MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS

FISHERIES DIVISION

JOB PROGRESS REPORT

STATE:	Montana	TITLE:	Southwest Montana Fisheries Study
PROJECT NO.:	F-9-R-28		
JOB NO.:	I-a	TITLE:	Inventory and Survey of the Water of the Gallatin and Madison Drainages

PROJECT PERIOD: July 1, 1979 through June 30, 1980

REPORT PERIOD : April 1, 1979 through March 31, 1980

ABSTRACT

Wild brown and rainbow trout population estimates were made on the Hoffman section of the East Gallatin River. It is located immediately below the sewage treatment outlet. Since 1973, when the sewage treatment outlet was relocated about two miles downstream to its present site, the wild trout numbers have increased 294 percent in numbers and 378 percent in biomass. This suggests either improved sewage treatment or higher dilution flows from the East Gallatin River or both.

Wild rainbow trout estimates from the Karst section of the Upper Gallatin River show an unusually high annual mortality for older trout (four and five years old). This would suggest that angling pressure is over-harvesting this portion of the wild rainbow trout population.

Brown trout population estimates were calculated for the Gallatin River at Logan. In 1979 the Gallatin had a total of 618 catchable size brown trout per mile of stream. Estimates calculated for spring 1980 showed 473 browns and 347 rainbows per mile.

Discharge of the Gallatin River was monitored. The minimum flow occurred on August 7 and was 382 cfs. This discharge was considered to be less than optimum for the fishery.

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.

OBJECTIVE AND DEGREE OF ATTAINMENT

1. To determine fish populations, species composition and growth rates for two sections on the East Gallatin and one section on the Gallatin River near Logan (Data included for one section on each river).

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 1-2 inch rainbow versus 4-6 inch rainbow by gill net sampling on Harrison Reservoir. (Data will be included in a future report.)

4. To obtain fish population data and run IFG-4 program to determine fishery-flow needs on selected rivers or tributaries as time permits. (Data will be included in a future report.)

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 fiberglas boat utilizing a mobile positive electrode. Fish populations in the lower Gallatin River were electrofished using fized positive electrode mounted on a boat. Population estimates were made by using the Peterson mark-and-recapture method. Usually, a 10-15 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 a computer programmed to use methods described by Vincent (1971 and 1974_a).

Discharges were recorded at the USGS gauge station located near Logan.

FINDINGS

East Gallatin River

In March, 1971, the City of Bozeman replaced an existing primary sewage treatment plant with a new plant capable of partial secondary treatment. The site of the new treatment plant was located about two miles downstream from the old site. The effluent from the old sewage treatment plant had detrimental effects on wild trout numbers, biomass, growth rates and reproduction. During the last few years the old plant was in operation (1966-70), electrofishing surveys showed few or no young-of-the-year or yearling trout present from the sewage outflow to the mouth of Middle Creek (Figure 1).

The Hoffman Ranch section was set up to monitor the effect of the new sewage treatment plant effluent on the wild trout populations. Since the past sewage effluent primarily effected reproduction (young-of-the-year and yearlings) and standing crops during the low flow winter period, spring and fall population work is essential. Table 1 shows the age structure, total numbers and total biomass estimates for wild brown and rainbow trout in the Hoffman Ranch section. Since the estimate of yearling and two-year old trout is greater in the fall than the spring, it suggests movement into the section of younger trout. Vincent (1968 and 1970) showed that limited or no reproduction below the old primary sewage effluent caused this same situation, which probably means that existed effluent levels are effecting reproduction ob both brown and rainbow trout. Figure 2 shows that the total biomass and numbers of brown and rainbow trout have increased 294 percent and 378 percent respectively since 1973, which suggests minimal effect on adult trout by existing effluent levels since 1977. This continued improvement is either due to (1) higher river flows diluting the effluent and/or improved sewage treatment has been discharging a less detrimental sewage effluent (Vincent, 1977).

