COAL CREEK FISHERIES MONITORING STUDY NO. IV

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INTRODUCTION

This report presents information on the continued assessment and monitoring of fish populations and sediment levels in streams of the Coal Creek Drainage of the North Fork of the Flathead River. Field activities were conducted during summer and fall, 1985.

Major activities included estimation of late summer fish abundance, evaluation of substrate composition in bull trout spawning areas and assessment of the 1985 bull trout spawning run. Existing methodologies and sampling sites were used to insure results comparable to past years (Shepard and Graham 1982, 1983a, 1983b, Weaver and White 1984, 1985).

METHODS

FISH ABUNDANCE ESTIMATES

Fish abundance estimates were completed by electrofishing three 150 m sections in the Coal Creek Drainage. The two sections in main Coal Creek (Dead Horse Bridge and South Fork Bridge) were established by Montana Department of Fish, Wildlife and Parks in 1981, and have been sampled annually during past studies (Shepard and Graham 1982, 1983a, Weaver and White 1984, 1985). The third electrofishing section was new in 1985 and was located in the South Fork of Coal creek (SE-1/4, NE-1/4, Sec. 26, T34N, R22W).

Electrofishing equipment and procedures described by Shepard and Graham (1983b) were used. Two-pass population estimates (Seber and LeCren 1967) were made for the South Fork Bridge section in main Coal Creek and the section in the South Fork of Coal Creek. A mark-recapture estimate (Vincent 1971) was

completed on the Dead Horse Bridge section. Estimates of numbers and densities were computed for westslope cutthroat trout and juvenile bull trout 75 mm total length or longer and compared to previous estimates.

SUBSTRATE COMPOSITION

Substrate samples were collected from several known bull trout spawning areas in the Coal Creek Drainage. A standard hollow core sampler (McNeil and Ahnell 1964) was used following methods described by Shepard and Graham (1982). Coring sites in the Dead Horse Bridge spawning area were located across the five transects sampled during previous studies. New transects were established in spawning areas in main Coal Creek above the South Fork Bridge (N-1/2, SE-1/4, Sec. 23, T34N, R22W) and in the South Fork of Coal Creek (SE-1/4, NE-1/4, Sec. 26, T34N, R22W).

It was determined during the 1985 sampling that annual duplication of exact coring sites was not necessary as long as selected sites were in the same vicinity, and appeared similar to areas used during spawning. Samples were collected prior to the majority of the 1985 spawning run, so only undisturbed sites were sampled.

Samples were placed in labeled bags and transported to the Flathead National Forest Soils Lab in Kalispell for analysis. After drying, each core sample was passed through the following sieve series:

76.1 mm	(3.00 inch)
50.8 mm	(2.00 inch)
25.4 mm	(1.00 inch)
16.0 mm	(0.62 inch)

12.7 mm	(0.50 inch)
9.52 mm	(0.38 inch)
6.35 mm	(0.25 inch)
4.76 mm	(0.19 inch)
2.00 mm	(0.08 inch)
0.85 mm	(0.03 inch)
0.42 mm	(0.016 inch)
0.063 mm	(0.002 inch)
Pan	(<0.002 inch)

All material retained on each sieve was weighed and the percent dry weight in each size class was calculated and compared with information collected during past years. Average survival to emergence in each of the spawning areas sampled was predicted using the three predictive equations developed for bull trout by Weaver and White (1985). Substrate scores (Leathe and Enk 1985) were calculated from data collected during the habitat assessment of Coal Creek by Weaver and White (1984).

SPAWNING SITE INVENTORIES

Bull trout spawning site inventories were conducted on two sections of Coal Creek on 15 October, 1985. The sections surveyed were from the junction of the South Fork of Coal Creek with main Coal Creek downstream to Dead Horse Bridge and from Dead Horse Bridge downstream to the Cyclone Lake Road. The South Fork of Coal Creek was not surveyed due to high flow conditions.

