MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS

FISHERIES DIVISION

JOB PROGRESS REPORT
Research Project Segment

State: Montana

Project No.: F-34-R-15 Title: Reservoir Investigations

Job No.: I-a Title: Noxon Rapids - Cabinet Gorge Reservoir Study

Period Covered : 1 July 1980 - 30 June 1981

ABSTRACT

Brown trout (*Salmo trutta*) spawning areas were located in the Bull River drainage, a tributary of Cabinet Gorge Reservoir. Measurements were taken on stream velocities, water depths, and gravel sizes at several redds. Above average high flows in Noxon Rapids Reservoir tributaries precluded sampling for spawning cutthroat trout in spring 1981.

OBJECTIVES

The objective of this job was to determine strength of the westslope cutthroat trout population established in Noxon Rapids and Cabinet Gorge Reservoirs from hatchery plantings into Noxon Rapids and four tributary streams and to locate and count brown trout spawning redds in Bull River, tributary to Cabinet Gorge Reservoir.

WORK ACCOMPLISHED

Bull River Redd Surveys

The major portion of the Bull River drainage was visually examined in late August 1981 to locate those stream reaches thought suitable for brown trout spawning. This preliminary survey indicated further examination of most all the meadow section of mainstem Bull River isn't warranted since bottom materials were found to be mostly sand and silt. Similarly, the lower two miles of mainstem Bull River will not be considered further since the bottom is almost all bedrock, boulders, or cobble material. Six stream reaches considered to have some spawning potential are shown in Figure 1.

Observations done in 1978 and 1979 indicated that brown trout started moving out of Cabinet Gorge Reservoir into Bull River for spawning in early October. The first trip to locate redds within each of the potential spawning

