WATER QUALITY SUMMARY REPORT NO. 32

BIG AND LITTLE ELK CREEKS
Idaho County, Idaho
1991-1992

Idaho Division of Environmental Quality
North Central Idaho Regional Office
April 1996

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ABSTRACT

The Idaho Antidegradation Program has designated Big and Little Elk Creeks, Idaho County, as "Stream Segments of Concern". The Elk City Local Working Committee (LWC) identified sediment as the major impact to water quality. A cooperative, intensive water quality monitoring study between the Division of Environmental Quality (DEQ), the Forest Service (USFS), and the Bureau of Land Management (BLM) began in 1991. The study was designed to evaluate site specific best management practices developed by the LWC and to assess the existing status of the macroinvertebrate, fisheries, and habitat components of the stream, emphasizing sediment related parameters.

Two segments on each creek were identified as representative reaches for the study. Each creek had a segment above and below the proposed USFS Rumpus-Lightening Timber Sale. Water Quality monitoring began in 1991, prior to any earth disturbing activity. DEQ data analysis indicated cobble embeddedness for both watersheds greater than 70%. The mean particle size distribution was in the medium gravel range (mean D50 of 4.4 mm). Fishery related habitat indices such as pool/riffle ratio (average 1 to 1.29 with 1 to 1 good) and habitat diversity index (average 62.5%) indicated fair to good fishery habitat with the exception of instream sediment related impacts such as poor pool complexity (average 2.2 on a 1 to 10 scale with 10 the best).

Ancillary data collected indicate good canopy cover (35 to 70%), excellent bank stability (average of 85%), and no excessive instream temperatures (range of 2 to 19 degrees celsius).

This study was contingent upon the implementation of the USFS Rumpus-Lightning Timber Sale. The sale has been delayed for an undetermined amount of time with the result that future monitoring will not resume unless the sale becomes active. The study provides valuable background data for comparison with any future nonpoint source activities in the area.

ACKNOWLEDGMENTS

A special thanks to the staff of the Elk City Ranger District, United States Forest Service. Their assistance, equipment, and expertise made this study possible. Specifically, I thank Bill Baer and Meg Kenny for their time and effort. Without the continued support and assistance of Mr. Baer, both in the field and in the office, I would not have been able to complete this project.

I thank Lila Richards, Idaho Division of Environmental Quality. She spent many long hours in the field which often ended with a difficult hike up very steep terrain with a fully loaded backpack. In addition, the assistance of William Clark, Idaho Division of Environmental Quality, is greatly appreciated.

INTRODUCTION

BACKGROUND

In November of 1988, the State of Idaho enacted Executive Order No. 88-23, to comply with the requirements of the 1987 Clean Water Act requiring each state to adopt an "antidegradation policy" to address nonpoint source water pollution The 1988 Idaho Antidegradation Agreement required public meetings to be held by the Idaho Department of Lands on designated stream segments of concern (SSOC). This process established local working committees (LWC) to review timber harvest best management practices (BMPS) in relation to water quality protection.

The Elk City LWC identified sediment as the major impact to water quality in the Big and Little Elk Creek watersheds. The LWC established site specific best management practices (BMPS) for timber harvest. These BMPS are listed in the Idaho Department of Lands Final Report for this committee. These practices are required to be followed in addition to the Idaho Forest Practices Act BMPS (Idaho Dept. Lands, 1990).

