



**INVENTORY OF REDBAND TROUT POPULATIONS  
IN THE JARBIDGE AREA**

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## ABSTRACT

The distribution and abundance of redband trout *Oncorhynchus mykiss* in Clover Creek was investigated in areas where they were historically documented. Due to drought influences, only five sites were successfully sampled prior to dewatering. Stream habitat, riparian habitat, and fish population data were collected at each sample site. No redband trout were found during the fisheries survey. Fish species sampled included bridgelip sucker *Catostomus columbianus*, chiselmouth chub *Acrocheilus alutaceus*, northern pikeminnow *Ptychocheilus oregonensis*, redband shiner *Richardsonius balteatus*, shorthead sculpin *Cottus confusus*, and speckled dace *Rhinichthys osculus*. Stream habitat within the sample sites was not found to be suitable salmonid habitat during the time of this study. Limiting factors included stream flow, water temperature, and suitable spawning habitat (e.g., gravel embeddedness). The associated riparian habitat was generally poor but showed some signs of recovery from past perturbations.

## INTRODUCTION

Clover Creek (i.e., East Fork Bruneau River) is a tributary to the Bruneau River, which eventually terminates at the Snake River at C.J. Strike Reservoir. Elevations range from about 980 m in elevation at its confluence to about 2,600 m at its headwaters in Nevada. The total drainage for Clover Creek encompasses approximately 700 km<sup>2</sup>, most of which is sagebrush steppe habitat sloping to the north from broad undulating plateaus northeast of the Jarbidge Mountains. Clover Creek flows through the steep basaltic East Fork Bruneau Canyon, which has very little human access.

Several streams in the Cedar, Clover, and Salmon Falls Creek basins are within the historic range of redband trout *Oncorhynchus mykiss ssp.* Little is known of the current distribution and abundance of redband trout or of the current habitat conditions within these drainages.

Flows in Clover Creek are subject to drought impacts and irrigation withdrawals. Most of the watershed falls on either private holdings or Bureau of Land Management (BLM) controlled livestock grazing allotments. These impacts have not been fully evaluated with respect to the current status of the resident redband trout population.

The purpose of this study was to examine redband trout distribution and abundance in drainages that were historically known to support redband trout populations. This report includes only data from Clover Creek and some of its tributaries as part of a collaborative effort with the BLM – Jarbidge Resource Area of the Lower Snake River District. The objectives were to: 1) examine redband trout abundance (density) in areas known to historically support redband trout; 2) examine the distribution and abundance in previously unsampled sections of the stream; and 3) collect stream habitat information which can be used to evaluate any changes in habitat conditions since the stream was last sampled.

## STUDY AREA

The study area included the reach of Clover Creek from the confluence of Three Creek and Flat Creek downstream to the confluence of Clover Creek and the Bruneau River. Five sites were selected, one of which (Three Creek) was previously sampled (Personal communication-Jim Klott, BLM) (Figure 1). Selected sites were not randomly chosen but were prioritized for access and for equal distribution within the reach. Coordinates and photo-points of each location sampled are reported in Table 1 and Appendix A, respectively.

Table 1. Location and brief description of Clover Creek sites electrofished in 2002.

Location	Stream	Site description	UTM of lower end of site	Length (m)
Site 1	Clover Cr.	Clover Crossing	634,262 M E, 4,699,985 M N, Z11	100
Site 2	Clover Cr.	Juniper Ranch	637,625 M E, 4,694,221 M N, Z11	100
Site 3	Clover Cr.	Salls Crossing	646,918 M E, 4,675,441 M N, Z11	78
Site 4	Clover Cr.	Smiths Crossing	647,919 M E, 4,669,429 M N, Z11	100
Site 5	Three Creek	Confluence	647,970 M E, 4,667,885 M N, Z11	100

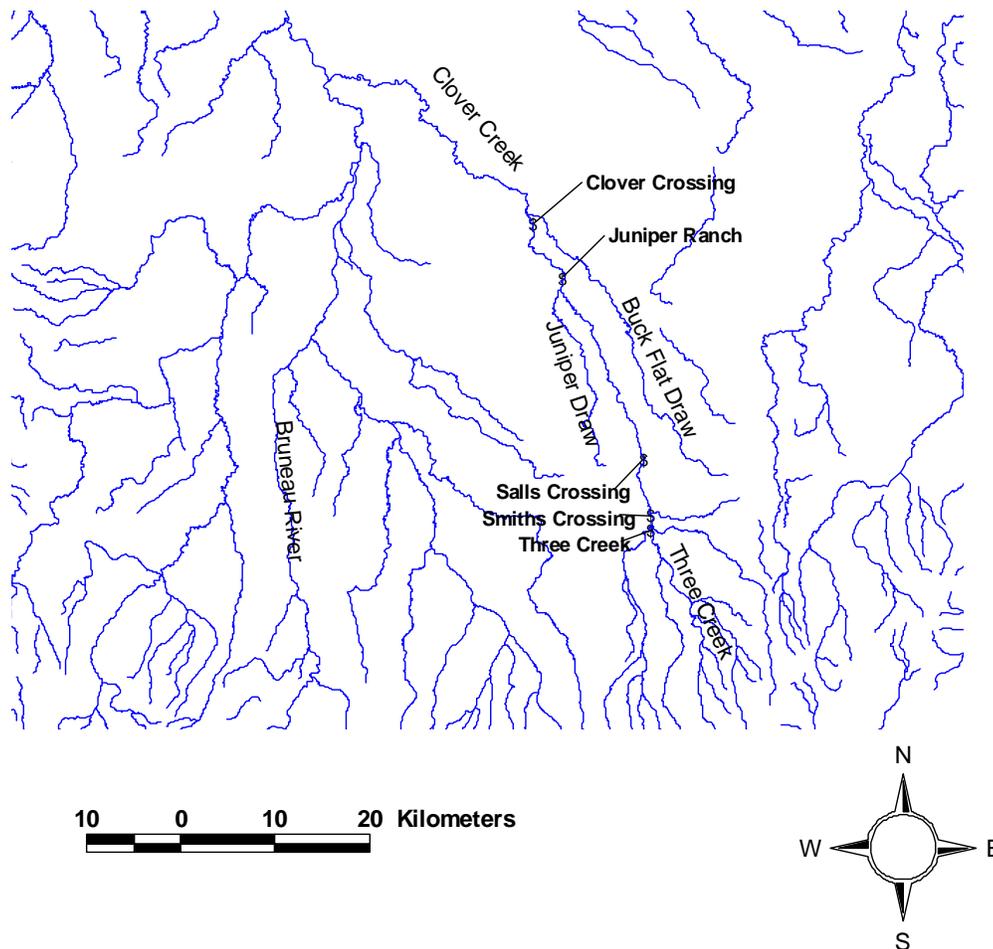


Figure 1. Location of five sites sampled on Clover Creek in June 2002.

