homes were checked by flushing flourescine dye into the sewer system and checking for its appearance in the stream. Twenty of the 25 homes were found to either have no disposal facilities at all or the septic tank and/or drain field was inadequate. The city-county sanitarian informed owners that they would have to comply with state regulations.

Bottom fauna samples were taken on Big Spring Creek to use as an index of the stream's productivity, and as a comparison after watershed dams are constructed on tributaries. Eight bottom fauna samples were taken on the stream from the fish hatchery to approximately 3 miles above the mouth. One bottom sample was taken on East Fork of Big Spring Creek, 100 yards above the mouth. Organisms from the 2 square-foot samples were consistantly more numerous in the areas above the city of Lewistown (Table 1). There was a sharp drop in the number of benthic organisms from the sample taken from the channel in the city and again below the sewage disposal plant. Few organisms were found in the lower sections of the stream below Hanover and above the mouth. Only 8 invertebrates were found in a 2 square-foot bottom sample from East Fork of Big Spring Creek (Table 1).

Judith River. - There are two main tributaries that form the Judith River, the South Fork and the Middle Fork (Figure 1). The Middle Fork and its tributaries were sampled the summer of 1968, with results published in job completion report F-5-R-18, Job No. 1.

The South Fork and the main Judith River were electrofished in July and August 1969 to determine species composition and abundance of trout and rough fish.

The section of the South Fork shocked was near the head of South Fork Canyon below the Trask Ranch. Four sections were electrofished on the Judith River. One was a short distance below the confluence of Middle Fork and South Fork (Korell) on an intermittent portion of the stream. Other sections were 5 miles above Utica (Flanagan Park), near Utica, and 4½ miles below the town of Hobson (Miller Ranch). Locations of sections electrofished are shown in Figures 1 and 2.

The best trout populations were found in the vicinity of Utica. Rainbow trout were the predominant game species present in the five different locations electrofished (Table 2). Cutthroat trout were found only in the South Fork tributary. All trout taken were under 2 pounds. Mountain whitefish were present in all sections, but in low numbers. Brown trout, carp, goldeye, and mountain suckers were found only in the section below Hobson and in low numbers.

TABLE 1. Total number of organisms taken from 2 square-foot bottom samples from Big Spring Creek and East Fork, July 9, 1969

Invertebrates	Location								
	Fish Hatchery	East Fork	Burleigh	Montana Power	St. Leo's Hi School	Above sewer	Below sewer	R.R. Tressle	Falls
Trichoptera									
Brachycentridae	557	2	1749	467	3	56	--	--	--
Leptoceridae	41	1	798	821	--	60	22	2	--
Glossosomatinae	25	2	142	48	--	22	--	--	--
Limnephilidae	--	--	--	--	--	13	--	--	--
Hydropsychidae	13	--	44	--	--	20	3	1	--
Ephemeroptera	46	3	80	66	71	282	51	99	32
Plecoptera	3	--	12	4	2	4	1	1	--
Diptera									
Tendipedidae	--	--	11	49	100	100	16	--	--
Simulidae	--	--	--	--	--	22	3	14	--
Tipulidae	7	--	6	--	--	--	8	9	7
Rhagionidae	--	--	--	--	--	7	--	1	1
Unknown	--	--	--	--	--	6	2	1	--
Coleoptera	--	--	--	18	8	7	--	4	2
Mollusca									
Physidae	1	--	4	--	--	--	--	--	--
Lymnaeidae	--	--	--	--	--	--	--	--	--
Planorbidae	1	--	1	--	--	--	--	--	--
Hydracarina	--	--	2	--	3	4	--	--	--
Total Number*	694(347)	8(4)	2849(1424)	1473(736)	187(94)	603(302)	106(56)	132(66)	42(21)

* Average number of organisms per square foot are in parenthesis.

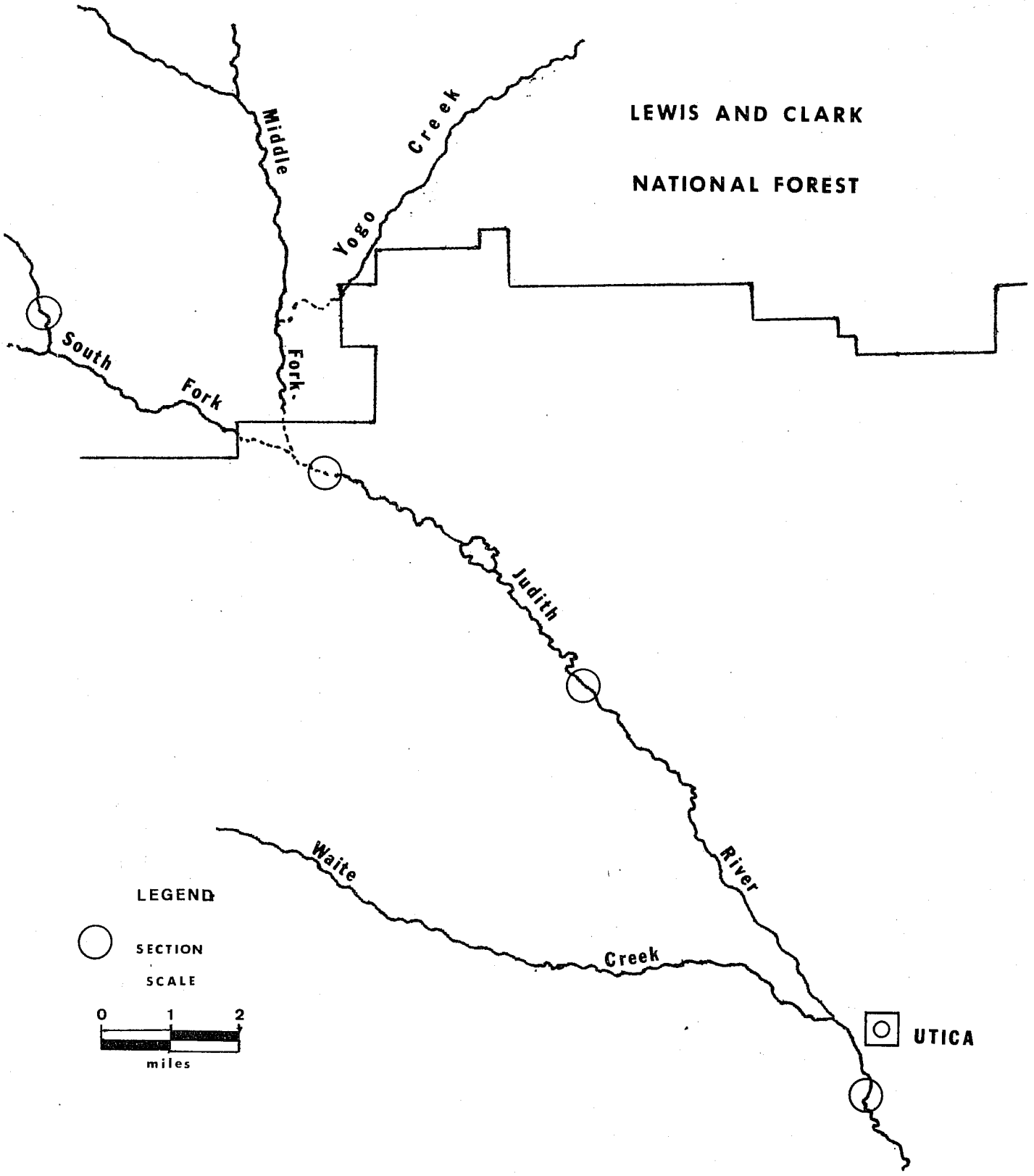


Figure 1. Map of Judith River and tributaries, showing sections electrofished.

