MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS
FISHERIES DIVISION

JOB PROGRESS REPORT

State: Montana Title: Southwest Montana Fisheries Investigation

Project No.: F-9-R-32 Title: Inventory and Survey of the Water of the

Job No.: Ia Gallatin and Madison Drainages

Project Period: July 1, 1983 through June 30, 1984

Report Period: July 1, 1983 through June 30, 1984

ABSTRACT

Wild brown and rainbow trout population estimates were made on a section of the East Gallatin River located immediately below the sewage treatment outflow from the City of Bozeman. From 1973 through 1982, wild trout biomass increased 930%. This increase suggests improvement was probably due to improved sewage treatment with the addition of secondary treatment in 1971. Wild rainbow trout biomass showed a large decline in 1983, decreasing 67% from September, 1982 to September, 1983. This decline is associated with a November, 1982 change in treatment where a more complete secondary treatment was added and some tertiary treatment installed. No decline was noted in wild brown trout biomass.

Gill netting data from Hebgen Reservior from 1971 through 1984 shows after the cessation of fall spawning rainbow trout stocking in 1980, the number of wild rainbow and brown trout netted increased 267% and 72%, respectively. The introduction of 6- to 8-inch McBride cutthroat trout in the spring (March-April 1983) resulted in their good survival for 1983 and 1984.

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 have direct access to the East Gallatin River via storm sewers which enter tributaries such as Sourdough Creek. Industrial wastes and septic tanks, not yet hooked up to city facilities, may also effect the river's fisheries. In November, 1982, the City of Bozeman began to operate its newest sewage treatment facility with the sewage effluent receiving secondary and some tertiary treatment.

Hebgen Reservoir has been managed since the mid-1950s with annual plants of either catchable-sized (7-inch and longer) or subcatchable-sized (4- to 6-inch) hatchery reared fall spawning rainbow trout. By the mid-1970s Hebgen Reservoir had no viable reproduction of spring spawning wild rainbow trout. Although prior to the mid-1950s spawning runs were large enough to obtain eggs for rearing in hatcheries. The rainbow trout population was at very low leels by the mid-1970s.

OBJECTIVES AND DEGREE OF ATTAINMENT

1. To determine fish populations, species composition and growth rates for one section of the East Gallatin River. One section of the East Gallatin River was sampled and is discussed under Findings.

2. To determine the success of planting 1- to 2-inch cutthroat trout versus 4- to 6-inch fall spawning rainbow trout in Hebgen Reservoir. The objective was met and is discussed under Findings.

3. To mitigate or enhance habitat alterations due to agricultural, residential, mining, and industrial development. To monitor fisheries throughout the drainages. A total of 15 stream alteration projects in the Madison Drainage were examined and commented on during the 1983-1984 period. Files are maintained in the Region 3 headquarters.

PROCEDURES

Electrofishing gear was used to sample fish populations in the East Gallatin River. Electrofishing was conducted by floating through the section in a fiberglass boat utilizing a mobile positive electrode. Population estimates were made using a 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 0.1 inch and weighed to the nearest 0.02 pound. Scales were taken (10 per 0.5 inch) to determine age and growth rates. Actual mathematical computations were made by a computer programmed to use methods described by Vincent (1971 and 1974).

Fish populations in Hebgen Reservoir were sampled using either 125-foot ex-

perimental gill nets set overnight.

FINDINGS

East Gallatin River

In March, 1971, the City of Bozeman replaced an existing primary sewage treatment plant with a newer facility capable of complete primary and potential secondary treatment. The site of this new facility was located approximately two miles downstream from the original site. In November, 1982, this facility received an addition allowing for full secondary and partial tertiary treatment with the effluent discharge site relocated to a point 3800 feet below the 1971 site (Figure 1).