## METHODS

Fish were collected at each site using a Smith-Root<sup>®</sup> Model 15-D backpack electrofishing unit. Block nets were installed at the upper and lower boundaries of each transect prior to electrofishing. Each transect was approximately 100 m long. Only one pass was completed if redband trout were not collected in the first pass. Fish were anesthetized, identified, measured (total length in mm), weighed (g), marked (trout only) and then released back into the stream. In some cases, vouchers were collected and preserved for final identification.

Habitat was measured at every ten meters across the stream channel throughout each site. The location for the initial cross-section location was randomly selected at 0 to 10 m (at one meter intervals) from the downstream end of the reach. Cross-section transects were used to determine stream widths (m), depths (m), and to classify the habitat. Stream depths were measured at  $\frac{1}{4}$ ,  $\frac{1}{2}$ , and  $\frac{3}{4}$  widths across the stream channel. The habitat was classified as pool, run, pocket water, riffle or backwater at each location where depths were measured.

Relative substrate composition was estimated using the following categories: sand ( $\leq 0.1$  cm), gravel (0.1-7.5 cm), rubble (7.5-30.0 cm), boulder ( $> 30.0$  cm) and bedrock. Instream vegetation and large woody debris were noted as present or absent along the cross-sections at each point water depth was measured. Overhead cover (undercut banks and overhead vegetation) was measured (m) along the stream bank at each cross section. Stream gradient was measured and reported as percent vertical drop between the upstream and downstream transect boundaries. Water quality measurements including temperature (C), specific conductivity ( $\mu$ S), salinity (ppm), total alkalinity (mg/l), total hardness (mg/l), and pH were recorded within each site. Instream aquatic vegetation was recorded as present or absent.

Streambank characteristics were evaluated within each transect (Table 2). Undercut banks and overhead vegetation were measured (m) when present. Recent grazing as noted when present.

Table 2. Classifications used to describe streambank stability at sample locations within the Clover Creek Drainage.

Classification	Vegetation cover	Cover type
Covered and stable (CS)	> 50% coverage	Deep-rooted riparian vegetation and/or anchoring rock
Covered and unstable (CU)	> 50% coverage	Perennial vegetation, but usually with shallow-rooted plants
Uncovered and stable (US)	< 50% coverage	Perennial vegetation or anchoring rock - no signs of erosion
Uncovered and unstable (UU)	< 50% coverage	Banks are eroding, slumped, or bare vertical banks

Fish abundance and density estimates were made from fish capture data. Population estimates were made using a multiple pass removal-depletion estimator (Zippin 1958). If only one pass was completed – due to lack of redband trout – then only species composition estimates (relative numbers) were provided in this report. Densities (fish/m<sup>2</sup>) were generated by dividing the population estimate by the total surface area within the sample reach.

## RESULTS

Five sites were evaluated in late July 2002. Initial sampling was to have occurred in 2001; however, this effort was postponed due to severe drought conditions. Drought conditions persisted in 2002 and upstream irrigation withdrawals essentially eliminated free flowing water after the last site was sampled.

No fish population or density estimates were made. Multiple passes were not made in any of the five sites sampled since no trout species were found.

A total of 458 fish were collected from all sites combined. Fish collected were from the Catostomidae, Cyprinidae, and Cottidae families. Fish species sampled included bridgelip sucker *Catostomus columbianus*, chiselmouth chub *Acrocheilus alutaceus*, northern pikeminnow *Ptychocheilus oregonensis*, redband shiner *Richardsonius balteatus*, shorthead sculpin *Cottus confusus*, and speckled dace *Rhinichthys osculus*. Several unidentified young-

of-the-year (YOY) cyprinids were also collected that ranged in length from approximately 1.5-3.0 cm. Close inspection indicated all appeared to be species listed above. No trout species were sampled at any of the sites.

The predominant species varied among reaches sampled. Catch data were summarized (Table 3) and reported in Appendix B. Chiselmouth chub were the dominant species in three of the five sites investigated. The dominant species were warmwater or transitional fish species with very few coldwater dependent species present. Length data from captured fish showed a fish community with only juvenile or subadult non-game fish species (Table 4). Ages were not confirmed; however, length frequencies of captured fish indicated the presence of only age-0, age-1 and age-2 northern pikeminnow.

The majority of stream habitat within the reaches sampled was made up of pools and runs with a sand and gravel substrate. The relatively low gradients measured ranged from 0.15 to 0.54% (Table 5) and coincided with the abundance of pools and runs and sparse riffle habitat (Table 6; Appendix C). Sand was the dominant substrate within most sites sampled except Clover Crossing where nearly equal proportions of sand and gravel were present (Table 7; Appendix C). When present, the gravel found in riffles and runs was heavily embedded with sand and silt (Table 8; Appendix C).

Generally, fish habitat within Clover Creek drainage was poor. Water temperatures increased rapidly from 12°C in the upstream site (Three Creek) to about 23°C in the downstream site (Clover Creek) (Table 9). Few locations were found to have undercut banks or significant overhanging vegetation (Table 10). Overhanging streamside vegetation was particularly scarce in sites where active grazing was observed. A larger proportion of the streambank was rated as uncovered/unstable within areas with active grazing observed than of those where grazing was not evident. Overall, the majority of streambanks within the five sites evaluated were classified as covered/stable or covered/unstable.

Table 3. Catch data from backpack electrofishing efforts on Clover Creek and Three Creek in July 2002. An asterisk indicates the greatest relative abundance.

Data	Stream	Site	Species						YOY <sup>g</sup>
			BLS <sup>a</sup>	CMC <sup>b</sup>	NPM <sup>c</sup>	RSS <sup>d</sup>	SPD <sup>e</sup>	SHS <sup>f</sup>	
Total catch	Clover Cr.	1		1	42	5	*43		
	Clover Cr.	2	16	*90	48	68	20		2
	Clover Cr.	3	1	6	8	*10	9		
	Clover Cr.	4	15	*24	15	12	11		7
	Three Cr.	5		*2	1			1	1
		<b>Total</b>	<b>32</b>	<b>123</b>	<b>114</b>	<b>95</b>	<b>83</b>	<b>1</b>	<b>10</b>
		<b>Total fish</b>	<b>458</b>						
Rel. Abund.	Clover Cr.	1	0%	1%	46%	5%	*47%	0%	0%
	Clover Cr.	2	7%	*37%	20%	28%	8%	0%	1%
	Clover Cr.	3	3%	18%	24%	*29%	26%	0%	0%
	Clover Cr.	4	18%	*29%	18%	14%	13%	0%	8%
	Three Cr.	5	0%	*40%	20%	0%	0%	20%	20%
		<b>Total</b>	<b>7%</b>	<b>27%</b>	<b>25%</b>	<b>21%</b>	<b>18%</b>	<b>0%</b>	<b>2%</b>

<sup>a</sup> bridgeliip sucker  
<sup>d</sup> redbside shiner  
<sup>g</sup> unidentified YOY

<sup>b</sup> chiselmouth chub  
<sup>e</sup> speckled dace

<sup>c</sup> northern pikeminnow  
<sup>f</sup> shorthead sculpin

Table 4. Length frequency (1 cm bins) and average weights (g) of fish collected from five sites on Clover Creek in July 2002.