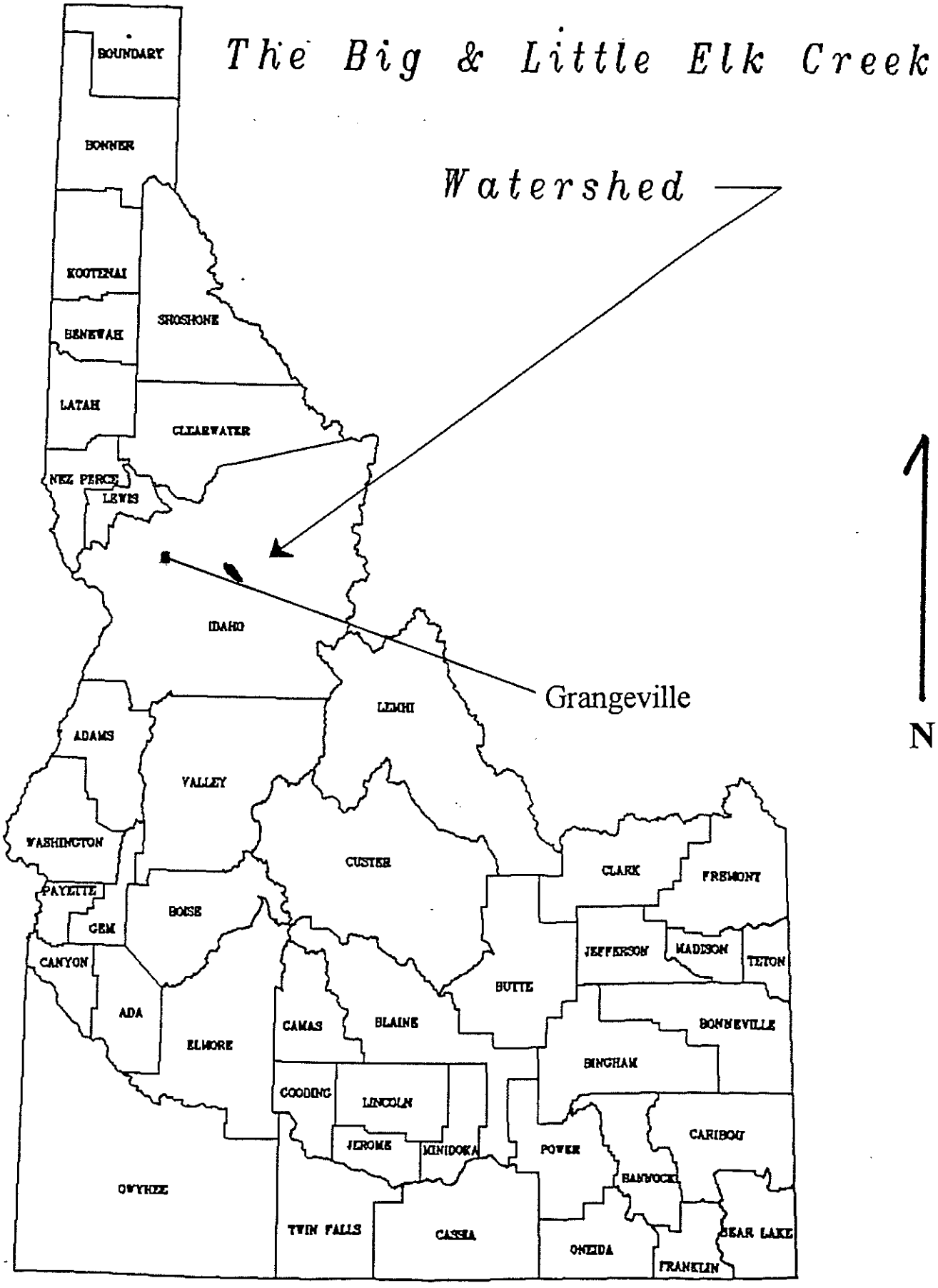
The Division of Environmental Quality (DEQ), the US Forest Service (USFS), and the Bureau of Land Management (BLM) chose Big and Little Elk Creeks for a long term, intensive level monitoring effort. This decision was based on existing monitoring and activities, the need for supplemental data, and a proposed timber sale in this area. Prior to the study onset, DEQ developed a comprehensive, coordinated monitoring plan (Stewart, 1992). See Figure 1, Watershed Location Map.

A number of past studies have occurred in the Big and Little Elk Creek drainages. These studies collected chemical water quality data (BLM 1981, USFS 1979, Idaho Department of Health and Welfare 1980, and Hydrometrics, 1990), inventoried riparian habitat conditions (BLM 1982, BLM 1987, and ID Fish and Game, 1981), and collected fisheries population and habitat data (USFS 1989).

The current intensive level study was projected to last 10 years with an in depth analysis of habitat quality and aquatic biota (fish and macroinvertebrates). The status of existing beneficial uses was documented and trends identified.

After two years of monitoring, and prior to any earth disturbing activity, the USFS Rumpus-Lightning timber sale was placed on indefinite hold. The USFS concluded that substantial uncertainty exists about whether an upward trend in fish habitat conditions can be established concurrent with the proposed timber management action.

