MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS

FISHERIES DIVISION

JOB PROGRESS REPORT

State: Montana Title: Southwest Montana Fisheries Study

Project No.: F-9-R-29 Title: Inventory and Survey of the Waters of the Big Hole, Ruby and Beaverhead River Drainages

Job No.: 1-b

Project Period: July 1, 1980 through June 30, 1981

Report Period: July 1, 1980 through June 30, 1981

ABSTRACT

Discharge and water temperatures were monitored at three sites on the Big Hole River. Minimum flow at the three sites occurred in early September. Average daily flow (ADF) during the 1980 water year was greater than during 1979. Water temperatures at the lower site on the Big Hole reached critical levels in early September when maximum daily temperatures reached 80.0°F.

Fall numbers of age III and older brown trout in the Melrose Section were greater and summer mortality rates lower than during 1979. Fall numbers of age IV and older brown trout continue to be related to summer flows. Total numbers of rainbow trout continue to increase, however, numbers of age III and older rainbow have increased only slightly. Total numbers of wild rainbow trout have increased by over 250 percent since planting of catchable size rainbow trout was discontinued in 1975.

Brown trout in the Heron Section continue to suffer high summer mortalities conicident with the low flows and high water temperatures due to irrigation dewatering.

Fall condition factors for brown trout in the Melrose Section were considerably greater than in the Heron Section.

Fall and spring numbers of brown trout in the Sailor Section of the Ruby River are given.

Instream flow recommendations for fifty tributary streams of the Big Hole, Beaverhead and Ruby Rivers are given. Trout population estimates in 1000 foot study sections of eighteen tributary streams of the Beaverhead and Ruby Rivers are presented.

BACKGROUND

The Big Hole River is one of Montana's blue ribbon waterways and receives a great deal of fishing pressure. The waters of the Big Hole are also used by irrigated hay and cattle ranches and during low water years, this demand is sufficient to totally dewater the river near its mouth. Dams have been, or currently are, proposed for this free-flowing river and many of its tributaries.

The Ruby River sustains a wild trout fishery of major importance, however, quantitative data on flow, water temperature and fish populations near the mouth of the river have not been available.

Under provisions of the 1973 Montana Water Use Act, the process of reserving flows for the benefit of fish and wildlife is outlined in Sec. 85-2-316. Because it contains some of the nations most acclaimed wild trout rivers, the upper Missouri River Drainage is being considered as one of the next water allocation areas in the state.

Fifty tributaries of the Big Hole, Beaverhead and Ruby Rivers were selected for flow reservations based on their merits as major watersheds, important fisheries or the presence of species of "special concern."

OBJECTIVES AND DEGREE OF ATTAINMENT

1. To determine trout populations and monitor discharge and water temperatures in at least two sections of the Big Hole River and one section of the Ruby River. Data is presented.

2. To determine trout populations in selected tributaries of the Ruby and Beaverhead Rivers and collect information needed to request flow reservations. Data is presented.

PROCEDURES

Flow and water temperatures were monitored at three U.S.G.S. gages on the Big Hole River and one on the Ruby River.

Fish populations in the Big Hole and Ruby Rivers were censused using a boat mounted electrofishing unit. Population and standing crop estimates were made using methods summarized by Vincent (1971 and 1974) and adapted for computer analysis.

Instream flow requirements for aquatic life in tributaries of the Big Hole, Ruby and Beaverhead Rivers were quantified using a plot of wetted perimeter versus discharge for a typical subreach of stream. Instream flow requests follow procedures outlined by Nelson (1980).

Fish populations were surveyed using a bank electrofishing unit in the tributaries. Population and standing crop estimates were made using methods summarized by Vincent (1971 and 1974) and adapted for computer analysis.

FINDINGS

Big Hole River

Flow

Discharge in the Big Hole River during the 1980 water year was greater than the 1979 water year but less than the 1978 water year.

Diversion of river water for irrigation occurs throughout the length of the Big Hole, but is most apparent in the lower river from Melrose to Twin Bridges (Figure 1). Irrigation diversions generally have the greatest impact on natural flows during August, usually the most critical flow month on the lower Big Hole River. Table 1 depicts mean and minimum recorded August flows at the U.S.G.S. gaging station near Melrose from 1968-1980 and indicate 1980 to be an above average water year. Minimum August flow in 1980 was 97 c.f.s. greater at Melrose than in 1979.

Figure 2 depicts average daily flow (ADF) at U.S.G.S. gages near Wise River, Melrose and near Twin Bridges from July 10 through September 10, 1980. Throughout the period, ADF was greatest at the Melrose site and least at either the Wise River or Twin Bridges sites.

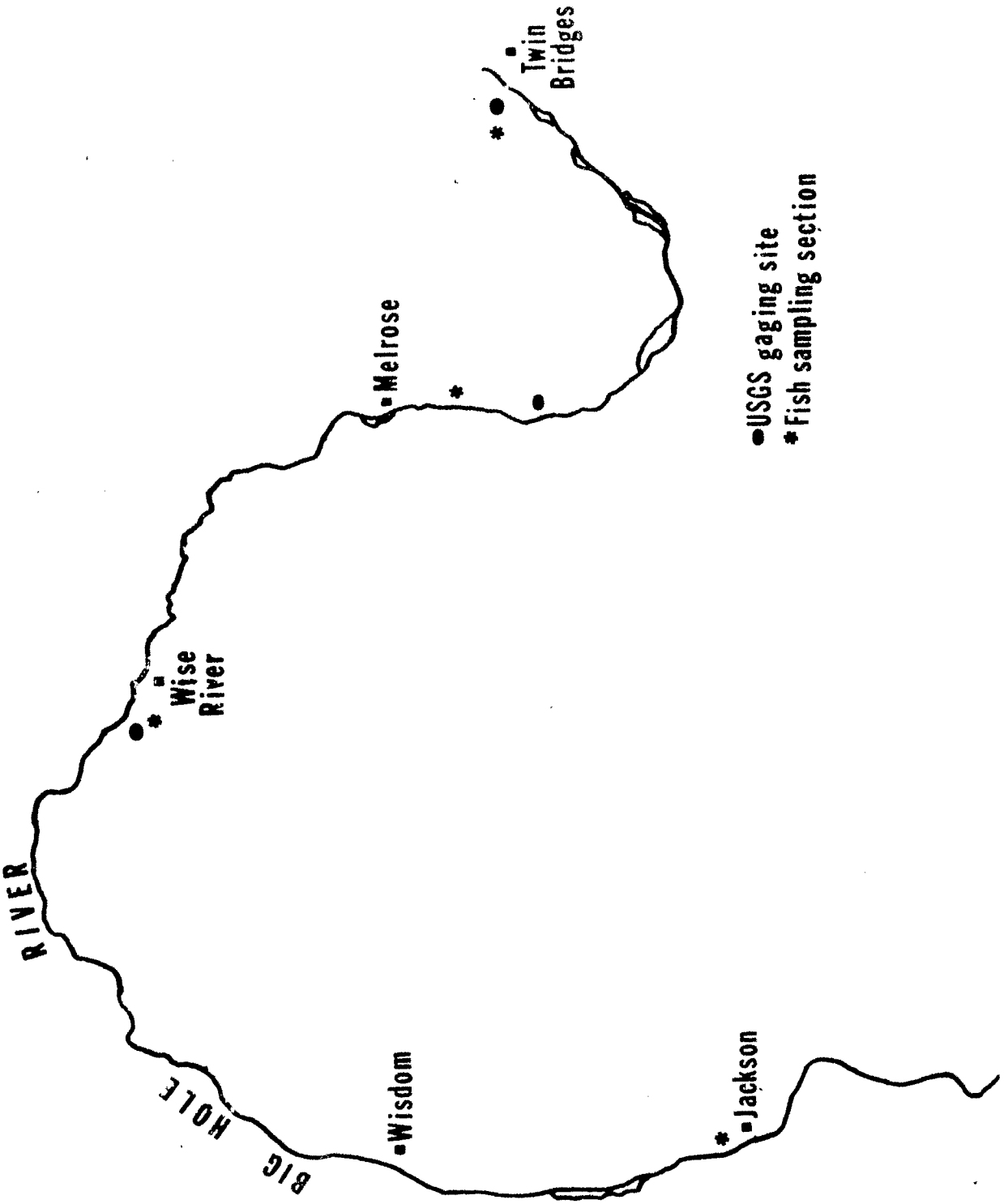
The gage near Wise River is located upstream from the large irrigation diversions of the lower river and upstream from several major tributary streams including the Wise River. Flow at the Wise River site reflects upstream tributaries, diversions for agriculture purposed and groundwater return.