TL (mm)	Species <sup>a</sup>													
	BLS		CMC		SPD		NPM		RSS		SHS		YOY	
	# fish	Avg. wt.	# fish	Avg. wt.	# fish	Avg. wt.	# fish	Avg. wt.	# fish	Avg. wt.	# fish	Avg. wt.	# fish	Avg. wt.
<30														30
30					2									
40			1											
50	1		1				2	1	10	2	1			
60			8	3	13	2	8	2	9	2				
70	3		6	3	18	4	21	4	15	6				
80	5	6	8	7	5		15	5	7	6				
90	2		9	7	1	8	7	7	4	8				
100			1				7	9						
110	3	13	8	12										
120	2	13	9	19			2	16						
130			5	21			4	22						
140	1	26	2	26			5	27						
150			2	28			4	32						
160	2	37					1	34						
170							4	45						
180	7	61	1	62			2	56						
190	4	62					2	61						
210	2	85					1	78						
Total	32		61		39		85		45		1			30

<sup>a</sup> See table 3 for species abbreviations and associated names

Table 5. Physical characteristics of five sample sites with the Clover Creek drainage in June 2003.

Site	Transects (n)	Interval (m)	Length (m)	Avg. Width (m)	Area (m <sup>2</sup> )	Gradient (%)
Clover Crossing	10	10	100	4.8	483	0.38
Juniper Ranch	10	10	100	5.1	505	0.18
Salls Crossing	8	10	78	6.5	505	0.15
Smiths Crossing	10	10	100	6.3	631	0.45
Three Creek	10	10	100	3.8	380	0.54

Table 6. Average depths and relative composition of stream habitat types from five sample sites within the Clover Creek drainage in June 2003.

Site	Data	Habitat Type				
		Backwater	Pocket	Pool	Riffle	Run
Clover Crossing	Composition (%)	0.0	16.7	16.7	10.0	56.6
Juniper Ranch		0.0	0.0	36.7	0.0	63.3
Salls Crossing		0.0	0.0	91.7	0.0	8.3
Smiths Crossing		6.7	0.0	36.6	10.0	46.7
Three Creek mouth		0.0	0.0	50.0	20.0	30.0
Clover Crossing	Ave depth (m)	0.0	0.3	0.5	0.2	0.3
Juniper Ranch		0.0	0.0	0.3	0.0	0.3
Salls Crossing		0.0	0.0	0.6	0.0	0.4
Smiths Crossing		0.3	0.0	0.5	0.2	0.3
Three Creek mouth		0.0	0.0	0.3	0.1	0.2

Table 7. Relative substrate composition of benthic substrate from five sample sites within the Clover Creek drainage in June 2003.

Substrate	Site				
	Clover Crossing	Juniper Ranch	Salls Crossing	Smiths Crossing	Three Creek
Silt/sand	36.8	59.9	84.9	62.7	56.0
Gravel	37.3	26.1	6.6	26.0	12.7
Rubble	4.8	11.6	4.3	8.0	29.5
Boulder	21.1	2.4	4.1	3.3	1.8
Bedrock	0.0	0.0	0.0	0.0	0.0

Table 8. Relative composition of benthic substrate by habitat type from five sites within the Clover Creek drainage in June 2003.

Site	Substrate (%)	Habitat Type (%)				
		Backwater	Pocket	Pool	Riffle	Run
Clover Crossing	Silt/sand	-	29.0	36.8	46.7	37.4
	Gravel	-	11.0	27.4	53.3	45.3
	Rubble	-	0.0	13.2	0.0	4.4
	Boulder	-	60.0	22.6	0.0	12.9
	Bedrock	-	0.0	0.0	0.0	0.0
		-	100.0	100.0	100.0	100.0
Juniper Ranch	Silt/sand	-	-	75.0	-	50.8
	Gravel	-	-	13.4	-	33.9
	Rubble	-	-	5.4	-	15.4
	Boulder	-	-	6.3	-	0.0
	Bedrock	-	-	0.0	-	0.0
		-	-	100.0	-	100.0
Salls Crossing	Silt/sand	-	-	84.7	-	87.5
	Gravel	-	-	6.5	-	7.5
	Rubble	-	-	4.3	-	5.0
	Boulder	-	-	4.5	-	0.0
	Bedrock	-	-	0.0	-	0.0
		-	-	100.0	-	100.0
Smiths Crossing	Silt/sand	100.0	-	66.4	66.7	53.6
	Gravel	0.0	-	21.8	33.3	31.4
	Rubble	0.0	-	11.8	0.0	7.9
	Boulder	0.0	-	0.0	0.0	7.1
	Bedrock	0.0	-	0.0	0.0	0.0
		100.0	-	100.0	100.0	100.0
Three Creek mouth	Silt/sand	-	-	67.3	32.5	52.8
	Gravel	-	-	11.7	12.5	14.4
	Rubble	-	-	20.7	46.7	32.8
	Boulder	-	-	0.3	8.3	0.0
	Bedrock	-	-	0.0	0.0	0.0
		-	-	100.0	100.0	100.0

Table 9. Water quality data from five sites within the Clover Creek drainage in June 2003.

Site	Date	Time (h)	Water quality					
			Temp (C)	Total alkalinity (mg/l)	Total hardness (mg/l)	pH	Specific cond. (µS)	Salinity (ppm)
Clover Crossing	June 19, 2003	1415	22.5	89	67	8.9	197.2	0.1
Juniper Ranch	June 19, 2003	1520	24.2	83	69	8.9	200.2	0.1
Salls Crossing	June 24, 2003	1320	- na -	76	73	8.4	202.5	0.1
Smiths Crossing	June 24, 2003	1540	15.0	63	67	8.5	196.0	0.1
Three Creek mouth	June 24, 2003	1215	12.0	61	69	8.6	154.0	0.1

Table 10. Stream bank and riparian habitat measurements from five sites within Clover Creek drainage in June 2003.

