F-2-21

A CENTURY OF CONSERVATION
1901 2001
Montana Fish, Wildlife & Parks
1400 South 19th
Bozeman, Montana 59718

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April 26, 2001

David Kampwerth
BLM – Dillon Resource Area
1005 Selway Drive
Dillon, Montana 59725

Dear David,

Enclosed you will find a copy of the report summarizing data we collected in the streams flowing across BLM lands in Southwest Montana that you asked that we survey during 2000. I hope this report meets your needs. As I mentioned on the phone, and explain in the report, we did collect genetic samples (fin clips); however, the Wild Salmon and Trout Genetics Lab has not yet processed these fins for genetic status. I will forward you a copy of their letter when it arrives.

I am also forwarding copies of this report to Dick Oswald and Scott Opitz of FWP and Jim Brammer of the Forest Service.

Thanks for your continued support. FWP has contributed over $5,000 towards this survey effort including completion of this report. I will ask Grants and Contracts office at MSU to bill you from the MSU banner number 429300 for this work completed in 2000 at $5,000 as per our agreement. Thanks again!

Sincerely,

Brad Shepard

Brad Shepard, Fisheries Biologist
phone: 406-994-3243 email: fwpbs@montana.edu

C: Dr. Robert White, Cooperative Fishery Research Unit
Grants and Contracts, MSU
Dick Oswald, FWP, Dillon
Jim Brammer, Beaverhead/Deerlodge National Forest
Scott Opitz, FWP, Dillon
Fisheries Division, FWP, Helena

Enc. 2 copies of 2001 Report

F-2-21

Fish Surveys of Cabin, Meadow, Craver, Kate, and North Fork Divide Creeks for the BLM, Dillon Field Office

Bradley B. Shepard
Montana Fish, Wildlife and Parks
and
Montana Cooperative Fishery Research Unit
1400 South 19th
Bozeman, Montana 59718

March 2001

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Introduction

The Montana Cooperative Fishery Research Unit and Montana Fish, Wildlife and Parks (FWP) were contracted by the Dillon Field Office of the BLM to conduct fish surveys in selected waters of the Horse Prairie, Medicine Lodge, and Big Sheep drainages in southwestern Montana to document the presence and status of westslope cutthroat trout (*Oncorhynchus clarki lewisi*) in five streams in these drainages.

Study Area

The streams selected by BLM for study included the North Fork of Divide Creek in the Horse Prairie drainage; Rape, Kate, and Craver creeks in the Medicine Lodge drainage; and Cabin and Meadow creeks in the Big Sheep Creek drainage (Figure 1). All these streams except Rape Creek were sampled during 2000. Sampling was confined to the upper portion of these drainages that were known or suspected to contain westslope cutthroat trout.

Methods

A systematic sampling scheme was employed to estimate both the relative abundance and distribution of fishes and to quantify stream habitat characteristics. Sample sections ranging from 45 to 100 m were surveyed at a frequency of approximately every 0.8 km (0.5 mile) of stream length by single-pass electrofishing with backpack Smith-Root electrofishers (Models SR-12BP, SR-15B). At approximately 3.2 km (2 mile) intervals we conducted two- or four-pass depletion population estimates (Van Deventer and Platts 1985). Population estimates were not made when few or no fish were captured during the first electrofishing pass. In Kate Creek, where much of the creek was either inundated by beaver dams or flowed through such dense stands of willow that sampling was not feasible (especially from stream kilometer 5.0 upstream), the stream was sampled wherever it could be accessed. In many cases the portions of Kate Creek that could be sampled (above stream kilometer 5.0) were extremely short segments (< 10 m) and these were aggregated above kilometer 6.5 and reported as a single sampling event.

Sample section lengths were at least 33 times the average wetted stream width. Lyons (1992) found that when stream lengths of 35 times the mean wetted width were sampled with a towed electrofishing unit, all species of fish in fish communities in warm water streams of Wisconsin were generally captured. Sample sites were referenced by mile above the stream's mouth and by latitude and longitude obtained from a global positions system (GPS). Field GPS locations were input into an ARCVIEW (Version 3.2; 1999; Environmental Systems Research Institute, Inc.) event theme and projected on 1:100,000 stream hydrography layers. The field GPS locations were corrected to overlay the hydrography layer and stream kilometer locations when discrepancies existed between field GPS and mapped locations (Figure 1).

Length (total length in mm) and weight (gm) were recorded for all captured salmonids. For two-pass estimates to provide reasonable results, we assumed that field calculated probabilities of capture (calculated as $1 - (C_2/C_1)$; where C_1= number captured on the first pass, and C_2 = number captured on second pass) had to be 0.80 or higher (see Riley and Fausch 1992). If field

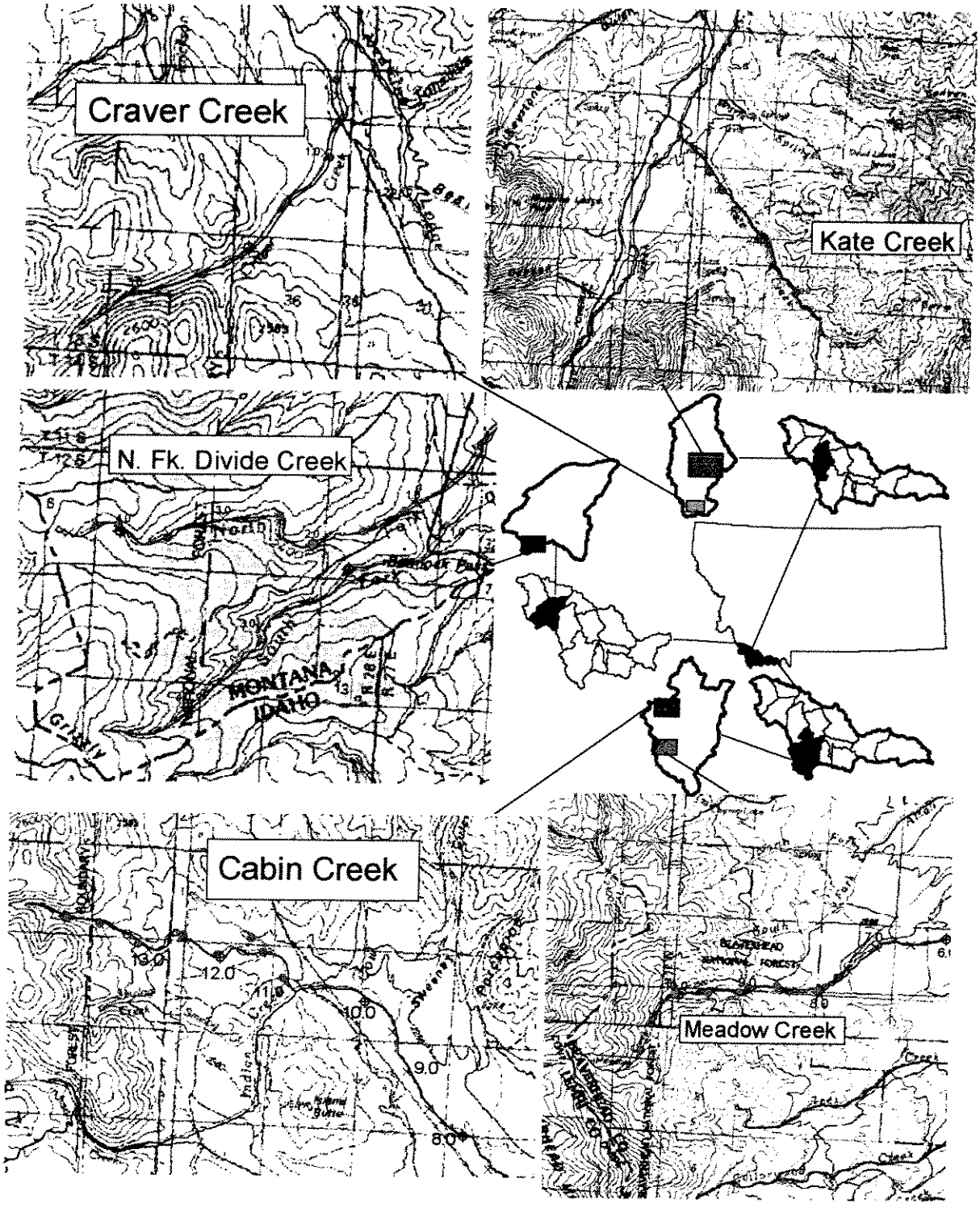


Figure 1. Maps of streams sampled during 2000 for the BLM showing sample site locations and stream miles.

calculated probabilities of capture were less than 0.80 after two passes, additional electrofishing passes were usually made. Population estimates were calculated using a maximum likelihood estimator within the MICROFISH program (Van Deventer and Platts 1985) by species for fish 75 mm and longer. Population estimates of fish 75 mm and longer were also standardized per 100 m of stream length. Relative fish abundance was calculated as the number of fish 75 mm and longer per 100 m of stream length captured in the first electrofishing pass.

Fin samples from westslope cutthroat trout were taken for genetic analysis. Where possible, a sub-sample of westslope cutthroat trout captured at each sample site within a stream was represented in the genetic samples. The University of Montana Wild Salmon and Trout Genetics Laboratory, using Paired Interspersed Nuclear DNA Element-PCR tests, will determine genetic status from these fin clips; however, results were not available at the time this report was completed. A listing of all tissue samples taken for genetic analyses and submitted to the Wild Salmon and Trout Genetics Laboratory are included in Appendix A.