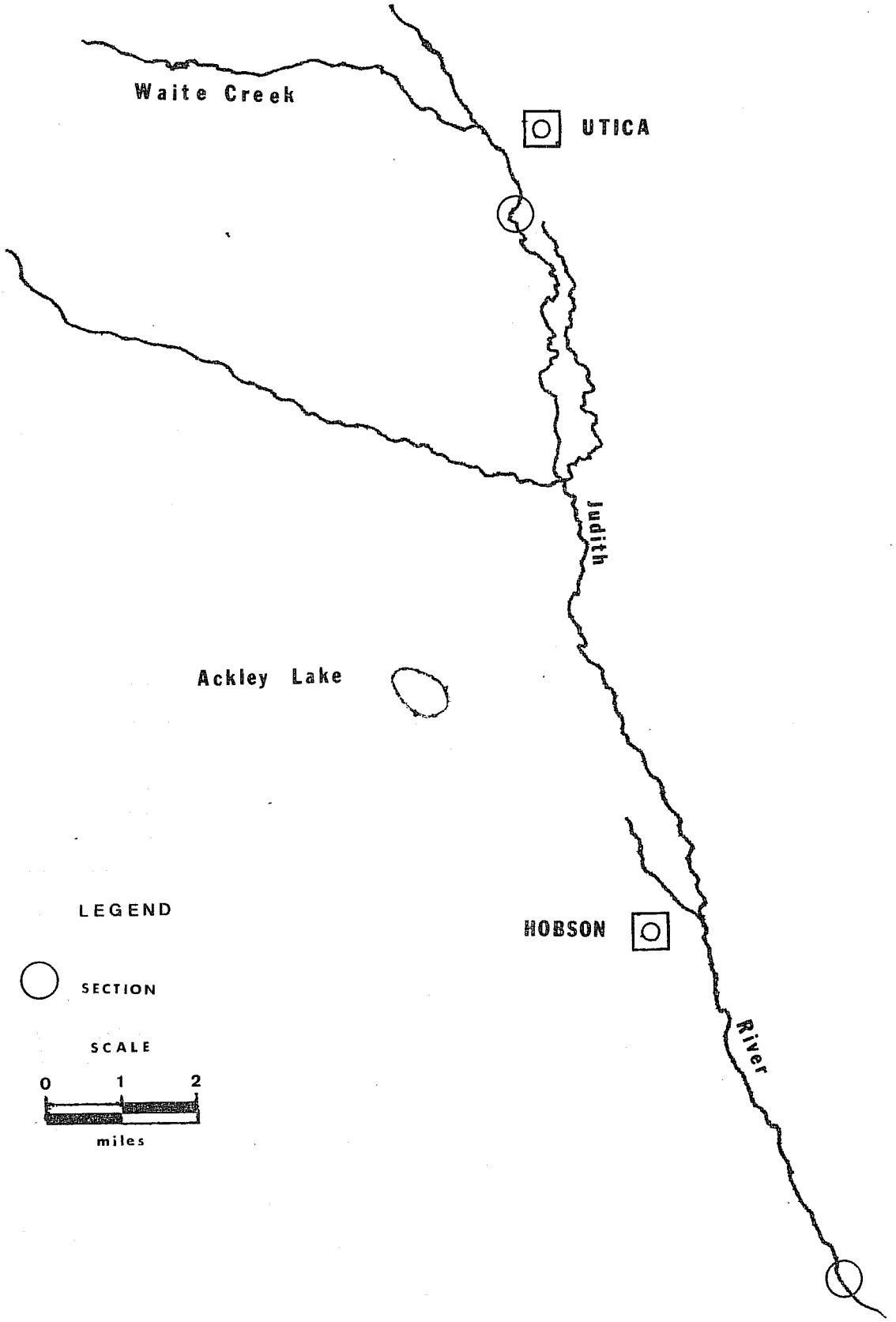


Figure 2. Map of Judith River, showing sections electrofished.

TABLE 2. Judith River and South Fork tributary electrofishing results

Location	Length of stream electrofished (ft.)	Species	Number	Average Length (in.)	Average Weight (lbs.)
South Fork					
Trask	1,000	Rainbow	16(1)*	8.5	.31
		Cutthroat	4	7.6	.23
		Whitefish	22	10.1	.47
Judith River					
Korell	600	Rainbow	1(9)	7.0	--
		Whitefish	1	6.0	--
Flanagan Park	400	Rainbow	28(12)	7.4	.20
		Brook	2	6.6	.14
		Whitefish	11	5.7	.08
Utica	6,800	Rainbow	76(41)	9.1	.35
		Brook	68	8.4	.35
		Whitefish	7	6.7	.11
Miller	1,065	Rainbow	4	9.1	.45
		Brown	1	14.8	1.26
		Whitefish	5	9.5	.31

* Number of hatchery rainbow are given in parenthesis.

The intermittent portion was shocked to check movement of fish both upstream and downstream. Only one wild rainbow, nine hatchery rainbow and one whitefish were caught.

No suckers were taken in the three sections electrofished upstream from Utica. Both white and longnose suckers were numerous in the stream near Utica. Only 21 white, 14 longnose and 11 mountain suckers were caught in the section below Hobson. Six carp and two goldeye were also taken. Cottus bairdi were found in the South Fork and Utica sections and in large numbers. Longnose dace were also numerous in the Utica section and common in the Flanagan Park area of the stream.

Five hundred catchable size rainbow were stocked in the Judith River near Hobson on July 11, 1969, to determine the feasibility of stocking in that particular area. All fish were jaw tagged. By September, 36 per cent of the fish tags were returned.

Present stocking of catchable rainbow in the Judith River includes 3,000 in the South Fork, 1,000 in the Middle Fork, and 3,000 in the Judith River above Hobson.

At times during the summer, fishing pressure on the South Fork is heavy within the Forest Service boundary. Many of the fish taken are planted rainbows. The stream is intermittent most years from Bower Canyon to Sapphire Village (a distance of approximately 4½ miles), and some years it dries up further upstream. Fishing is light in the area of the stream lacking road access. The South Fork Canyon is ideal for camper-type outings and has excellent scenery. According to the Forest Service, there were 2,200 visitor days (1 visitor for 12 hours) use on the South Fork in 1968.

Fishing pressure is also light in the vicinity around Utica where the best trout populations were found. The stream is located on private property but access is not limited.

Habitat, i.e., pools in relation to riffle areas and brush cover, was good from approximately 3 miles above Hobson to 6 miles above Utica. There are areas where excessive erosion and silt deposition are causing problems, however. Habitat (especially brush cover) downstream from Hobson was very poor. Silt was heavy along all portions of the stream bottom in this area. Severe erosion of banks is common and little willow or brush cover is found along the stream banks.

Average flows of the South Fork near the Trask Ranch for 11 years is 20.7 cfs, according to USGS records. There are minor diversions for irrigation above the station. The 50 year average flow in the Judith River 4 miles below the confluence of Middle and South Forks is 52.7 cfs. Several diversions are located above this point for irrigation.

Considerable water for irrigation is taken out below the last USGS gauging station. Storage water for Ackley Lake (State Water Board Reservoir) is taken by a 5 mile canal from the Judith River. Irrigation water is taken in several places, both above and below this point. Water flows measured on August 21, 1969, above and below the Ackley Lake headgate was 41 cfs above and 21 cfs below. Nearly half of the water in

the Judith River was being taken via canal to Ackley Lake at this time of year. Additional irrigation water is also taken out below this point.

It seems to be a common practice to carry water in irrigation ditches and canals, even after harvest of crops has been completed. In an area near Hobson in October, an irrigation ditch was carrying more water than the Judith River.

Three invertebrate samples were taken from the Judith River 5 miles above Utica, near Utica, and 4½ miles below the town of Hobson. One sample was also taken at the head of South Fork Canyon on the South Fork of the Judith River. Total numbers of benthos were low at all sample stations (Table 3).

TABLE 3. Number of organisms taken from two square foot bottom samples from the Judith River and South Fork of the Judith River in July, 1969

Invertebrates	South Fork	Judith River		
	Trask	Flanagan	Utica	Miller
Trichoptera	14	163	9	31
Ephemeroptera	26	35	32	30
Plecoptera	3	10	12	3
Diptera	14	37	19	9
Coleoptera	--	--	2	--
Total Number	57(28)*	245(122)	74(37)	73(36)

* Average number of organisms per square foot are in parenthesis.