Figure 1. Watershed Location Map



STUDY OBJECTIVES

Two primary objectives have been identified for the study. The first was developed through public input while the second is more technical and was developed during the monitoring plan development.

The local working committee water quality objectives:

> "Improve water quality to fully support beneficial uses. Control forest practice impacts to sediment, temperature, water yield and other water quality parameters that could effect beneficial uses" (Worman, D. 1991).

The monitoring plan objectives:

To document the effectiveness of site specific best management practices developed by the Local Working Committee and implemented during the USFS Rumpus-Lightning timber sale.

In addition, assess and document the existing condition of the stream and stream side habitat, fish, and macroinvertebrate populations.

The monitoring stations are located upstream and downstream of the timber sale area. The upstream stations will serve as controls not effected by the activity. The monitoring will document existing conditions and changes relative to timber harvest activities and the effectiveness of site specific BMPS.

MONITORING STATION LOCATIONS

Little Elk Creek is a tributary to Big Elk Creek. This system drains into the American River forming the South Fork Clearwater River. These watersheds are wholly contained within Idaho County, Idaho. See Figure 2. For Study Area Location Map and Monitoring Station Location Map.

BLM Two monitoring stations are located on Little Elk Creek. Eight monitoring stations are located on Big Elk Creek. The BLM is responsible for compilation of BLM data. All BLM monitoring stations are located downstream of this studies monitoring stations. BLM monitoring data will not be included in this water quality summary report.

USFS/DEQ Two monitoring stations are located on Big Elk Creek and two on Little Elk Creek. The beginning of and all cross sections are permanently marked with rebar for repeat measurements.

FSB1
BIG ELK CREEK (LOWER SITE)
T30N, R7E, SE1/4 Sec.31
Elevation 4600 ft (1402 m)

FSB2
BIG ELK CREEK (UPPER SITE)
T30N, R7E, NW1/4 Sec.25
Elevation 5000 ft (1524 m)

FSL1
LITTLE ELK CR. (LOWER SITE)
T30N, R8E, SW1/4 Sec.33
Elevation 4200 ft (1280 m)

FSL2
LITTLE ELK CR. (UPPER SITE)
T30N, R8E, NW1/4 Sec.32
Elevation 4400 ft (1341 m)

Big Elk Creek: The total surface area encompasses 15650 acres. Total stream miles including Little elk are 71.2 with the main channel 12.7 miles in length. The tributaries are 58.5 miles in length. The watershed length is 9.4 miles. The highest elevation in the watershed is 6,386 feet. Basic geology is schist, quartz border zone with a vegetative cover type of meadows and riparian areas. A road density of 1.38 miles per square mile.

The designated beneficial uses include domestic water supply, agricultural water supply, cold water biota, salmonid spawning, primary and secondary contact recreation (Idaho Department of Health and Welfare, 1988).

Ownership	Area	Percent
BLM	2470 acres	16
USFS	7070 acres	45
IDL	1280 acres	8
Other	4830 acres	31
	Totals 15650 acres	100