Site level habitat surveys were conducted at 3.2 km (2 mile) intervals in sample sections where fish population estimates were made. The following information was collected for each macrohabitat type (pool, riffle or run) within a sample section: length of the macrohabitat type; wetted and channel width (width of normal bank-full channel), measured at a single location which represented an average width and depth of a habitat type; average depth, estimated by taking three depth measurements at equal distances across the single cross section where width was measured and dividing by 4; average maximum pool depth using 4 maximum (thalweg) depths were measured longitudinally down the channel and averaged; residual pool depth and volume were estimated using the average maximum depth of the pool minus the maximum depth of the adjacent downstream habitat unit, along with surface area of the pool for volume (Lisle 1987). Over the entire sample section the following information was collected: surface area of suitable spawning habitat (defined as patches of substrate dominated by material 10 to 30 mm which cover at least 0.5 m^2); number of large (>15 cm in diameter) and small ($\leq$ 15 cm in diameter) woody debris within the stream channel; number of large and small woody debris which span the stream channel; qualitative assessment of stream bank condition that ranked relative stability from low to high (and described the composition of the stream bank and the source of instability); qualitative assessment of instream cover which ranked the relative amount of instream cover from a low to high proportion of water volume with cover; qualitative assessment of bank overhead cover which ranked the amount of the water's surface which is covered or shaded; estimate of surficial streambed composition by size class in percentage by class; qualitative assessment of relative use of riparian areas by livestock or wildlife.

Continuously recording digital thermographs (models WTA08, Onset Computer Corporation, Pocasset, Massachusetts) were used to record water temperatures in lower and upper Meadow Creek and the lower portions of North Fork Divide, Cabin, Rape, and Craver creeks. Model WTA08 thermographs were set to record temperatures every half hour. During mid-July Thermographs were placed in well-mixed pools, shielded from direct solar radiation, from late June to mid- July and left to record stream temperatures until late September. Daily stream temperatures were summarized into daily average, maximum, and minimum recorded temperatures and graphed for each thermograph site by year.

Results

Cabin Creek

Cabin Creek, a 23.3 kilometer-long tributary to Big Sheep Creek, drains the Beaverhead Mountains near the Montana-Idaho border. The upper 2.4 km of stream flows through lands administered by the U.S. Forest Service. The valley bottom in this reach is constrained with conifers dominating the riparian vegetation. Stream flows above km 21.7 appeared to be too low to support fish. Below Forest Service land, the stream flows across open, sage covered foothills. Dense willows dominate the riparian vegetation and become sparser in a downstream direction. Below the forest boundary, Cabin Creek flows through one section of land administered by the BLM. The remaining stream length flows through privately owned land. Channel gradient is moderate to low throughout the length of Cabin Creek. During the summer sampling period, Cabin Creek was isolated from Big Sheep Creek by an extensive intermittent reach. At least the lower 7.2 km of Cabin Creek were dry, and this dry reach likely extended several kilometers upstream. An unnamed tributary enters Cabin Creek from the west at stream km 21.0 but appeared too small to support fish. Another unnamed tributary enters Cabin Creek at km 18.5 from the north, and this stream supported low densities of juvenile WCT. Sawlog, Indian, Simpson, Crystal, Tex, and Alkali creeks are all tributaries to Cabin Creek, but no surface flow was observed in any of these streams during the summer sampling period.

Westslope cutthroat trout and mottled sculpin were the only fish captured in Cabin Creek above km 17.5. Mottled sculpin were common to abundant up to km 21, but were not observed above km 21.5. The relative abundance of westslope cutthroat trout was moderately high from km 17.5 up to km 21.0, but the stream above km 21 supported few fish (Figure 2; Appendix B). A few age-1 westslope cutthroat trout were captured in an unnamed tributary. No fish were captured at km 22.5 and flows were deemed too low to support fish above this point. A population estimate made in a 109 m long section at km 19.3 estimated that 17 (SE: 1.2) westslope cutthroat trout 75 to 149 mm and 16 (SE: 0.9) 150 mm and longer inhabited this section of stream on June 20, 2000.

Very few westslope cutthroat trout captured in Cabin Creek were longer than 200 mm (Figure 3). Average lengths by section ranged from 100 to 190 mm and average weights ranged from 15 to 58 grams (Table 1).

Cabin Creek had an average wetted width of 1.1 m at stream kilometer 19.3 on June 20, 2000 (Table 2). Slightly less than one-fourth of the channel's length consisted of pool habitats and those pools averaged slightly over 11 cm deep. Much of the streambed was composed of small gravel and smaller particles (Table 3). Small woody debris was very abundant within the channel, primarily willow debris, and spawning habitat was relatively abundant (Table 3). Based on the relative amount of spawning habitat within the sample section, spawning habitat appeared to be adequate (Table 3). Water temperatures in Cabin Creek from June 24, 2000 to September 30, 2000 ranged from about 0 to 20 C with average temperatures staying between 10 and 15 C during the summer period (Figure 4).

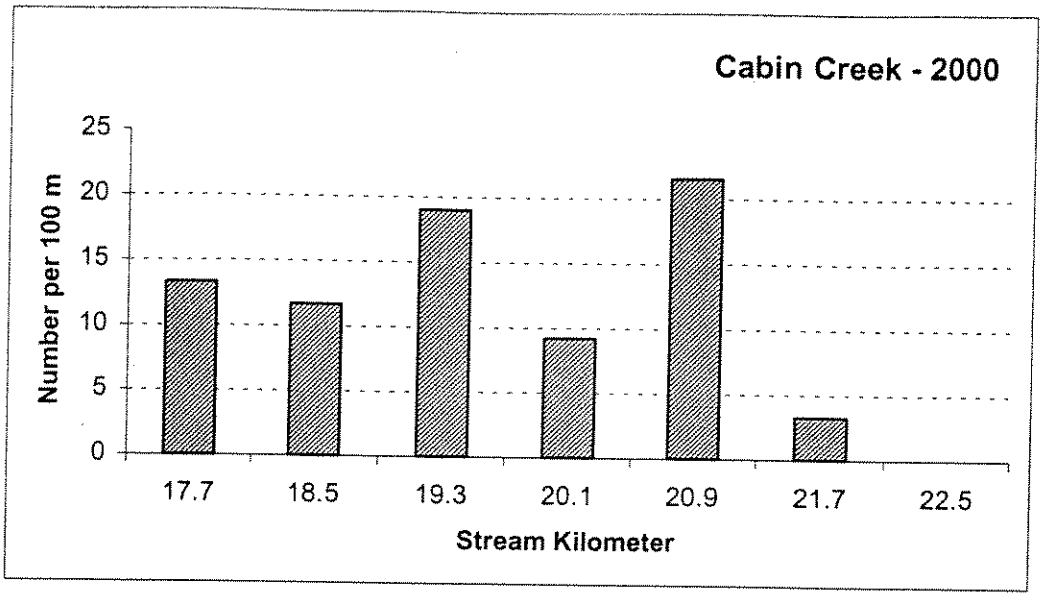


Figure 2. Number of westslope cutthroat trout 75 mm and longer captured on the first electrofishing pass per 100 m of stream length (relative catch) in Cabin Creek by stream kilometer during 2000. No fish were captured in a 60 m section sampled near stream kilometer 22.5.

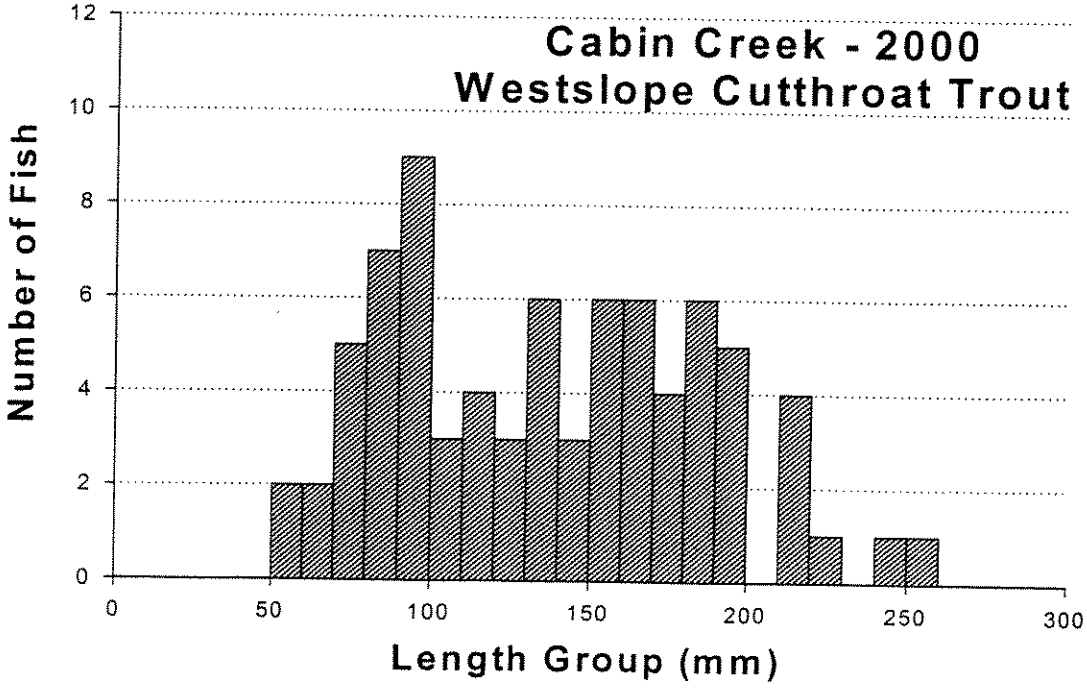


Figure 3. Length frequency histogram for westslope cutthroat trout captured in Cabin Creek during June 2000.