Surveys were conducted by two crews of two walking down the channel. Redds were enumerated, classified and pace located as described by Shepard and Graham (1983b). Counts were compared to past surveys of the same sections.

RESULTS AND DISCUSSION

FISH ABUNDANCE ESTIMATES

The 1985 estimates of fish numbers and densities indicated stable to increasing fish populations in both sections (Table 1). Estimated westslope cutthroat trout numbers remained relatively stable, while densities increased slightly from last year. The small density increase was probably related to the low flow conditions prior to the 1985 estimates. The notable increase in westslope cutthroat abundance in the Dead Horse Bridge section during the 1983 estimate was due to an experimental planting of cutthroat trout just upstream from the section in fall, 1982. This experiment was briefly discussed by Weaver and White (1985).

A low probability of capture ($\hat{p}$) during the first pass was obtained for cutthroat trout in the South Fork Bridge section of main Coal Creek in 1985 (Table 1). Relatively high probability of capture ($\hat{p} \geq 0.60$ is recommended for dependable two-pass estimates. Therefore, the 1985 South Fork Bridge estimate for cutthroat, although similar to previous records, may not reflect actual abundance. The probability of capture for cutthroat trout during the 1985 estimate in the South Fork of Coal Creek (0.53) was closer to 0.60, the value recommended by Shepard and Graham (1983b) for reliable two-pass estimates. Considering the lack of previous information from this area, this estimate should also be viewed cautiously.

In 1985, estimated numbers of juvenile bull trout in the Dead Horse Bridge section increased by approximately 88% over the 1984 estimate (Table 1). This increase may be related to the record

Table 1. Comparison of population estimates ($\hat{N}$) and densities (#/100 m^2) for westslope cutthroat and juvenile bull trout $\geq$ 75 mm total length from three electrofishing sections in the Coal creek Drainage during August of 1982, 1983, 1984, and 1985.

Section	Date	Estimation technique	$\hat{N}$	95% C.I.	$\hat{p}$	Density
Cutthroat trout						
Dead Horse Bridge	8/05/82	M&R	12	± 9	2*	0.6
	8/23/83	M&R	56	± 15	3*	2.8
	8/31/84	M&R	10	± 8	1*	0.5
	8/29/85	M&R	9	± 6	5*	0.6
South Fork Bridge	8/04/82	Two-pass	32	± 6	.74	2.5
	8/28/83	Two-pass	23	± 2	.84	2.0
	8/29/84	Two-pass	31	± 9	.65	2.8
	8/27/85	Two-pass	36	± 12	.33	3.2
South Fork of Coal Creek	8/28/85	Two-pass	63	± 35	.53	6.0
Bull Trout						
Dead Horse Bridge	8/05/82	M&R	130	± 36	2*	5.9
	8/23/83	M&R	99	± 33	1*	4.1
	8/31/84	M&R	89	± 27	1*	4.2
	8/29/85	M&R	167	± 65	0*	11.2
South Fork Bridge	8/04/82	Two-pass	17	± 9	.60	1.3
	8/28/83	Two-pass	18	± 3	.78	1.5
	8/29/84	Two-pass	48	± 12	.63	3.4
	8/27/85	Two-pass	41	± 5	.77	3.7
South Fork of Coal Creek	8/28/85	Two-pass	62	± 8	.74	5.9

* These are numbers of mortalities recorded between the marking and recapture efforts and should be added to estimated numbers (N) to obtain final estimates.

bull trout spawning run documented in 1982. Juvenile bull trout numbers in the South Fork Bridge section remained stable between 1984 and 1985, after increasing from 1983 to 1984 (Table 1). Thermograph records have shown consistantly cooler summer water temperature in the Dead Horse Bridge section which would result in slower growth. It is possible that juvenile bull trout residing in this area did not exceed minimum size restrictions of our electrofishing gear until after the 1984 estimates were made, while the majority of those in the South Fork Bridge section did. This could explain the lag in estimated population increase in the Dead Horse Bridge section following the record spawning run in 1982.