Thermographs were placed in the Judith River from June to the middle of October. One was placed 5 miles above Utica (Flanagan Park), and the other 4½ miles below Hobson (Miller Ranch). Temperature extremes in the river upstream from Utica

were from 39° to 74° F. Average minimum and maximum temperatures for June 24 through September 30, 1969 were 50° and 64° F, respectively. There were 21 days on which the minimum temperature was 70° F or above.

Extreme temperatures for the Judith River below Hobson were from 32° to 78° F. Average minimum and maximum temperatures for the period June 18 through September 30, 1969 were 55° and 68° F. There were 49 days in the June - September period on which maximum temperature was 70° F or greater.

The Judith River will probably never be a good trout fishery because of poor habitat, de-watering of the stream and possibly high water temperatures.

Poor habitat (especially a lack of brush cover) exists in many portions of the river, particularly downstream from Hobson. Dewatering of the stream, both naturally and man caused, contribute further to degrade the river. During the latter part of the summer, portions of the South and Middle Forks dry up naturally. Irrigation and channel changes cause additional dewatering and habitat destruction.

Housing development in conjunction with Yogo Sapphire mining in the Little Belt Mountains will produce additional fishing pressure on the river. At the present time, few people are using the stream or the adjacent Sapphire Village.

Future trout fishing on the river looks dim. Because of lack of willow and brush for stabilization, erosion of stream banks, is and will continue to be, a major problem.

Other Streams. - Yogo Creek, a tributary of Middle Fork; and Smith Creek, a tributary of South Fork, were electrofished. A total of 118 brook trout were caught in addition to eight cutthroat in Yogo Creek (400 foot section). Fish ranged from 2.8 to 8.8 inches in length. Young-of-the-year fish were numerous.

In a 650 foot section of Smith Creek, seven cutthroat and three cutthroat-rainbow hybrids were caught. The fish ranged in size from 4.2 to 9.3 inches.

Three short sections of Cottonwood Creek, a tributary of Big Spring Creek in Fergus County, were electrofished. One hatchery rainbow was caught in 300 feet of intermittent stream shocked. A 400 foot section, 5 miles above the old town of Cottonwood yielded 15 brook trout, 1 longnose sucker, plus mottled sculpins and minnow spp. This portion of the stream had good bank cover and little silt on the stream bottom. The trout averaged 7.6 inches and .23 pounds.

Five brown trout were caught in a section (200 feet) approximately 2 miles above the mouth of Cottonwood Creek prior to flowing into Big Spring Creek. Average size of the trout was 13.2 inches and 1.02 pounds. Twelve white suckers, two longnose suckers, mottled sculpins and longnose dace were also taken.

Two portions of Rock Creek in Fergus County were electrofished. The first area (225 feet) was in an intermittent portion of the stream. Only 2 rainbow were caught. The other section (675 feet) was a short distance below the Rock Creek School. The 30 rainbow collected averaged 10.2 inches in length and .60 pounds. One mottled sculpin was taken and no minnows or suckers were seen. The stream is very silty -- up to two feet in many places. The majority of trout were probably escapees from a small reservoir (Rimer's) upstream.

The headwaters of East Fork of Big Spring Creek, Cottonwood and Running Wolf Creeks were fished with hook and line. Cutthroat trout were the only species of fish caught in the small streams. Both Cottonwood and Running Wolf Creeks are intermittent some distance below the areas fished.

The Yogo Sapphire mining in the Little Belt Mountains is creating a pollution problem on Yogo Creek. The matrix containing sapphires is hauled into Yogo Creek Canyon and washed with water from Yogo Creek. Settling basins were built to collect tailings. A dozer was used to straighten the stream, and dirt from the settling basins was pushed adjacent to the channel. During spring high water, considerable amounts of silt is carried by the stream.

A fish kill on the South Fork of the Musselshell River near the town of Martinsdale occurred in August. Primarily, brown trout were killed. The Montana State Water Board were attempting to chemically treat aquatic vegetation in an irrigation canal. Leakage from the canal running back into the stream caused the kill. Evidently, this is not the first time this has happened.

All the water from the South Fork of the Musselshell River is diverted into the irrigation canal during a major portion of the summer and fall. If the canal did not leak, the stream would be dry for a considerable distance downstream.

Missouri River. - Water fluctuation in the Missouri River below Holter Reservoir is felt to be detrimental to fish and food organisms living in the river. Fluctuations between 1,000 and 7,000 cubic feet per second occur every 24 hours during October and November of most years. Smaller fluctuations occur during the rest of the year.

A survey to help determine effects of water flow manipulation on fish and fish habitat was attempted. Our objective was to have the Montana Power Company cut flows in the river below Holter Reservoir to 3,000 cubic feet per second, 2,000 cubic feet per second, and 1,000 cubic feet per second. At these 3 flows, the amount of exposed bottom, dry channels and loss of bank habitat would be determined from aerial photos and ground observations.

Due to flow patterns during the year, the Montana Power Company could not cut flows without reducing their power generating capacity. Consequently, observations of these flows could not be made, but will be attempted next year.

Boat shocking of the river was tried in several sections of the river below Holter Reservoir. Not enough trout were taken to make population estimates and very few small trout were taken. Other attempts will be made using modified electrofishing gear.

Reservoirs

Ackley Lake. - Snagging for kokanee salmon was excellent from the middle of November, 1969 to January, 1970. Fish were caught by snagging in open water before freezing, and later through the ice. Forty-six kokanee caught by snagging on December 12, 1969 averaged 14.7 inches in length and 1.08 pounds. Twenty-two of the salmon were males and averaged slightly larger than the 24 females. Average size of kokanee given in Table 4 are fish from the first year class, planted after the reservoir was rehabilitated in the fall of 1966.

Three gill nets were set overnight in the lake in September, 1968 and May of 1969 and 1970. Kokanee have increased in both length and weight during the three years. Rainbow have remained practically the same size in the same amount of time (Table 4).

Martinsdale Reservoir. - Four gill nets were set overnight in the reservoir in August, 1969. Rainbow (21), brown (3), white suckers (340), and longnose suckers (38) were caught in the nets. Rainbow averaged 13.4 inches in length and 1.14 pounds in weight. The three brown trout averaged 21.4 inches in length and 5.06 pounds. Large numbers of crayfish were taken in the nets.

In an attempt to improve survival, 6 inch fish will be stocked in the future.

Bair Reservoir. - Bair Reservoir (also known as Harris or Durand Reservoir) is located in Meagher County on the North Fork of the Musselshell River. The reservoir is 272 acres in size

and was built in 1939 by the State Water Board. Extreme water level fluctuations have made management of the reservoir impossible.

The lake was chemically treated with rotenone in 1961. Rainbow trout have been stocked in the reservoir since. Brook trout taken by fishermen are migrants from the North Fork. Suckers are numerous (Table 5), and fishing for trout has been poor the past 3 years. Rehabilitation of the reservoir would be desirable in the near future. Gill netting results in August, 1969 are given in Table 5, as well as trout caught in nets in 1966.

TABLE 4. Number, average length and weight of fish caught in three gill nets from Ackley Lake

	Total number	Average length (in.)	Average weight (lbs.)
September, 1968			
Rainbow	60	13.2	0.85
Kokanee	48	9.2	0.32
White sucker	78	--	--
Longnose sucker	61	--	--
May, 1969			
Rainbow	89	13.2	0.82
Kokanee	45	11.5	0.53
White sucker	172	--	--
Longnose sucker	78	--	--
May, 1970			
Rainbow	13	13.1	0.93
Kokanee	31	14.0	0.94
White sucker	38	--	--
Longnose sucker	210	--	--

TABLE 5. Number, average length and weight of fish caught in two gill nets from Bair Reservoir

	Total number	Average length (in.)	Average weight (lbs.)
1966*			
Rainbow	18	11.8	.62
Brook	2	10.8	.57
1969			
Rainbow	43	10.3	.42
Brook	30	9.0	.30
White sucker	930	--	--
Longnose sucker	44	--	--

* No information on suckers.