Table 1. Average lengths (mm), weights (g), and their ranges (in parentheses) for westslope cutthroat trout (WCT) and brook trout (EBT) captured in BLM streams during 2000.

LOCATION Km	Date	Species	n	Length (range)	Weight (range)
CABIN CR					
17.70					
	06/20/2000	WCT	10	145.4 (58- 260)	48.3 (3- 205)
18.50					
	06/20/2000	WCT	8	126.3 (71- 196)	21.4 (4- 57)
19.31					
	06/20/2000	WCT	33	143.8 (78- 247)	34.6 (3- 140)
20.11					
	06/20/2000	WCT	8	110.3 (68- 166)	15.4 (3- 40)
20.92					
	06/20/2000	WCT	16	134.8 (71- 216)	29.0 (5- 90)
21.72					
	06/20/2000	WCT	3	188.0 (183- 192)	58.0 (55- 61)
CRAVER CR					
0.80					
	07/19/2000	EBT	4	194.5 (178- 230)	99.0 (51- 215)
	07/19/2000	WCT	2	154.0 (143- 165)	42.0 (38- 46)
1.61					
	07/18/2000	EBT	8	177.0 (125- 249)	87.6 (17- 220)
	07/18/2000	WCT	7	195.9 (142- 242)	98.0 (26- 215)
2.41					
	07/19/2000	EBT	17	156.6 (57- 245)	53.1 (3- 225)
	07/19/2000	WCT	5	163.2 (132- 204)	42.6 (23- 75)

Table 1. (continued).

LOCATION Km	Date	Species	n	Length (range)	Weight (range)
KATE CR					
1.13					
	06/21/2000	EBT	4	144.3 (125- 172)	30.0 (18- 52)
1.61					
	06/21/2000	EBT	4	145.8 (98- 213)	43.8 (10- 104)
3.22					
	06/21/2000	EBT	11	131.8 (98- 171)	25.0 (9- 50)
4.83					
	06/21/2000	EBT	2	131.5 (128- 135)	- -
6.44					
	06/21/2000	WCT	1	160.0 (160- 160)	40.0 (40- 40)
MEADOW CR					
12.87					
	07/17/2000	WCT	32	131.2 (71- 215)	29.5 (5- 90)
13.68					
	07/18/2000	WCT	4	188.8 (143- 222)	95.0 (30- 160)
14.48					
	07/17/2000	WCT	4	158.5 (64- 230)	70.0 (5- 157)
15.29					
	07/17/2000	WCT	5	194.8 (159- 220)	94.0 (42- 180)
16.09					
	07/18/2000	WCT	7	169.0 (114- 236)	93.9 (21- 212)
16.89					
	07/18/2000	WCT	3	166.7 (97- 220)	102.3 (15- 210)

Table 1. (continued).

LOCATION Km	Date	Species	n	Length (range)	Weight (range)
N FK DIVIDE CR					
1.61					
	07/18/2000	WCT	4	117.0 (85- 166)	18.8 (7- 42)
2.41					
	07/18/2000	WCT	7	146.6 (102- 180)	30.1 (6- 54)
3.22					
	07/18/2000	WCT	21	120.7 (64- 175)	22.5 (3- 54)
4.02					
	07/19/2000	WCT	5	149.0 (103- 168)	31.8 (10- 42)
5.63					
	07/19/2000	WCT	16	100.9 (60- 156)	13.9 (3- 40)
6.44					
	07/20/2000	WCT	23	131.0 (50- 188)	26.7 (2- 66)
TRIB TO CABIN CR					
0.80					
	06/20/2000	WCT	3	60.7 (60- 62)	2.3 (2- 3)

Table 2. Total length (m), average length (m), average width (m), average depth (cm), and average volume (cubic meters) of each habitat type and average thalweg depth (cm) and residual pool volume (cubic meters) by stream and section.

STREAM Section	Date	Habitat type	n	Total length	Average length	Average width	Average Depth	Volume	Average thalweg depth	Residual pool volume
DRAINAGE:	BIG SHEEP CREEK									
CABIN CR										
	06/20/200	**STREAM KM: 19.3**								
		POOL	9	23.6	2.6	1.3	11.4	0.4	21.6	0.3
		RIFFLE	10	62.7	6.3	1.1	4.3			
		RUN	4	22.5	5.6	0.9	10.8			
	For Entire Section			108.8	4.7	1.1	8.2			
MEADOW CR										
	07/17/200	**STREAM KM: 12.9**								
		POOL	4	20.2	5.1	1.9	17.0	1.3	36.3	1.4
		RIFFLE	8	52.8	6.6	1.6	9.1			
		RUN	3	9.0	3.0	1.4	12.7			
	For Entire Section			82.0	5.5	1.6	11.9			
	07/18/200	**STREAM KM: 16.1**								
		POOL	6	9.0	1.5	1.7	18.7	0.5	28.8	0.3
		RIFFLE	12	79.0	6.6	1.7	5.6			
		RUN	7	33.3	4.8	1.4	10.9			
	For Entire Section			121.3	4.9	1.6	10.2			

Table 2. (continued)

STREAM Section	Date	Habitat type	n	Total length	Average length	Average width	Average Depth	Volume	Average thalweg depth	Residual pool volume
DRAINAGE: HORSE PRARIE CREEK										
N FK DIVIDE CR										
	07/18/200	**STREAM KM:**	**3.2**							
		POOL	4	8.7	2.2	1.2	9.8	0.3	21.5	0.2
		RIFFLE	6	78.5	13.1	1.8	6.8			
		RUN	2	15.0	7.5	1.8	8.0			
	For Entire Section			102.2	8.5	1.6	8.0			
	07/20/200	**STREAM KM:**	**6.4**							
		POOL	7	8.9	1.3	1.1	11.6	0.2	22.4	0.3
		RIFFLE	7	60.0	8.6	0.7	3.1			
		RUN	1	3.0	3.0	0.8	7.0			
	For Entire Section			71.9	4.8	0.9	7.3			

[1] N/A indicates value not available.

Table 3. Streambed composition, frequency of small (< 150 mm) and large (>= 150 mm) in-channel and cross-channel woody debris per km, and square meters of spawning habitat per km by stream, section, and date.

STREAM Km	Date	Streambed composition (% by class) Bould	Cobble	Lg Grav	Sm Grav	Sand	Silt	Frequency (# km) of woody debris by In-channel Small	Large	Cross-channel Small	Large	Square meters of spawning habitat per km
CABIN CR												
19.3	06/20/200	0	10	15	40	10	25	490.0	0.0	190.0	0.0	70.0
MEADOW CR												
12.9	07/17/200	15	10	10	30	30	5	306.7	0.0	0.0	0.0	26.7
16.1	07/18/200	20	15	20	30	10	5	78.4	68.6	19.6	19.6	98.0
N FK DIVIDE CR												
3.2	07/18/200	10	20	15	15	10	30	50.0	70.0	20.0	10.0	10.0
6.4	07/20/200	15	15	25	20	15	5	93.3	0.0	0.0	0.0	26.7

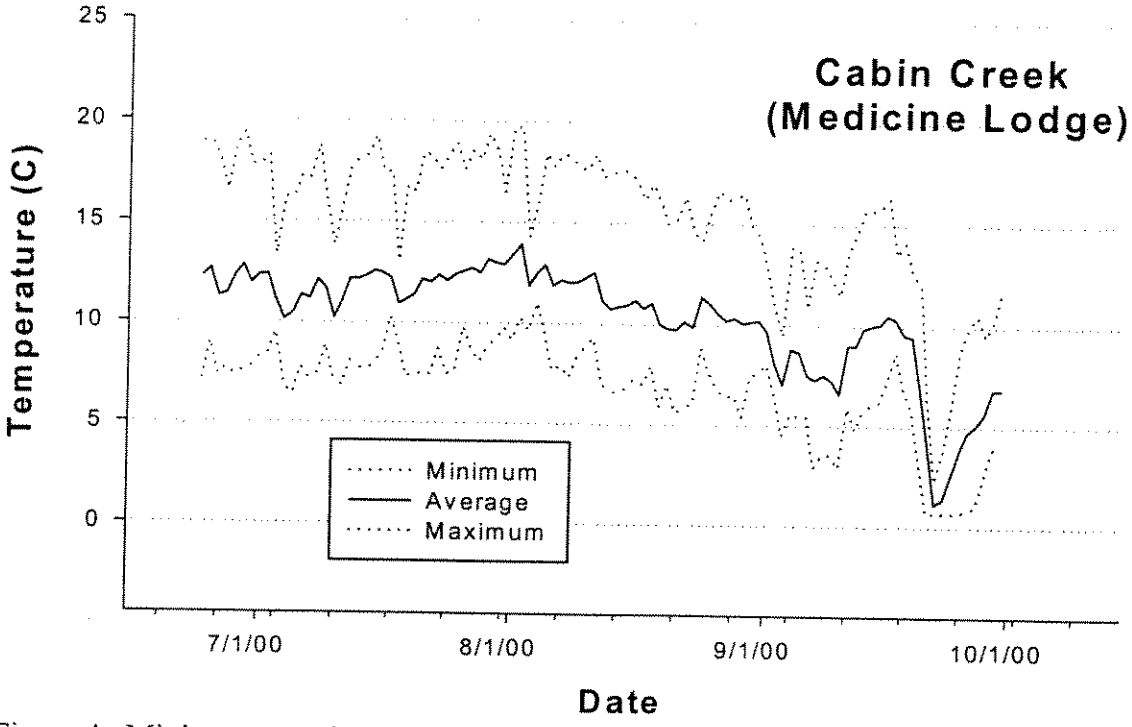


Figure 4. Minimum, maximum, and average water temperatures recorded in Cabin Creek at the Medicine Lodge Creek Road crossing from June 24 to September 30, 2000.