The Hoffman Ranch section established to monitor the effect of this new sewage treatment plant effluent on wild trout populations. Sewage effluent from the 1966-1970 Bozeman treatment plant was shown to either prevent or limit salmonid reproduction in the first 20 miles of the East Gallatin River below the effluent discharge site (Vincent 1968 and 1970). Data from the Hoffman Ranch section indicated the 1971-1979 discharge allowed only limited salmonid reproduction (Vincent and Rehwinkle 1981). Wild rainbow population data gathered from 1980 to 1983 (except 1981) showed continued low rainbow trout reproduction rates within the study section with most young rainbow moving into the section as two-year-olds during the winter and spring period (Table 1). Wild brown yearling numbers did show an appreciable increase in numbers in 1983, suggesting some improvement in conditions for this species.

In spite of low reproductive success within the study section, wild rainbow trout biomass has shown a steady increase from September, 1973 through September, 1982 with a total pounds increase of 496% (Figure 2). Brown trout, during this same period, increased 834%. From the September, 1982 estimate and the September, 1983 estimate, wild rainbow have exhibited a sharp decrease in total weight (67%). Using spring, 1983 population estimates of numbers, it was determined this large loss occurred during the March-September period, as three-year-olds and older declined 61%. All sizes of rainbow trout were effected, with losses ranging from 54% for the 10.0-12.9 inch group to 80% for the 13.0-15.9 inch group (Table 2). Brown trout exhibited little appreciable change during the 1982-1983 period.

The cause of the 1983 decline in rainbow trout numbers is not certain at this time. A plausable explanation may be the present sewage effluent may be altered enough to change the existing rainbow's food organisms.