Petrolia Reservoir. - Fishing for walleye pike continues to be poor in this 515 acre reservoir. Large schools of carp are numerous throughout the reservoir. Black crappie were introduced in September, 1969 in an attempt to provide more fishing.

Yellow Water Reservoir. - Two gill nets were set in the reservoir in June, 1969. A total of 46 rainbow, 210 black bullheads and 104 white suckers were taken. Fingerling rainbow, planted in the spring averaged 7.7 inches in length and .22 pounds in weight. Older rainbow averaged 16.9 inches in length and 2.23 pounds.

Commercial fishermen from Lewistown have fished Yellow Water Reservoir for black bullheads since May, 1968. The bullheads averaged seven dressed fish per pound then, and by the following spring (1969), they averaged $4\frac{1}{2}$ dressed bullheads per pound. The fall of 1969, the fish were averaging three per pound and have continued to remain this size. Bullhead numbers have been reduced considerably since they began fishing. Pounds of bullheads taken from the reservoir since commercial fishermen began are given in Table 6.

War Horse Reservoir. - Commercial fishermen fished for black bullheads in War Horse Reservoir in 1968 and again in 1970. Bullheads are large but commercial fishermen have had trouble catching sufficient numbers. Approximately 5,155 pounds of

dressed bullheads have been removed. Several tons of white suckers too small in size to market, were removed by 1 3/8 inch mesh hoop nets.

Sport fishing has been excellent for both bullheads and largemouth bass in the 1,000 acre reservoir.

TABLE 6. Black bullheads taken from Yellow Water Reservoir by commercial fishermen.

Date fished	Dressed bullheads (lbs.)	Live bullheads (lbs.)
1968 Oct.-Dec.	3,995	--
1969 Jan.-Dec.	23,319	450
1970 Jan.-Nov.	1,816	--
Total	29, 130	450

Ponds

Fish losses due to winter-kill were light the past winter (1969-70). Eight small reservoirs were gill netted to determine fish species present, growth rate and abundance.

Crayfish were introduced into two weedy reservoirs (lower Carter and Peterson Reservoirs) to observe their effect on aquatic vegetation. Black crappie were introduced into a reservoir near Winifred to provide more fishing in that area.

LITERATURE CITED

Prepared by Richard J. Baldes

Date January 19, 1971

Waters referred to:

16-0300	Big Spring Creek
16-0900	Cottonwood Creek
16-1340	East Fork
16-1820	Judith River
16-3040	Rock Creek
16-3160	Running Wolf Creek
16-3480	Smith Creek
16-4260	Yogo
16-4300	Ackley Lake
16-4620	Carter
17-4896	North Fork Musselshell River
18-4350	North & South Forks, Musselshell River
18-5670	South Fork Musselshell River
18-7750	Harris Reservoir
18-8380	Martinsdale Reservoir
18-8720	Petrolia
18-8745	Peterson
18-9440	War Horse Reservoir
18-9500	Yellow Water Reservoir

MONTANA FISH AND GAME DEPARTMENT
ENVIRONMENTAL RESOURCES DIVISION

JOB PROGRESS REPORT

State Montana

Project No. FW-1-R-2 Title Smith River Drainage Inventory and Planning Investigation

Job No. I Title Planning Inventory, Fisheries

Period Covered July 1, 1969 to June 30, 1970

ABSTRACT

A field inventory of the fishery resources in the Smith River drainage was initiated to form the framework for development of immediate and long-range management plans. A step down plan was established to develop guidelines for the inventory. Trout populations and channel morphology were measured on two sections of the Smith River. Rainbow trout appear to be the most abundant trout in the main stem of the river. Fish populations were censused in 11 tributary streams. Water chemistry, water temperatures, and flow data were gathered from several streams.

BACKGROUND

Fishery resource planning has been and continues to be a phase of each fish manager's work; however, the constant pressure of day-to-day management consumes most of his time. The intensity of individual fishery problems also varies from place to place in a management area. Consequently, managers have not been able to develop complete inventories in a common area. This project will accomplish a complete fishery inventory and probably uncover problems affecting the resource. It will be a total ecological approach that has not been accomplished previously in Montana and will attempt to unify the Department's effort to solve resource management problems.

The purpose of this job will be to develop immediate and long-range fishery plans. The problem of planning will be approached from the field level beginning with the collection of basic field inventory data. Once the inventory is complete, the needs of the fishery resource determined, and the areas of land use conflicts identified, the plans for meeting fishery needs will be proposed. In order to accomplish this, a planning unit was assigned to inventory and develop plans pertaining to the Smith River Drainage in District 4.

The importance of fish and wildlife resource planning has only recently been realized. Planning activities have rapidly increased in the past ten years, but have dealt mainly with urban development and the needs and problems of the urban population. California is probably the leader in developing ground level fish and wildlife plans. Their planning efforts were initiated in 1964, and at the present time they have completed state fish and wildlife plans. Since initiation of California's planning process, other states have become interested and involved with fish and wildlife resource planning.

OBJECTIVES

The objectives of this study are to conduct and evaluate a basic planning procedure of an intensive nature. The planning procedure will be supported by basic fish and wildlife inventory data collected from the Smith River drainage. The objective of this job is to inventory and evaluate data dealing with the fishery resource within the drainage.

PROCEDURES

A single copy topographic map of the Smith River drainage was needed for convenience of the inventory. Project personnel constructed a work map by combining National Forest maps and Montana Highway Department county road maps. This piecemeal map was photographed and reproduced at a scale of one-half inch per mile.

A step-down plan was developed to serve as a guideline for the field inventory. This plan has proved a valuable guide to achieving the project objectives as the inventory advances. Following is the plan outline:

SMITH RIVER DRAINAGE INVENTORY AND PLANNING INVESTIGATION

1. To conduct and evaluate a basic planning procedure for the perpetuation of fish and wildlife populations.
    2. To conduct and evaluate a basic planning procedure for fisheries.
        3. To determine species present.
            4. To determine species distribution and abundance.
                5. To obtain information from past surveys and stocking records.
                5. To inventory waters by electrofishing, angling, netting.
            4. To determine importance and use.
                5. To determine angler days from fishing pressure survey.
                5. To conduct limited creel census.
                5. To determine economy to local area and state.
                5. To determine importance to overall state program.
        3. To determine quality and quantity of habitat.
            4. To develop standard stream classification method.
                5. To determine physical and biological properties of stream channels.
                    6. To determine cover characteristics.
                    6. To determine velocity in relation to cover.
                    6. To determine sinuosity and pool-riffle ratios.
                5. To determine and classify floodplain characteristics.

Limited water chemistry was conducted on streams where population inventories were conducted. Water chemistry included pH, conductivity, hardness and turbidity.

A total of 10 staff gauges were installed on streams throughout the drainage to aid in monitoring flow regimes and to help determine the quality of habitat available throughout the year. A discharge curve was constructed for each staff gauge by periodically measuring the volume of flow with a Gurley current meter. Stream gauging methods and techniques employed are described by Corbett (1962) and Wipperman (1967). Also, a water stage recorder was installed in the United States Geological Survey gage house (Eden Station) on the Smith River near the mouth of Hound Creek. The U.S.G.S. discontinued monitoring this station following the water year 1969.

Maximum-minimum thermometers were installed on some of the larger tributary streams within the drainage. The thermometers were read about once a week. A thermograph was installed on the Smith River in the U.S.G.S. gage house near the mouth of Hound Creek in the spring of 1970.

A method of measuring and describing stream morphology was initiated to determine the quality and quantity of habitat available to the fishery resource. The goal of this phase of the project is to develop a standard outline to aid the fishery worker in classifying stream habitat.

Channel morphology and physical habitat was measured in two sections of the Smith River where trout populations were estimated. The length of each section was measured down the center of the channel. Cross section data was recorded at 100 foot intervals on one section and at 200 foot intervals on the other section. Width measurements were recorded at each cross section and 9 to 10 depth readings were taken at equal intervals along a tag line. Stream bank or shoreline characteristics were subsampled by recording features within five feet on each side of the cross-section tag line.