The Melrose gage is located downstream from all major tributaries except Willow Creek, and flow reflects tributary input, diversion for agriculture and Butte municipal use and groundwater return between the Wise River and Melrose sites.

Table 1. Mean and minimum August flow in the Big Hole River (U.S.G.S. gaging site near Melrose) from 1968-1980.

Year	Mean	Minimum
1968	626	411
1969	407	230
1970	504	248
1971	611	301
1972	650	503
1973	165	113
1974	341	290
1975	1457	925
1976	927	715
1977	304	174
1978	691	479
1979	381	279
1980	486	376

Figure 1. Map of the Big Hole River Study Area.



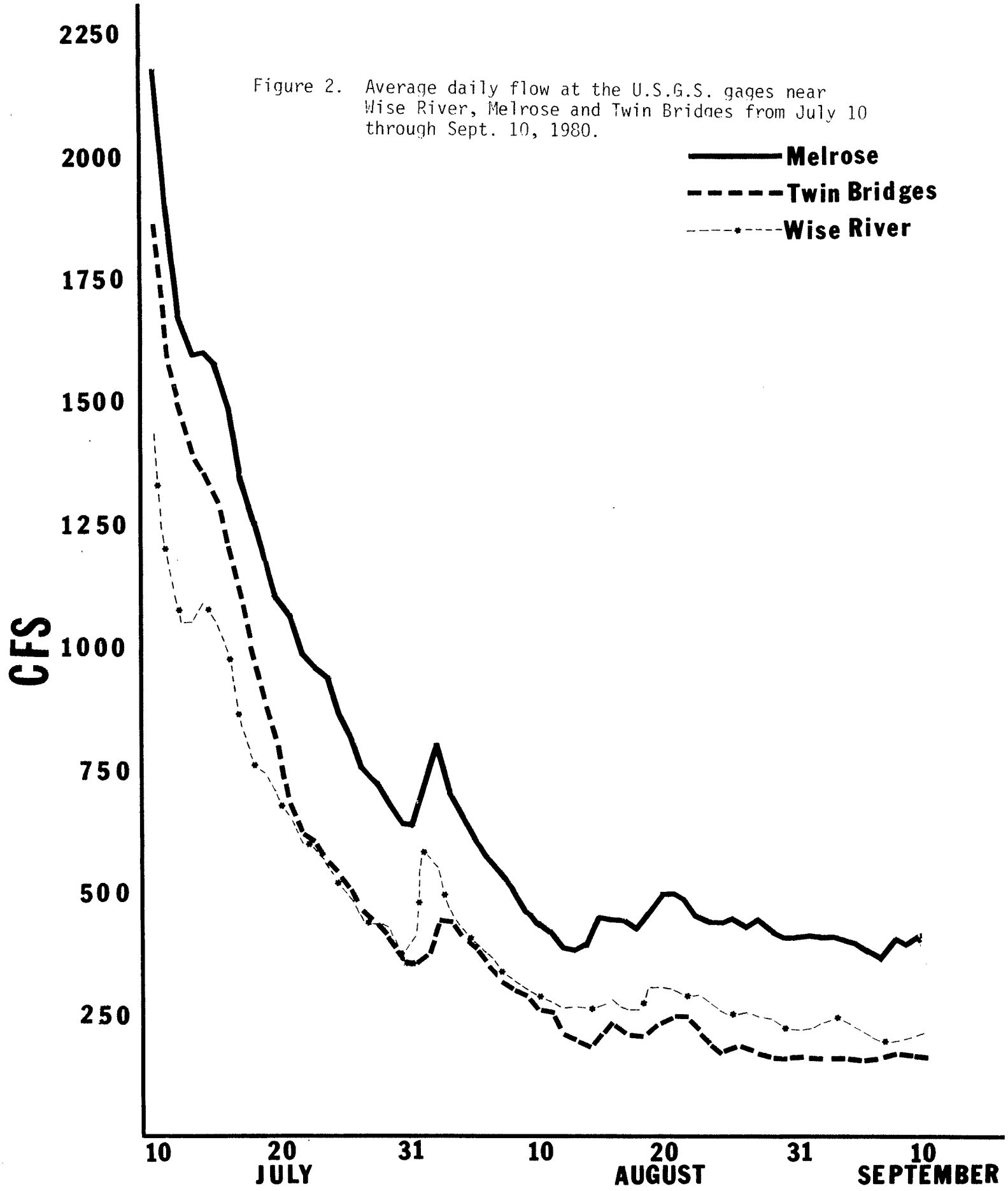
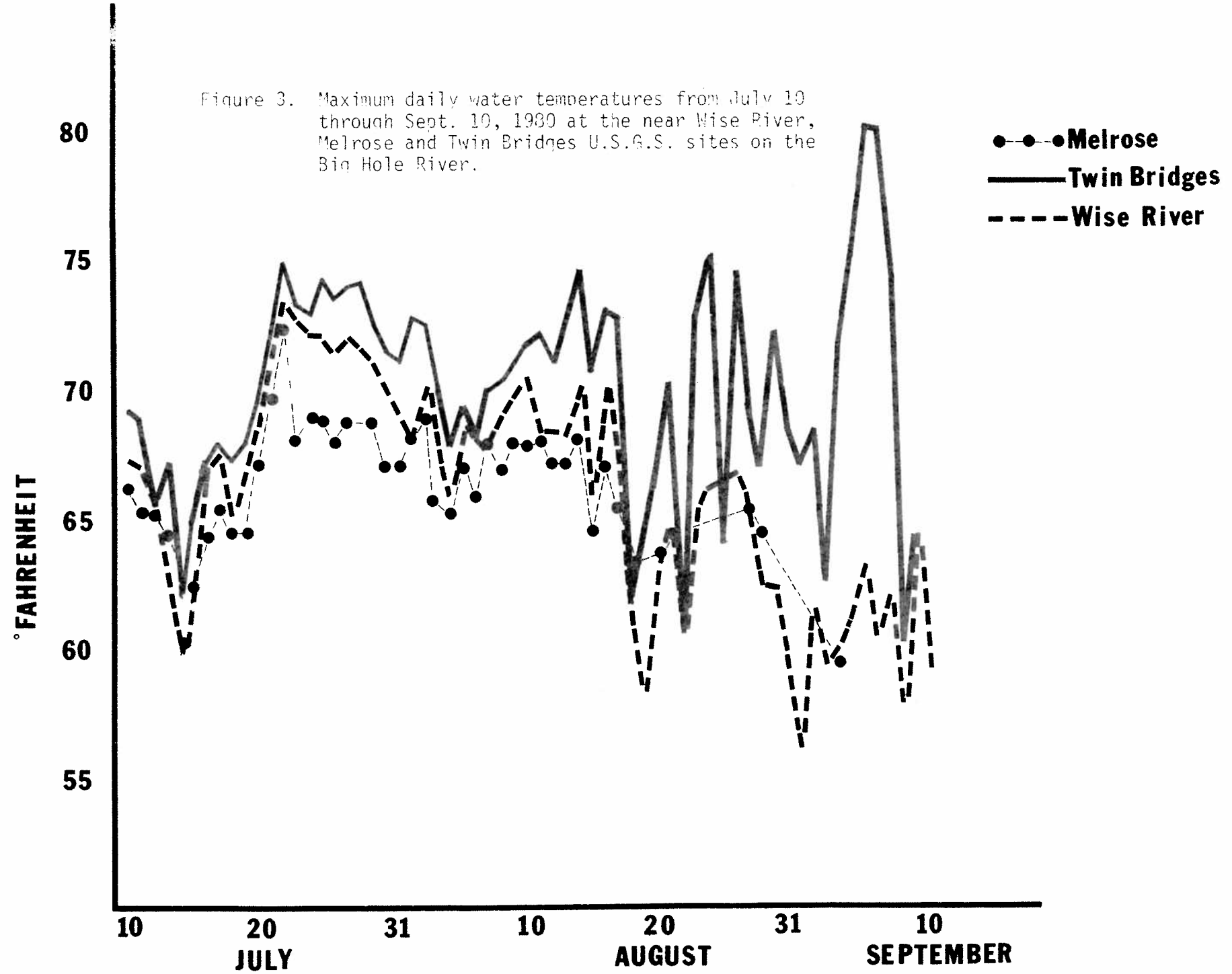


Figure 2. Average daily flow at the U.S.G.S. gages near Wise River, Melrose and Twin Bridges from July 10 through Sept. 10, 1980.