Craver Creek

Craver Creek is a small tributary to Medicine Lodge Creek. A very large beaver dam complex impounds Craver Creek from stream km 2.9 to km 3.9. We didn't sample the ponds but observed fish throughout the complex. Above this beaver complex fish habitat was marginal, with low flows, few pools, and channel instability. Dense willow stands were present along channel for about one km below the beaver complex and the channel meandered extensively and was often braided. The lower kilometer of stream just above the Medicine Lodge Road had less overhead cover and larger substrate, but the stream bottom was covered with a layer of fine sediment. Below Medicine Lodge Road, Craver Creek was over-widened and, except for some decadent willow stands, had little in the way of riparian vegetation because of extensive cattle grazing.

Both brook and westslope cutthroat trout were captured in Craver Creek from its mouth up to a series of beaver ponds starting at about stream kilometer 2.9 and extending up to about kilometer 3.9 (Figure 5; Appendix B). Abundance of these trout increased in an upstream direction up to stream kilometer 2.5, below the beaver ponds. These beaver ponds were too deep to sample effectively, so we are uncertain of the exact abundance of brook and westslope cutthroat trout in these ponds; however, fish were observed throughout these ponds. It is likely that the beaver complex extended the upper distribution of fish in Craver Creek. No fish were captured in a 75 m sample section immediately above these ponds (stream kilometer 4.0), or in several pools sampled near stream kilometer 4.8. Stream flows above stream kilometer 4.5 were extremely

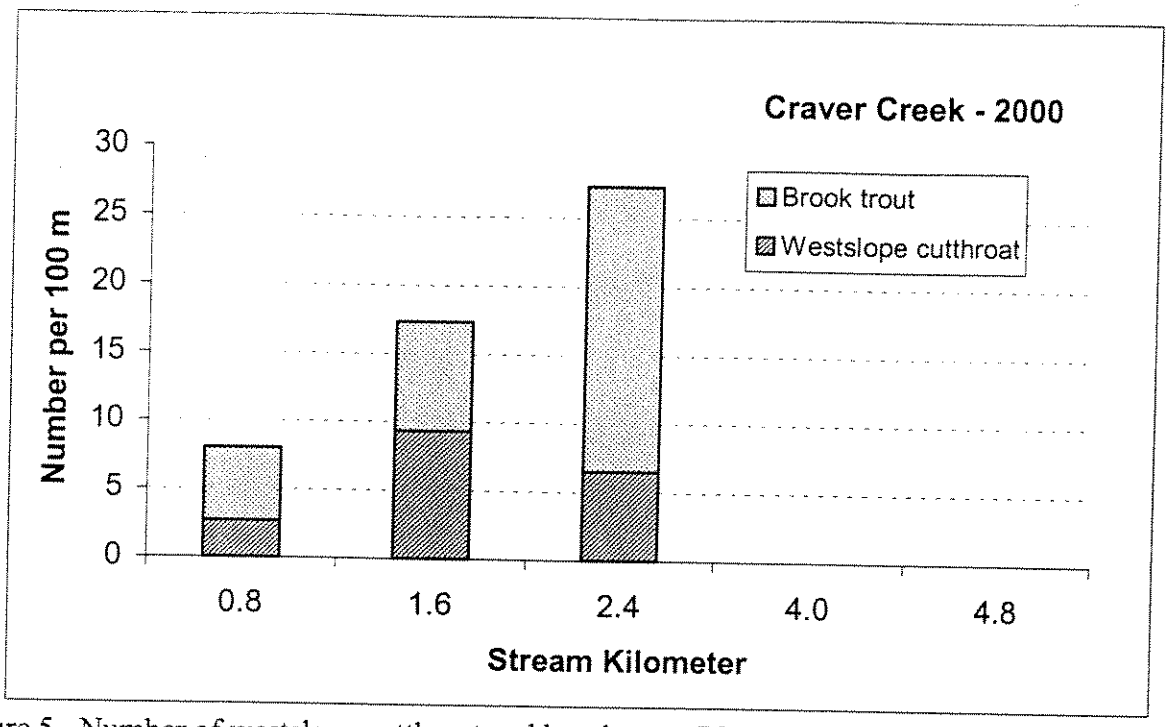


Figure 5. Number of westslope cutthroat and brook trout 75 mm and longer captured on the first electrofishing pass per 100 m of stream length (relative catch) in Craver Creek by stream kilometer during 2000. No fish were captured in either a 75 m section sampled near stream kilometer 4.0 or seen above this point.

low and the stream above this point was probably too small to support fish. The channel was also unstable and contained few pools, leading us to conclude that no fish could likely survive above kilometer 4.5. Mottled sculpin were abundant up to stream kilometer 2.4. A leopard frog was observed at stream kilometer 0.8. A 75 m sample section located at stream kilometer 1.6 supported an estimated 8 brook trout (SE: 0.9) and 7 westslope cutthroat trout (SE: not estimated because no fish were captured on second pass).

Captured westslope cutthroat and brook trout ranged in length from 130 to 250 mm with one young-of-the-year brook trout (57 mm) captured at stream kilometer 2.4 (Figure 6 and Table 1). Average length of captured westslope cutthroat trout was greatest at stream kilometer 1.6, while average length of brook trout decreased in an upstream direction (Table 1).

Craver Creek had an average wetted width of 1.3 m at stream kilometer 2.4 on July 19, 2000 (Table 2). Slightly less than 10% of the channel's length consisted of pool habitats; however, those pools were relatively deep, averaging over 22 cm deep. Very little gravel-sized material was observed in the streambed, which was predominated, by cobble, boulders, and silt (Table 3). Small woody debris was moderately abundant within the channel, primarily willow debris, and spawning habitat was relatively sparse (Table 3). Spawning habitat within the sample section may be limiting, especially with the high proportion of fine silts within the streambed (Table 3).

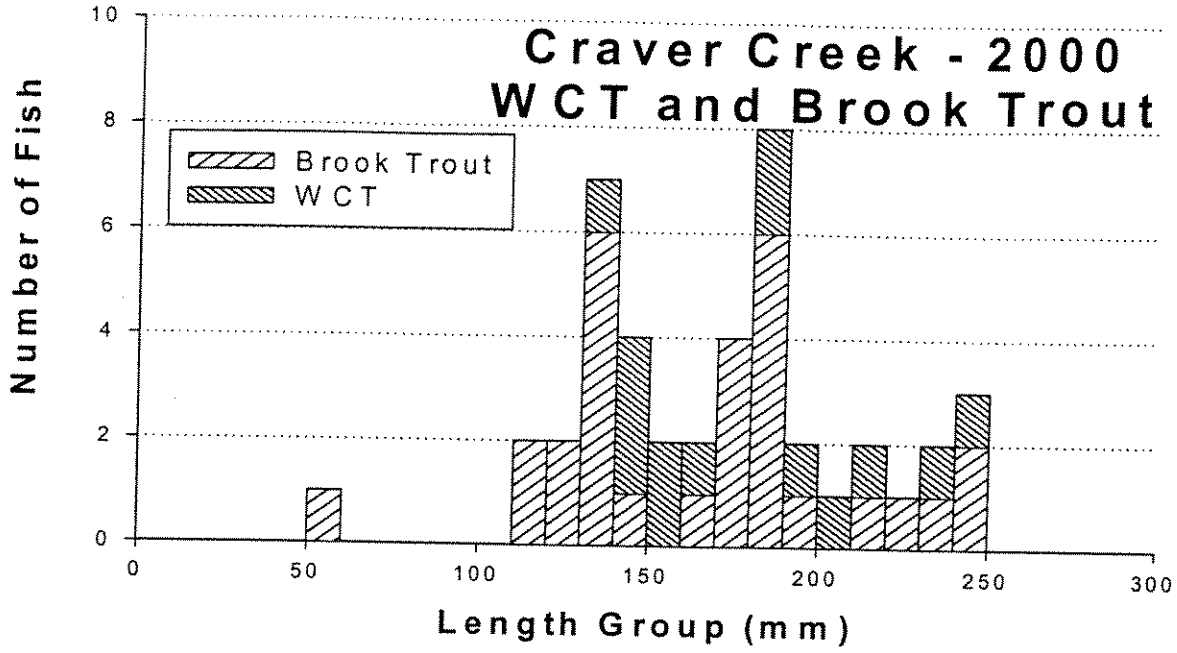


Figure 6. Length frequency histogram for westslope cutthroat (WCT) and brook trout captured in Craver Creek during June 2000.

Water temperatures in Craver Creek from June 24, 2000 to September 30, 2000 ranged from about 2 to 18 C with average temperatures staying between 12 and 15 C during the summer period (Figure 7).

Kate Creek

Kate Creek is an 8 kilometer-long tributary to Medicine Lodge Creek, draining the west side of the Tendoy Mountains. The upper 5 km flow through land administered by the U.S. Forest Service. Below the forest boundary, Kate Creek flows through 1 km of BLM land, and 2.4 km of private land. Throughout the stream's length, beaver dams have extensively modified the channel. Most dam complexes are decadent and many have filled in completely, with the stream re-cutting a channel through the soft substrate. Where the channel is not impounded or otherwise modified by beaver activity, dense willows dominate the riparian zone. As sampling continued upstream the willows become thicker to the point where even seeing the creek, let alone electrofishing, became almost impossible. The lower portion (up to km 3.5) of Kate Creek appeared to have been heavily impacted by livestock grazing.