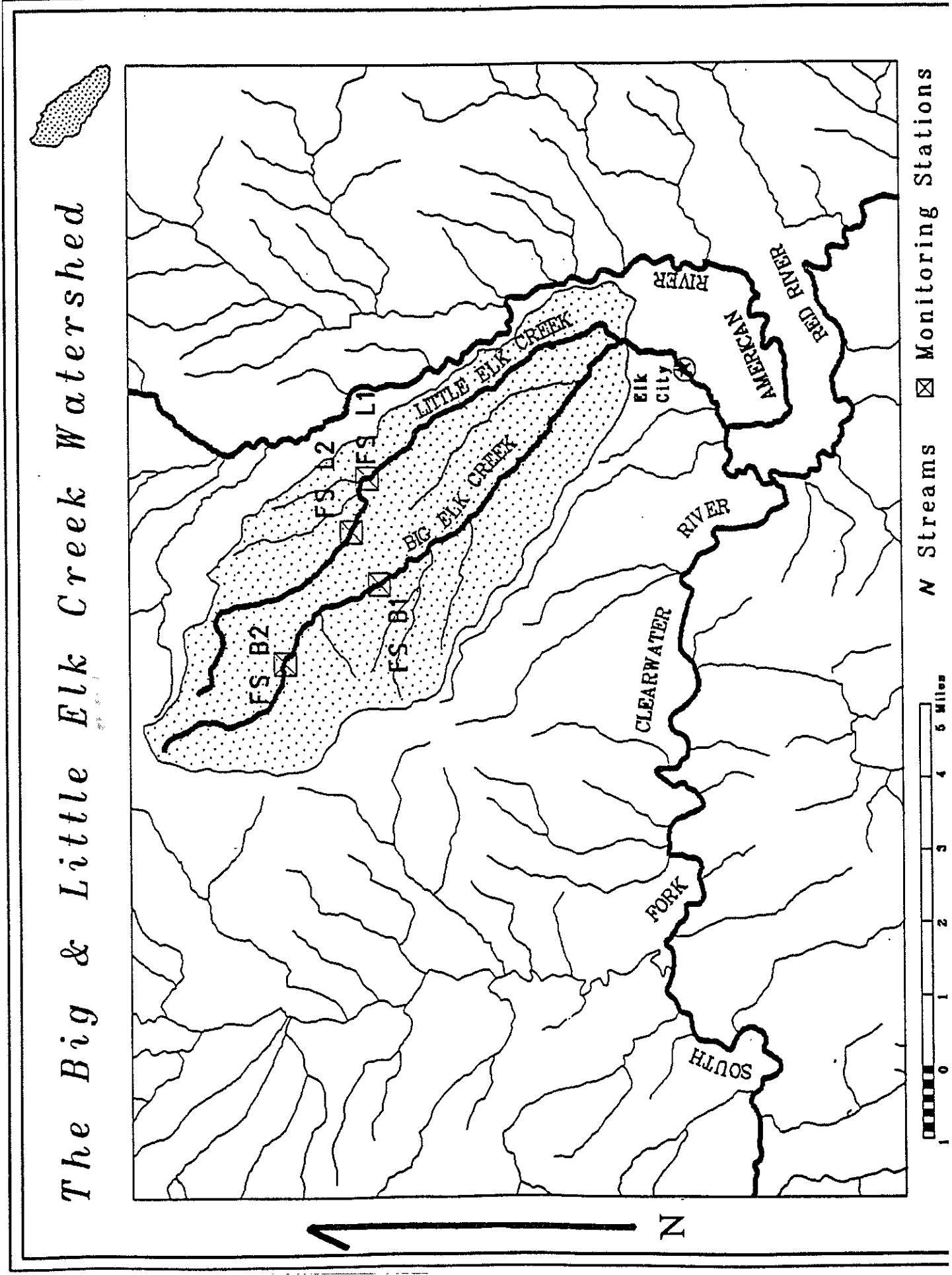
Little Elk Creek: The total surface area encompasses 5100 acres. The total stream miles are 23.4 with the main channel being 10.5 miles in length and tributary miles being 12.9 miles. the watershed length is 8.5 miles. The highest elevation the watershed is 6,280 feet. Basic geology is border zone of gneiss and schists with a vegetative cover type of meadows, small old burns and timber. A road density of 2.25 miles per square mile.

Ownership	Area	Percent
BLM	725 acres	14
USFS	3225 acres	63
IDL	0	0
Other	1150 acres	23
	Totals 5100 acres	100

DURATION/FREQUENCY

As stated in the monitoring plan, "in this study monitoring is proposed for 10 years, but this may be adjusted pending analysis of results at the study's midpoint." This summary report will be considered a final. The USFS Rumpus-Lightning Timber Sale which was the impetus for this monitoring has been delayed for an undetermined amount of time. Should the sale be offered someday, monitoring may resume.

Figure 2. Study Area and Monitoring Station Location Map



MATERIALS AND METHODS

Stream bed surface particle size was determined utilizing the Wolman Pebble Count (Wolman, G.M. 1954) A minimum 100 pebbles per stream segment were picked with pebbles measured from all cross sections and all habitat types. Smaller particles such as sand and silt are detrimental to salmonid spawning, macroinvertebrate survival, and habitat availability. Activities which contributes to smaller particles entering the stream will need additional BMPS. This data will be used to determine BMP effectiveness, existing water quality conditions, and to indicate any water quality condition changes.