Figure 3. Maximum daily water temperatures from July 10 through Sept. 10, 1980 at the near Wise River, Melrose and Twin Bridges U.S.G.S. sites on the Big Hole River.



In general, flow decreased markedly from July 10 through August 10, 1980 at all three sites, and then stabilized or decreased slowly through September 10, 1980. Minimum flow at the three sites occurred in early September and was 191 cfs, 368 cfs and 157 cfs at the Wise River, Melrose and Twin Bridges sites, repsectively. These minimum flows are 193 percent, 132 percent and 143 percent of minimums recorded in 1979 at the Wise River, Melrose and Twin Bridges sites, respectively. Minimum ADF recorded in 1980 was slightly greater than that required for low levels of aquatic habitat potential at the Melrose site (Montana Fish, Wildlife and Parks, 1979). Minimum ADF in 1980 at the Wise River site was slightly less than that required for low levels of aquatic habitat potential and minimum ADF at Twin Bridges was only half of flow necessary for a low level of aquatic habitat potential (Montana Fish, Wildlife and Parks, 1979).

The reduction in flow between the Melrose and Twin Bridges sites from July 10 through September 10, 1980 is attributed to irrigation withdrawals and represents reductions up to 328 cfs between the two sites.

Water Temperatures

Maximum daily water temperatures from July 10 through September 10, 1980 at the Wise River, Melrose and Twin Bridges sites are depicted in Figure 3. Thermograph problems resulted in very little data collection at the Melrose site from August 20 through September 10, 1980. Maximum daily water temperatures at the Wise River and Melrose sites occurred on July 22 and were 73.4 and 72.5°F, respectively. Maximum daily water temperature at the Twin Bridges site was 80.0°F on September 5, 1980.

Maximum daily water temperatures in general were lowest at the Melrose site, intermediate at the Wise River site and greatest at the Twin Bridges site. Maximum daily water temperatures were in excess of 70°F for 32 of the 62 days of record at the Twin Bridges site. Of particular concern was the period of September 4-6, 1980 when water temperatures reached 75, 80 and 79.9°F, respectively. The impact of the low flow and high summer water temperature regime of the Twin Bridges site on the trout population is adverse as will be seen later in this report.

Maximum daily water temperatures at the Wise River and Melrose sites corresponded with the highest air temperatures of the reporting period (Climatological Data, 1980). Maximum daily water temperature at the Twin Bridges site corresponded with minimum ADF of the period and maximum daily air temperature of 89°F (Climatological Data, 1980).

Fish Population Data

Melrose Section

This study section was established in 1969 and its trout population described by Elser and Marcoux (1972), Peterson (1978), Wells and Nelson (1978), Wells and Rehwinkel (1979) and Wells and Decker-Hess (1980).

Population, standing crop and mortality estimates for brown and rainbow trout in this section for spring and fall, 1980, are given in Table 2.

Figure 4. Minimum August discharge and September numbers of age IV and older brown trout in the Melrose Section of the Big Hole River, 1969, 1970 and 1977-1980.

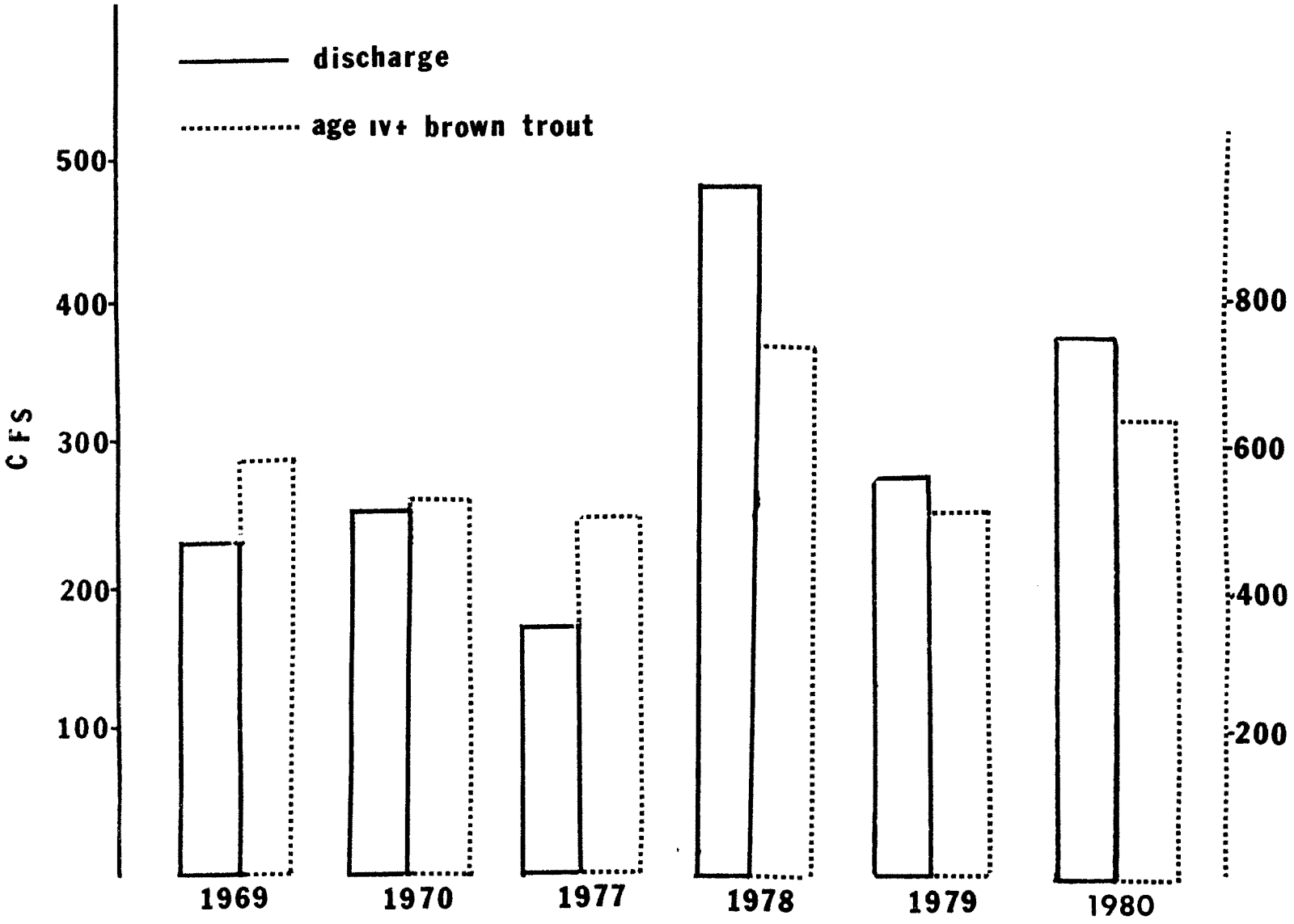


Table 2. Estimated numbers, standing crops and summer mortality rates of trout by age group in the 4.5 mile Melrose Section of the Big Hole River (80% C.I.).