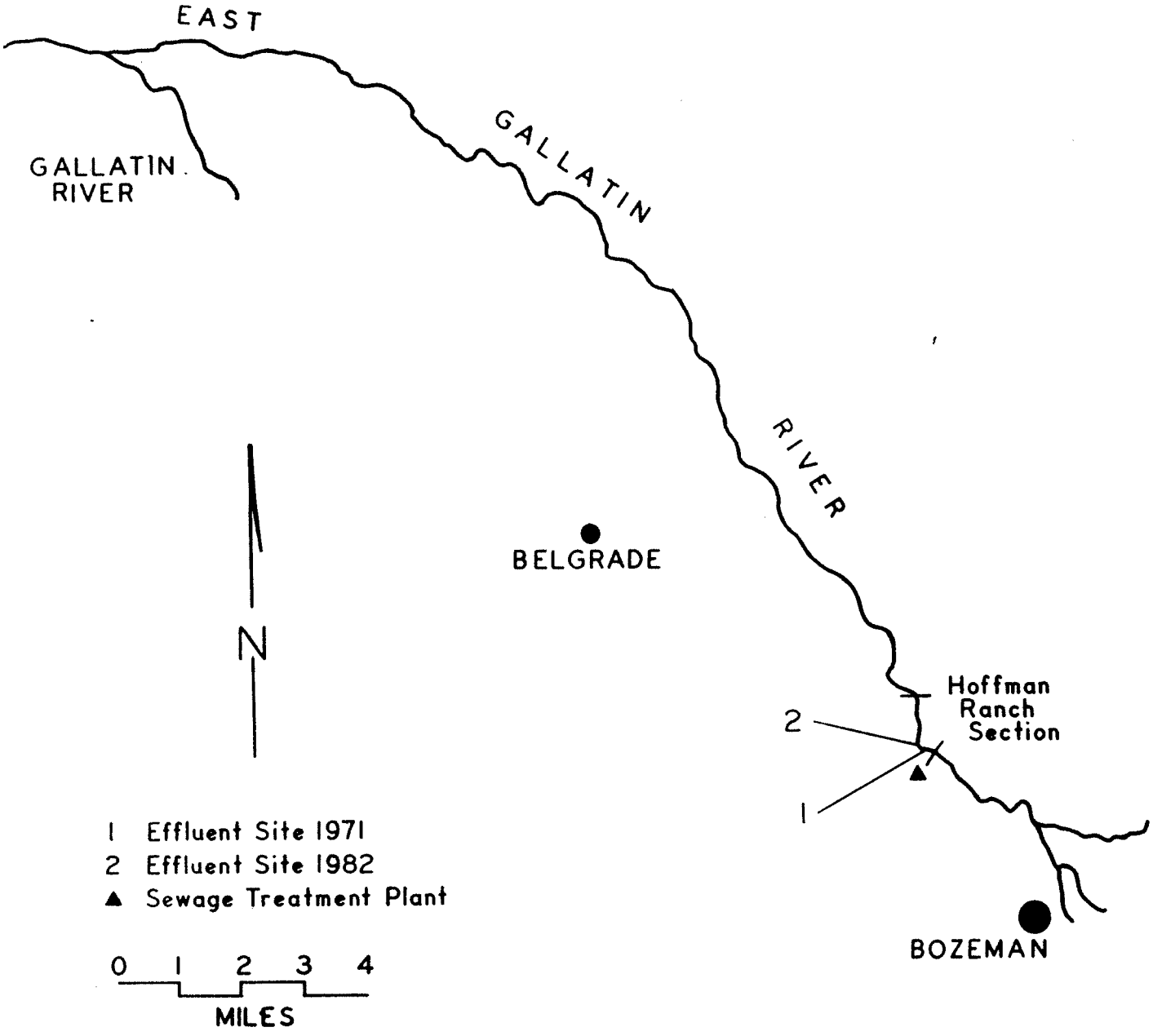

Figure 1. Map of the East Gallatin River showing study section.

Table 1. Spring and fall wild brown and rainbow trout estimates of age structure total biomass and numbers for the Hoffman Ranch section of the East Gallatin River for 1980-1983 (section length 8125 feet).

YEAR	AGE GROUP I	II	III	IV+	TOTALS Number	Weight (lbs)
			SPRING ESTIMATES (March)			
			Rainbow Trout			
1980	--[1]	254	1619	1261	3134 (± 144)	1782 (± 88)
1983	--	150	2063	2368	4581 (± 364)	1894 (± 144)
			Brown Trout			
1980	--	140	177	45	362 (± 44)	205 (± 24)
1983	--	16	108	265	389 (± 73)	455 (± 119)
			FALL ESTIMATES (Sept.-Oct.)			
			Rainbow Trout			
1980	248	1601	1778	1441	5068 (± 346)	2254 (± 159)
1981[2]	2059	2268	1253	658	6238 (± 589)	2027 (± 154)
1982	375	3446	2253	1028	7102 (± 864)	2710 (± 331)
1983	360	258	1153	555	2326 (± 142)	897 (± 53)
			Brown Trout			
1980	350	202	68	59	679 (± 112)	367 (± 72)
1981[2]	249	213	142	60	664 (± 120)	359 (± 85)
1982	557	260	203	157	1177 (± 316)	691 (± 229)
1983	995	273	169	184	1621 (± 321)	655 (± 118)

[1] No spring estimates of yearlings made due to insufficient recaptures.

[2] Section length shortened to 7785 feet.