Gallatin River

Karst Section - The Karst Ranch section of the Gallatin River is located approximately 24 miles downstream from the Yellowstone National Park boundary and is 2.2 miles in length (Figure 3). Beginning in the mid-50's and continuing through 1973, the Gallatin River in this area had been annually stocked with catchable sized rainbow trout. From 1970 through 1973 about 11,000 catchable sized rainbow trout were annually stocked in the 41 miles of the Gallatin from the Park boundary downstream. With the cessation of stocking in 1973, the river is being managed as a wild trout fishery. In 1978, the creel limit for trout changed from the 10 trout or 10 pounds and one trout limit to a five trout limit with only one to exceed 18 inches to insure a good larger wild trout fishery.

Table 2 shows the age structure, total numbers and total biomass for wild rainbow trout. No population estimates were made for brown trout due to their low numbers. Total numbers of rainbow trout one-year-old and

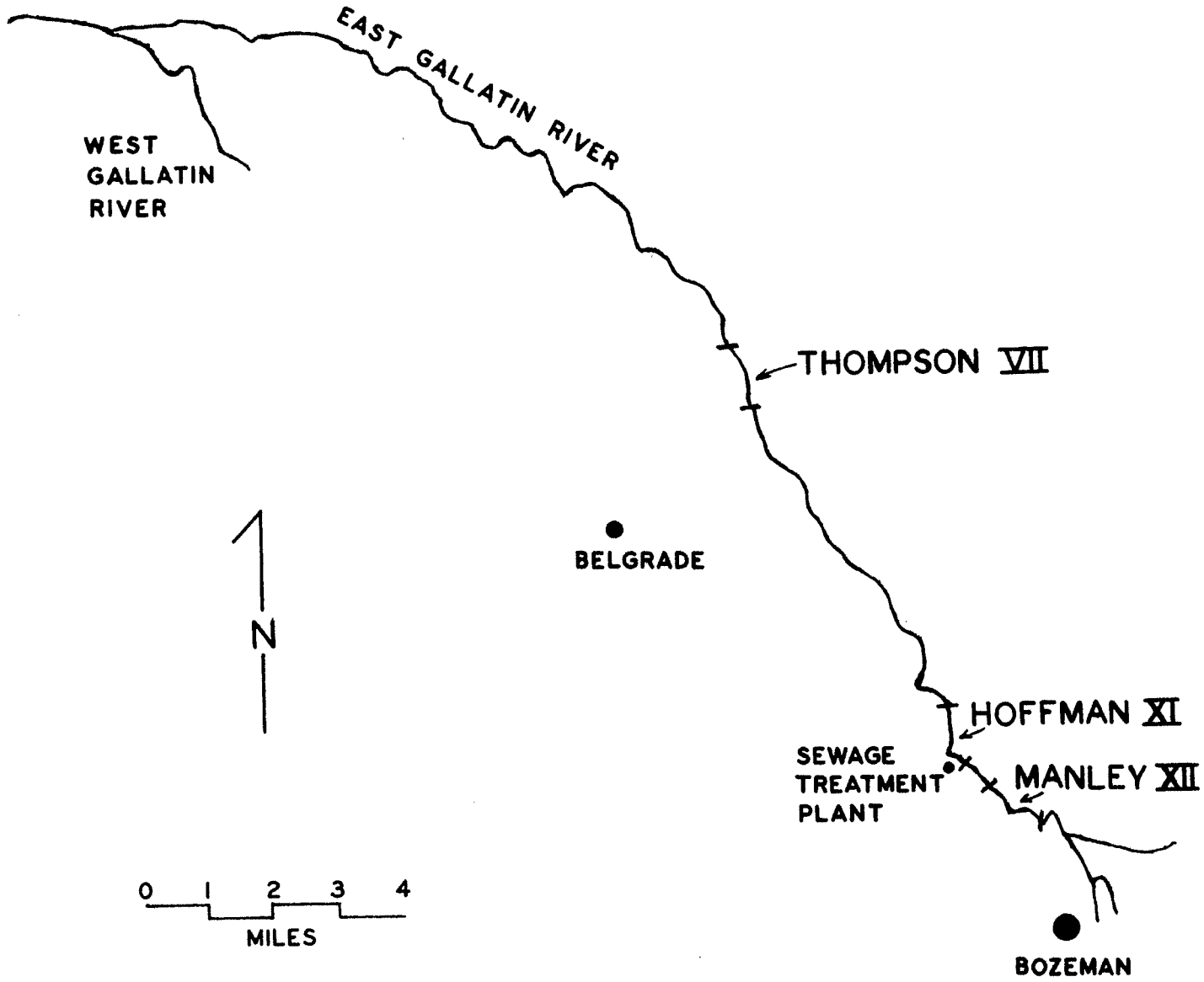

FIGURE 1. Map of the study area.

