MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS

FISHERIES DIVISION

JOB PROGRESS REPORT

State: Montana Title: Southwest Montana Fisheries Study

Project No.: F-9-R-30 Title: Inventory and Survey of the Waters of the Gallatin and Madison Drainages

Job No.: I-a

Project Period: July 1, 1981 through June 30, 1982

Report Period: April 1, 1981 through March 31, 1982

ABSTRACT

Brown trout population estimates were calculated for the Gallatin River at Logan. In 1981, the Gallatin had a total of 378 III+ browns per mile of stream--the highest number documented to date. The estimate for rainbow trout was not achieved due to spawning movements.

Discharge and temperature of the Gallatin River were monitored. The minimum flow occurred on August 16th -- 379 cfs. The maximum daily water temperature exceeded 70.0°F on 38 days. Both of these situations are considered detrimental to the trout resource.

BACKGROUND

The East Gallatin River flows through both a heavily developed agricultural and urban area (City of Bozeman). The City of Bozeman discharges treated sewage effluent into the East Gallatin River near its source. Other urban runoff effluents such as storm sewers have direct access to the East Gallatin River via tributaries, such as Sourdough Creek. Industrial wastes and septic tanks not yet hooked up to city facilities may also effect the river fishery.

The Gallatin River is one of Montana's excellent trout rivers. The upper reaches are considered of Blue Ribbon quality and receive enough angler pressure that trout population size and age structure may be altered, reducing its quality as a larger trout fishery. The lower reaches are not nearly as well known, but do support 3,900 angler days of fishing (1975). The lower river is impacted severely by the almost total annual dewatering of the Gallatin River above the confluence with the East Gallatin River.

OBJECTIVES AND DEGREE OF ATTAINMENT

1. To determine fish populations, species composition and growth rates for one section on the East Gallatin River and one section on the Gallatin River near Logan. Work completed on both rivers. Gallatin River data entered below. East Gallatin data will be in a future report.

2. To obtain water temperature and water flow data on a section of the Gallatin River near Logan (data included).

3. To determine the success of planting 1- to 2-inch rainbow versus 4- to 6-inch rainbow by gill net sampling on Harrison Reservoir. (Data will be included in a future report).

4. To mitigate or enhance habitat alterations due to agricultural, residential, mining and industrial development. Work accomplished and reported below.

PROCEDURES

Electrofishing gear was used to sample fish populations in the East Gallatin and upper Gallatin rivers. Electrofishing was conducted by floating through the section in a fiberglass boat, utilizing a mobile positive electrode. Fish populations in the lower Gallatin River were electrofished using a fixed-positive electrode mounted on a boat. Population estimates were made using the Peterson mark-and-recapture method. Usually, a 10- to 15-day period was allowed between marking and recapture trips. Captured fish were measured to the nearest 0.02 pound and 0.1 inch. Scales were taken (1.0 per 0.5 inch) to determine age and growth rates. Mathematical computations were made by using a computer program employing methods described by Vincent (1971 and 1974). Discharges were recorded at the USGS gage station located near Logan.

FINDINGS

Lower Gallatin River

Fish Population

Manhattan-Logan Section

This study section (Figure 1) is located in the lower Gallatin drainage, beginning at Nixon Bridge immediately below the confluence of the East Gallatin and Gallatin rivers. The section runs for 5 miles downstream to the Burlington Northern Railroad Bridge adjacent to the west edge of the town of Logan.

The Gallatin River within this reach meanders through a cottonwood bottom on the left bank and against cliffs on the right bank. Man's impacts on this section of the river include woody cover removal, rock rip-rap, channel straightening and dewatering.

Game fish in this section (in descending order of abundance) include: mountain whitefish, brown, rainbow and brook trout. Nongame fish present include: white suckers, longnose suckers, mottled sculpin, and longnose dace.

Estimates for standing crop of brown trout in the spring of 1981 are given in Table 1 and for the 1979 to 1981 period in Table 2.

Table 1. Estimates of brown trout standing crop in the Manhattan-Logan study section of the Gallatin River, spring 1981 (80% confidence intervals in parentheses).