Stream bank features were classified into one of the following four categories:

Brush.....All woody vegetation within ten feet of the shoreline. Brush was considered cover if overhanging live branches were within five feet of the water surface or if live or dead branches and roots were immediately above or beneath the water surface. Brush cover was measured horizontally along the tag line from the soil bank to the furthest extension of the vegetation over or in the water.

Grass.....Herbacious plants on immediate shoreline.

Deposition Zone.....Includes silt and gravel bars, rocks, and boulders. No vegetation within ten feet of the shoreline.

Cliff.....Parent material or bed rock within near vertical position to shoreline.

5. To classify streams by volume of flow.
5. To determine area of streams (acres or miles).

4. To classify ponds, lakes, and reservoirs.
5. To determine areas, depths.

4. To measure basic water quality.
5. To monitor chemical characteristics.
5. To monitor flow regimes and water levels.
5. To monitor water temperatures.

4. To determine detrimental programs and practices.
5. To monitor extent of dewatering and water level fluctuations.
5. To monitor extent of stream channel alterations.
6. To monitor manmade alterations.
6. To monitor alterations caused by industrial practices.
5. To determine practices altering water quality.

4. To evaluate beneficial programs and practices.
5. To determine extent and effect of Agricultural Conservation Programs.
5. To determine effects of Stream Preservation Law.
5. To determine effect of the Dredge Mining Regulation.

3. To determine access and area availability.
4. To determine land ownership.
4. To determine acceptance of recreational use of private lands.
5. To contact private landowners with reaction study.
4. To determine areas of potential development.

Trout populations were inventoried in the Smith River with the aid of electric shocking gear. The electric gear and collecting equipment was placed in a boat and fish were gathered as the boat and crew moved slowly downstream. Population estimates were made by using the Petersen-type mark-and-recapture method using Chapman's modified formula as follows:

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

Where: N = population estimate
M = the number of fish marked
C = the number of fish in the recapture sample
R = the number of marked fish in the recapture sample (C).

Methods involved for population estimates, age structure and confidence intervals largely follow those described by Vincent (1969).

Electric shocking gear was also used to inventory fish populations in small tributary streams. The electric power source was placed on the stream bank and fish were collected from stream sections varying from 125 to 405 feet in length. All game fish captured were measured and weighed.

Other characteristics that further describe the physical features of the shoreline included the following:

Eroding bank.....Banks are unstable and loss of soil is evident through action of water or trampling by livestock.
Undercut.....An overhanging shelf of soil or vegetation. Only grass and bed rock banks were considered undercut. Undercut associated with brush is considered brush cover.
Debris.....Includes driftwood, snags, and logs not permanent or rooted. If presenting cover, debris is measured the same as for brush.

A landowner-recreation survey questionnaire was drawn up which is intended to determine problems and areas of conflict with private landowners and fish-wildlife-recreation related affairs. Private landowners were personally contacted with the questionnaire for the following reasons:

1. To briefly explain the objectives of this project;
2. To insure all pertinent questions on the survey form are answered;
3. To establish a personal relationship with the landowner and obtain permission to do inventory work on private property.

Results and comments from the questionnaire will not be reported until the survey is completed.

DESCRIPTION OF STUDY AREA

Findings:

The Smith River drainage lies in west central Montana, almost due south of Great Falls. Most of the western edge of the drainage is flanked by the Big Belt Mountains and the eastern boundary is flanked by the Little Belt and Castle Mountains (Figure 1). The drainage is approximately 75 miles in length and the width varies from 3 to 45 miles. The total area is slightly over 2,000 square miles. The elevation of the floor of the drainage varies from 3,350 to 5,400 feet above sea level. The highest mountain peaks range from 8,500 to 9,500 feet above sea level.

The Smith River is formed by the junction of the North and South Forks about four miles southwest of White Sulphur Springs. The North Fork drains part of the southwest slopes of the Little Belt Mountains and the northwest slopes of the Castle Mountains. The South Fork arises along the southwest flank of the Castle Mountains and from the bench lands between the Castle and Big Belt Mountains. The main stem of the Smith River then flows northwesterly through a wide valley until it enters a deep mountain gorge about 10 miles north of Fort Logan. After emerging from the canyon, the river meanders through a relatively narrow valley flanked by rolling grasslands until it joins the Missouri River near Ulm.

Numerous tributaries arise in the Big Belt and Little Belt Mountains to join the Smith River. A few of the major tributaries arising in the Big Belt Mountains

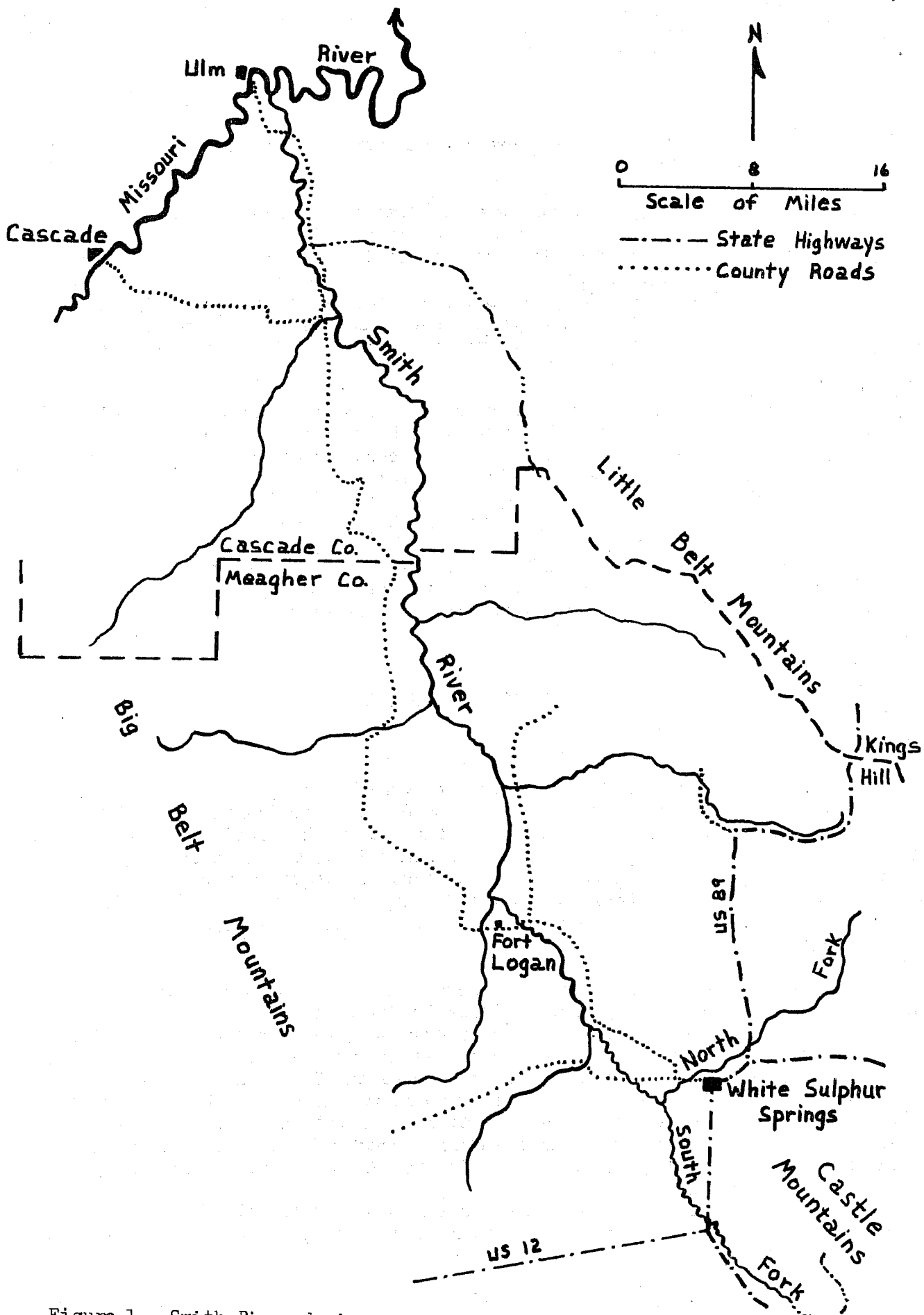


Figure 1. Smith River drainage.

and flowing generally northeasterly are Birch, Camas, Beaver, Rock, and Hound Creeks. Those from the Little Belt Mountains flowing generally westerly are Newlan, Sheep, Eagle, Tenderfoot, and Deep Creeks. A complete list of tributary streams within the drainage was compiled by Thoreson (1953); however, this list will not appear in this report.