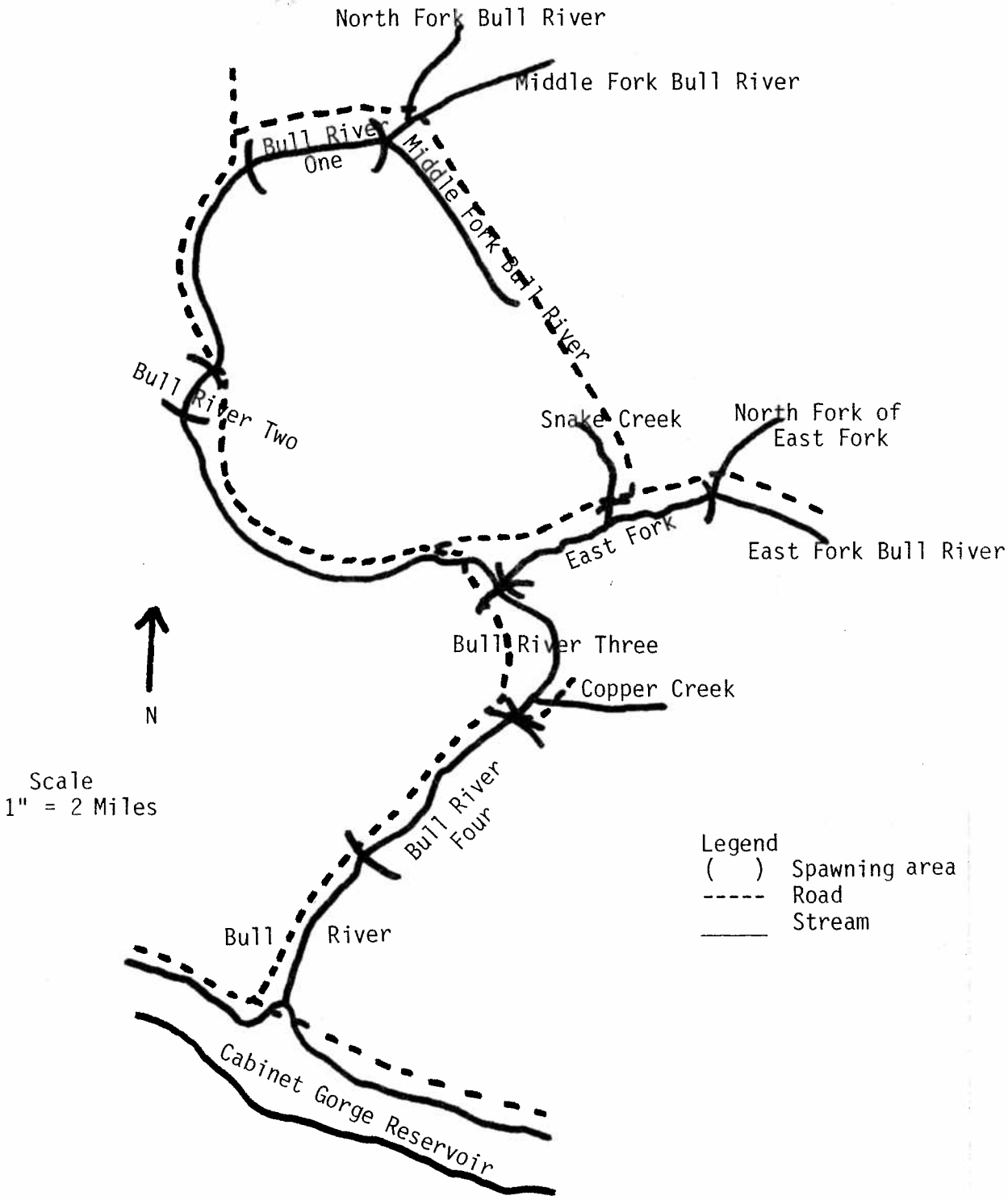

Figure 1. Potential brown trout spawning areas in Bull River drainage.

reaches was made November 5, 1980. Further examination of the reaches were made about every two weeks through December 17, 1980. Three mainstem Bull River reaches were examined January 7, 1981 after a flood in late December, 1980. All reaches on a particular trip were examined the same day. Individual redds were marked with reinforcing iron bar flagged with different color plastic ribbon coded to each examination date. Redds located by reach and date are listed in Table 1. Water temperatures taken with a pocket thermometer are also listed.

Table 1. Brown trout redds observed in six stream reaches, Bull River drainage, November through December 1980, and January 1981. Temperatures in Degrees Fahrenheit shown in brackets.

	Stream Reach					
	Bull River sectors				Tributaries	
Date	One	Two	Three	Four	Snake Creek	East Fork
November 5	0 (46)	0 (44)	0 (44)	0 (44)	0 (42)	0 (44)
November 24	0	0	0	0	1	3
December 4	2 (42)	0 (42)	3 (43)	0 (43)	1 (40)	4 (42)
December 17	----	----	6 (39)	0 (39)	5 (36)	10 (38)
January 7	----	2	1	0	----	----
TOTAL REDDS FOUND	2	2	10	0	7	17

The data shown in Table 1 indicate that the most important brown trout spawning area in the Bull River drainage is the East Fork Bull River which includes Snake Creek. The next most important area is mainstem Bull River Sector Three which includes Bull River from the mouth of the East Fork downstream to the Copper Creek Bridge.

Stream gradients were calculated from quadrangle maps to define this aspect of channel configuration between the various stream reaches. The East Fork Bull River and Snake Creek reaches had a gradient of 104 feet per mile. Bull River Sectors Three and Four had gradients of only eight feet per mile. The lower two miles of Bull River which had no spawning potential due to coarse bottom material had a gradient of 28 feet per mile, while for the meadow section it was four feet per mile.

Water temperature appears to play an important part in triggering spawning activity. Brown trout ranging from 14 to 24 inches long were observed in mainstem Bull River and the East Fork Bull River November 5, but few redds were found until December 4. The redd counts would indicate most spawning took place between December 4 and December 17 when water temperatures ranged from 42° to 38° F.

Stream depth and velocity profiles were taken from three redds, one each in Snake Creek, East Fork Bull River, and Bull River Reach Three on December 18, 1980. The depth, velocity profiles and redd locations within the profiles are shown in Figure 2.