Age	Average Length (In.)	Number	Number/Mile	Biomass (lbs)
III	13.2	1314 (±356)	263	1167.7
IV+	16.6	575 (±234)	115	912.9
TOTAL		1889 (±425)	378	2080.6

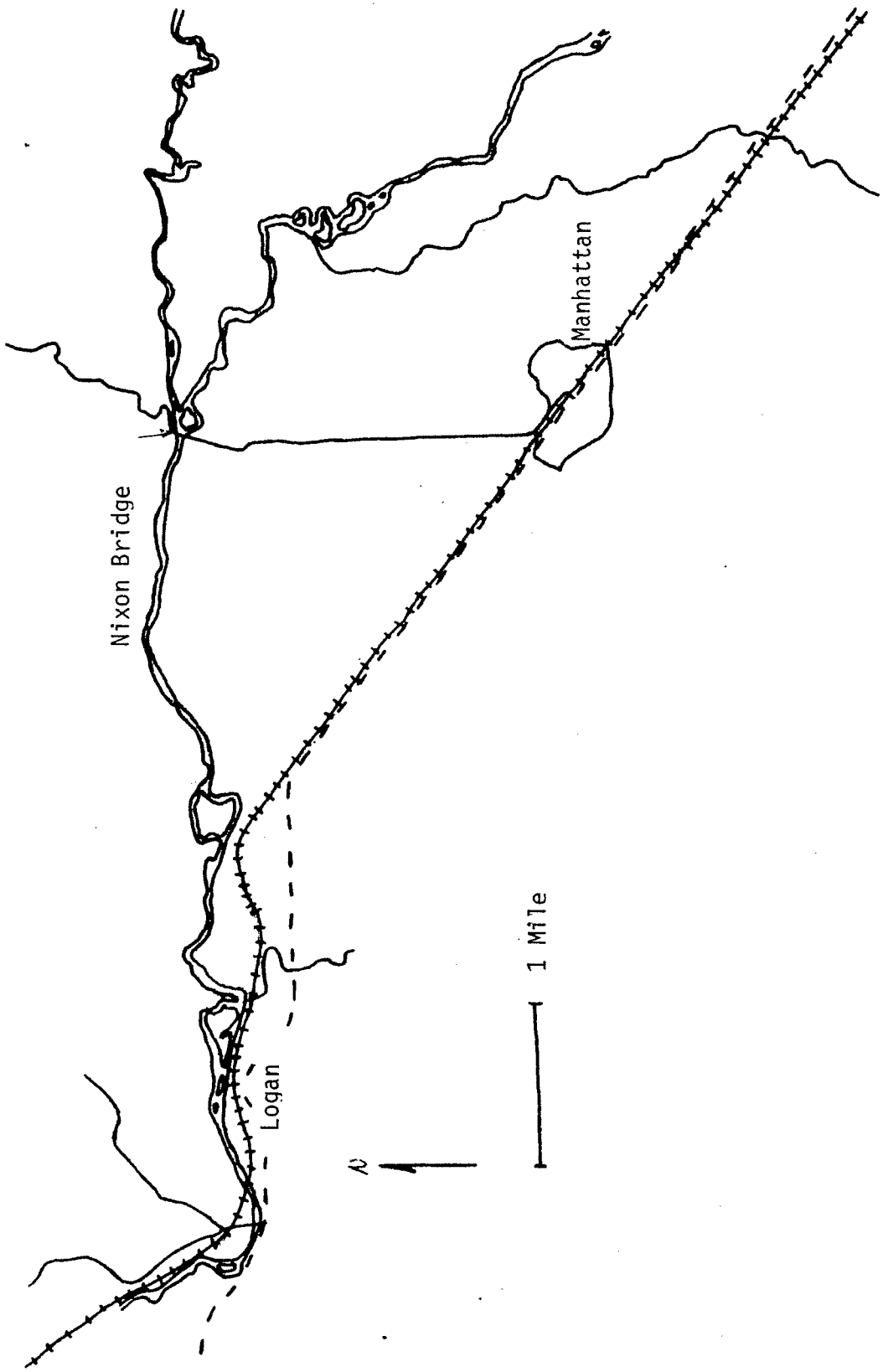

Figure 1. Map of the Gallatin River study section.

Table 2. Estimates of brown trout numbers per mile by age from fall 1979, and spring 1980 and 1981 for Age III+ fish (80% confidence intervals in parentheses).

Age	Fall 1979	Spring 1980	Spring 1981
III	182 (±109)	132 (±18)	263 (±71)
IV+	68 (± 63)	106 (±20)	115 (±47)
TOTAL	243 (±126)	238 (±27)	378 (±85)

Mortality rates are given in Table 3. Generally, these rates of mortality do not appear excessive, and do not suggest overharvest by anglers.

Table 3. Mortality rates for brown trout in the Manhattan-Logan section of the Gallatin River over recent years.