The climate within the drainage is greatly influenced by the three mountain ranges previously mentioned. The extreme topographical conditions afforded by the mountain ranges and intermountain valleys cause the climate to be quite variable.

Winters in general are cold, with an occasional mild, open year. Prolonged cold spells may be abruptly terminated by the occurrence of a warm chinook and followed by mild weather. Snowfall has been recorded in every month of the year, and the average annual recorded snowfall is about 60 inches. Summers are characterized by wide diurnal temperature variations, low relative humidity and showers that are frequented by an occasional cloudburst.

Where climatic data has been officially recorded, mean annual temperatures vary from 34 degrees F at Kings Hill to about 45 degrees F at Ulm. Extreme recorded ranges between minimum winter and maximum summer temperatures are -61 degrees F at Fort Logan and 107 degrees F at Ulm. Average frost free periods are less than 30 days in many mountain valleys to about 130 days near the lower Smith River.

Average annual precipitation along the floor of the drainage varies from about 12 inches at Fort Logan to 16 inches near the mouth. Kings Hill records about 28 inches of precipitation annually. It is probable that some of the more favorable mountain areas receive 30 to 40 inches a year.

SMITH RIVER

Channel morphology and physical characteristics were measured in two sections of the Smith River in August, 1969. The Loney Ranch Section (T 10N, R 5E, S 26) is located about 10 miles northwest of White Sulphur Springs. This section of river flows through a meadow zone with a floodplain varying from 300 to 1,200 yards in width. The Zeig Ranch section (T 12 & 13N, R 4E, S 2 & 34) lies 25 miles northwest of White Sulphur Springs. This river section flows through a mountain zone where the floodplain width varies from 80 to 350 yards. The Zeig section lies at the entrance of the Smith River Canyon and contains the last vehicle access for about 20 river miles. The characteristics concerning the two river sections are presented in Table 1.

Trout populations were estimated from the two river sections on September 10 and 11, 1969. Population estimates in the Loney Ranch section reveal rainbow trout comprised about 53% of the number of yearling and older trout, brown trout 32% and brook trout 15%. Brown trout comprised about 58% of the standing crop (weight), rainbow trout 34% and brook trout 8% (Table 2). Hatchery rainbow trout are planted about one mile upstream from the section. They comprised less than two percent of the total standing crop by number and weight.

Table 1. Morphology and physical characteristics of two sections of the Smith River, August, 1969.

Channel Characteristic	Loney Section	Zeig Section
Length of channel measured (ft)	6,900	9,500
Average width (ft)	44.2	84.8
Average Depth (ft)	1.2	1.2
Average Thalweg Depth (ft)	1.9	1.8
Volume of flow, August 29 (cfs)	48	118
Sinuosity	1.6	1.2
Gradient (ft/mile)	23	27
Shoreline Characteristics		
Brush (%)	46.4	18.7
Grass (%)	33.3	60.4
Deposition Zone (%)	18.1	7.6
Cliff (%)	2.2	13.3
Supplemental Shoreline Characteristics		
Brush cover (ft^2/1,000 ft of channel)	1,877	210
Undercut (ft^2/1,000 ft of channel)	153	137
Eroding (%)	8.0	12.3

Table 2. Estimated trout populations from the Loney Ranch section of the Smith River, September, 1969. Section length - 8,435 ft. (95% confidence limits in parenthesis)

Age	Length Range	Number	Weight (lbs)
	Rainbow trout		
I	5.5 - 9.5	285	54.7
II	8.8 -12.8	67	33.3
III	10.1 -14.1	67	46.9
IV-V	13.6 -16.7	15	16.8
		434 (±111)	151.6
	Hatchery Rainbow trout		
-	8.4 -12.5	14 (± 10)	7.5
	Brown trout		
I	6.6 -10.4	134	33.0
II	11.2 -14.1	33	26.7
III	13.3 -17.8	48	75.2
IV	16.9 -19.1	41	91.1
V-VI	18.7 -22.0	17	43.0
		273 (± 50)	269.0
	Brook trout		
I	6.7 - 9.1	70	14.0
II	8.0 -11.9	50	21.5
III	11.0 -11.9	3	1.8
		123 (± 59)	37.3
Grand total		844	465.4
Standing crop per 1,000 ft		100	55.2
Standing crop per acre		99	54.4

Rainbow trout formed the bulk of the standing crop in the Zeig Ranch section (Table 3). They comprised about 92% by number and 78% by weight of the yearling and older trout. Brown trout comprised 8% by number and 22% of the total weight. Only 2 brook trout and 3 cutthroat trout were captured in the section. These five fish ranged from 8.8 to 10.6 inches in total length. Hatchery rainbow trout are planted near the head end of this section. The estimates revealed they comprised about 4% of the number and 7% of the weight of the total trout population.

Table 3. Estimated trout populations from the Zeig Ranch section of the Smith River, September, 1969. Section length - 10,750 feet. (95% confidence limits in parenthesis)

Age	Length Range	Number	Weight (lbs)
	Rainbow trout		
I	6.3 - 8.9	317	57.5
II	7.8 -11.0	302	90.0
III	9.7 -13.3	160	85.9
IV-V	11.5 -15.2	44	36.1
		823 (246)	269.5
	Hatchery Rainbow trout		
-	10.4 -13.5	38 (36)	24.5
	Brown Trout		
I	6.8 - 9.4	35	7.7
II	10.5 -14.2	7	7.2
III	14.8 -16.6	12	17.6
IV-V	16.8 -19.9	22	48.9
		76 (36)	81.4
Grand Total		937	375.4
Standing crop per 1,000 ft		87	34.9
Standing crop per acre		45	17.8

A total of 48 young-of-the-year rainbow trout were collected from both sections on September 3 and 4. The size range of these fish was 2.6-4.7 inches, with an average length of 3.6 inches. Young-of-the-year brown trout and brook trout were scarce. Mountain whitefish were abundant in both sections but were not collected.

The Loney Section supports about 58% greater biomass (weight) of trout per 1,000 feet of stream than the Zeig Section. The standing population of trout in any stream is controlled by the quantity and quality of available habitat.

The Loney Section has several pools associated with bank cover which offer desirable resting and hiding places for large trout. The Zeig Section contains little bank cover in relation to pools, and therefore the depth and bottom contours of these pools offer the only security for large trout. A note of conjecture is that most of the Smith River from the mouth of Sheep Creek to the mouth of Hound Creek physically resembles the Zeig Section.

The subsampling of the habitat in each section based upon the cross sectioning was not sufficient to accurately describe the quantity of pools and riffles. Cross section data was acquired every 100 feet in the Loney Section and every 200 feet in the Zeig Section. Ground observations on other streams reveal a cross section at intervals equivalent to the approximate average width of the channel would probably be sufficient to describe the pool-riffle complex. Following this rule, the Loney Section should have been cross sectioned about every 50 feet and the Zeig Section about every 100 feet.

SMITH RIVER TRIBUTARIES

Fish populations were sampled in 11 tributary streams during the fall of 1969. The data gathered from the inventory is presented in Table 4. Brook trout were found in 8 streams, cutthroat trout in 6 streams, and rainbow trout in 5 streams. Mottled sculpins were the only other fish species collected from the sections worked. Where some chemical work was done, conductivity ranged from 70 to 540 micromhos/cm and pH ranged from 6.3 to 8.5.