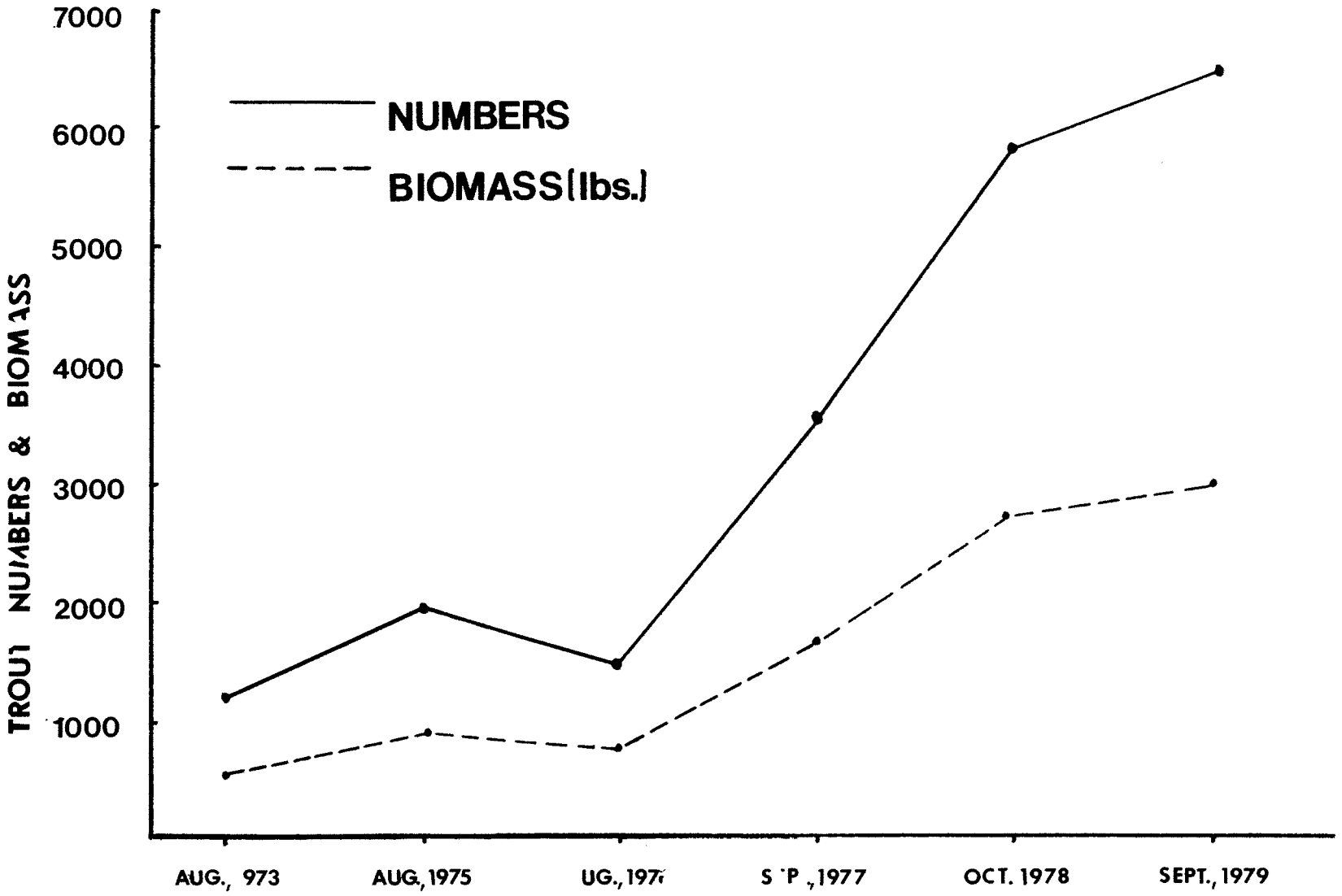

FIGURE 2. Comparison of wild brown and rainbow trout numbers and biomass in the Hoffman Ranch section of the East Gallatin River from August 1973 through September 1979.