Because this was the first year of sampling in the South Fork of Coal Creek, no comparison with previous electrofishing estimates can be made. First pass efficiencies ($\hat{p}$) for juvenile bull trout in 1985 were more than adequate for reliable two-pass population estimation (Table 1).

High flows associated with record rainfall during the late summer, and fall of 1985 forced the cancellation of several other non-contract fish abundance estimates required to further assess the effects of the 1982 spawning run on juvenile bull trout abundance and carrying capacity. This lack of information makes further discussion of bull trout population regulation and carrying capacity inappropriate at this time.

SUBSTRATE COMPOSITION

No significant change in the percentage of substrate material smaller than 6.35 mm was observed in the Dead Horse Bridge

spawning area (Table 2). The lack of information from past years prevented comparison of the other two sections. Annual changes of up to 5.0% have been documented in other North Fork tributaries (Weaver and White 1985).

Table 2. Comparison of the annual mean percentages of substrate material smaller than 6.35 mm from undisturbed sites in the Dead Horse Bridge spawning area from 1981 through 1985.

Creek	Year	n	Percent smaller than 6.35 mm
Coal Creek	1981	10	33
	1982	19	38
	1983	20	37
	1984	18	33
	1985	20	36

Results of the 1985 core sampling showed that main Coal Creek above the South Fork Road Bridge (North Fork) contained the least amount of fine material, followed by the Dead Horse Bridge area and the South Fork of Coal Creek, respectively (Table 3). Predictions of bull trout survival to emergence in these three areas were made using all three survival equations presented by Weaver and White (1985) (Table 4). All predictions are relatively low, but of the three equations, the one developed during the field study predicted the highest survival (Table 4). Reasons for this difference are briefly discussed by Weaver and White (1985).

Table 3. Percentages of substrate material smaller than 0.85 mm, 6.35 mm and 9.53 mm from undisturbed sites in the Coal Creek Drainage during 1985 core sampling in known bull trout spawning areas.

Spawning area	n	%<0.85 mm	%<6.35 mm	%<9.52 mm
Dead Horse Bridge	20	6.0	35.8	44.0
North Fork (main Coal)	12	5.5	34.2	41.8
South Fork Coal	12	6.2	37.1	45.8

Table 4. Mean predicted survival to emergence for three bull trout spawning areas in the Coal Creek Drainage. Percent survival was predicted from application of survival equations developed by Weaver and White (1985) to results from sieve analysis of spawning area core samples.

Spawning area	n	Lab study (Multiple reg.)	Lab study (simple reg.)	Field Study
Dead Horse Bridge	20	9.6%	12.4%	31.5%
North Fork (main Coal)	12	8.1%	15.3%	39.3%
South Fork	12	5.2%	9.8%	24.2%

Due to the coincidence of spring peak flows with bull trout fry emergence, the field study equation should have a term which incorporates the effects of peak flow intensity and timing.

Substrate score for the Dead Horse Bridge and main Coal Creek above the South Fork Road Bridge (North Fork) were 10.2 and 12.2 respectively. The substrate score for the South Fork of Coal Creek is not available at this time and will be presented as an addendum to this final report.

SPAWNING SITE INVENTORIES

A total of 40 bull trout redds were enumerated during the 1985 spawning site inventory in Coal Creek (Table 5). This number is slightly lower than the 6-year average (1979-1984) of 48 for the section recommended for monitoring by Shepard and Graham (1983b). The total count for the North Fork (168) was also somewhat lower than the 6-year average (224). Record rainfall during late summer, 1985, resulted in high streamflows, making redd counts difficult. This was especially true in the larger, higher order tributaries in the North Fork Drainage, where bedload movement probably obscured redds prior to surveys. Therefore, the 1985 bull trout spawning run may have actually been similar to the 6-year average figure.

Table 5. Numbers of bull trout redds observed in the monitoring section of Coal Creek from 1979 through 1985.