Detrimental practices to fish habitat were noted on several of these streams. The watersheds on Rock and Little Birch Creeks were noticeably overgrazed by livestock. Silt bars were common in these streams. The stream banks were badly trampled in several places and much of the streambank vegetation was in a deteriorated condition. Overgrazed stream banks were also evident on a considerable portion of the South Fork of Eight Mile Creek. Logging along a portion of the North Fork of the Smith River destroyed the natural channel of this stream. Trees had been clear cut along the stream; the unwanted debris and undesirable logs had been left where they fell with much of it in the stream channel. Considerable disturbance must have been dealt to the stream channel by men and machines during this logging operation.

Five maximum-minimum thermometers were placed in four Smith River tributary streams on August 6, 1969 and were read weekly until October 1, 1969. The weekly maximum-minimum water temperatures are presented in Table 5. The warmest readings were recorded on the South Fork of the Smith River. In late summer this stream flows less than 5 cfs and the water is heavily utilized for irrigation.

Water temperatures of 73 degrees F were recorded from the lower end of Sheep Creek, one of the largest tributaries of the Smith River. This stream flows through a narrow mountain canyon most of its length. Sheep Creek and its tributaries supply water for irrigation of about 1,900 acres within the drainage as well as supplemental water for about 1,200 acres in the Newlan Creek drainage.

Table 4. Inventory of some Smith River tributary streams.

Stream	Section Length (ft)	Location T. R. S.	Estimated flow(cfs)	Conductivity Micromhos/cm	pH	Fish Species	Number Caught	Length Range	Number over 6 inches T.L.
Benton Gulch	200	11N, 3E, 27	2	540	6.6	Eb[1/]	30*	5.1 - 9.2	26
						Rb	21*	2.1 - 6.8	3
						RbXCt	5	5.0 - 6.5	3
Big Birch Creek	400	9N, 4E, 26	12	70	6.3	Eb	31	2.3 - 7.6	16
						Ct	4	5.3 - 8.0	3
	300	9N, 5E, 10	6	210	7.7	Eb	79*	3.3 -11.7	31
						Rb	24*	2.3 -11.9	8
Deep Creek	400	15N, 4E, 24	10	-	8.5	Ct	120*	3.4 -12.5	61
North Fork	125	15N, 5E, 20	6	-	8.5	Ct	54*	3.2 -10.0	25
North Fork 8 Mile Cr.	405	10N, 8E, 1	1	-	-	Eb	69	3.2 - 9.6	24
Camas Creek	250	10N, 4E, 34	8	170	8.2	Eb	55	2.6 -10.5	25
						Ct	2	7.2 -11.9	2
South Fork 8 Mile Cr.	300	10N, 8E, 24	3	-	-	Eb	33	3.3 - 7.5	6
						Rb	5	2.7 - 7.3	2
Four Mile Creek	300	9N, 8E, 17	6	100	7.5	Eb	60*	3.6 -10.7	28
						Ct	6	4.8 - 7.3	1
Little Birch Creek	300	9N, 5E, 31	3	-	-	Eb	10	2.8 - 8.5	8
						Ct	12	3.6 - 8.4	8
North Fork Smith River	320	11N, 8E, 25	10	-	-	Eb	100	2.6 -10.1	50
						Rb	7	3.6 -11.8	3
Rock Creek	310	13N, 2E, 30	8	225	-	Rb	31*	2.2- 10.1	9
						RbXCt	4*	4.3 - 9.0	1

*Many of the young-of-the-year fish not captured.
1/ Abbreviations: Eb, brook trout; Rb, rainbow trout; Ct, cutthroat trout; RbXCt, rainbow trout-cutthroat trout hybrid.

Table 5. Maximum-minimum water temperatures from tributaries in the Smith River drainage, 1969. (Expressed in Fahrenheit degrees).

Period Covered	Sheep Creek (Upper) T12N,R7E,S26	Sheep Creek (lower) T12N,R5E,S18	North Fork Smith River T9N,R6E,S13	South Fork Smith River T9N,R6E,S21	Rock Creek T13N,R3E,S31
8/6 to 8/13	62 - 42	70 - 50	68 - 45	71 - 48	65 - 48
8/13 to 8/20	62 - 54	71 - 51	70 - 52	71 - 52	66 - 48
8/20 to 8/28	64 - 46	73 - 53	70 - 55	74 - 62	66 - 48
8/28 to 9/4	-	68 - 46	66 - 47	69 - 43	63 - 43
9/4 to 9/11	60 - 39	64 - 43	63 - 46	66 - 42	-
9/11 to 9/17	59 - 38	67 - 42	65 - 45	67 - 41	63 - 42
9/17 to 9/24	54 - 40	59 - 46	61 - 44	64 - 40	57 - 44
9/24 to 10/1	52 - 38	-	58 - 44	60 - 41	54 - 45

Although Sheep Creek is fairly well shaded within the narrow canyon it traverses, the wide, shallow stream channel characteristic of the stream contributes to warm summer water temperatures. Increased diversion of flow into the Newlan Creek drainage and increased development of irrigable lands within Sheep Creek drainage could cause higher maxima and diurnal variations in water temperatures in Sheep Creek. These changes in the water temperatures could possibly have a detrimental impact on the existing fish and aquatic insect populations.

Water temperatures were also secured from the Smith River near the mouth of Hound Creek with the aid of a thermograph. Up to June 30, 1970, the maximum water temperature recorded was 68 degrees in late June. Review of water temperature records secured from the same location reveal a history of high temperatures. Thermograph records covering the summers of 1962 through 1964 revealed water temperatures over 70 degrees each year. During July and August 1963, daily maximum water temperatures varied from 70 to 79 degrees every day over a 31 day period. Spot observations by USGS personnel from 1951-65 also reveal water temperatures over 70 degrees.

Discharge monitoring stations were set up on 10 streams within the drainage. The locations of these stations are presented in Figure 2. The staff gages installed at each location were read about twice a week during spring runoff and about weekly after flows had stabilized later in the summer. Since these stations were set up in the spring of 1970, the data will not appear in this report in order that the information may be reported on over a complete field season. An example of a discharge curve and monitored flow is presented in Figure 3.

Recommendations:

The field inventory of the aquatic resources and factors influencing these resources will be the basis for development of a fishery management plan for the Smith River drainage. The collection of field data should continue to complete the inventory. Emphasis for the next field season will be placed on the association of fish populations and habitat, water quality, angler use, availability of waters, and landowner-recreationist relationships.