Brook trout and mottled sculpin were the only fish species found in lower Kate Creek, below km 5.0, and only two westslope cutthroat trout and an unidentified fry were captured above a beaver pond located near km 6.4 (Appendix B). A decadent beaver complex was found in the valley from about km 4.8 upstream. Above km 7.0 the channel of Kate Creek became very small and densely overgrown with willows. Short segments of the channel were shocked at a few locations where it was accessible from km 7.0 up to km 8.0. Mottled sculpin were common to abundant

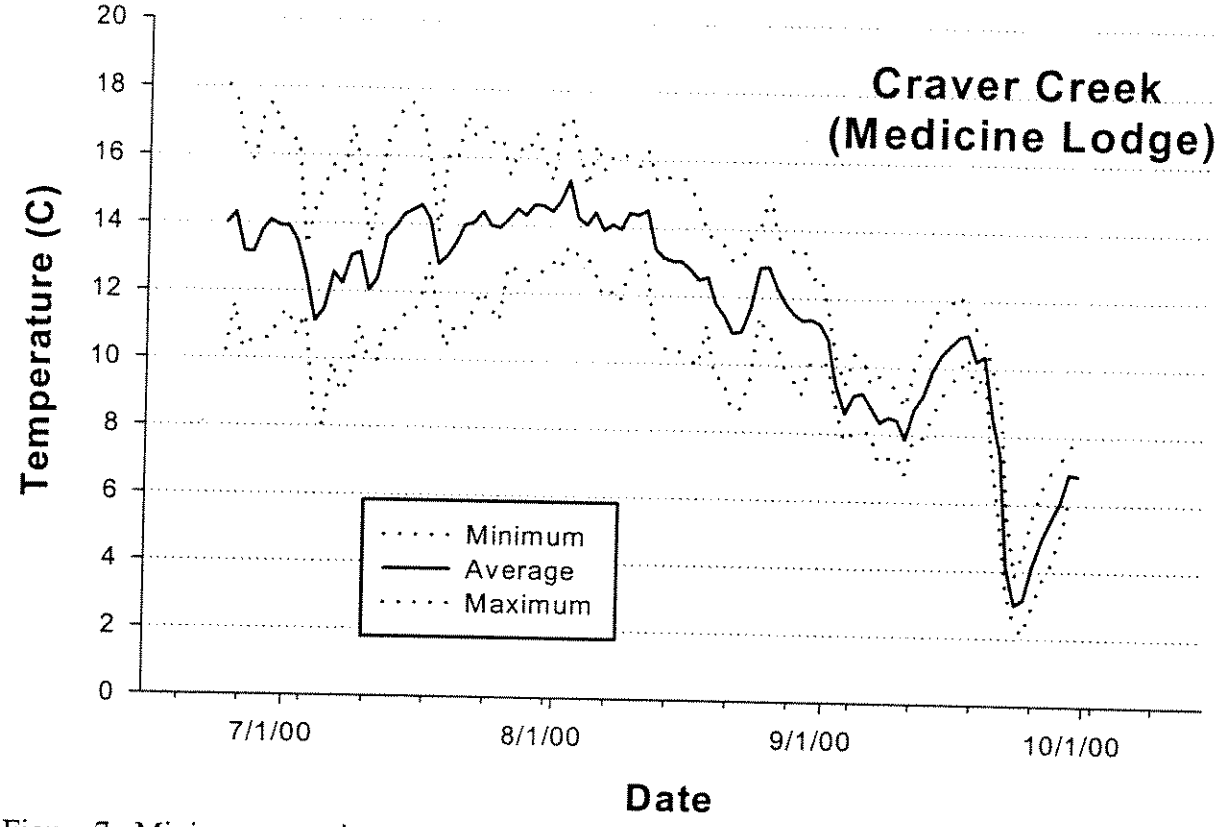


Figure 7. Minimum, maximum, and average water temperatures recorded in Craver Creek at the Medicine Lodge Creek Road crossing from June 24 to September 30, 2000.

up to km 3.0, but were not observed above km 6.0. Leopard frogs were observed above the old beaver complex located near km 4.8. Westslope cutthroat trout were absent from lower Kate Creek and rare above the beaver complex, while brook trout were moderately abundant in lower Kate Creek. Captured brook trout ranged in length from 98 to 212 mm and averaged about 140 mm, while the single captured and measured westslope cutthroat trout was 160 mm long (Table 1 and Figure 8). Due to the extremely low densities of fish, no population estimates or habitat surveys were completed.

Meadow Creek

Meadow Creek is an approximately 19 kilometer-long tributary to Big Sheep Creek. Its upper 5 km flow through land administered by the U.S. Forest Service. This reach is largely forested with occasional open meadows. At stream km 17.0, two tributaries enter Meadow Creek. Neither of these tributaries was large enough to support fish, and above these tributaries Meadow Creek provided marginal fish habitat. The upper basin seemed to be geologically unstable. Above stream km 17.0, all deeper habitat units such as pools or low velocity runs were filled with fine sediment. Several landslides and unstable stream banks were observed above km 17.0. Below km 17.0 channel gradient decreases and habitat condition improves. Near stream km 14.5 the channel is deeply entrenched and appeared as if a beaver dam impounded it at some time. However, no recent beaver activity was observed. Below km 14.5 the riparian vegetation changes from conifer to mixed aspen and willow. Below the forest boundary, Meadow Creek

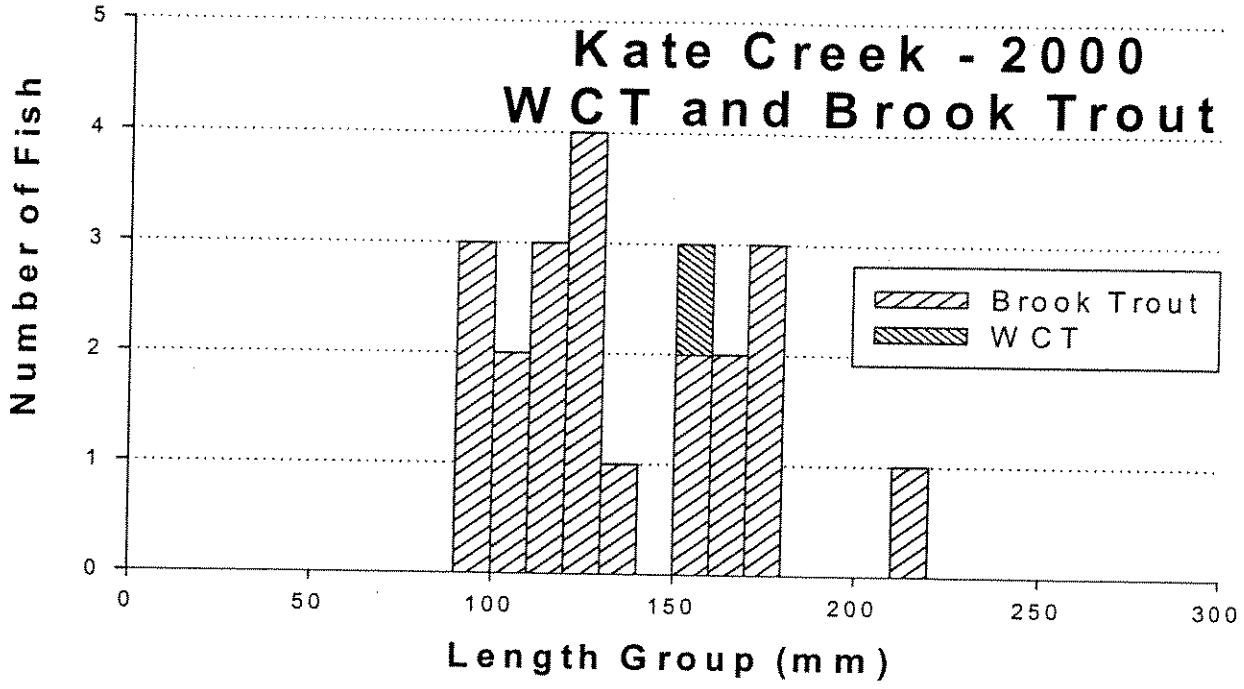


Figure 8. Length frequency histogram for westslope cutthroat (WCT) and brook trout captured in Kate Creek during June 2000.

flows through a quarter section of BLM land. Not far below the BLM boundary, Meadow Creek loses surface flow as it crosses broad sagebrush flats.

Westslope cutthroat trout and mottled sculpin were the only fish captured in Meadow Creek above km 12.1 (Appendix B). We observed a few mottled sculpin at km 12.1, but none were seen further upstream. No westslope cutthroat trout were captured at km 12.1; however, they were abundant at km 12.9, then declined to relatively low abundance from km 13.7 up 16.8 (Figure 9). No fish were captured at km 17.7 and habitat from here upstream was deemed too poor to support fish. We noted that pools were filled with fine sediments in this portion of the stream. A 75 m long section at km 12.9 contained an estimated 16 (SE: 0.3) westslope cutthroat trout 75 to 149 mm and 29 (SE: 0.2) 150 mm and longer, while a 102 m sample section located at stream km 16.1 supported an estimated 3 (SE: 0.7) westslope cutthroat trout 75 to 149 mm and 7 (SE: 0.4) 150 mm and longer in mid-July 2000.

No westslope cutthroat trout longer than 240 mm were captured in Meadow Creek (Figure 10). From the length-frequency data it appeared that age 1 fish were under 100 mm and age 2 fish were between 100 and 140 mm. Average lengths by section ranged from 130 to 195 mm and average weights ranged from 30 to 102 grams, but there did not appear to be any type of longitudinal trend up the stream (Table 1).