Number III + Browns Fall 1979: 243	Number IV+ Browns Spring 1980: 106	% Mortality: 56.4
Number III+ Browns Spring 1980: 238	Number IV+ Browns Spring 1981: 115	% Mortality: 51.7

Fisheries investigations on the lower Gallatin River indicate a catchable brown trout population (9.0 inches and larger) which varies between approximately 400 and 700 individuals per mile of stream in different years (Vincent and Rehwinkle, 1980 and 1981). Population estimates for rainbow trout show the catchable population (9.0 inches and larger) varies between approximately 350 and 1000 individuals per stream mile (Vincent and Rehwinkle, 1980 and 1981). The brown population is characterized by good numbers of fish exceeding 16.0 inches (approximately 75 to 80 per mile). Conversely, the rainbow population is almost completely confined to individuals of less than 16.0 inches.

As stated in previous reports, reliable sampling, and therefore reliable estimates, are confined to fish of Age III+ in the spring and II+ in the fall. Greatest consistancy is achieved when estimates are conducted in the non-spawning season (browns in the spring, rainbows in the fall). This annual sampling precludes seasonal mortality calculations.

Discharge and Temperature

Mean monthly discharges of the Gallatin River for the period of record (September 1893 to December 1905, and August 1928 to present), and 1981 monthly means are given in Table 4 (USGS 1981). Mean daily discharges for 1981 are given in Table 5.

Table 4. A comparison of mean monthly discharges of the Gallatin River at Logan, and 1981 monthly means.

Month	Mean Discharge (cfs)	1981 Mean Monthly Discharge
May	2 081	3 280
June	2 962	4 447
July	960	1 040
August	472	421
September	645	490

Table 5. Mean daily discharge of the Gallatin River at Logan, 1981 (USGS).

Day	Month				
	May	June	July	August	September
1	1 860	5 650	2 610	479	435
2	2 360	5 110	2 510	485	420
3	2 540	4 730	2 270	496	414
4	2 090	4 720	2 040	457	420
5	1 830	4 310	1 860	452	409
6	1 790	4 650	1 780	425	430
7	1 720	5 620	1 750	409	441
8	1 570	5 640	1 620	404	435
9	1 510	6 280	1 410	409	420
10	1 440	5 640	1 140	414	414
11	1 800	4 790	1 010	404	414
12	1 930	4 350	1 000	399	420
13	1 820	4 600	941	394	425
14	1 770	4 370	825	394	435

(continued on next page)

Table 5. Mean daily discharge of the Gallatin River at Logan, 1981 (USGS) (concluded).

Day	Month May	June	July	August	September
15	1 900	4 110	718	394	425
16	2 100	3 850	628	379	420
17	2 330	4 230	585	394	420
18	2 350	4 370	596	384	414
19	2 440	4 210	612	389	425
20	2 900	4 520	611	420	457
21	3 260	4 430	570	446	490
22	4 940	4 190	536	441	496
23	6 920	4 180	497	446	508
24	6 350	4 080	472	446	531
25	5 850	3 800	496	425	573
26	5 770	3 650	580	420	677
27	6 350	3 700	573	409	690
28	6 010	3 570	518	404	690
29	5 560	3 220	497	399	753
30	5 280	2 850	495	409	812
31	5 350	---	490	435	---
Maximum:	6 920	6 280	2 610	496	812
Minimum:	1 440	2 850	472	379	409
Mean:	3 280	4 447	1 040	421	490

The lowest flow occurred on August 16th (379 cfs). The recommended in-stream flow based on wetted perimeter measurements on riffles is 850 cfs. During the July 15th through September 15th period, all daily flows were below this level. In fact, the low flow period extended well beyond this usual period and on into October. The 1981 summer flow in the Gallatin River can be described by flows much higher than usual early, due to unusually high precipitation and flows lower than usual for the last half of the season. This low flow situation is very detrimental to the aquatic resource: it impacts the invertebrate production, fish security related to overhead vegetative cover, and indirect thermal addition. In the three years of work on the Gallatin River, this flow problem has occurred every year. A solution to this problem does not appear likely.

Water temperature data collected during the 1981 open-water period is presented in Tables 6a and 6b. During the period from May 13th to September 30th, six days of "no record" occurred in late August due to instrument problems.

Table 6a. Water temperatures of the Gallatin River at Logan during 1981 (Fish and Wildlife-operated Taylor 7-day thermograph), May - July.