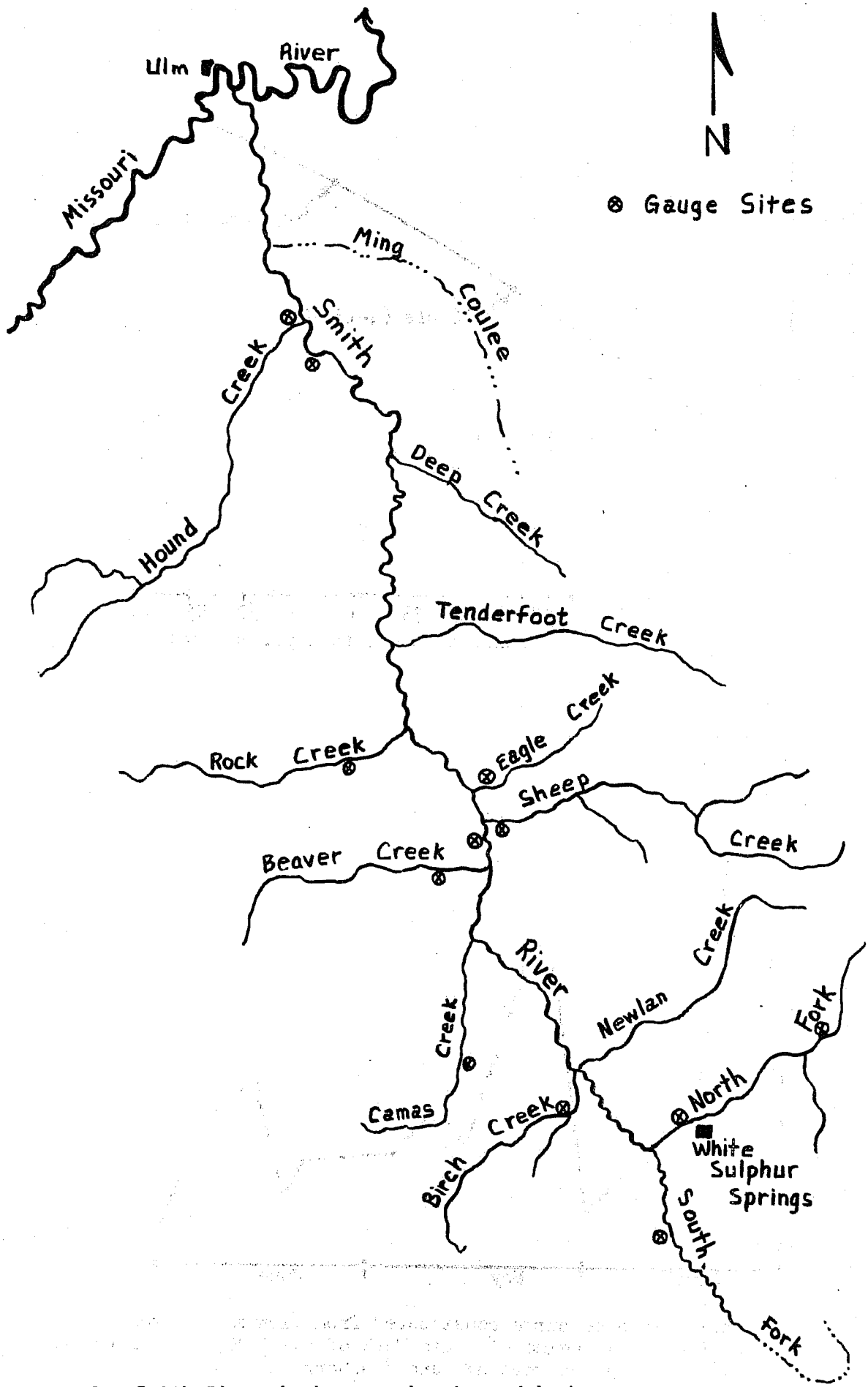
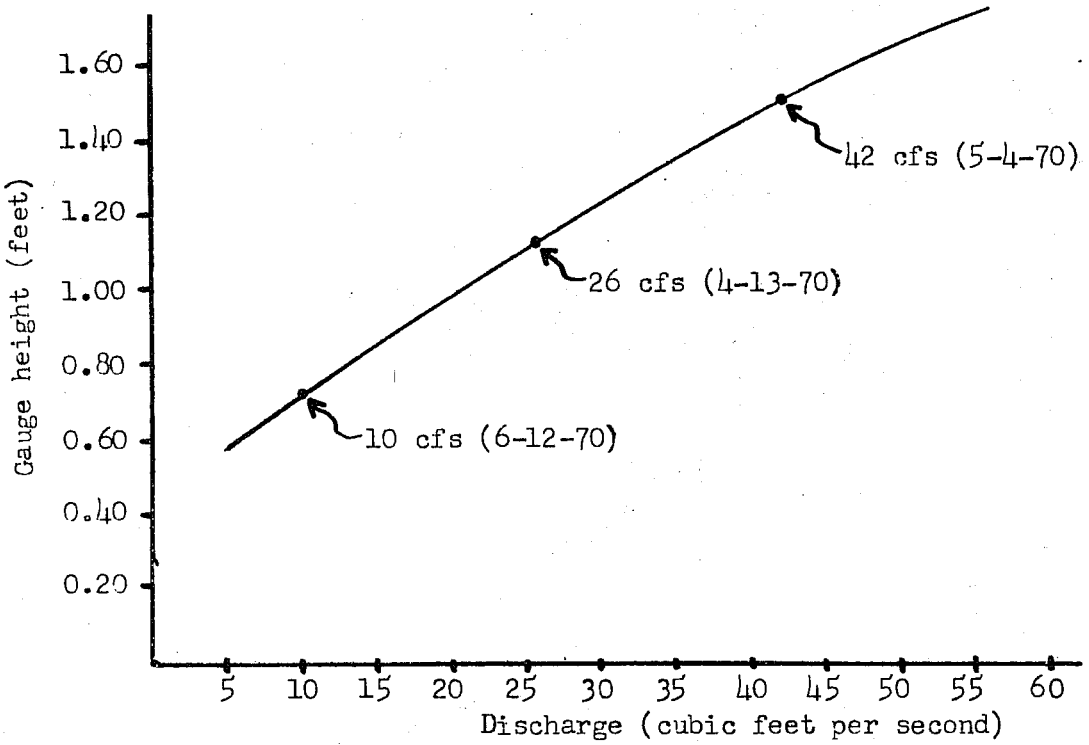


Figure 2. Smith River drainage and major subdrainages.



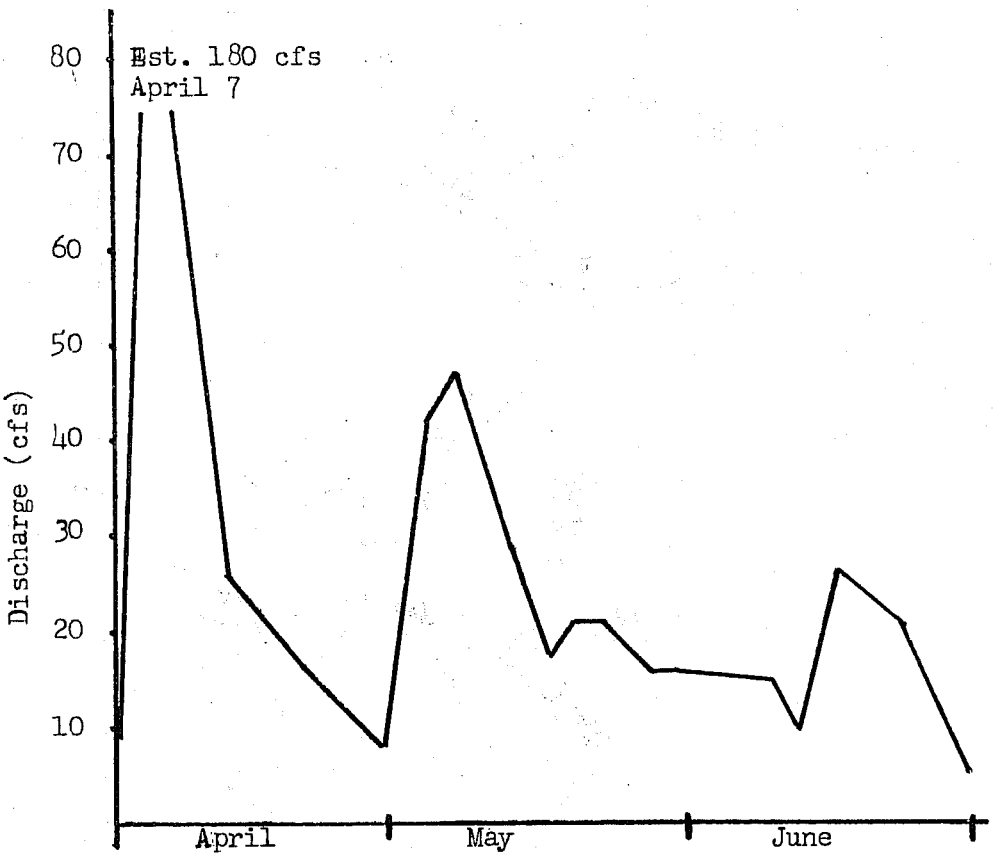


Figure 3. Top: Discharge curve constructed from flow measurements. Bottom: Flow regime of South Fork of Smith River interpolated from staff gauge readings and discharge curve.

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17-1980	17-4112	17-5328	17-6816	17-7536