April, 1980					September, 1980			
Age	Avg. Length	Number	Biomass	Summer Mortality	Age	Avg. Length	Number	Biomass
			Brown Trout					
II	9.6	1211	400	--	II	12.5	--	--
III	12.8	1447	1185	27%	III	14.6	1050	1305
IV+	16.2	1279	2077	50%	IV+	17.2	639	1287
		3937(±660)	3662(±607)				1689	1592
			Rainbow Trout					
II	9.9	959	357	--	II	11.6	823	512
III	12.3	555	400	36%	III	13.5	357	348
IV+	14.8	396	504	37%	IV+	15.0	250	331
		1910(±394)	1261(±261)				1430(±299)	1191(±235)

A reliable estimate for II year old brown trout in the fall was not attained, however, fall numbers of age III and age IV+ brown trout are shown in Table 2.

Summer mortality rates for age III and age IV and older brown trout during the summer of 1980 are reduced from those of the low water years of 1977 and 1979 (Wells and Decker-Hess, 1980). Age III brown trout experienced a mortality rate of only 27 percent while age IV and older fish suffered fifty percent mortality during the summer of 1980.

Summer mortality rates of age IV and older brown trout appear to be directly related to the magnitude of flow during the crucial irrigation season. Figure 4 depicts estimated numbers of age IV and older brown trout in the fall of 1969, 1970, 1977, 78, 79, 80 and minimum August flow in the Big Hole River. Numbers of age IV and older brown trout were greatest in the fall of 1978, a year when August flow did not drop below 479 cfs, and lowest in 1977, a year in which August flow dropped to 177 cfs, lowest of the study years.

Simple linear regression indicated a significant (P=0.05) relationship between minimum August flow and estimated fall numbers of age IV and older brown trout.

Summer mortality rates for age III and age IV and older rainbow trout were significantly less during 1980 than in the 1977, 78, 79 period (Wells

and Rehwinkel, 1979) (Wells and Decker-Hess, 1980). This decrease in summer mortality may reflect the higher flow year of 1980 and the increase in numbers of rainbow in the population. Numbers of rainbow trout remained low in this section for three years following the cessation of planting catchable size hatchery rainbow in 1975. However, since 1977 numbers of rainbow have increased dramatically (Wells and Rehwinkel, 1979) as depicted in Table 3. Numbers of wild rainbow trout in the Melrose Section in the spring of 1980 were over 200 percent greater than during the 1970-71 period when catchable size hatchery rainbow were planted annually.

Table 3. Estimated spring numbers of seven inch and larger wild rainbow trout in the Melrose Section of the Big Hole River (80% C.I.).

Year	Numbers
1970	873($\pm$183)
1971	754($\pm$219)
1977	614($\pm$181)
1978	1763($\pm$633)
1979	1426($\pm$433)
1980	1910($\pm$394)

Heron Section

This study section was established in the spring of 1979 and is 15,000 feet long. The section ends at the mouth of the Big Hole River and its trout population has been described by Wells and Decker (1980). Estimated numbers, standing crop and summer mortality rates for brown trout are given in Table 4. Rainbow trout are very rare in this reach of the river.

Table 4. Estimated spring and fall, 1980, numbers, standing crops and summer mortality rates for brown trout in the Heron Section of the Big Hole River (80% C.I.).

April, 1980					September, 1980			
Age	Avg. Length	Number	Biomass	Summer Mortality %	Age	Avg. Length	Number	Biomass
II	9.9	1364	493	35%	II	12.5	891	672
III	12.1	1070	698	55%	III	14.4	484	554
IV+	14.8	947	1098	75%	IV+	16.4	239	384
		3382	2289				1614	1610
		($\pm$1097)	($\pm$497)					

Numbers of brown trout age III and age IV and older decreased by 55 and 75 percent from spring to fall. These mortality rates are less than those encountered in 1979 but remain excessive when compared with the Melrose Section (Wells and Decker-Hess, 1980). Flows during the irrigation season in 1980 were greater than during 1979, however, water temperatures reached 80°F in early September, 1980. The effect of low irrigation season flow and associated high water temperatures appeared to cause excessive decreases in the numbers of older brown trout from spring to fall during 1979 and 1980. The adverse effects of low flow and high water temperatures are also apparent if we compare fall condition factors for brown trout in the Melrose Section with brown trout in the Heron Section (Table 5).

Table 5. Fall condition factors for brown trout in the Melrose and Heron Sections of the Big Hole River, September, 1980.

Length Group	Section	Mean Condition Factors
7.0-10.9	Melrose	39.45
	Heron	37.76
10.9-13.9	Melrose	39.24
	Heron	37.91
14.0+	Melrose	39.11
	Heron	35.62

Condition factor is a means of assessing the general well being of fishes using a length/weight relationship. Condition factors for brown trout of all length groups in the Melrose Section were greater than for the Heron Section.

Ruby River

Sailor Section

This study section was established in the spring of 1979 and is 16,500 feet long. It begins at the county bridge located in T4S R6W S23 and extends downstream. The fish population of this section has been described by Wells and Decker-Hess (1980). A U.S.G.S. stream gaging station was installed just downstream from the study section in July, 1979. The long term objective of this study section will be to investigate the relationship between stream flow, water temperature and trout populations.

Average daily flow from July 24 through Sept. 30, 1980 and maximum daily water temperature from July 24 through Sept. 30, 1980 are depicted in Figure 5. Average daily flow was least on Aug. 3 (110 cfs) and greatest on Sept. 13 (349 cfs). The maximum daily water temperature was 70.2°F on July 25, 1980.

Numbers and standing crops of brown trout during March and September, 1980 are given in Table 6.