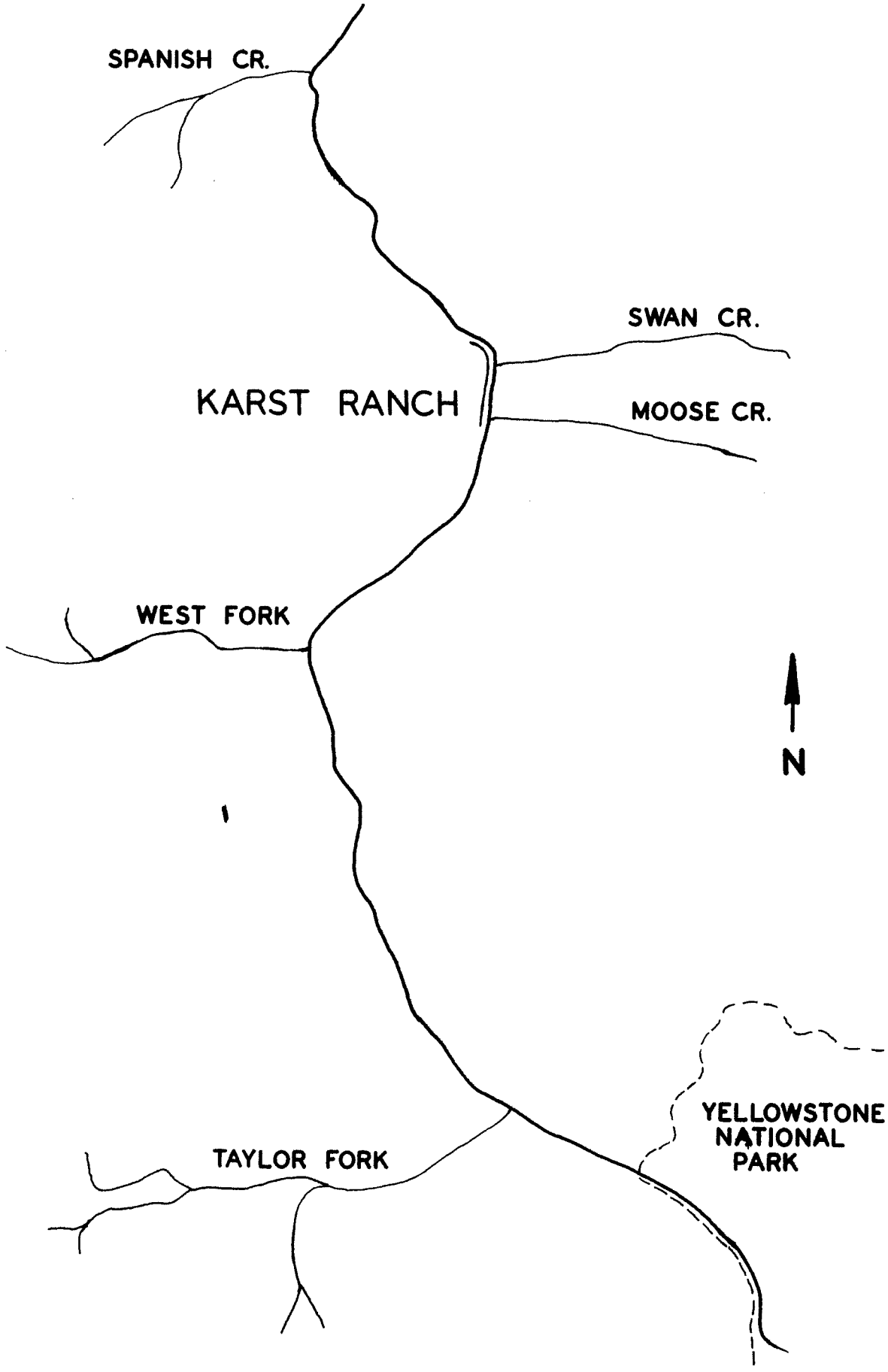

FIGURE 3. Map of the Gallatin River showing study section.

older were 16 percent less than in October, 1978, but 15 percent more biomass (Vincent, 1979). This was mainly due to fewer yearling rainbow in 1979, but more two and three year olds which are larger trout.

In comparing mortality rates between the various age groups of wild rainbow trout, only the older rainbow trout (five years old and older during the summer of 1978 and four years and older from October, 1978 to October, 1979) showed a high mortality. This high rate of mortality, 65 percent for the summer of 1978 and 70 percent for the annual loss between October, 1978 and October, 1979, probably is angling related, similar to the high angler caused mortality found in the Snoball (1975 and 1976) and Pine Butte (1977) sections of the Madison River (Vincent, 1978). Most of the rainbow trout in these age groups are about 13 inches or larger. These high losses of larger rainbow trout suggests more stringent angling regulations may be necessary.

Manhattan-Logan Section. This section is located in the lower Gallatin drainage. It begins at Nixon Bridge which is immediate below the confluence of the East Gallatin and Gallatin Rivers (Figure 1). The Gallatin River in this area meanders through a cottonwood bottom on the left bank and against cliffs on the right bank. Man's impacts on this section of river include woody cover removal, rip-rap and channel straightening.

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

Population estimates for brown and rainbow trout are presented in Tables 4, 5 and 6.

In general, the lower Gallatin River has a good trout population and fishermen use of this reach is quite low.

The growth of brown trout appears to be comparable to that of the Big Hole, Jefferson and Missouri Rivers. The population estimate for fall 1979 also appears to be balanced as to the numbers in each age class. In addition, electrofishing has revealed occasional observations of several very large brown trout. The available estimates indicate significant over-winter mortality in browns. However, any conclusions will be reserved until more computer calculated age-class estimates are available.

There exists one area particularly worthy of note. During the spring of 1980, a total of 6 marking runs were made on this section. The rainbow trout collection of specimen over 16 inches totaled only 8 fish. This situation is not understood, especially when considering the numbers present in younger age-classes. This might be the result of angling (appears unlikely at these pressures), dewatering, or inadequate habitat. Further study is needed to quantify these mortality rates and pinpoint the season of mortality before conclusions can be made.