Fish were collected with a backpack electrofishing unit (Coffelt model BP-4). The three pass/removal system with block nets was employed to estimate abundance. Lengths and weights of all fish were recorded. The abundance data will be used to document the existing fish community and any changes resulting from the proposed activities.

It was necessary to "salt" the creek to raise the specific conductance to a sufficient concentration for electroshocking (100 micromhos per centimeter or greater). This was accomplished by using fifty pound blocks of sodium chloride and a specific conductance meter.

Macroinvertebrates were collected with a 0.5 mm mesh D-Frame kick net consistent with DEQ intensive level monitoring (Clark and Maret, 1993). Three separate riffles per monitoring site were sampled. The three samples were than composited and a minimum 100 organisms were selected via a random pick, preserved in 70% ethanol, and sent to the State Laboratory in Boise for analysis.

All habitat parameters were measured using an extendable fiber glass rod. The rapid thalweg profile procedure (Burton, 1991) was used to measure the thalweg profile and associated stream/pool widths and depths. A spherical densiometer was utilized to measure % canopy cover (Burton,1991). Densiometer measurements were taken at all cross sections (n=10). The 30 hoop cobble embeddedness technique with a screen to measure fine sediment was used. Embeddedness measurements were collected from all transect with the intention that all habitat types were sampled.

QUALITY ASSURANCE/QUALITY CONTROL

Parameter collection methodology was consistent with DEQ monitoring protocols for assessment of sediment related impacts to aquatic biota and habitat (Burton et al. 1990, Burton and Harvey 1990, Burton 1991, Burton et al. 1991, Chandler, Maret and Zaroban, 1993, Clark and Maret 1993). The stream segment monitored was divided into 10 evenly spaced cross sections.

All laboratory analysis was consistent with the methods identified in the Standard Methods for Examination of Water and Waste Water (American Public Health Association, 1992).

DISCUSSION OF RESULTS

A brief discussion of the results are as follows:

Analysis of the data indicate a high amount of instream stored medium to fine sediment. Cobble embeddedness for both watersheds was greater than 70%, with the upper Big Elk Creek reach having an embeddedness of 89%. Mean particle size distribution was in the medium gravel range with the four reaches having a percent surface fines of 50% or greater. Both creeks have an abundance of large organic debris. While an attribute as a fisheries and stream morphology characteristic, this debris appears to be functioning as a significant sediment trapping and storage feature.

All fisheries related habitat parameters indicated good habitat with the exception of sediment. Pool to riffle ratios ranged from 1 to 1 for the lower Big Elk reach to 1 to 2.2 at the Upper Little Elk reach. It was noted that 1992 had lower flows than 1991 and comparison of habitat typing data reveals some pools became runs, and runs became riffles due to low flows.

Fish and macroinvertebrates showed good diversity, species composition, and taxa richness. Macroinvertebrates included the presence of clean water indicators. These results indicate a healthy biotic community.

Data collected indicated good canopy cover, excellent bank stability, and no excessive temperature problems.

The following tables 1 though 4 contain a complete tabulation of all the monitoring results.

Table 1. Habitat Data for the Big Elk Creek Lower Station, FSB1, 1991 and 1992.

	1991		1992
Cobble Embeddedness (%)	92.0		86.0
% fines	65.0		71.0
Interstitial Space Index	0.26	0.24	
Pebble Count (% surface fines)	59.0		--
D50(mm)	4.4	--	
Pool/Riffle Ratio	0.83	1.0	
Habitat Diversity Index	71.0		62.0
Residual Pool Volume	0.42		0.30
Photo Points	Yes		Yes
Fish (% young of year salmonid)	5.0		--
Abundance (all fish/hectare)	375.0		--
Salmonid Biomass (kg/hectare)	2.4		--
Macroinvertebrates:			
Species Richness	--		24.0
Percent EPT	--		68.0
Modified HBI	--		2.2
USFS-BCI Tolerance Quotient	--		58.6
Trophic Structure:			
% scrapers	--		7.0
% filterers	--		4.7
% shredders	--		1.6
Abundance (per sq meter)	--		7111.0

Table 2. Habitat Data for the Big Elk Creek Upper Station, FSB2, 1991 and 1992.