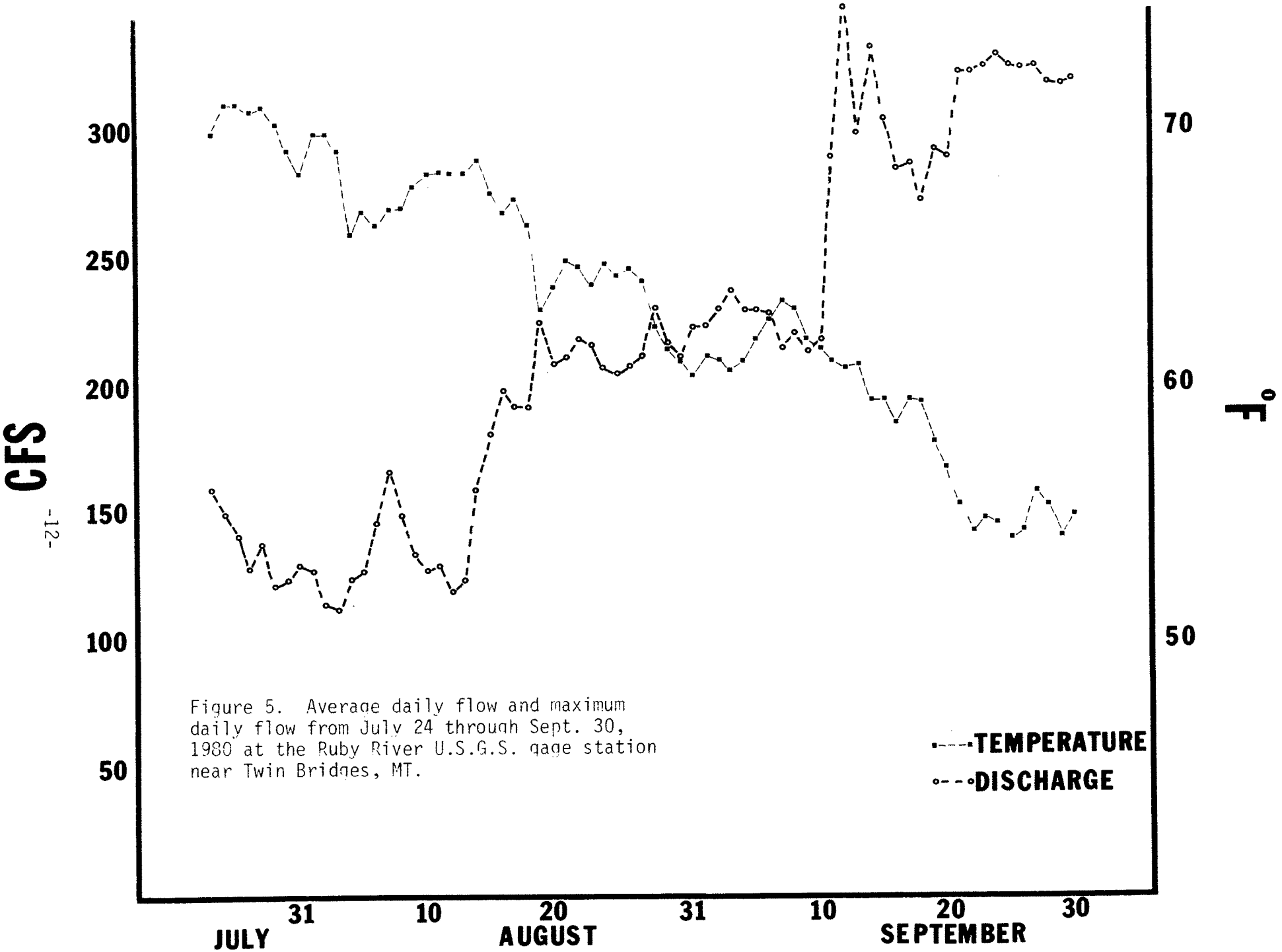


Figure 5. Average daily flow and maximum daily flow from July 24 through Sept. 30, 1980 at the Ruby River U.S.G.S. gage station near Twin Bridges, MT.

Table 6. Numbers and standing crops of brown trout in the Sailor Section of the Ruby River, March and September, 1980.

March				September*			
Age	Avg. Length	Number	Biomass (lbs)	Age	Avg. Length	Number	Biomass (lbs)
II	9.5	1300	444	II	11.2	1405	743
III	12.0	849	533	III	14.6	789	920
IV+	14.1	553	561	IV+	16.6	770	1326
		2702	1538			2964	2989
		(±412)	(±198)			(±926)	(±969)

*Numbers of brown trout in September, 1980 are overestimated due to movement of spawning brown trout into and out of the study section between mark-and-recapture.

Big Hole, Beaverhead and Ruby River Tributaries

During the field season of 1979 and 1980, fifty tributaries of the Beaverhead, Big Hole and Ruby Rivers were selected for investigation of their fisheries and as potential water allocation areas. The fishery surveys completed for the Big Hole River tributaries have been presented (Wells and Decker-Hess, 1981). The following streams were selected in the Beaverhead River drainage: Big Sheep Creek, Blacktail Deer Creek, East Fork Blacktail Deer Creek, West Fork Blacktail Deer Creek, Bloody Dick Creek, Corral Creek, Deadman Creek, East Fork Clover Creek, Grasshopper Creek, Hellroaring Creek, Horse Prairie Creek, Long Creek, Medicine Lodge Creek, Odell Creek, Red Rock Creek, Tom Creek and West Creek (Figure 6). Cottonwood Creek, East Fork Ruby River, Middle Fork Ruby River, Upper Ruby River, Warm Springs Creek and West Fork Ruby River were the streams selected in the Ruby Drainage (Figure 7).

Instream Flow Recommendations

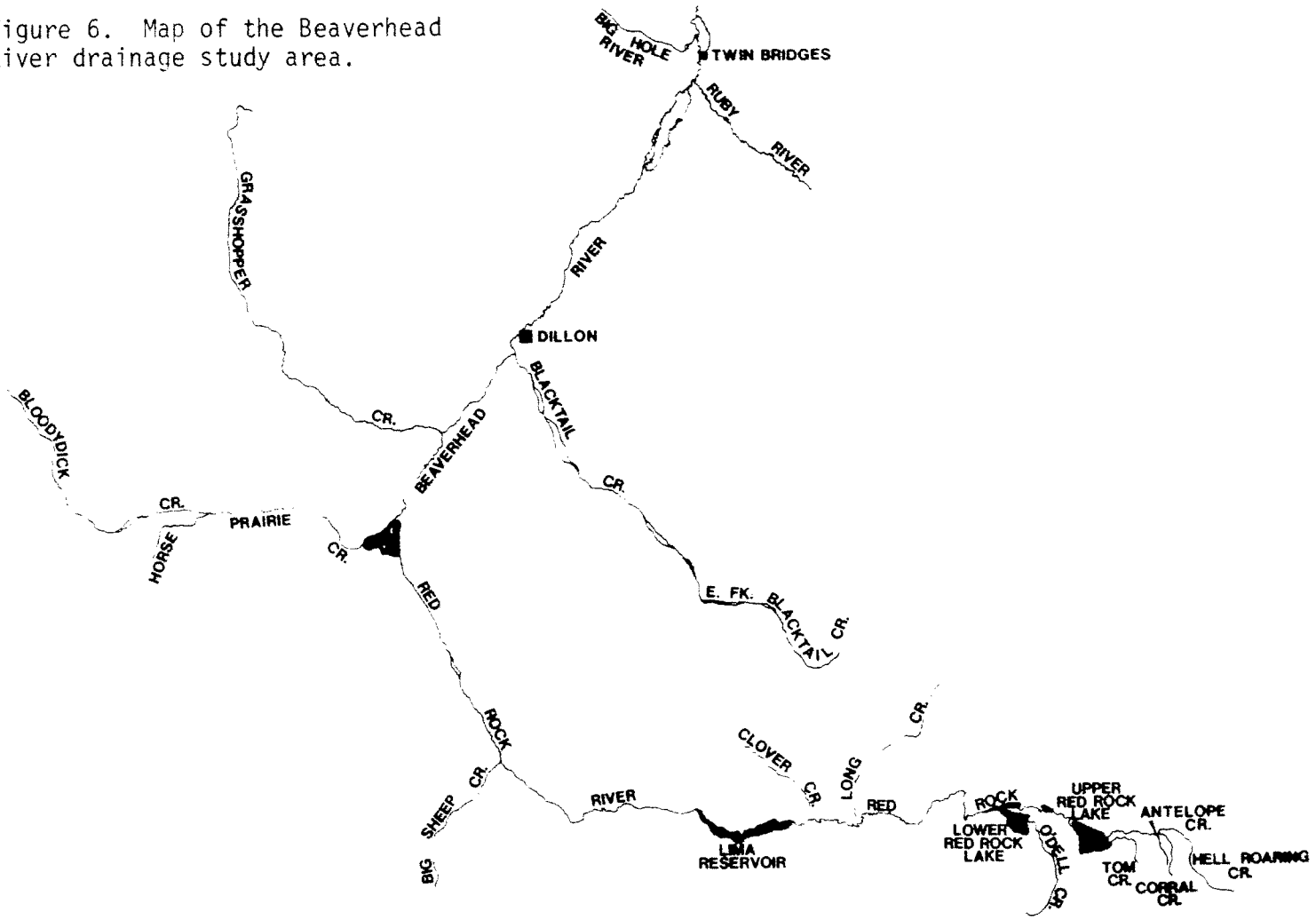
Recommendations for the low flow period (ten month period of the year when flows not influenced by snowmelt) and the lower and upper inflection points are presented for the selected tributaries of the Big Hole (Figure 8), Beaverhead and Ruby Rivers (Table 7). Low flow recommendations corresponded to the upper inflection point in streams where arctic grayling utilized the stream, an excellent fishery existed, recreational use was high, or a major quantity of water was provided to the drainage.

Recommendations for the high flow period (two month period of year when flows influenced by snowmelt) are not presently available on most streams due to a lack of long-term flow data.

Fisheries Surveys - Beaverhead and Ruby Tributaries

Game fish captured by electrofishing in the tributaries of the Beaverhead and Ruby Rivers were brook trout (Salvelinus fontinalis), rainbow trout (Salmo

Figure 6. Map of the Beaverhead River drainage study area.



The study areas of the Beaverhead and Red Rock River Drainages.