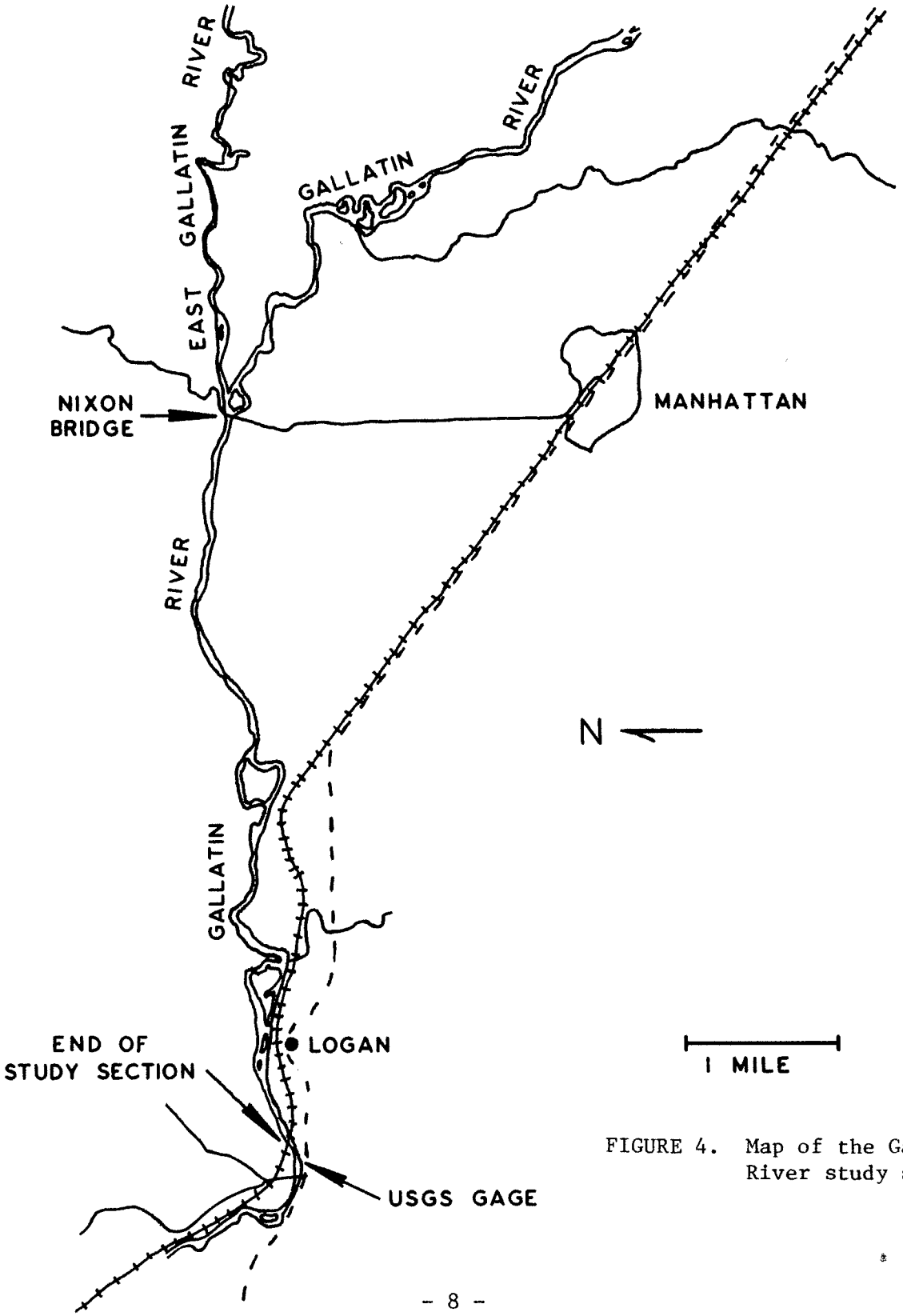

FIGURE 4. Map of the Gallatin River study section.

TABLE 1. Wild trout population, biomass and age structure estimates for the Hoffman Ranch section of the East Gallatin River for 1978. Confidence intervals at the 80 percent level are shown in parenthesis. Section length is 8,125 feet.

Age Group	Spring Population Estimate (March)	Fall Population Estimate (Sept.)
	Rainbow Trout	
I	1/	216
II	1,013	2,537
III	2,047	2,084
IV	732	536
V	380	94
VI & older	172	31
Total No.	4,344 (± 518)	5,498 (± 375)
Total Wt.	2,117 (± 218)	2,409 (± 153)
	Brown Trout	
I	1/	251
II	219	316
III	234	205
IV & Older	79	94
Total No.	532 (±132)	911 (±197)
Total Wt.	332 (± 97)	586 (±173)

1/ No yearling estimates made due to lack of recaptures.

Table 2. Wild rainbow trout population, biomass and age structure estimates for the Karst Ranch section of the Gallatin River for October, 1979. Confidence intervals at the 80 percent level are shown in parenthesis. Section length is 2.2 miles.

	AGE GROUPS					
	I	II	III	IV	V and Older	Total
Numbers	1388	3601	1517	631	219	7356 (±1544)
Biomass	138	881	660	404	277	2360 (±469)

Table 3. Comparison of summer 1978 and annual (Oct., 1978 - Oct., 1979) mortality rates for rainbow trout in the Karst section of the Gallatin River.