Day	May			June			July		
	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.	Mean
1				56	50	53.0	66	60	63.0
2				55	49	52.0	65	59	62.0
3				53	51	52.0	66	60	63.0
4				52	49	50.5	66	61	63.5
5				56	50	53.0	67	62	64.5
6				58	54	56.0	66	64	65.0
7				57	53	55.0	66	63	64.5
8				53	51	52.0	62	58	60.0
9				51	59	50.0	64	59	61.5
10				54	50	52.0	65	62	63.5
11				55	52	53.5	67	63	65.0
12				55	51	53.0	68	63	65.5
13	51	42	46.5	53	51	52.0	71	65	68.0
14	54	48	51.0	51	47	49.0	71	67	69.0
15	56	50	53.0	50	46	48.0	69	66	67.5
16	53	46	49.5	51	49	50.0	68	64	66.0
17	51	45	48.0	52	49	50.5	67	64	65.5
18	57	48	52.5	53	49	51.0	65	61	63.0
19	58	52	55.0	56	51	53.5	72	63	67.5
20	57	53	55.0	56	53	54.5	73	61	67.0
21	54	49	51.5	57	52	54.5	74	62	68.0
22	49	48	48.5	60	54	57.0	74	62	68.0
23	58	48	53.0	61	56	58.5	71	61	66.0
24	59	53	56.0	61	54	57.5	68	61	64.5
25	59	52	55.5	62	54	58.0	71	60	65.5
26	56	53	54.5	64	57	60.5	67	56	61.5
27	59	50	54.5	64	57	60.5	71	59	66.0
28	58	52	55.0	62	56	59.0	73	60	66.5
29	60	52	56.0	62	54	58.0	72	60	66.0
30	56	53	54.5	65	56	60.5	72	60	66.0
31	56	51	53.5				73	60	66.5

Table 6b. Water temperatures of the Gallatin River at Logan during 1981 (Fish and Wildlife-operated Taylor 7-day thermograph), August and September.

Day	August Max.	August Min.	August Mean	September Max.	September Min.	September Mean
1	75	60	67.5	65	58	61.5
2	74	61	67.5	66	54	60.0
3	74	62	68.0	65	53	59.0
4	74	62	68.0	64	53	58.5
5	73	61	67.0	61	56	58.5
6	74	61	67.5	65	53	59.0
7	75	61	68.0	66	53	59.5
8	74	62	68.0	67	54	60.5
9	73	61	67.0	67	55	61.0
10	73	59	66.0	67	57	62.0
11	74	59	66.5	66	55	60.5
12	74	60	67.0	67	55	61.0
13	75	61	68.0	66	56	61.0
14	73	62	67.5	67	57	62.0
15	73	60	66.5	65	55	60.0
16	75	61	68.0	65	54	59.5
17	74	61	67.5	65	54	59.5
18	74	62	68.0	65	54	59.5
19	74	61	67.5	64	54	59.0
20	72	61	66.5	57	50	53.5
21	73	63	68.0	59	50	54.5
22	73	61	67.0	56	48	52.0
23	73	60	66.5	57	49	53.0
24	73	61	67.0	56	50	53.0
25	73	62	68.5	53	51	52.0
26				51	48	49.5
27				55	50	52.5
28				58	52	55.0
29				55	51	53.0
30				54	49	51.5
31				--	--	--

The maximum water temperature recorded was 75.0°F on August 1st, 7th, 13th, and 16th. The daily maximum exceeded 70.0°F 38 times (July 13th to August 25th). The daily mean never exceeded 70.0°F. The highest mean temperature was 69.0°F on July 14th. In general, the high number of days where the maximum water temperature exceeded 70°F is very undesirable. With no daily means exceeding 70°F it is suggested that the problem is not as severe as other rivers in the area. The impact of high maximums on the fishery resource as opposed to high means is still not clear.

In conclusion, the trout fishery of the lower Gallatin River has been quantified and is an excellent resource. The mortality rate of this population fluctuates. The causes of this fluctuation has not been proven, but summer discharges and elevated water temperatures are suspected. In light of the unlikelyhood of correcting these negative influences, and responsibilities elsewhere, further work on the lower Gallatin River will be terminated until corrective measures are identified and time is available.

East Gallatin River

Wild brown and rainbow trout population estimates were made in September 1980 and 1981. Data is not analyzed at this time, but will be included in a future progress report.

Hebgen Reservoir

No gill netting was done on Hebgen Reservoir during 1980 and 1981. Gill netting will be conducted in the future, time permitting.

Habitat Enhancement

A total of 15 streambank inspections were made in the Madison River drainage. These inspections involved streambank or streambed alterations by agricultural, residential, mining or industrial interests. Inspections resulted either prevented or minimized streambed or bank destruction.

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