Year	1979	1980	1981	1982	1983	1984	1985
	38	34	23	60	73	58	40

Comparison of redd frequency distributions illustrated that the same stream sections have been utilized annually since 1981 (Figure 1) (Shepard et al. 1982, Shepard and Graham, 1983a, Weaver and White 1984, 1985). We recommend that bull trout redd surveys be conducted in the South Fork of Coal Creek and Mathias Creek in 1986. We also recommend that redd surveys and streambed monitoring be continued for the sites on main Coal Creek.

All field data and calculations pertaining to this study are included in a separate attachment (Attachment A).

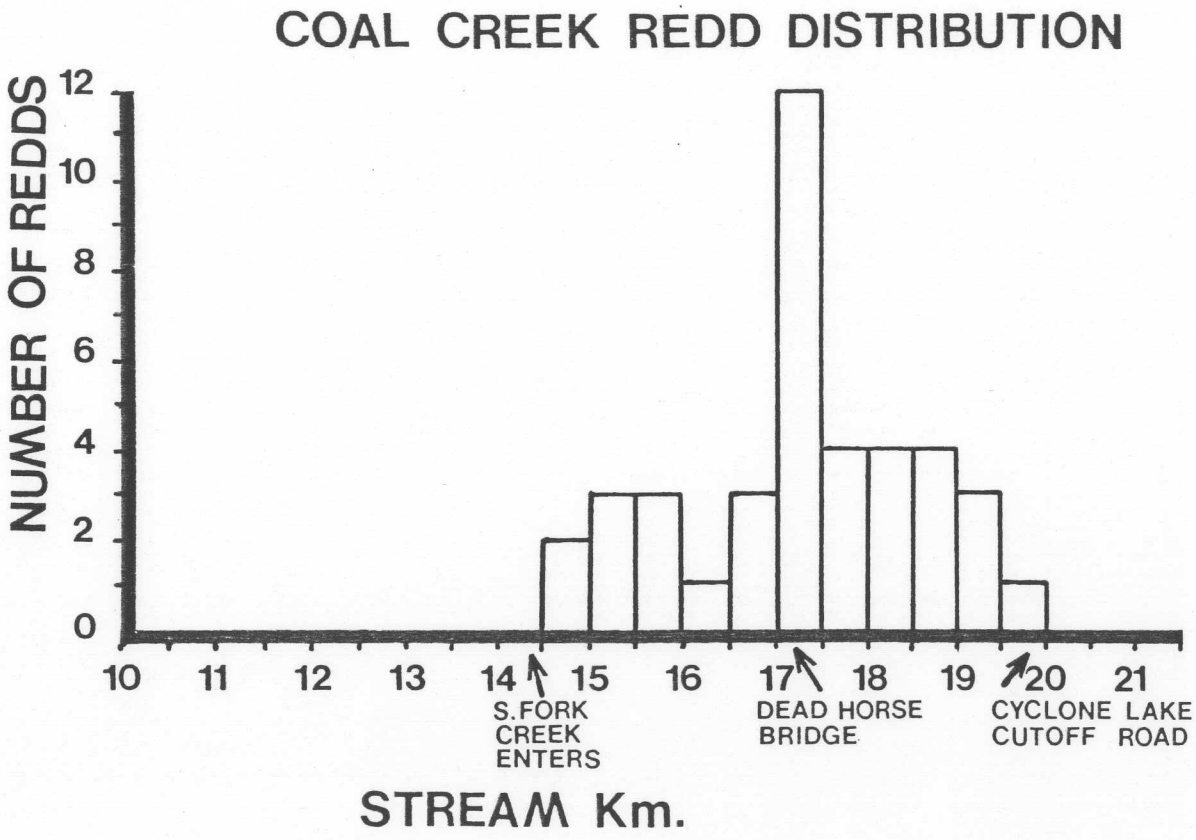

Figure 1. Bull trout redd distribution by 0.5 km in the monitoring section of Coal Creek during the 1985 spawning site inventory.

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