Site	Trans.	Undercut bank		Instream vegetation	Overhanging vegetation		Bank stability		Woody debris	Grazing
		Left bank (m)	Right bank (m)		Left bank (m)	Right bank (m)	Left bank	Right bank		
Smiths Crossing	8	0.0	0.0	Present	0.0	0.0	CU	UU	Absent	Yes
	18	0.0	0.0	Present	0.0	0.7	CU	CU	Absent	Yes
	28	0.0	0.3	Present	0.0	0.0	CS	CS	Absent	Yes
	38	0.2	0.0	Present	0.5	0.0	CU	CU	Absent	Yes
	48	0.0	0.2	Present	0.0	0.0	CU	UU	Absent	Yes
	58	0.0	0.0	Present	2.3	0.0	CS	CU	Absent	Yes
	68	0.0	0.0	Present	0.4	0.0	UU	CU	Absent	Yes
	78	0.0	0.0	Present	0.0	0.0	CU	CU	Absent	Yes
	88	0.0	0.0	Present	0.0	0.0	UU	CU	Absent	Yes
98	0.0	0.0	Present	1.5	0.0	CS	UU	Absent	Yes	
Juniper Ranch	10	0.0	0.0	Present	0.0	0.0	CU	CU	Absent	Yes
	20	0.0	0.0	Present	0.0	0.0	CU	CU	Absent	Yes
	30	0.0	0.0	Present	0.0	0.0	CU	CU	Absent	Yes
	40	0.0	0.0	Present	0.0	0.0	CU	CU	Absent	Yes
	50	0.0	0.0	Present	0.0	0.0	CU	CU	Absent	Yes
	60	0.0	0.0	Present	0.0	0.0	CU	CU	Absent	Yes
	70	0.0	0.0	Present	0.0	0.0	CU	UU	Absent	Yes
	80	0.0	0.0	Present	0.0	0.0	CU	UU	Absent	Yes
	90	0.0	0.0	Present	0.0	0.0	CU	UU	Absent	Yes
100	0.0	0.0	Present	0.0	0.0	CU	UU	Absent	Yes	
Clover Crossing	10	0.0	0.0	Present	0.0	0.0	CU	CU	Absent	Yes
	20	0.0	0.0	Present	0.0	0.0	CS	CU	Absent	Yes
	30	0.0	0.0	Present	0.0	0.0	CU	CS	Absent	Yes
	40	0.0	0.1	Present	0.0	0.0	CU	CU	Absent	Yes
	50	0.0	0.0	Present	0.0	0.0	CU	CU	Absent	Yes
	60	0.0	0.3	Absent	0.0	0.0	CU	CU	Absent	Yes
	70	0.0	0.2	Present	0.0	0.0	CU	CU	Absent	Yes
	80	0.0	0.0	Present	0.0	0.0	CU	UU	Absent	Yes
	90	0.0	0.0	Absent	0.0	0.0	CU	UU	Absent	Yes
100	0.0	0.0	Present	0.0	0.0	CU	UU	Absent	Yes	
Salls Crossing	0	0.0	0.0	Absent	2.0	1.0	CS	CS	Absent	No
	10	0.0	0.0	Absent	1.5	0.0	CS	CS	Absent	No
	20	0.4	0.0	Absent	2.0	0.0	CS	CS	Absent	No
	30	0.0	0.0	Absent	0.0	3.0	UU	CS	Absent	No
	40	0.0	0.0	Absent	3.0	2.0	CS	CS	Absent	No
	50	0.0	0.0	Absent	0.0	4.5	CS	CS	Absent	No
	60	0.0	0.0	Present	0.0	3.0	CS	CS	Absent	No
	70	0.0	0.0	Absent	2.5	0.0	CS	CS	Present	No
Three Creek	5	0.0	0.0	Absent	0.0	0.0	CS	CS	Absent	No
	15	0.0	0.0	Present	0.0	0.0	CS	CS	Absent	No
	25	0.0	0.0	Present	0.0	0.0	CS	CS	Absent	No
	35	0.0	0.0	Present	0.0	0.0	CS	CU	Absent	No
	45	0.0	0.0	Present	0.0	0.0	CS	CS	Absent	No
	55	0.0	0.0	Present	0.0	0.0	CU	CS	Absent	No
	65	0.0	0.0	Present	0.6	0.0	CU	CS	Absent	No
	75	0.0	0.0	Present	0.0	0.0	CU	CS	Absent	No
	85	0.0	0.0	Present	0.0	0.0	CU	CS	Absent	No
95	0.0	0.0	Present	0.0	0.0	CS	CS	Absent	No	

## DISCUSSION

Redband trout were not present within the areas sampled in the Clover Creek drainage. Redband trout distribution was mainly limited by insufficient discharge (i.e. flows) and relatively poor habitat quality.

The repeated seasonal dewatering is the most obvious limiting factor in relation to redband trout distribution and densities within the areas sampled. Clover Creek was dewatered in mid summer in 2001 and 2002 due to the combined effects of drought and irrigation use. This repeated loss of flow likely reduced the prospect of recolonization by redband trout during this time period. If conditions in the upper reaches of the drainage provide more suitable habitat during low water years then there may be a source for recolonization.

The stream and riparian habitat was generally poor. Livestock grazing can impact the streamside vegetation, stream channel morphology, and water quality within stream and riparian ecosystems (Platts 1979). These impacts can alter the structure of resident fish populations and diminish fish numbers (Platts 1991). Past and present riparian land use (e.g. grazing) has heavily impacted Clover Creek in the areas sampled. The lack of overhanging banks, overhanging vegetation, and deep pools as well as the presence of a heavy sediment load, sloughed banks, high water temperatures, and widened banks are consistent with known grazing impacts (Platts 1979, 1991). Additionally, the level of silt and sand in the river substrate was indicative of an active erosion problem. In some sites the riparian vegetation appeared to be in a state of recovery. The majority of the stream banks within the three lower sites were classified as covered and unstable. This determination was made when the bank showed evidence of past erosion but was in the initial stages of colonization by willows and grasses. Riparian vegetation was taking hold on what appears to be previously unstable stream banks. Further evidence of a recent riparian recovery is that shoreline grasses were present without evidence of past years growth (e.g. detritus vegetation mat). The reason for the improved stabilization was not determined but may include differences in land use, high spring water flows, water use, or precipitation among years.

Stream conditions were not optimal for salmonid populations. The temperature range for rainbow trout *Oncorhynchus mykiss* is generally from 0°C to 28°C with an optimum below 21°C (Carlander 1969). June water temperatures were recorded at about 24°C before the dewatering event in the downstream transects. In these reaches, water temperatures were already nearing upper levels known to limit redband trout distribution (Zoellick 1999). Water temperatures in July and August would likely have exceeded those recorded in June particularly when flows were reduced due to diversions. The Smiths Crossing and Three Creek sites had lower water temperatures but no salmonids were captured suggesting the involvement of other limiting factors. Salmonid natural recruitment within the drainage may be limited by seasonal dewatering. Redband trout from the Kootenai River were shown to spawn from June 6 to June 24 (Muhlfeld 2002). Clover Creek flows were greatly reduced or eliminated in June of 2001 and 2002 due to irrigation demands thus eliminating any possible natural recruitment if the Clover Creek population spawns during the same time period. Additionally, most of the available spawning gravel suitable for salmonids was embedded in the abundant sand and silt.

The resident fish community was made up of species adapted to warm or transitional water zones with cyprinids dominating the fish community. The only coldwater stenothermic fish species sampled was a shorthead sculpin found at the Three Creek site. The lack of coldwater fish species is indicative of the warm water stream conditions.