	1991	1992
Cobble Embeddedness (%)	81.0	68.0
% Fines	63.0	44.0
Interstitial Space Index	0.24	0.37
Pebble Count (% surface fines)	64.0	--
D50(mm)	1.8	--
Pool/Riffle Ratio	0.94	0.69
Habitat Diversity Index	43.0	51.0
Residual Pool Volume	0.38	0.33
Photo Points	Yes	Yes
Fish (% young of year salmonid)	15.0	--
Abundance (all fish/hectare)	294.0	--
Salmonid Biomass (kg/hectare)	3.0	--
Macroinvertebrates:		
Species Richness	--	19.0
% EPT	--	68.7
Modified HBI	--	2.65
USFS-BCI Tolerance Quotient	--	60.0
Trophic structure:		
% scrapers	--	10.8
% filterers	--	6.0
% shredders	--	13.3
Abundance (per sq. meter)	--	2306.0

Table 3. Habitat Data for the Little Elk Creek Lower Site, FSL1, 1991 and 1992.

	1991	1992
Cobble Embeddedness (%)	69.0	70.0
% Surface Fines	39.0	38.0
Interstitial Space Index	0.25	0.31
Pebble Count (% surface fines)	50.0	--
D50(mm)	5.7	--
Pool/Riffle Ratio	0.82	0.84
Habitat Diversity Index	91.0	62.0
Residual Pool Volume	0.30	0.39
Photo Points	Yes	Yes
Fish (% young of year salmonid)	12.2	--
Abundance (all fish/hectare)	263.0	--
Salmonid Biomass (kg/hectare)	2.1	--
Macroinvertebrates:		
Species Richness	--	23.0
% EPT	--	51.5
Modified HBI	--	2.8
USFS-BCI Tolerance Quotient	--	69.0
Trophic Structure:		
% scrapers	--	9.9
% filterers	--	2.0
% shredders	--	5.0
Abundance (per sq meter)	--	2806.0

Table 4. Habitat Data for the Little Elk Creek Upper Station, FSL2, 1991 and 1992.

	1991	1992
Cobble Embeddedness (%)	74.0	76.0
% Surface Fines	41.0	49.0
Interstitial Space Index	0.29	0.36
Pebble Count (% surface fines)	50.0	--
D50(mm)	5.8	--
Pool/Riffle Ratio	0.56	0.45
Habitat Diversity Index	76.0	45.0
Residual Pool Volume	0.11	0.63
Photo Points	Yes	Yes
Fish (% young of year Salmonid)	5.7	--
Abundance (all fish/hectare)	290.0	--
Salmonid Biomass (kg/hectare)	2.7	--
Macroinvertebrates:		
Species Richness	--	24.0
% EPT	--	69.0
Modified HBI	--	2.05
USFS-BCI Tolerance Quotient	--	53.0
Trophic Structure:		
% scrapers	--	14.6
% filterers	--	7.8
%shredders	--	11.7
Abundance (per sq meter)	--	3815.0

**** In addition, general data has been collected for:

Width/depth ratio
% canopy cover
Fast/slow water ratio
Mean width (bankful and low flow)
Mean cross sectional area (bankful and low flow)
Mean pool complexity (rearing quality)
Bank stability
% stream bank with cover
Water temperature
Mean depth (bankful and low flow)

CONCLUSIONS

The local working committee objectives of "improving water quality to fully support the beneficial uses" and "controlling forest practices impacts" were not met due to the timber sale cancellation. The monitoring plan objectives to document the effectiveness of the LWC's site specific BMP's were not met due to the timber sale cancellation. The monitoring plan objective to assess and document the existing condition of the stream and stream side habitat, fish, and macroinvertebrate population was accomplished.

The designated beneficial uses for Big Elk Creek are all supported, but, without a reference stream for comparison, the support status remains inconclusive.

The monitoring indicates excessive sedimentation contained within the Big and Little Elk Creek systems. Although present, grazing and bank stability presently do not appear to be contributing to the high instream sediment load. The two major sediment contributors appear to be logging and the natural granitic nature of the Idaho Batholith border zone material. The data collected are not sufficient to assign a percentage of contribution to either source.

RECOMMENDATIONS

It is recommended that every five years, or when timber harvest is planned, the monitoring stations are revisited with data for all parameters collected. It is recommended that no activity occur in these watersheds which will produce and deliver sediment to these creeks until the bedload sediment has decreased significantly.

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