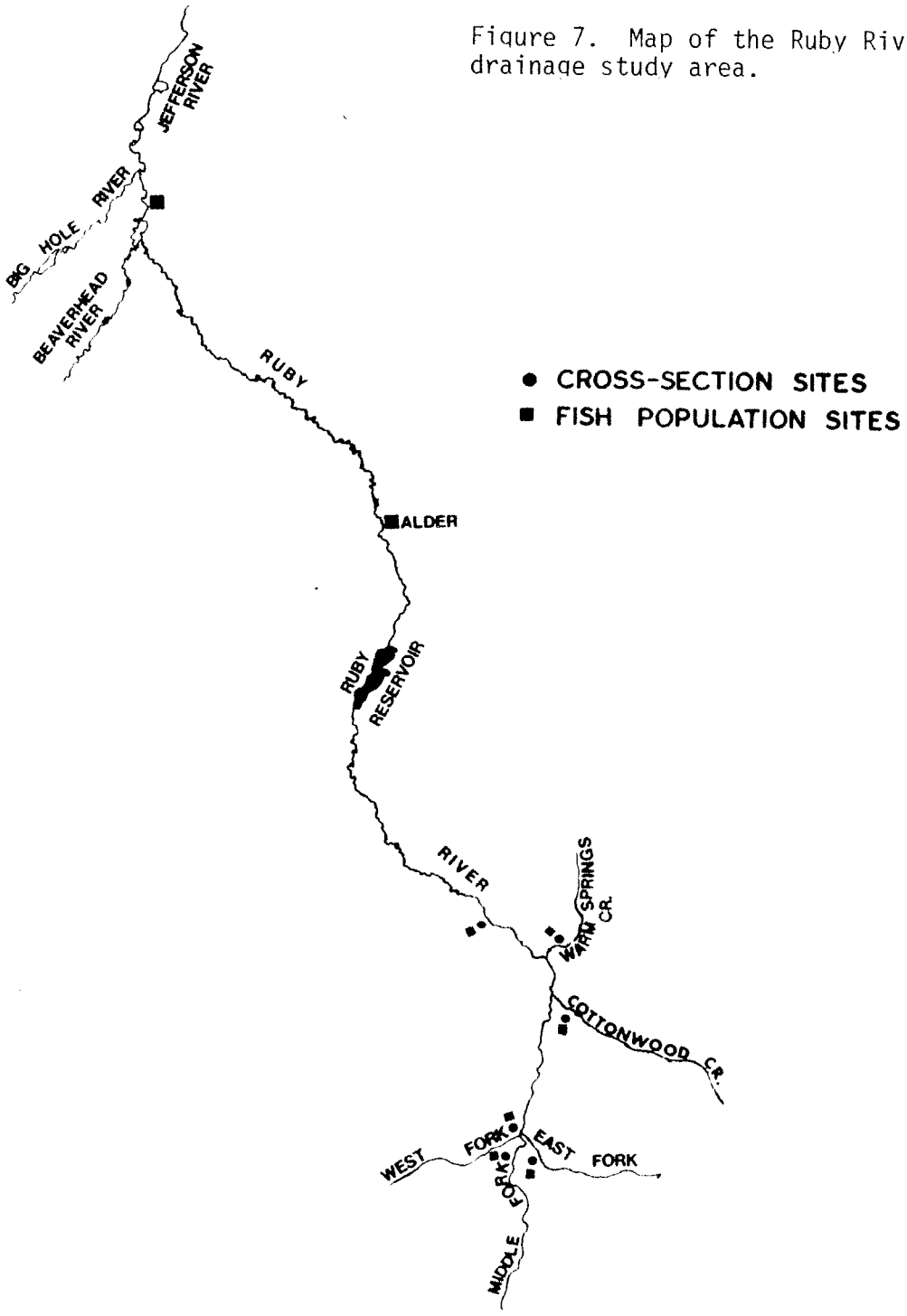


Figure 7. Map of the Ruby River drainage study area.

The study area of the Ruby River Drainage.

gairdneri), cutthroat trout (Salmo clarki), cutthroat X rainbow hybrids, brown trout (Salmo trutta), arctic grayling (Thymallus arcticus), mountain whitefish (Prosopium williamsoni), and burbot (Lota lota). Nongame species included longnose sucker (Catostomos catostomos), white sucker (Catostomus commersoni), mountain sucker (Catostomus platyrhynchus), mottled sculpin (Cottus bairdi), longnose dace (Rhinichthys cataractae) and a species of special concern, the stonecat (Notorus flavus).

The brook trout was present in nine of the twelve streams electrofished in the Beaverhead drainage (Table 8). It was the predominant salmonid species in seven of the streams. Numbers of brook trout captured in two 1,000 ft. runs (calculated to 1,000 ft. on longer sections for comparison) varied from a low of four in Horse Prairie Creek to a high of 325 in Corral Creek. Length of the individuals captured ranged between 2.0-14.9 inches.

Table 7. Low flow recommendations with lower and upper inflection points (in cfs) for selected tributaries of the Big Hole, Beaverhead and Ruby Rivers.

Stream	Low Flow Recommendations (cfs)	Inflection Points (cfs) Lower	Upper
Big Hole Tributaries			
Birch Cr.	12	12	24
Canyon Cr.	4	2	5
Camp Cr.	4	3	5
Deep Cr.	30	20	40
Divide Cr.	3	1.5	3
Fishtrap Cr.	10	5	10
Francis Cr.	5	2	5
French Cr.	10	8	14
Governor Cr.	9	3	9
Johnson Cr.	7	5	8.5
Joseph Cr.	4	3	5.5
LaMarche Cr.	15	12	20
Miner Cr.	10	3	10
Moose Cr.	6	3	8
Mussigbrod Cr.	5	2	7
N. F. Big Hole River	45	25	60
Pattongail Cr.	20	20	64
Pintlar Cr.	3	3	7
Ruby Cr.	8	4	12
S. F. Big Hole River	24	12	24
Steel Cr.	9	2	9
Swamp Cr.	10	8	15
Trail Cr.	14	14	25
Trapper Cr.	4	3	6
Warm Springs Cr.	14	8	18
Willow Cr.	10	8	13
Wise River	45	45	60

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Table 7. Continued

Stream	Low Flow Recommendations (cfs)	Inflection Points (cfs) Lower	Upper
Beaverhead River Tributaries			
Big Sheep Cr.	40	20	50
Blacktail Deer Cr.	40	36	50
E. Fk. Blacktail Deer Cr.	20	16	26
W. Fk. Blacktail Deer Cr.	4	3.0	4.5
Bloody Dick Cr.	24	18	26
Corral Cr.	4.5	2	4.5
Deadman Cr.	7	4.5	8.0
E. Fk. Clover Cr.	4	2	4.5
Grasshopper Cr.	25	22	28
Hellroaring Cr.	15	10	15
Horse Prairie Cr.	34	24	38
Long Cr.	6	4.0	6
Medicine Lodge Cr.	11	10	12
Odell Cr.	16	10	16
Red Rock Cr.	18	12	18
Tom Cr.	2	0.4	2
West Cr.	2	2	2
Ruby River Tributaries			
Cottonwood Cr.	4.5	4.5	6.5
E. Fk. Ruby River	9	9	11
Middle Fk. Ruby River	9	7	17
Upper Ruby River	85	55	120
Warm Springs Cr.	*	--	--
W. Fk. Ruby River	6	6	14

*The majority of the flow in lower Warm Springs Creek is provided by warm springs. Because of the unique environment resulting from these warm springs, all unappropriated waters are requested to remain instream for purposes of maintaining fish and wildlife habitat.

Table 8. Numbers and length ranges of game fish species captured in two electrofishing runs for selected tributaries of the Beaverhead and Ruby Rivers (section length is 1,000 ft. unless designated otherwise).