Redd location as depicted in Figure 2 was generally near the thalweg in water depths of 1.5 feet or less. Velocities taken across the head of the redds, at 0.6 total depth, varied from 1.1 feet per second to 2.3 feet per second. Velocity and depth measurements were taken at the head of four additional redds; one in Snake Creek and three in Bull River Sector Three. Paired depth-velocity measurements for the Bull River redds were 2.6 feet deep - 1.2 feet per second, 2.3 feet deep - 2.0 feet per second, and 1.2 feet deep - 1.1 feet per second. The measurements for the Snake Creek redd were a depth of 0.6 foot and a velocity of 2.8 feet per second.

The two redds sampled for substrate composition in Snake Creek were visually picked to represent the extremes of substrate surface which fish had chosen for redd sites. Redds sampled in the East Fork and Bull River were visually selected to represent the average substrate selected for spawning.

Table 2. Size of substrate found in brown trout redds, Bull River drainage, December 1980 by percent of total sample weight.

	Location of redd			
	Snake Creek		East Fork	
Gravel Size	#1	#2	Bull River	Bull River
2.0-3.0 inches	0.0%	29.6%	8.0%	8.2%
1.0-2.0 inches	15.3%	19.4%	22.2%	16.8%
0.5-1.0 inches	14.8%	19.6%	25.7%	19.4%
0.2-0.5 inches	22.5%	12.2%	23.3%	13.7%
0.03-0.25 inches	38.0%	15.9%	16.6%	32.7%
Less than 0.03	9.4%	3.3%	4.2%	9.2%