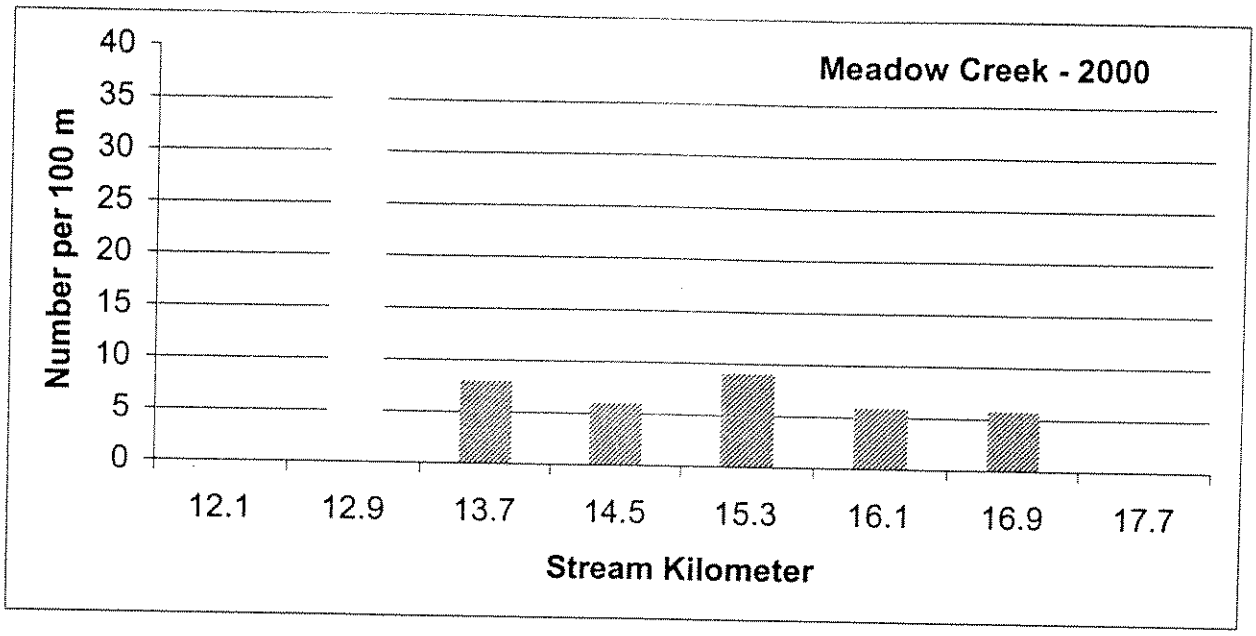


Figure 9. Catch (number per 100 m) of westslope cutthroat trout during the first electrofishing pass in Meadow Creek from stream km 12.1 up to km 17.7 during mid-July 2000. No fish were captured at stream km 12.1 or 17.7.

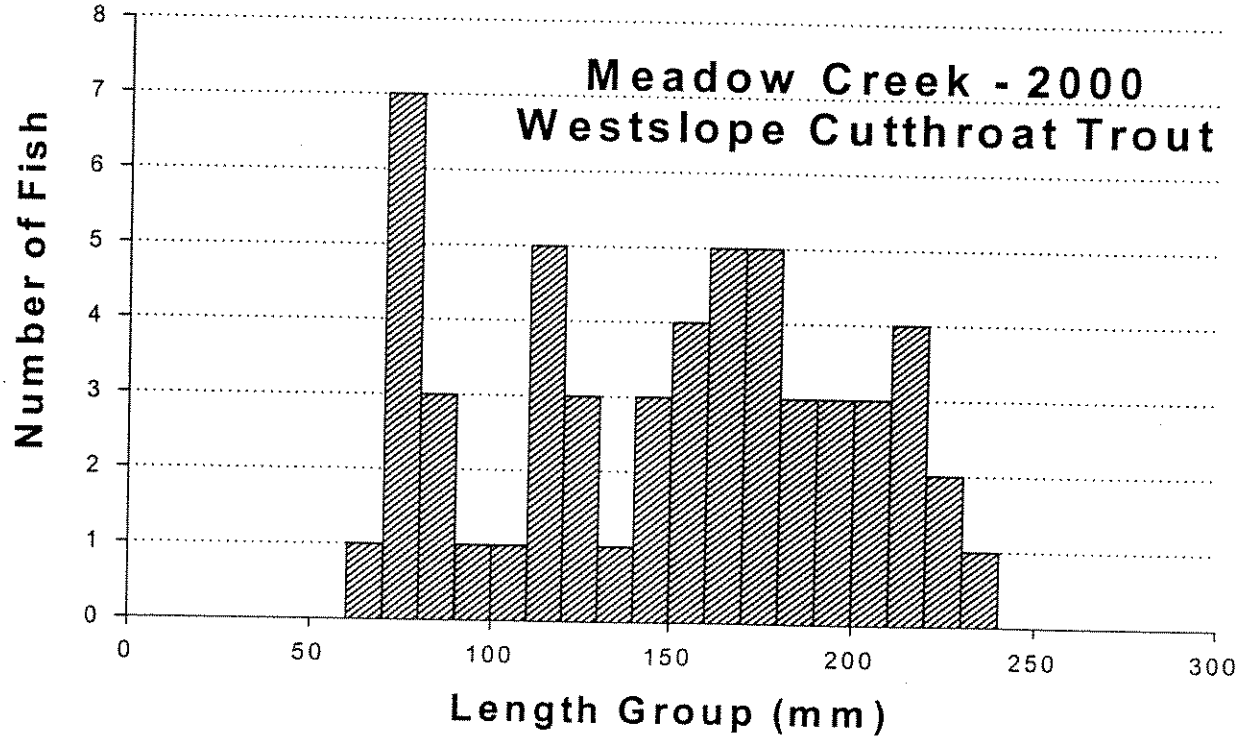


Figure 10. Length frequency histogram for westslope cutthroat trout captured in Meadow Creek during July 2000.

Meadow Creek had an average wetted width of 1.6 m at two survey sites, stream kilometers 12.9 and 16.1, during mid-July 2000 (Table 2). Pool habitats made up more of the channel's length at km 12.9 (about 25%) than at km 16.1 (<10%). Pool habitats averaged slightly over 17 cm deep at both locations. Much of the streambed was composed of small gravel and smaller particles, especially in the lower survey section (Table 3). Small woody debris was very abundant within the channel, primarily willow debris, and spawning habitat was relatively scarce in the lower section (km 12.9; Table 3). Less small woody debris was observed in the upper section; however, large woody debris was found in this upper section, while it was absent from the lower section. Spawning habitat within the upper sample section appeared to be more abundant and spawning habitat was probably adequate in both sections (Table 3). Average daily water temperatures in Meadow Creek were about 2 C cooler during the summer of 2000 at km 16.1 than at km 12.9 (Figure 11). Maximum temperatures did not exceed 17 C at either location.

North Fork of Divide Creek

The North Fork of Divide Creek is a tributary to Horse Prairie Creek draining the Beaverhead Mountains near the Montana-Idaho border. Its upper 2 kilomters flows through Forest Service land, with the remaining length flowing predominately through BLM land. The creek heads at a series of springs about 7.2 km above its mouth. It quickly gains flow within the first few hundred yards of stream, and flows stay consistent throughout its length until about km 1.0, where it braids extensively and loses surface flow. It has a spring creek like character through much of its length. Riparian vegetation was predominately low growing willow with occasional patches of conifers and aspen groves. In general habitat conditions were good.

Westslope cutthroat trout was the only fish species captured in the North Fork of Divide Creek (Appendix B). Mottled sculpin were not observed in this stream. A leopard frog was observed at km 2.4. The relative abundance of westslope cutthroat trout was higher in upstream sample sections (Figure 12). No fish were captured at km 7.2 and flows were deemed too low to support fish above this point. Population estimates were made in a 100 m long section at km 3.2 and in a 75 m long section at km 6.4. The section at km 3.2 supported an estimated 10 (SE: 0.3) westslope cutthroat trout 75 to 149 mm and 6 (SE: 0.5) 150 mm and longer, while the section at km 6.4 supported an estimated 13 (SE: 0.3) 75 to 149 mm and 8 (SE: 0.9) 150 mm and longer.

No westslope cutthroat trout captured in North Fork of Divide Creek were longer than 200 mm (Figure 13). Average lengths by section ranged from 100 to 150 mm and average weights ranged from 14 to 32 grams (Table 1).