Results from this study represent a snapshot in time and do not represent the potential for redband trout recovery in this basin. Changes in land use, water use, and seasonal precipitation may result in an increased abundance of redband trout. Concurrent sampling within this drainage by study cooperators (BLM) may show the presence of isolated redband trout populations elsewhere in the drainage. These isolated populations may provide a source for colonization if stream habitat conditions improve. It is possible that the Clover Creek drainage was historically subject to seasonal dewatering during drought years and the resident redband trout population has adapted, resulting in a dynamic distribution. Little is known of the distribution of redband trout within the surrounding drainages. Redband trout populations within adjacent drainages may provide the potential for colonization by straying. The possibility also exists that remnant isolated populations are persisting within Clover Creek in areas where natural springs are providing refuge during harsh summer conditions. The number of sites sampled by the Department was insufficient to make drainage-wide conclusions and results should be considered accordingly.

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## **APPENDICES**

Appendix A. Photos taken at five sites within the Clover Creek drainage in June 2002.



Clover Crossing – lower end



Clover Crossing – upper end



Juniper Ranch – lower end



Juniper Ranch – upper end



Salls Crossing – lower end



Salls Crossing – mid transect



Salls Crossing – mid transect



Salls Crossing – mid transect

Appendix A. Continued.



Smiths Crossing – benchmark



Smiths Crossing – drainage overlook



Smiths Crossing – drainage overlook



Smiths Crossing – drainage overlook



Three Creek – benchmark



Three Creek – drainage overlook



Three Creek – mid transect



Three Creek – riparian vegetation

Appendix B. Fish collected (raw data) at five sites from the Clover Creek drainage in July 2003.

Record	Date	Stream	Site	Fish collected				Comments
				Species <sup>a</sup>	Length	Weight	#'s	
1	7/23/2002	Clover Creek	Smiths Crossing (4)	RSS	60	3		
2			Smiths Crossing (4)	BLS	80	8		preserved for ID
3			Smiths Crossing (4)	NPM	150	33		
4			Smiths Crossing (4)	NPM	100	8		
5			Smiths Crossing (4)	NPM	120	17		
6			Smiths Crossing (4)	BLS	180	57		
7			Smiths Crossing (4)	RSS	60	1		
8			Smiths Crossing (4)	CMC	90	5		
9			Smiths Crossing (4)	BLS	80	4		
10			Smiths Crossing (4)	NPM	70	5		
11			Smiths Crossing (4)	CMC	90	9		
12			Smiths Crossing (4)	CMC	90	6		
13			Smiths Crossing (4)	CMC	80	7		
14			Smiths Crossing (4)	CMC	90			
15			Smiths Crossing (4)	RSS	80	6		
16			Smiths Crossing (4)	BLS	50			
17			Smiths Crossing (4)	BLS	70			
18			Smiths Crossing (4)	RSS	70			
19			Smiths Crossing (4)	RSS	80			
20			Smiths Crossing (4)	RSS	60			
21			Smiths Crossing (4)	CMC	70			
22			Smiths Crossing (4)	CMC	60			
23			Smiths Crossing (4)	CMC	60			
24			Smiths Crossing (4)	RSS	70			
25			Smiths Crossing (4)	CMC	60			
26			Smiths Crossing (4)	RSS	50			
27			Smiths Crossing (4)	NPM	70			
28			Smiths Crossing (4)	CMC	50			
29			Smiths Crossing (4)	CMC	70			
30			Smiths Crossing (4)	CMC	60			
31			Smiths Crossing (4)	RSS	60			
32			Smiths Crossing (4)	RSS	50			
33			Smiths Crossing (4)	unk. YOY				preserved for ID
34			Smiths Crossing (4)	RSS	70	6		
35			Smiths Crossing (4)	NPM	100	9		
36			Smiths Crossing (4)	CMC	90	7		
37			Smiths Crossing (4)	NPM	100	10		
38			Smiths Crossing (4)	NPM	140	25		
39			Smiths Crossing (4)	NPM	170	50		
40			Smiths Crossing (4)	CMC	90	9		
41			Smiths Crossing (4)	CMC	110	12		
42			Smiths Crossing (4)	CMC	80			
43			Smiths Crossing (4)	CMC	90			
44			Smiths Crossing (4)	BLS	110	12		preserved for ID
45			Smiths Crossing (4)	NPM	130	21		
46			Smiths Crossing (4)	SPD	60			preserved for ID
47			Smiths Crossing (4)	SPD	60			
48			Smiths Crossing (4)	NPM	130	24		
49			Smiths Crossing (4)	CMC	120	17		
50			Smiths Crossing (4)	NPM	140	29		
51			Smiths Crossing (4)	BLS	160	30		preserved for ID
52			Smiths Crossing (4)	CMC	120	30		
53			Smiths Crossing (4)	BLS	180	67		
54			Smiths Crossing (4)	NPM	140	26		
55			Smiths Crossing (4)	NPM	170	47		
56			Smiths Crossing (4)	CMC	110			
57			Smiths Crossing (4)	CMC	60			
58			Smiths Crossing (4)	CMC	130	22		
59			Smiths Crossing (4)	SPD	80			preserved for ID
60			Smiths Crossing (4)	CMC	60			
61			Smiths Crossing (4)	CMC	110	10		
62			Smiths Crossing (4)	BLS	120	13		
63			Smiths Crossing (4)	BLS	80			
64			Smiths Crossing (4)	BLS	160	43		
65			Smiths Crossing (4)	BLS	140	26		