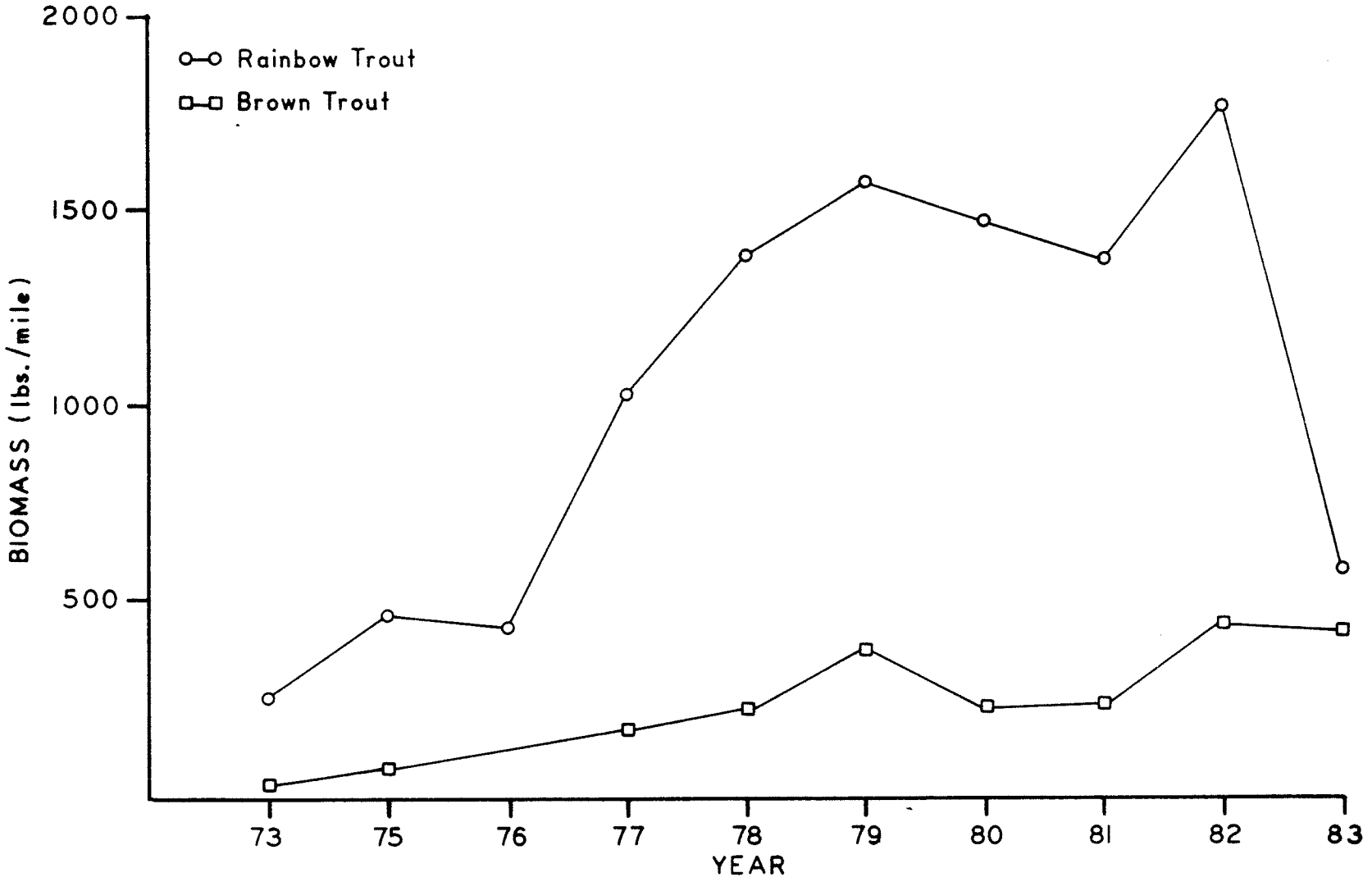

Figure 2. Comparison of yearling and older wild brown and rainbow trout biomass (pounds/mile) in the Hoffman Ranch section of the East Gallatin River. Estimates are made for the Sept.-Oct. period (fall).

Table 2. Comparison of fall numbers per four size groups of wild brown and rainbow trout for the Hoffman Ranch section of the East Gallatin River (confidence intervals at the 80% level for total numbers shown in parentheses).

YEAR	SIZE GROUP 5.0 - 9.9	10.0 - 12.9	13.0 - 15.9	16.0/Larger	Total
			Rainbow Trout		
1980	2375	2198	472	23	5068 (± 346)
1981[1]	4157	1716	337	28	6238 (± 589)
1982	4210	2483	376	33	7102 (± 864)
1983	1099	1142	74	11	2326 (± 142)
			Brown Trout		
1980	381	158	110	30	679 (± 112)
1981[1]	265	244	122	33	664 (± 120)
1982	576	328	203	70	1177 (± 316)
1983	1134	264	171	52	1621 (± 321)

[1] Section length shortened to 7785 feet.