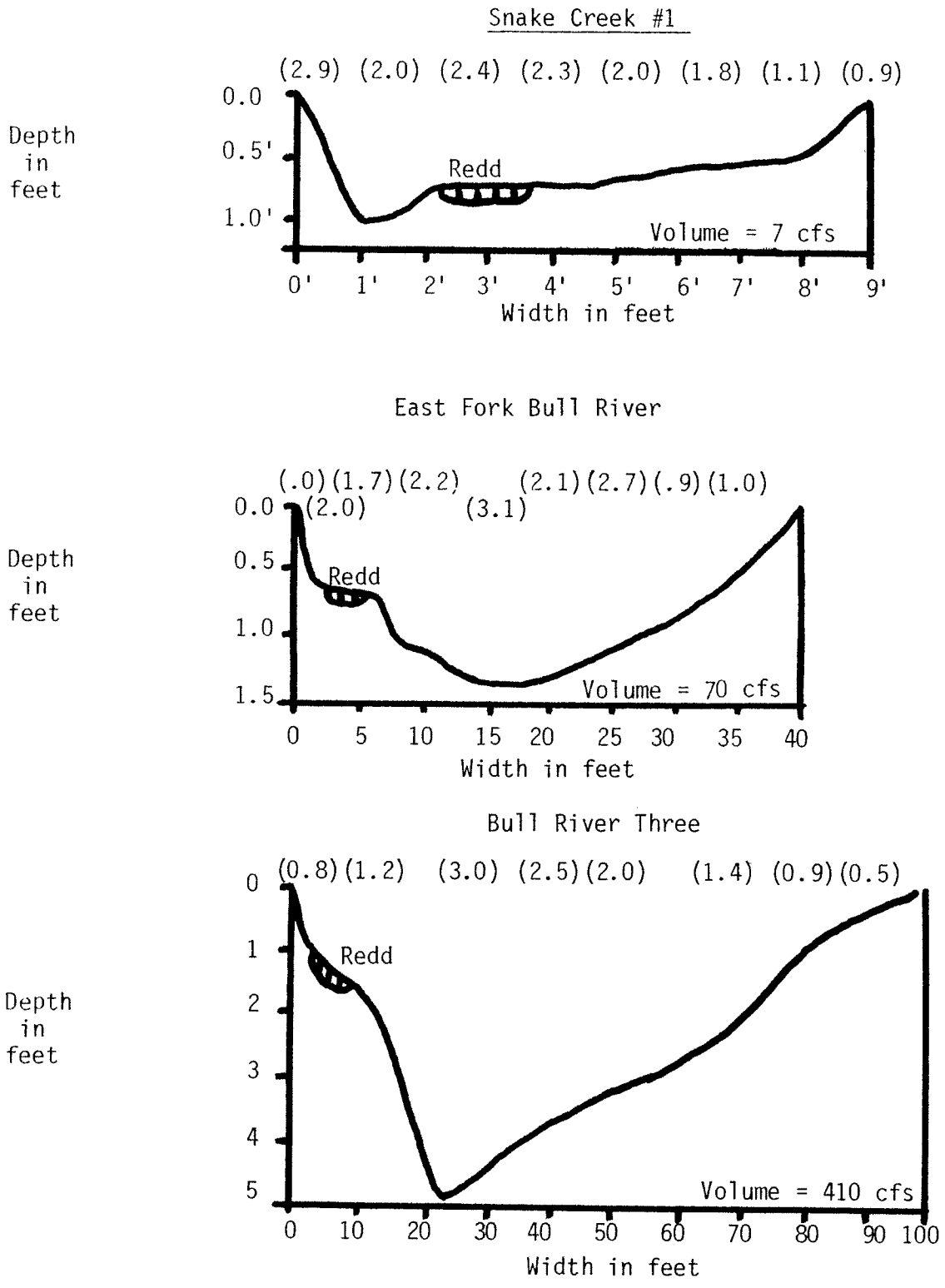

Figure 2. Depth and velocity (0.6 of depth) cross sections over brown trout redds. 18 December 1980. Velocity shown in brackets ( ) in feet per second.

The above data indicate that brown trout in the Bull River drainage can spawn in a fairly wide range of depths, velocities, and gravel sizes. Likely the redd location is a function of fish size. Size of fish entering Bull River for spawning in 1979 averaged about 20 inches total length but varied from 14 to 24 inches total length. The larger fish should be able to spawn in fast water with large substrate material.

Certain general stream characteristics were noted wherever redds were located. There did not appear to be a relationship between proximity of stream cover or shade to redd locations. Some redds were located within a few feet of both cover and shade while others were up to a hundred feet away from either shade or cover. Redds were always found at the tails of pools or runs (where water surface was smooth) but not in riffle areas where surface water was broken. All redds except one appeared to be a single excavation covering from one-half to one square yard. The one exception was a redd about 16 feet long and four feet wide in which four different excavations were distinct. This "multiple" redd was located in Bull River Sector Three.

It appears that brown trout select the same spawning from year to year. Cursory examination of Bull River Sector Three was done in 1978, 1979, as well as 1980. Two single redds were observed each year at one riffle and within the same square yard. The multiple redd was found in the same short meander all three years.

Noxon Rapids Reservoir

Greater costs than anticipated for the brown trout spawning survey precluded Department efforts to net sample the reservoir or electrofish any tributaries to measure population numbers of westslope cutthroat trout.

Westslope cutthroat trout fry were planted in Noxon Rapids and four tributaries, Prospect, Graves, Trout and Swamp creeks in 1977, 1978 and 1979. The fish planted in 1977 will be four years old and should start spawning in spring 1981. Unusually high flows in tributaries prevented either Department or Washington Water Power Company personnel from sampling in the spring of 1981.

RECOMMENDATIONS

Mineral exploration is an ongoing activity in the Bull River drainage with the major activity occurring in the East Fork Bull River drainage. It is imperative that sound data be collected about numbers of brown trout spawning in Bull River drainage and that spawning habitats be quantified. It is recommended that counting of brown trout redds be continued for three years and that spawning habitat be further quantified and qualified. Counting of redds should be expanded to include all of the East Fork Bull River drainage, not just the section below the junction of the East Fork and North Fork of the East Fork. Timing and number of counting trips will be dependent upon Washington Water Power Company providing Bull River water temperatures so that these trips can start after spawning is thought to

be completed.

The Department planted Noxon Rapids Reservoir with large numbers of one to two inch cutthroat trout in 1977, 1978 and 1979. About 200,000 five to seven inch rainbow trout were also planted in late June 1981. Reservoir sampling using gill nets should be done in late fall, 1981 to determine if any of these planted fish are contributing to the reservoir fish population. Streams tributary to Noxon Rapids should be sampled by any appropriate method to determine if the westslope cutthroat planted in the late 1970's are utilizing these creeks for spawning.

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Waters Referred To:
Bull River - 5-0864
Snake Creek - 5-6512
East Fork Bull River - 5-2272

Key Words:
Brown Trout - Spawning