Stream	Species	No. Captured Per Total Section/1,000 ft.	Length Range (inches)
Beaverhead and Red Rock Rivers			
Big Sheep[a/]	Brown Trout	249/37	4.5-24.4
	Rainbow Trout	158/22	4.5-20.4
Blacktail Deer Cr.[b/]	Brook Trout	156/30	3.0-13.9
	Rainbow Trout	14/3	6.6-14.7
	Mountain Whitefish	--	
E. Fk. Blacktail Deer Cr.[c/]	Brook Trout	599/164	4.0-14.9
	Mountain Whitefish	46/3	9.4-18.1
	Rainbow Trout	34/9	6.4-16.1
W. Fk. Blacktail Deer Cr.	Brook Trout	83	4.0-10.4
	Rainbow Trout	9	6.4-16.1
Blood Dick Cr.[d/]	Brook Trout	568/161	3.5-12.5
	Rainbow Trout	168/48	2.9-14.9
	Mountain Whitefish	80/23	9.1-18.3
Corral Cr.	Brook Trout	325	2.0-12.9
	Yellowstone Cutthroat Trout	9	3.9- 6.2
Deadman Cr.	Rainbow, Cutthroat Trout & Rainbow x Cutthroat Hybrids	143	4.0-12.7
E. Fk. Clover Cr.	Brook Trout	90	2.0- 9.9
	Cutthroat Trout	13	4.2- 9.6
Grasshopper Cr.[e/] (blow Bannck, MT)	Brown Trout	57/8	6.5-17.4
	Mountain Whitefish	25/3	6.9-15.0
	Rainbow Trout	9/1	4.1-14.4

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Table 8. Continued.

Stream	Species	No. Captured Per Total Section/1,000 ft.	Length Range (inches)
Horse Prairie Cr.[f/]	Brown Trout	165/21	6.7-24.3
	Brook Trout	31/4	6.7-14.1
	Rainbow Trout	15/2	7.8-18.8
Long Cr.	Cutthroat Trout	46	4.0-13.9
	Brook Trout	5	6.0-14.2
Medicine Lodge Cr.	Brook Trout	49	3.0-12.9
	Rainbow Trout	33	4.5-12.4
Ruby River Tributaries			
Cottonwood Cr.	Rainbow Trout	4	5.9-11.3
	Cutthroat Trout	1	15.5
E. Fk. Ruby River[g/]	Rainbow Trout	46/23	3.7-13.6
	Rainbow x Cutthroat Hybrids	26/13	4.2-10.6
Middle Fk. Ruby River[h/]	Cutthroat Trout	12/7	4.2-10.3
	Rainbow Trout	11/7	6.4-10.1
	Rainbow x Cutthroat Hybrids	11/7	4.7-10.9
Upper Ruby River[i/]	Rainbow Trout	727/177	3.5-15.2
	Mountain Whitefish	143/35	4.0-17.9
	Brown Trout	51/12	13.3-17.6
Warm Springs Cr.	Rainbow & Cutthroat Trout and Rainbow x Cutthroat Hybrids	24	7.7-12.7
	Mountain Whitefish	3	13.6-14.6
	Stonecat	3	4.0- 6.1
W. Fk. Ruby River[j/]	Rainbow Trout	5/3	5.4-13.1
	Rainbow x Cutthroat Hybrids	19/10	6.2-10.8
	Mountain Whitefish	4/2	10.7-15.2

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Table 8. Continued.

[a/] two sections totalling 13,728 ft. in length
[b/] 5,280 ft. section
[c/] 3,650 ft. section; Peterson, 1975
[d/] 3,540 ft. section; Peterson, 1975
[e/] 7,280 ft. section
[f/] 7,590 ft. section electrofished in 1972
[g/] 2,000 ft. section; Elser and Marcoux, 1972
[h/] 1,650 ft. section; Elser and Marcoux, 1972
[i/] 4,100 ft. section; Peterson, 1979
[j/] 1,900 ft. section; Elser and Marcoux, 1972

The rainbow trout were captured in eight of the twelve streams electrofished in the Beaverhead drainage. This species was only predominant in the upper section of Big Sheep Creek. Numbers of rainbow trout captured in two 1,000 ft. electrofishing runs varied from one in Grasshopper Creek to 48 in Bloody Dick Creek. Length range varied from 2.9 to 20.4 inches.

Cutthroat trout were present in three of the twelve streams electrofished. Only in Corral Creek were pure Yellowstone cutthroat trout found. In the East Fork Clover Creek and Long Creek, the trout captured were westslope x Yellowstone cutthroat hybrids (BLM, unpublished data). The cutthroat trout were predominant only in Long Creek. Numbers captured varied from nine in Corral Creek to 46 in Long Creek. Length range varied from 3.9-13.9 inches.

The brown trout were captured in three of the larger streams where the electrofishing sections were located in their lower reaches. It was the predominant salmonid species in Horse Prairie and Grasshopper Creeks and the lower section of Big Sheep Creek. Numbers of brown trout captured ranged from eight in Grasshopper Creek to 27 in lower Big Sheep Creek. Length varied from 4.5 to 24.4 inches.

The rainbow x cutthroat hybrid was found in only one stream, Deadman Creek, where it was the only salmonid present.

The mountain whitefish was captured in four of the twelve streams electrofished in the Beaverhead drainage. It was present in Blacktail Deer Creek, East Fork Blacktail Deer Creek, Bloody Dick Creek and Grasshopper Creek. Total length varied between 6.9-18.3 inches.

Red Rock, Odell, Hellroaring and Tom Creeks in the Centennial Valley have been investigated to determine their importance as spawning areas for the adfluvial arctic grayling and cutthroat trout from the Red Rock Lakes. Red Rock Creek is the major stream used by the spawning grayling (Peterson, 1976 and 1979 and Wells and Decker-Hess, 1981). Tom and Odell Creeks appear to be of lesser value during their reproductive stage. While not currently used by the grayling, cutthroat trout from the upper lake have been documented spawning in Hellroaring Creek (Peterson, 1976).

The fishery of upper Ruby River is dominated by the rainbow trout (Table Numbers of this species captured in two 1,000 ft. electrofishing runs varied from three in the West Fork Ruby River to 177 in the upper Ruby River below Warm Springs Creek. Lesser numbers of cutthroat trout and rainbow x cutthroat hybrids were also captured throughout the upper drainage. The mountain whitefish was found in low number in three of the streams surveyed. The brown trout was only captured in the main river, ranging in length from 13.3 to 17.6 inches.

Warm Springs Creek, fed primarily by 70° water from springs located in its lower reaches, is also inhabited by the stonecat. This is the only mountainous stream where this species has been found. Its normal habitat is lowland warm water streams and river (Brown, 1971).

Standing crop estimates of gamefish in the tributaries of the Beaverhead River were caluculated using a mark-recapture method (Table 9). Population

estimates of brook trout per 1,000 ft. varied from seven trout weighing four pounds in Horse Prairie Creek to 547 trout totalling 43 pounds in Corral Creek. The brook trout was the predominant salmonid species in seven of the twelve streams surveyed.

Standing crop estimates of rainbow trout per 1,000 ft. varied from four trout weighing three pounds in Horse Prairie Creek to 100 trout weighing twelve pounds in Bloody Dick Creek. The rainbow trout was predominant in only one of the twelve streams surveyed.

The brown trout standing crop estimates in a 1,000 ft. section varied from eleven trout weighing six pounds in Grasshopper Creek to 76 trout weighing sixty-seven pounds in the lower section of Big Sheep Creek. The brown trout was predominant in three streams.

The largest standing crop of gamefish in a tributary of the Beaverhead River was in Bloody Dick Creek. A total of 618 gamefish weighing 102 pounds in a 1,000 ft. section was estimated.

Standing crop estimates of rainbow trout (including rainbow x cutthroat hybrids and cutthroat trout) varied from 27 trout weighing six pounds in the Middle Fork Ruby River to 659 trout weighing 63 pounds in the upper Ruby River. Peterson (1976 and 1979) found depressed trout populations throughout the three forks and in the main Ruby above the confluence of Warm Springs Creek. The section on the main Ruby discussed in this report was below the confluence.

In comparing the trout populations in the tributaries of the Big Hole, Beaverhead and Ruby Rivers, several differences are apparent. The salmonid population of the tributaries of the upper Ruby are severely depressed. High natural and man-caused sediment loads and low riparian zone quality are the major limiting factors in this drainage. Condition of trout in the tributaries of the Ruby River was lower than that found in the other two drainages. Total biomass of trout in a 1,000 ft. section were significantly different (PS .10) between the tributaries of the Big Hole and Ruby Rivers.