Appendix B. Continued

Record	Date	Stream	Site	Species <sup>a</sup>	Fish collected			Comments
					Length	Weight	#'s	
66			Smiths Crossing (4)	NPM	60			
67			Smiths Crossing (4)	SPD	70			
68			Smiths Crossing (4)	SPD	70			
69			Smiths Crossing (4)	BLS	80			
70			Smiths Crossing (4)	SPD	60			
71			Smiths Crossing (4)	SPD	60			
72			Smiths Crossing (4)	BLS	70			
73			Smiths Crossing (4)	SPD	60			
74			Smiths Crossing (4)	SPD	60			
75			Smiths Crossing (4)	SPD	60			
76			Smiths Crossing (4)	SPD	70			
77			Smiths Crossing (4)	BLS	70			
78			Smiths Crossing (4)	RSS	50			
79			Smiths Crossing (4)	Unk. YOY			6	preserved for ID
1	7/23/2002	Clover Creek	Salls Crossing (3)	SPD	60			
2			Salls Crossing (3)	RSS	70			
3			Salls Crossing (3)	RSS	50			
4			Salls Crossing (3)	NPM	60			
5			Salls Crossing (3)	RSS	90			
6			Salls Crossing (3)	RSS	60			
7			Salls Crossing (3)	NPM	80	4		
8			Salls Crossing (3)	RSS	90	7		
9			Salls Crossing (3)	NPM	140	25		
10			Salls Crossing (3)	BLS	90			
11			Salls Crossing (3)	SPD	70			
12			Salls Crossing (3)	CMC	70			
13			Salls Crossing (3)	NPM	120	15		
14			Salls Crossing (3)	CMC	80			
15			Salls Crossing (3)	NPM	80			
16			Salls Crossing (3)	SPD	70			
17			Salls Crossing (3)	CMC	90			
18			Salls Crossing (3)	CMC	70			
19			Salls Crossing (3)	NPM	80			
20			Salls Crossing (3)	SPD	60			
21			Salls Crossing (3)	SPD	70			
22			Salls Crossing (3)	NPM	80			
23			Salls Crossing (3)	CMC	70			
24			Salls Crossing (3)	SPD	60			
25			Salls Crossing (3)	SPD	60			
26			Salls Crossing (3)	NPM	50			
27			Salls Crossing (3)	RSS	50			
28			Salls Crossing (3)	RSS	50			
29			Salls Crossing (3)	RSS	50			
30			Salls Crossing (3)	RSS	50			
31			Salls Crossing (3)	CMC	60			
32			Salls Crossing (3)	SPD	30			
33			Salls Crossing (3)	SPD	30			
34			Salls Crossing (3)	RSS	50			
1	7/23/2002	Three Creek	Confl. Clover Cr (5)	Unk. YOY				preserved for ID
2			Confl. Clover Cr (5)	SHS				preserved for ID
3			Confl. Clover Cr (5)	CMC	40			
4			Confl. Clover Cr (5)	NPM	80			
5			Confl. Clover Cr (5)	CMC	80			
1	7/24/2002	Clover Creek	Clover Crossing (1)	NPM	80	5		
2			Clover Crossing (1)	NPM	90	7		
3			Clover Crossing (1)	NPM	90	5		
4			Clover Crossing (1)	SPD	70	3		preserved for ID
5			Clover Crossing (1)	SPD	70	4		preserved for ID
6			Clover Crossing (1)	NPM	130	23		
7			Clover Crossing (1)	RSS	90	8		
8			Clover Crossing (1)	NPM	90	7		
9			Clover Crossing (1)	NPM	80	4		
10			Clover Crossing (1)	NPM	70	2		
11			Clover Crossing (1)	NPM	70	4		
12			Clover Crossing (1)	NPM	70	3		
13			Clover Crossing (1)	NPM	80	6		
14			Clover Crossing (1)	NPM	60	3		
15			Clover Crossing (1)	NPM	80	4		

Appendix B. Continued

Record	Date	Stream	Site	Species <sup>a</sup>	Fish collected			Comments
					Length	Weight	#'s	
16			Clover Crossing (1)	NPM	70		3	
17			Clover Crossing (1)	NPM	80		6	
18			Clover Crossing (1)	RSS	80		7	
19			Clover Crossing (1)	NPM	60		2	
20			Clover Crossing (1)	NPM	50		1	
21			Clover Crossing (1)	NPM	60		2	
22			Clover Crossing (1)	SPD	70		4	
23			Clover Crossing (1)	RSS	50		2	
24			Clover Crossing (1)	SPD	90		8	
25			Clover Crossing (1)	SPD	70		5	preserved for ID
26			Clover Crossing (1)	SPD	70		4	
27			Clover Crossing (1)	SPD	60		2	
28			Clover Crossing (1)	NPM	70		4	
29			Clover Crossing (1)	NPM	70		4	
30			Clover Crossing (1)	RSS	80		6	
31			Clover Crossing (1)	NPM	80		6	
32			Clover Crossing (1)	SPD	70		4	
33			Clover Crossing (1)	NPM	70		3	
34			Clover Crossing (1)	SPD	70		4	
35			Clover Crossing (1)	NPM	70			
36			Clover Crossing (1)	SPD	70		4	
37			Clover Crossing (1)	NPM	100		9	
38			Clover Crossing (1)	NPM	90		8	
39			Clover Crossing (1)	RSS	80		6	
40			Clover Crossing (1)	NPM	60			
41			Clover Crossing (1)	NPM	70			
42			Clover Crossing (1)	NPM	70			
43			Clover Crossing (1)	NPM	70			
44			Clover Crossing (1)	NPM	80			
45			Clover Crossing (1)	NPM	90			
46			Clover Crossing (1)	SPD	70		4	
47			Clover Crossing (1)	NPM	70			
48			Clover Crossing (1)	NPM	70			
49			Clover Crossing (1)	NPM	170		41	
50			Clover Crossing (1)	NPM	70			
51			Clover Crossing (1)	SPD	70		2	
52			Clover Crossing (1)	NPM	60			
53			Clover Crossing (1)	NPM	70			
54			Clover Crossing (1)	NPM	100		10	
55			Clover Crossing (1)	SPD	70			
56			Clover Crossing (1)	SPD	70			
57			Clover Crossing (1)	SPD	80			
58			Clover Crossing (1)	NPM	100		9	
59			Clover Crossing (1)	NPM	70			
60			Clover Crossing (1)	SPD	80			
61			Clover Crossing (1)	SPD			9	adult
62			Clover Crossing (1)	SPD			13	adult
63			Clover Crossing (1)	NPM	70			
64			Clover Crossing (1)	NPM	60			
65			Clover Crossing (1)	NPM	70			
66			Clover Crossing (1)	SPD			5	subadult
67			Clover Crossing (1)	CMC	60		3	
1	7/24/2002	Clover Creek	Juniper Ranch (2)	RSS	60			
2			Juniper Ranch (2)	NPM	90			
3			Juniper Ranch (2)	NPM	80			
4			Juniper Ranch (2)	RSS	90			
5			Juniper Ranch (2)	RSS	70			
6			Juniper Ranch (2)	RSS	70			
7			Juniper Ranch (2)	CMC	120	12		
8			Juniper Ranch (2)	CMC	140	22		
9			Juniper Ranch (2)	CMC	120	18		
10			Juniper Ranch (2)	CMC	70	3		
11			Juniper Ranch (2)	RSS	80			
12			Juniper Ranch (2)	CMC	130	17		
13			Juniper Ranch (2)	CMC	120	16		
14			Juniper Ranch (2)	RSS	60			
15			Juniper Ranch (2)	RSS	70			
16			Juniper Ranch (2)	RSS	70			