The North Fork of Divide Creek had an average wetted width of 1.6 m at stream kilometer 3.2 and 0.9 m at km 6.4 in late July 2000 (Table 2). Less than 10% of the channel's length consisted of pool habitats at km 3.2 and just over 10% at km 6.4. Pools averaged about 10 cm deep at both locations. Much of the streambed was composed of gravels at km 3.2 and cobbles and silt at km 6.4 (Table 3). Small woody debris was common within the channel, primarily willow debris, while spawning habitat was relatively scarce (Table 3). Large woody debris was only observed

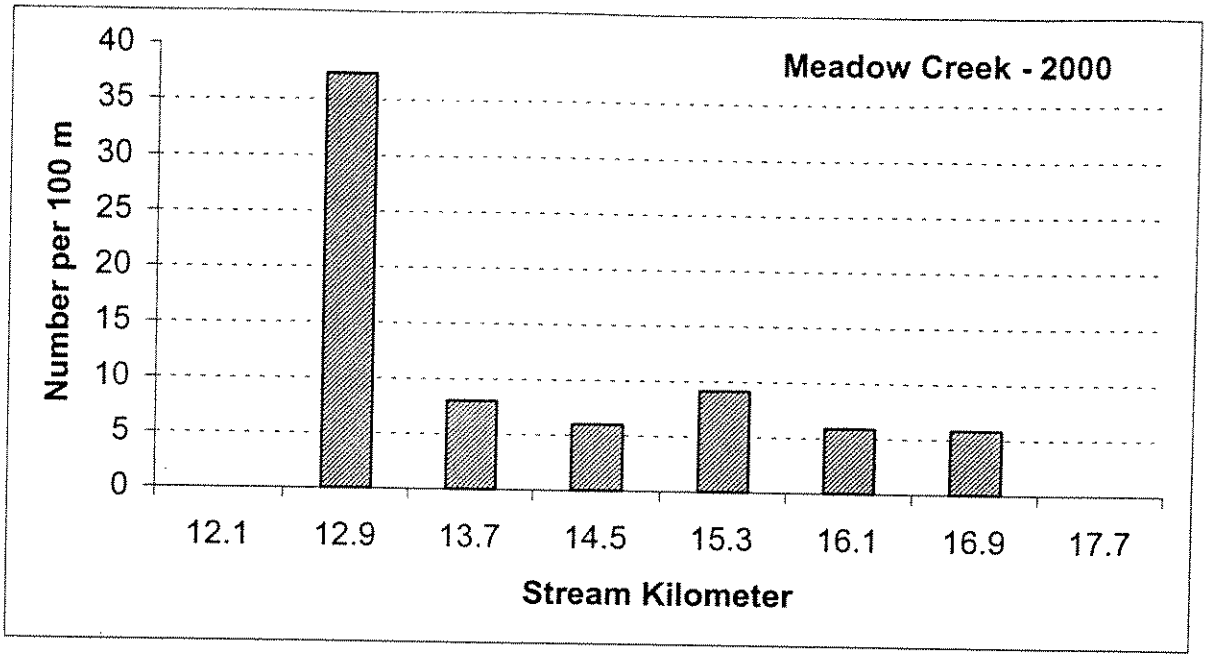
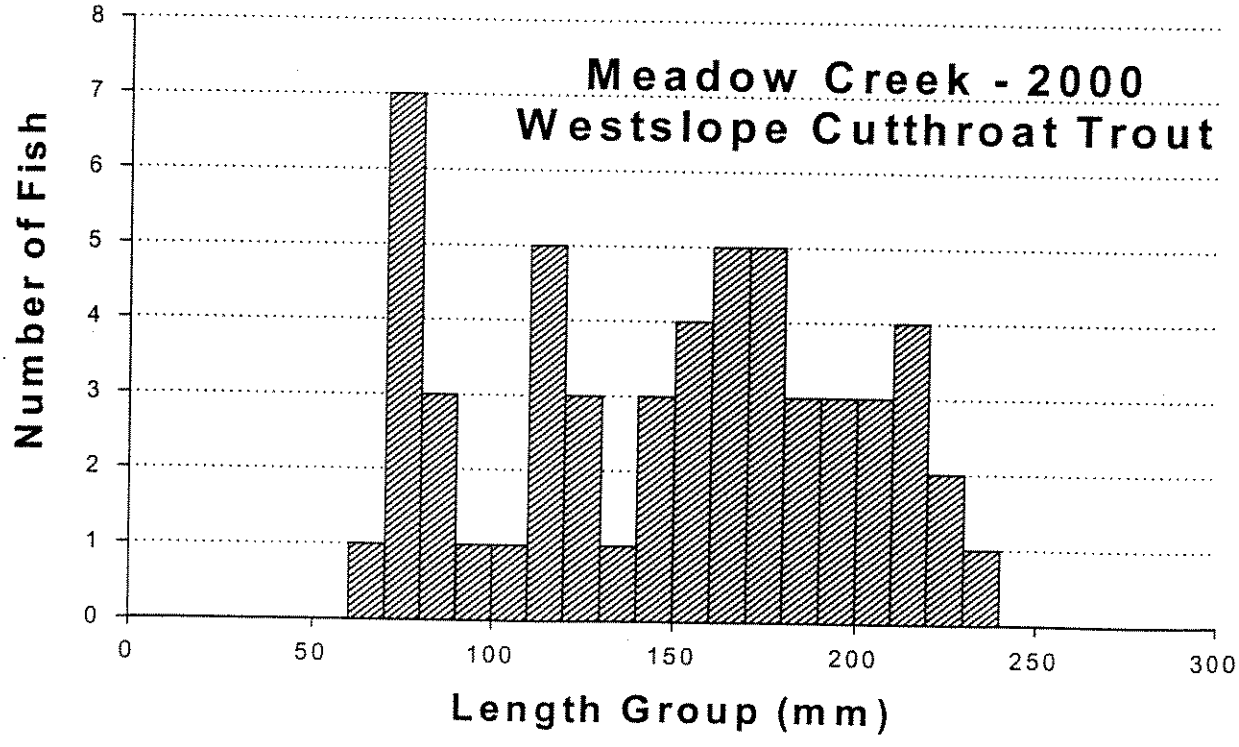


Figure 9. Catch (number per 100 m) of westslope cutthroat trout during the first electrofishing pass in Meadow Creek from stream km 12.1 up to km 17.7 during mid-July 2000. No fish were captured at stream km 12.1 or 17.7.



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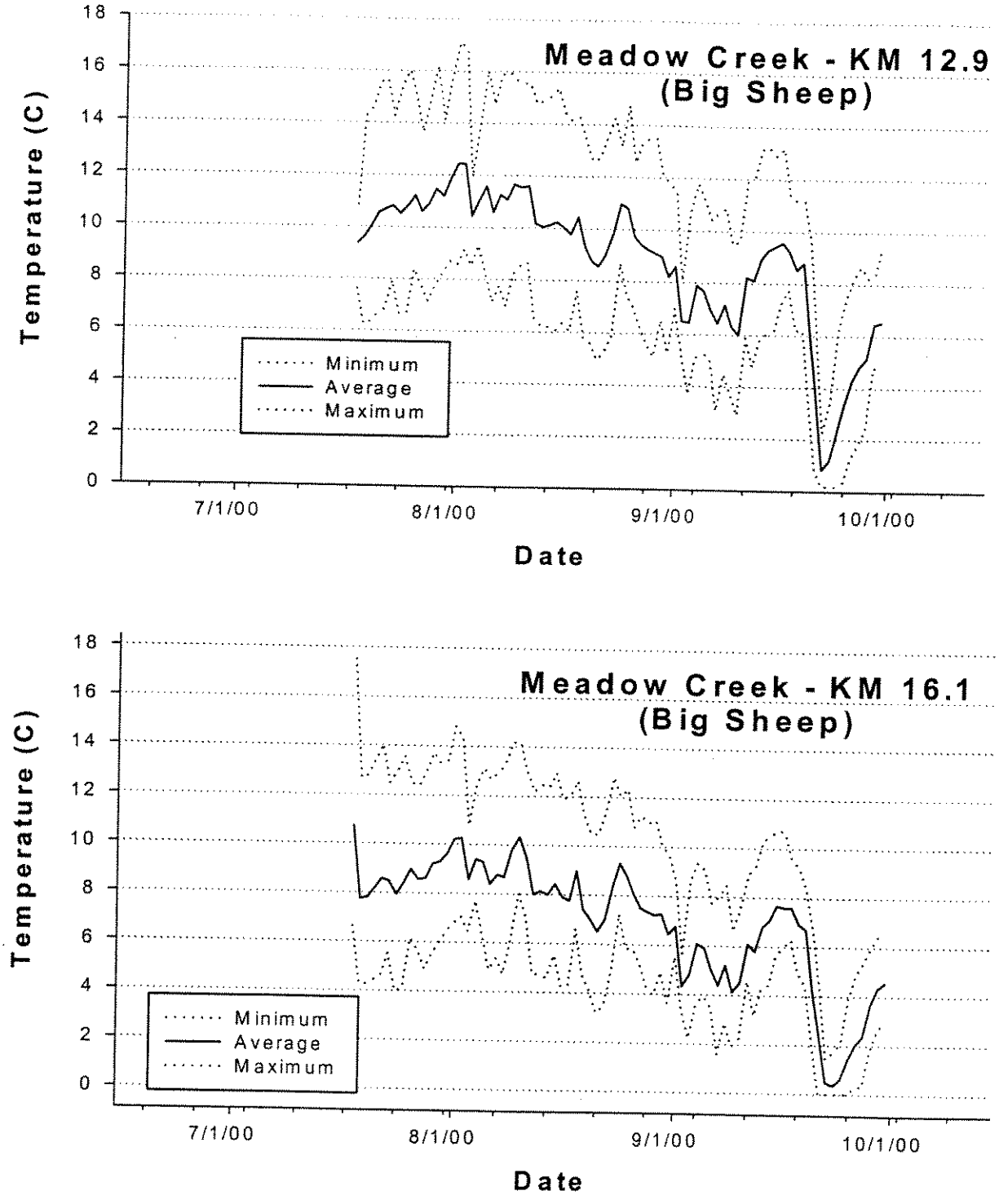

Figure 11. Minimum, maximum, and average daily water temperatures in Meadow Creek during the summer of 2000 at stream kilometer 12.9 (top) and 16.1 (bottom).