Hebgen Reservoir

Fish populations in Hebgen Reservoir were monitored by bottom set gill nets since 1971 to follow population trends of wild and hatchery rainbow trout, brown trout, cutthroat trout, mountain whitefish and Utah chub (Figure 3). From 1954 through 1980, the primary fish stocked in Hebgen was various sizes of fall spawning rainbow trout (Table 3). Catchable-sized rainbow were stocked for 21 years (1954-1974). Large amounts of subcatchable-sized rainbow (4-6 inches) were stocked from 1968 through 1980. In spite of this stocking, population trend monitored through gill nets showed a very low number of hatchery trout present in the reservoir except for 1971; even this year class lasted for only one summer (Table 4). Few hatchery fish last in the reservoir more than one year after stocking based on known aged hatchery fish. Wild rainbow trout during the 1971-1980 period were also very low in numbers. Wild brown trout were the most abundant trout species, averaging 9.0 per net set for the 1971-1980 period.

Stocking of fall spawning rainbow trout strains was discontinued in 1981, and a management program to introduce wild strains of cutthroat (McBride) trout initiated. The first introductions of McBride cutthroat was in 1979 when 208,000 1- to 2-inch fry were stocked in the spawning tributaries and in the reservoir during July and August. This was repeated in 1980. From 1981-1983 a larger (2- to 4-inch) cutthroat was stocked in the resesrvoir during September to encourage survival. Gill netting data from 1982 indicated a very poor survival of both sizes as no cutthroat were found. A third size of McBride cutthroat was tried in March-April, 1983 when 105,000 6- to 8-inch over-winter reared trout were stocked in Hebgen Reservoir. This resulted in good survival as shown by 1983 and 1984 gill net data when 1.5 and 5.9 per net set were found.

Since fall spawning rainbow trout stocking ceased, the number of wild rainbow trout has shown some increase in number as the average number per net set for the 1974-1980 period was 0.3 versus 1.1 for the 1981-1983 period. Wild brown trout numbers have also shown some substantial increase as the 1971-1980 period averaged 9.0 per net set versus 15.5 for the 1981-1983 period. Little changes in mountain whitefish numbers are noted between the two periods as 17.6 per net set was noted for the 1971-1980 period versus 17.0 for the 1981-1983 period.

Figure 3. Trout stocking records for Hebgen Reservoir, 1954-1983 (stocking size in inches).

YEAR	Fall Spawning Rainbow 1 to 3"	Fall Spawning Rainbow 4 to 6"	Fall Spawning Rainbow 7" +	Spring Spawning Rainbow 4 to 8"	Cutthroat 0-2"	Cutthroat 2-4"	Cutthroat 4"+
1954-61[1]	232,000	144,000	73,000				
1962-66[1]	--		79,000				
1967	--	67,000	83,000				
1968	--	251,000	19,000				
1969	--	153,000	7,000				
1970	--	105,000	48,000				
1971	--	--	32,000				
1972	--	34,000	136,000				
1973	--	94,000	78,000				
1974	--	85,000	68,000				
1975	--	166,000	--				
1976	--	161,000	--				
1977	--	151,000	--				
1978	--	164,000	--				
1979	--	124,000	--		208,000		
1980	--	38,000	--		246,000		
1981	--	--	--			280,000	
1982	--	--	--			285,000	48,000
1983	--	--	--	60,000		260,000	105,000

[1] Number stocked average for the period.

Table 4. Average number of fish caught per bottom set gill net from Hebgen Reservoir during the 1971-1984 period (number of gill net sets per year shown in parentheses).

YEAR	Wild Rainbow	Hatchery Rainbow	Brown Trout	Cutthroat Trout	Mountain Whitefish	Utah Chub
1971 (10)	0	5.1	6.2	0.1	11.8	66.3
1972 (16)	0.6	0.4	8.2	0	17.3	19.8
1973 (19)	0.6	0.3	9.6	0.1	18.5	23.5
1974 (9)	0.1	0.3	9.7	0	21.9	28.1
1980 (4)	0	0	11.3	0	18.3	48.0
1982 (14)	1.1	0	14.7	0	15.9	93.7
1983 (12)	0.3	0	13.8	1.5	20.5	113.2
1984 (21)	1.8	0	18.1	5.9	14.5	92.3