Appendix B. Continued

Record	Date	Stream	Site	Species <sup>a</sup>	Fish collected			Comments
					Length	Weight	#'s	
17			Juniper Ranch (2)	RSS	70			
18			Juniper Ranch (2)	NPM	70			
19			Juniper Ranch (2)	CMC	80			
20			Juniper Ranch (2)	RSS	70			
21			Juniper Ranch (2)	RSS	70			
22			Juniper Ranch (2)	RSS	80			
23			Juniper Ranch (2)	RSS	70			
24			Juniper Ranch (2)	CMC	90			
25			Juniper Ranch (2)	RSS	70			
26			Juniper Ranch (2)	CMC	110	14		
27			Juniper Ranch (2)	CMC	110	10		
28			Juniper Ranch (2)	CMC	110			
29			Juniper Ranch (2)	RSS	70			
30			Juniper Ranch (2)	NPM	80			
31			Juniper Ranch (2)	CMC	120			
32			Juniper Ranch (2)	NPM	190	60		
33			Juniper Ranch (2)	RSS			1	no data
34			Juniper Ranch (2)	CMC	130	21		
35			Juniper Ranch (2)	NPM	80			
36			Juniper Ranch (2)	NPM	140	29		
37			Juniper Ranch (2)	NPM	150	33		
38			Juniper Ranch (2)	NPM	180	58		
39			Juniper Ranch (2)	NPM	180	54		
40			Juniper Ranch (2)	NPM	160	34		
41			Juniper Ranch (2)	NPM	170	41		
42			Juniper Ranch (2)	NPM	130	21		
43			Juniper Ranch (2)	CMC	120	19		
44			Juniper Ranch (2)	CMC	130			
45			Juniper Ranch (2)	CMC	110			
46			Juniper Ranch (2)	CMC	100			
47			Juniper Ranch (2)	CMC	80			
48			Juniper Ranch (2)	CMC	80			
49			Juniper Ranch (2)	NPM	100			
50			Juniper Ranch (2)	CMC	110			
51			Juniper Ranch (2)	CMC	120			
52			Juniper Ranch (2)	CMC	80			
53			Juniper Ranch (2)	RSS	70			
54			Juniper Ranch (2)	NPM	90			
55			Juniper Ranch (2)	SPD	80			
56			Juniper Ranch (2)	RSS	60			
57			Juniper Ranch (2)	RSS	60			
58			Juniper Ranch (2)	RSS			11	
59			Juniper Ranch (2)	SPD	60			
60			Juniper Ranch (2)	SPD	80			
61			Juniper Ranch (2)	Unk. YOY			2	
62			Juniper Ranch (2)	CMC	120	18		
63			Juniper Ranch (2)	NPM	190	62		
64			Juniper Ranch (2)	BLS	180			preserved for ID
65			Juniper Ranch (2)	CMC	140	30		
66			Juniper Ranch (2)	CMC	150			
67			Juniper Ranch (2)	CMC	130	24		
68			Juniper Ranch (2)	BLS	190	62		preserved for ID
69			Juniper Ranch (2)	NPM	150			
70			Juniper Ranch (2)	NPM	150	29		
71			Juniper Ranch (2)	BLS	110	13		
72			Juniper Ranch (2)	BLS	210	85		
73			Juniper Ranch (2)	BLS	180	59		
74			Juniper Ranch (2)	CMC	150	28		
75			Juniper Ranch (2)	BLS	190			
76			Juniper Ranch (2)	BLS	180			
77			Juniper Ranch (2)	NPM	210	78		
78			Juniper Ranch (2)	CMC	180	62		
79			Juniper Ranch (2)	BLS	210	85		
80			Juniper Ranch (2)	BLS	190			
81			Juniper Ranch (2)	BLS	180			
82			Juniper Ranch (2)	BLS	180			
83			Juniper Ranch (2)	BLS	190			
84			Juniper Ranch (2)	BLS	90			

Appendix B. Continued

Record	Date	Stream	Site	Fish collected				
				Species <sup>a</sup>	Length	Weight	#s	Comments
85			Juniper Ranch (2)	BLS	120			
86			Juniper Ranch (2)	BLS	110			
87			Juniper Ranch (2)	BLS	80			
88			Juniper Ranch (2)	SPD			17	
89			Juniper Ranch (2)	RSS			38	
90			Juniper Ranch (2)	NPM			29	
91			Juniper Ranch (2)	CMC			62	

<sup>a</sup> See Table 3 for species abbreviation descriptions

Appendix C. Stream habitat characteristics measured at five sample sites within the Clover Creek drainage in June 2003.

					Substrate composition (%)				
Transect <sup>a</sup>	Width (m)	Point	Habitat	Depth (m)	Silt / Sand	Gavel	Rubble	Boulder	Bedrock
10	7.5	1/4	pool	0.50	0	0	0	100	0
		1/2	pool	0.60	100	0	0	0	0
		3/4	pocket	0.40	0	0	0	100	0
20	5.5	1/4	pool	0.50	60	10	30	0	0
		1/2	run	0.50	0	0	10	90	0
		3/4	run	0.40	0	0	0	100	0
30	4.7	1/4	run	0.27	20	70	10	0	0
		1/2	run	0.25	45	45	10	0	0
		3/4	run	0.12	50	50	0	0	0
40	3.2	1/4	riffle	0.15	40	60	0	0	0
		1/2	riffle	0.17	50	50	0	0	0
		3/4	riffle	0.24	50	50	0	0	0
50	3.8	1/4	run	0.35	40	50	10	0	0
		1/2	run	0.55	35	35	30	0	0
		3/4	pocket	0.40	25	5	0	70	0
60	5.5	1/4	run	0.37	25	70	5	0	0
		1/2	run	0.45	50	20	0	30	0
		3/4	pocket	0.35	70	0	0	30	0
70	4.6	1/4	run	0.20	20	80	0	0	0
		1/2	run	0.28	70	30	0	0	0
		3/4	pocket	0.15	0	0	0	100	0
80	5.7	1/4	run	0.54	70	30	0	0	0
		1/2	pool	0.50	5	95	30	0	0
		3/4	pool	0.45	30	40	10	20	0
90	4.4	1/4	run	0.28	90	10	0	0	0
		1/2	pocket	0.40	50	50	0	0	0
		3/4	run	0.15	5	95	0	0	0
100	3.4	1/4	run	0.40	100		0	0	0
		1/2	run	0.40	5	95	0	0	0
		3/4	run	0.32	10	90	0	0	0

Appendix C. Continued.

Stream: Clover Creek					Distance surveyed: 100m				
Site: Juniper Ranch					Gradient: 0.18%				
Date: 06/19/03					Substrate composition (%)				
Transect <sup>a</sup>	Width (m)	Point	Habitat	Depth (m)	Silt / Sand	Gavel	Rubble	Boulder	Bedrock
10	5.5	1/4	pool	0.10	85	5	10	0	0
		1/2	run	0.15	60	20	20	0	0
		3/4	run	0.20	35	65	0	0	0
20	3.9	1/4	run	0.35	60	10	0	0	0
		1/2	run	0.37	50	30	30	0	0
		3/4	pool	0.30	95	5	20	0	0
30	4.0	1/4	run	0.20	20	75	5	0	0
		1/2	run	0.22	40	40	20	0	0
		3/4	run	0.20	30	45	25	0	0
40	6.1	1/4	pool	0.15	100	0	0	0	0
		1/2	pool	0.20	90	10	0	0	0
		3/4	run	0.27	60	40	0	0	0
50	5.0	1/4	run	0.35	25	65	10	0	0
		1/2	run	0.30	40	40	20	0	0
		3/4	pool	0.25	60	40	0	0	0
60	6.0	1/4	pool	0.35	100	0	0	0	0
		1/2	run	0.65	70	30	0	0	0
		3/4	pool	0.65	70	30	0	0	0
70	4.7	1/4	pool	0.35	95	5	0	0	0
		1/2	pool	0.50	30	50	0	20	0
		3/4	pool	0.40	15	5	30	50	0
80	6.0	1/4	pool	0.15	100	0	0	0	0
		1/2	run	0.30	40	30	30	0	0
		3/4	run	0.27	40	2	40	0	0
90	4.4	1/4	run	0.35	90	10	0	0	0
		1/2	run	0.40	60	30	10	0	0
		3/4	run	0.30	100	0	0	0	0
100	4.9	1/4	run	0.30	40	45	5	0	0
		1/2	run	0.15	40	20	40	0	0
		3/4	run	0.15	40	30	30	0	0

Appendix C. Continued.