Age Group	Spring Population Estimate March, 1978	Fall Population Estimate Oct., 1978	Fall Population Estimate Oct., 1979[2/]	Summer Mortality 1978	Annual Mortality 1978-79
I	1/	4,435	3,601		19%
II	1/	2,937	1,517		48%
III	952	674	631	29%	6%
IV	738	489	219[3/]	34%	70%
V & older	724	253		65%	

1/ No valid estimate made.

2/ Ages are one year older than shown to make mortality rates estimates for same age class.

3/ IV and older rainbow trout.

TABLE 4. Population estimates for fall 1979 brown trout in the 5.6 mile section of the Gallatin River.

Age	Average Length	Number	Number per mile	Biomass (lbs)
I	9.0	1402	250.4	395.8
II	12.5	706	126.1	544.6
III	15.1	1017	181.6	1364.1
IV and older	17.4	340	60.7	653.4
			618.8	

TABLE 5. Population estimates for spring 1980 brown trout in the 5.3 mile section of the Gallatin River(hand calculated).

Length Interval	Estimated Number Per Mile
6.5 - 9.9	147.5
10.0 - 12.9	210.6
13.0 - 15.9	76.1
16.0 and larger	39.7
	473.9

TABLE 6. Population estimates for spring 1980 rainbow trout in the 5.3 mile section of the Gallatin River (hand calculated).

Length Interval	Estimated Number Per Mile
6.5 - 9.9	94.7
10.0 - 12.9	192.7
13.0 - 14.9	60.2
	347.6

Discharge of the Gallatin River has been monitored by USGS at the Logan site since 1928. The minimum flow of record was 130 cfs on July 19, 1939.

Mean daily discharges are given in Table 7. The lowest mean daily flow occurred on August 7 and was 382 cfs. Discharges during that time appeared to be much lower than desirable from the fisheries point of view. Most of the individual gravel bars (riffles) were exposed and water levels had pulled away from overhanging vegetative cover.

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Waters Reported: East Gallatin River 09-1710-01
Gallatin River 09-2090-01

Key Words: Rainbow Trout - overfishing
Trout - Population dynamics
Trout - Numbers
Trout - Biomass

Appendix Table 1. Mean daily discharge of the Gallatin River (1979) at Logan, Montana. (U.S.G.S.).

MAR	APR	MAY	JUN	JUL	AUG	SEP
758	915	1680	2380	2320	423	626
735	883	1760	2060	2090	404	619
706	890	1690	1970	1830	391	610
722	885	1710	2240	1600	392	584
724	901	1840	2660	1450	390	591
750	1110	2070	3140	1250	391	584
902	1400	2040	3070	1120	382	577
1250	1280	1800	2590	1040	398	562
958	1220	1670	2170	993	411	552
847	1220	1530	1990	819	400	566
821	1190	1440	2070	725	409	589
865	1120	1410	2220	650	416	590
947	1070	1390	2660	618	463	588
949	1050	1450	3200	588	542	577
937	1060	1520	3040	583	554	554
974	1140	1680	2580	561	528	533
1080	1240	2050	2400	518	525	538
1050	1410	2220	2460	487	513	531
1040	1430	2290	3460	460	524	523
971	1350	2320	3890	450	556	521
928	1280	2370	3670	444	566	532
946	1270	2520	3570	452	589	544
935	1330	2690	3370	539	575	564
984	1400	2900	3180	531	557	576
1160	1410	3100	3070	498	644	560
1020	1330	3200	3030	464	658	563
965	1290	3500	2930	448	674	566
920	1350	3700	2800	444	666	560
949	1480	4000	2620	485	640	550
951	1570	3320	2440	482	616	538
940	---	2760	---	446	604	---
28734	36474	69620	82930	25385	15803	16968
927	1216	2246	2764	819	510	566
1250	1570	4000	3890	2320	674	626
706	883	1390	1970	444	382	521
56990	72350	138100	164500	50350	31350	33660