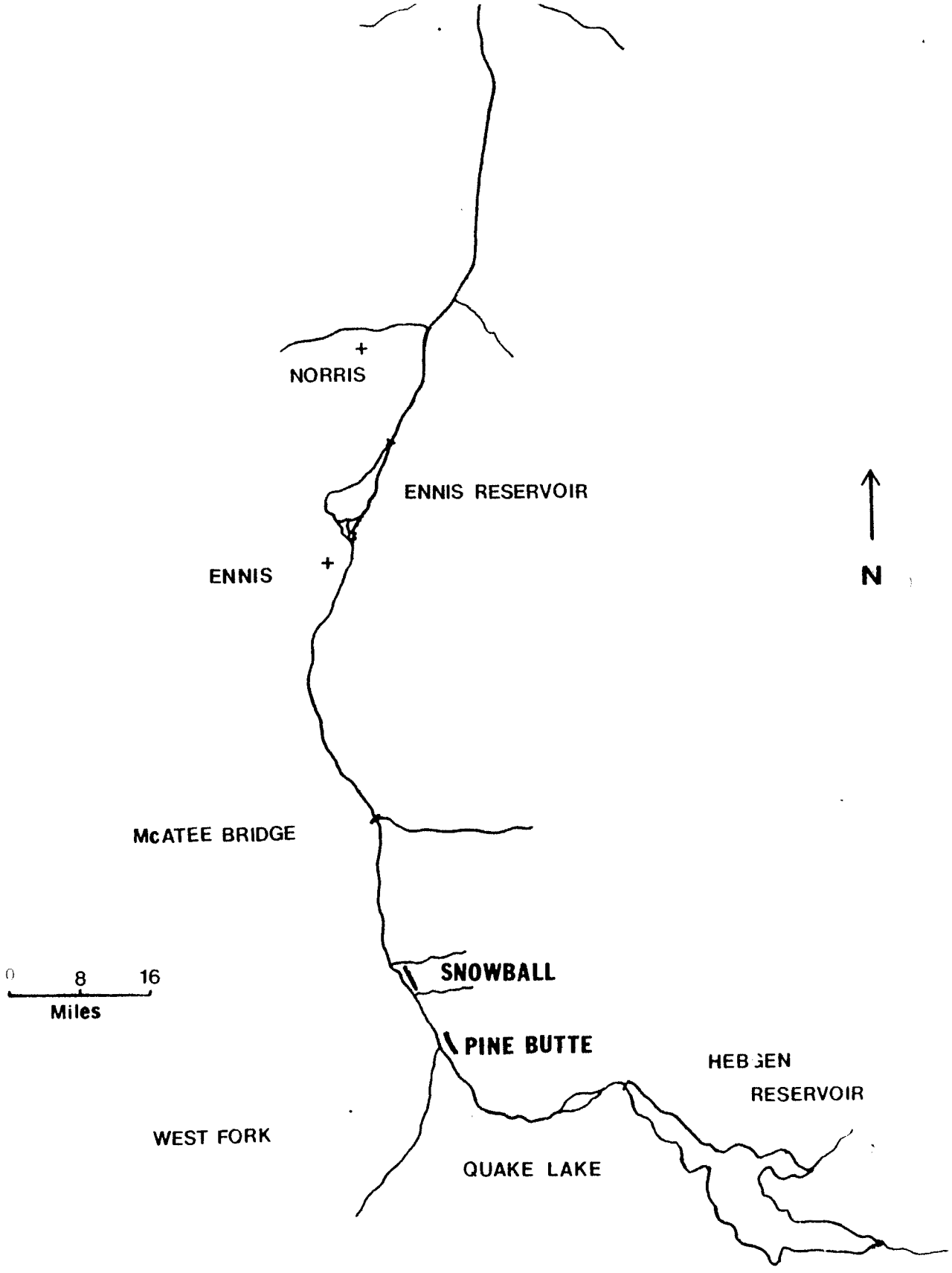

Figure 3. Map of the Madison River showing study sections.

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Hebgen Reservoir