Stream: Clover Creek					Distance surveyed: 78M					
Site: Salls Crossing					Gradient: 0.15%					
Date: 06/24/03					Substrate composition (%)					
Transect <sup>a</sup>	Width (m)	Point	Habitat	Depth (m)	Silt / Sand	Gavel	Rubble	Boulder	Bedrock	
0	7.4	1/4	pool	0.60	100	0	0	0	0	
		1/2	pool	0.60	80	20	0	0	0	
		3/4	pool	0.35	80	20	0	0	0	
10	6.9	1/4	pool	0.80	100	0	0	0	0	
		1/2	pool	0.60	90	10	0	0	0	
		3/4	pool	0.70	80	20	0	0	0	
20	7.2	1/4	pool	0.35	100	0	0	0	0	
		1/2	pool	0.80	100	0	0	0	0	
		3/4	pool	0.90	80	10	10	0	0	
30	6.2	1/4	pool	0.35	100	0	0	0	0	
		1/2	pool	0.50	85	5	10	0	0	
		3/4	pool	0.50	70	20	10	0	0	
40	5.5	1/4	pool	0.70	100	0	0	0	0	
		1/2	pool	0.75	70	10	20	0	0	
		3/4	pool	0.55	90	0	10	0	0	
50	6.4	1/4	pool	0.35	90	0	10	0	0	
		1/2	pool	0.50	80	0	0	20	0	
		3/4	pool	0.50	75	0	5	20	0	
60	6.5	1/4	pool	0.40	100	0	20	0	0	
		1/2	pool	0.65	50	10	0	40	0	
		3/4	pool	0.65	60	20	0	20	0	
70	5.7	1/4	pool	0.15	100	0	0	0	0	
		1/2	run	0.40	95	5	0	0	0	
		3/4	run	0.37	80	10	10	0	0	

Appendix C. Continued.

Stream: Clover Creek					Distance surveyed: 100m				
Site: Smiths Crossing					Gradient: 0.45%				
Date: 06/24/03					Substrate composition (%)				
Transect <sup>a</sup>	Width (m)	Point	Habitat	Depth (m)	Silt / Sand	Gavel	Rubble	Boulder	Bedrock
8	5.5	1/4	pool	0.35	70	30	0	0	0
		1/2	pool	0.45	70	30	0	0	0
		3/4	pool	0.30	80	10	10	0	0
18	7.3	1/4	pool	0.55	100	0	0	0	0
		1/2	pool	0.55	90	10	0	0	0
		3/4	run	0.40	0	0	0	100	0
28	5.8	1/4	pool	0.35	100	0	0	0	0
		1/2	run	0.35	90	10	0	0	0
		3/4	run	0.40	70	30	0	0	0
38	9.9	1/4	back-water	0.25	100	0	0	0	0
		1/2	run	0.20	100	0	0	0	0
		3/4	riffle	0.20	50	50	0	0	0
48	4.9	1/4	run	0.10	40	60	0	0	0
		1/2	run	0.15	40	60	0	0	0
		3/4	run	0.25	70	30	0	0	0
58	5.3	1/4	pool	0.60		40	60	0	0
		1/2	pool	0.60	30	40	30	0	0
		3/4	pool	0.50	95	5	0	0	0
68	5.5	1/4	pool	0.30	45	45	10	0	0
		1/2	pool	0.40	50	30	20	0	0
		3/4	run	0.55	60	10	30	0	0
78	4.4	1/4	run	0.25	50	40	10	0	0
		1/2	riffle	0.16	100	0	0	0	0
		3/4	riffle	0.20	50	50	0	0	0
88	7.7	1/4	run	0.05	80	20	0	0	0
		1/2	run	0.15	30	60	10	0	0
		3/4	run	0.25	30	50	20	0	0
98	6.8	1/4	back-water	0.30	100	0	0	0	0
		1/2	run	0.25	70	30	0	0	0
		3/4	run	0.40	20	40	40	0	0

Appendix C. Continued.

Stream: Three Creek					Distance surveyed: 100m				
Site: Near confluence					Gradient: 0.54%				
Date: 06/24/03					Substrate composition (%)				
Transect <sup>a</sup>	Width (m)	Point	Habitat	Depth (m)	Silt / Sand	Gavel	Rubble	Boulder	Bedrock
5	3.8	1/4	riffle	0.10	20	10	60	10	0
		1/2	riffle	0.10	10	10	80	0	0
		3/4	riffle	0.10	25	25	40	10	0
15	3.9	1/4	riffle	0.20	50	10	30	10	0
		1/2	riffle	0.15	60	10	30	0	0
		3/4	riffle	0.15	30	10	40	20	0
25	5.2	1/4	pool	0.50	95	0	0	5	0
		1/2	pool	0.55	40	0	60	0	0
		3/4	pool	0.50	100	0	0	0	0
35	3.4	1/4	pool	0.25	100	0	0	0	0
		1/2	pool	0.30	40	10	50	0	0
		3/4	pool	0.30	45	25	30	0	0
45	3.5	1/4	pool	0.16	95	5	0	0	0
		1/2	run	0.20	10	20	70	0	0
		3/4	pool	0.15	70	0	30	0	0
55	3.8	1/4	pool	0.05	30	0	70	0	0
		1/2	run	0.17	45	5	50	0	0
		3/4	run	0.20	90	0	10	0	0
65	3.2	1/4	pool	0.30	45	45	10	0	0
		1/2	pool	0.30	20	30	50	0	0
		3/4	pool	0.25	80	20	0	0	0
75	4.4	1/4	pool	0.35	50	40	10	0	0
		1/2	pool	0.40	100	0	0	0	0
		3/4	pool	0.25	100	0	0	0	0
85	4.0	1/4	run	0.10	50	40	10	0	0
		1/2	run	0.15	40	10	50	0	0
		3/4	run	0.25	100	0	0	0	0
95	2.8	1/4	run	0.15	55	5	40	0	0
		1/2	run	0.17	20	20	60	0	0
		3/4	run	0.15	65	30	5	0	0