Table 9. Estimated standing crops of gamefish per 1,000 ft. for selected tributaries of the Beaverhead and Ruby Rivers. Eighty percent confidence intervals are in parentheses.

Stream	Species	Length Group	Per 1,000 ft. Number	Pounds
Big Sheep Cr. (Upper Section)	Rainbow Trout	8.0- 9.9	12	
		10.0-13.9	35	
		14.0-20.5	5	
			52(±16)	33(±10)
	Brown Trout	8.0- 9.9	2	
		10.0-13.9	12	
		14.0-24.4	10	
			24(±9)	32(±14)
			76(±18)	65(±17)
(Lower Section)	Brown Trout	9.0- 9.9	4	
		10.0-13.9	54	
		14.0-18.9	18	
			76(±23)	67(±17)
Blacktail Deer Cr.	Brook Trout	5.0- 6.9	10	
		7.0- 9.9	35	
		10.0-13.9	24	
			69(±17)	24(±6)
E. Fk. Blacktail Deer Cr.	Brook Trout	4.0- 5.9	43	
		6.0- 9.9	67	
		10.0-14.9	46	
			156(±11)	48(±2)

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Table 9. Continued

Stream	Species	Length Group	Per 1,000 ft. Number	Pounds
	Rainbow Trout	6.4- 9.9	5	
		10.0-16.1	3	
			8(±1)	4(±1)
	Total Trout		164(±11)	52(±2)
W. Fk. Blacktail Deer Cr.	Brook Trout	5.0- 5.9	26	
		6.0- 9.9	57	
		10.0-10.4	1	
			84(±9)	15(±1)
Bloody Dick Cr.	Brook Trout	4.0- 5.9	254	
		6.0- 9.9	218	
		10.0-12.5	9	
			481(±99)	54(±8)
	Rainbow Trout	4.0- 5.9	69	
		6.0- 9.9	25	
		10.0-14.9	6	
			100(±33)	12(±2)
	Mountain Whitefish	9.1-14.9	30	
		15.0-18.3	7	
			37(±10)	36(±9)
	Total Game Fish		618(±105)	102(±11)
Corral Cr.	Brook Trout	4.0- 5.9	406	
		6.0- 9.9	135	
		10.0-12.9	6	
			547(±69)	43(±3)

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Table 9. Continued.

Stream	Species	Length Group	Per 1,000 ft. Number	Pounds
Deadman Cr.	Cutthroat, Rainbow, and Cutthroat x Rainbow Hybrid Trout	4.0- 5.9	116	
		6.0- 9.9	83	
		10.0-12.7	3	
			202(±34)	23(±3)
E. Fk. Clover Cr.	Brook Trout	4.0- 5.9	111	
		6.0- 9.9	159	
			270(±101)	35(±13)
Grasshopper Cr.	Brown Trout	6.5- 9.9	4	
		10.0-13.9	5	
		14.0-17.4	2	
			11(±2)	6(±1)
	Mountain Whitefish	4.1-14.4	5(±2)	2(±1)
	Total Game Fish		16(±3)	8(±1)
Horse Prairie Cr.	Brown Trout	8.0-12.9	6	
		13.0-16.9	19	
		17.0-24.9	5	
			30(±4)	39(±5)
	Rainbow Trout	7.8-18.8	4(±1)	3(±1)
	Brook Trout	6.7-14.1	7(±3)	4(±1)
	Total Trout		41(±5)	46(±5)
Long Cr.	Cutthroat Trout	4.0- 5.9	33	
		6.0- 9.9	96	
		10.0-13.9	9	
			138(±64)	26(±13)

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Table 9. Continued.

Stream	Species	Length Group	Per 1,000 ft. Number	Pounds
Medicine Lodge Cr.	Brook Trout	4.0- 5.9	22	
		6.0- 9.9	71	
		10.0-12.9	34	
			127(±58)	33(±15)
	Rainbow Trout	4.5- 5.9	16	
		6.0- 9.9	15	
		10.0-12.4	7	
			38(±8)	10(±2)
	Total Trout		165(±59)	43(±15)
E. Fk. Ruby River	Rainbow and Cutthroat Trout and Rainbow x Cutthroat Hybrids	4.0- 5.9	28	
		6.0- 9.9	15	
		10.0-13.6	4	
			47(±10)	6(±2)
M. Fk. Ruby River	Rainbow and Cutthroat Trout and Rainbow x Cutthroat Hybrids	4.2- 5.9	2	
		6.0- 9.9	16	
		10.0-11.8	9	
			27(±6)	6(±2)
Upper Ruby River	Rainbow Trout	4.0- 5.9	532	
		6.0- 9.9	89	
		10.0-15.2	38	
			659(±136)	63(±8)
	Brown Trout	13.3-17.6	15(±2)	19(±2)
	Mountain Whitefish	10.0-17.9	46(±9)	32(±6)
	Total Game Fish		720(±136)	114(±10)

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Table 9. Continued.

Stream	Species	Length Group	Per 1,000 ft. Number	Pounds
W. Fk. Ruby River	Rainbow, Cutthroat, and Rainbow x Cutthroat Hybrids	5.0- 5.9	1	
		6.0- 9.9	16	
		10.0-13.4	15	
			32(±12)	12(±4)

RECOMMENDATIONS

This project should be continued. Efforts should be continued to assess the effects of flow and water temperatures on trout populations in the Big Hole and Ruby Rivers.

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Waters Referred to:

Big Hole River Sec. 1	3-02-0425-01
Big Hole River Sec. 2	3-02-0450-01
Birch Creek	3-02-0575-01
Canyon Creek	3-02-1075-01
Deep Creek	3-02-1980-01
Divide Creek	3-02-1725-01
Fish Trap Creek	3-02-2200-01
Francis Creek	3-02-2325-01
French Creek	
Governor Creek	3-02-2525-01
Joseph Creek	3-02-3025-01
Johnson Creek	3-02-3000-01
LaMarche Creek	3-02-3175-01
Miner Creek	3-02-3950-01
Moose Creek	3-02-4050-01
Mussigbrod Creek	3-02-4150-01
North Fork Big Hole River	3-02-4275-01
Pattengail Creek	3-02-4500-01
Pintlar Creek	3-02-4550-01
Ruby River Sec. 1	3-01-6360-01
Ruby Creek	3-02-5000-01
South Fork Big Hole River	3-02-0475-01
Steel Creek	3-02-5950-01
Swamp Creek	3-02-6175-01
Trail Creek	3-02-6450-01
Trapper Creek	3-02-6475-01
Warm Springs Creek	3-02-6750-01
Willow Creek	3-02-6950-01
Wise River	3-02-7025-01
Big Sheep Creek	3-01-6740-01
Blacktail Deer Creek	3-01-0720-01
East Fork Blacktail Deer Creek	3-01-2380-01
West Fork Blacktail Deer Creek	3-01-8120-01
Bloody Dick Creek	3-01-0740-01
Corral Creek	3-01-1500-01
Deadman Creek	3-01-1940-01
East Fork Clover Creek	3-01-2400-01
Grasshopper Creek	3-01-3100-01
Hellroaring Creek	3-01-3340-01
Horse Prairie Creek	3-01-3500-01
Long Creek	3-01-4570-01
Medicine Lodge Creek	3-01-4860-01
Odell Creek	3-01-5600-01
Red Rock Creek (River Sec. 3)	3-01-6180-01
Tom Creek	3-01-7750-01
West Creek	3-01-8080-01

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Cottonwood Creek	3-01-1620-01
East Fork Ruby River	3-01-2520-01
Middle Fork Ruby River	3-01-6380-01
Ruby River Sec. 2	3-01-6380-01
Warm Springs Creek	3-01-8020-01
West Fork Ruby River	3-01-8160-01

Key Words:

Trout, rainbow
Trout, brown
Population survey
Population dynamics
Stocking problems
Temperature/environment/
Instream flow needs