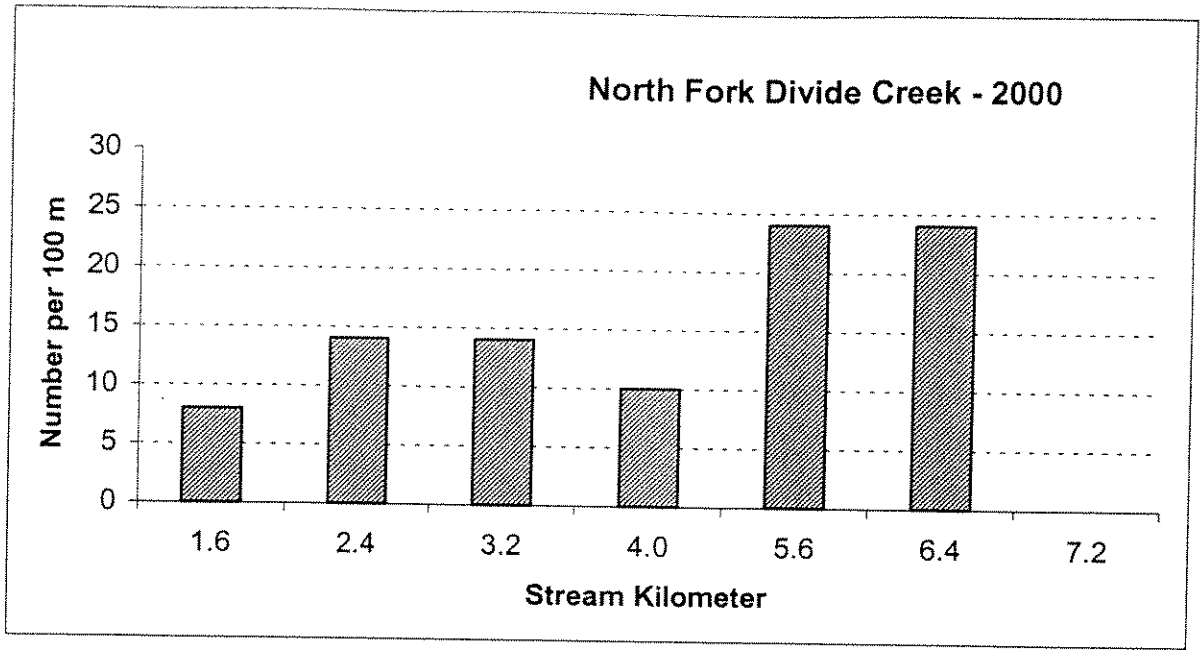

Figure 12. Catch (number per 100 m) of westslope cutthroat trout during the first electrofishing pass in North Fork of Divide Creek from stream km 1.6 up to km 7.2 during mid-July 2000. No fish were captured for at km 7.2.

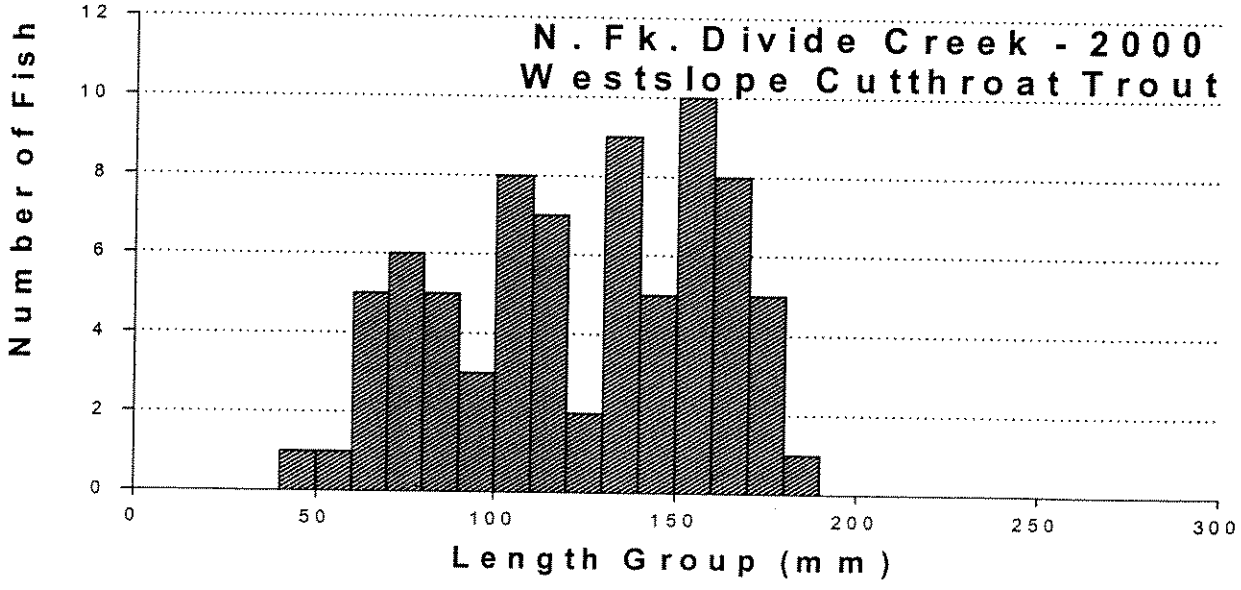

Figure 13. Length frequency histogram for westslope cutthroat trout captured in the North Fork of Divide Creek during July 2000.

at km 6.4. Based on the relative amount of spawning habitat within the sample section and high levels of silt in the upper sample site, spawning habitat may be limiting (Table 3). Average daily water temperatures in both the North and South forks of Divide Creek rarely exceeded 15 C during the summer of 2000 (Figure 14). It appeared that thermographs were exposed to the air for a few-day time period near the end of September. Maximum daily temperatures were higher in the South Fork than the North Fork.

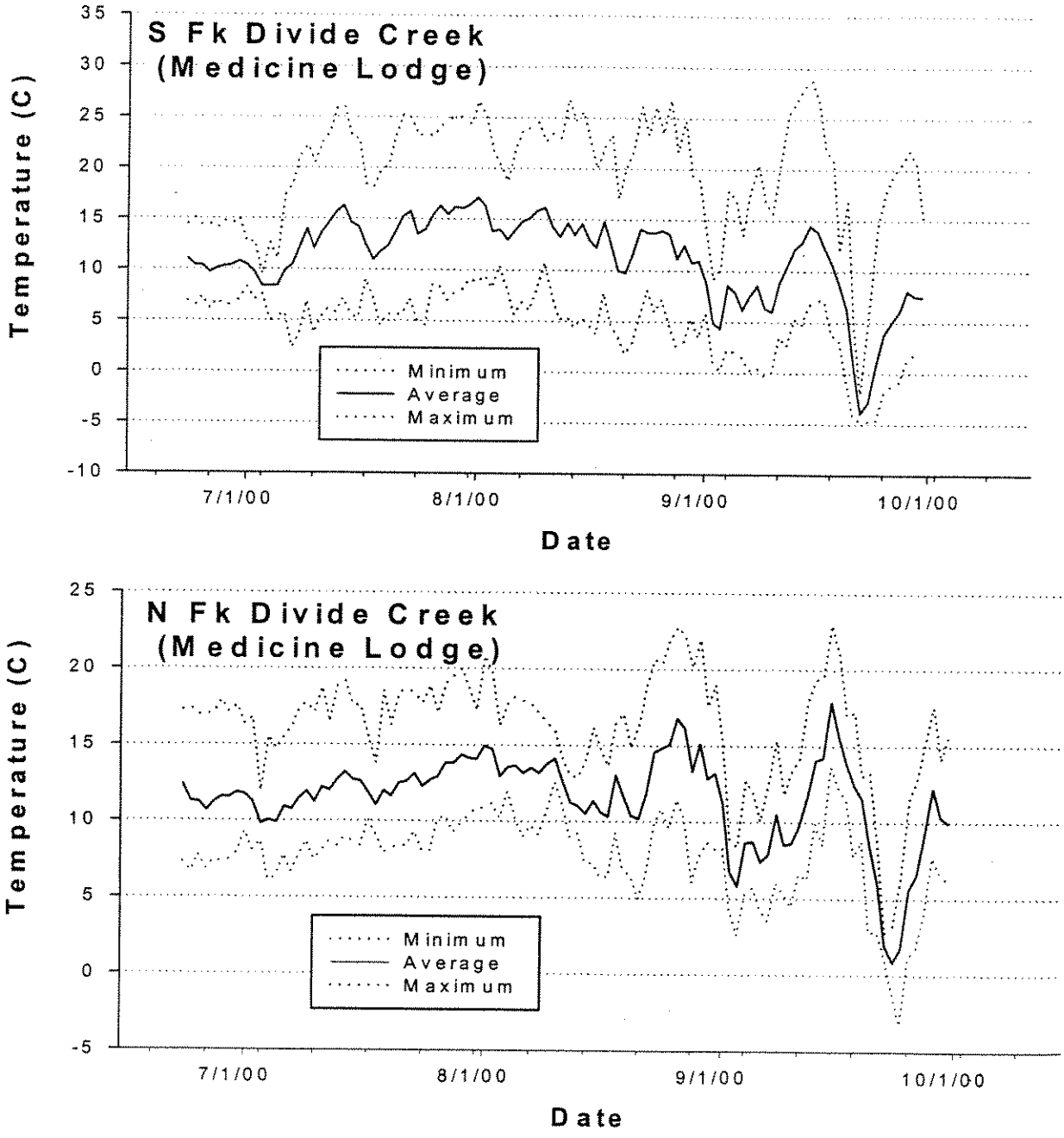

Figure 14. Minimum, maximum, and average daily water temperatures in the South (top) and North (bottom) forks of Divide Creek during the summer of 2000. Thermographs in both forks were exposed to the air for a couple of days during the end of September.

Rape Creek

No fish or fish habitat data were collected in Rape Creek; however, a thermograph was placed in Rape Creek near the north boundary of the state section (Figure 15). Average daily temperatures fluctuated near 15 C during most of the summer daily maxima climbing over 20 C.

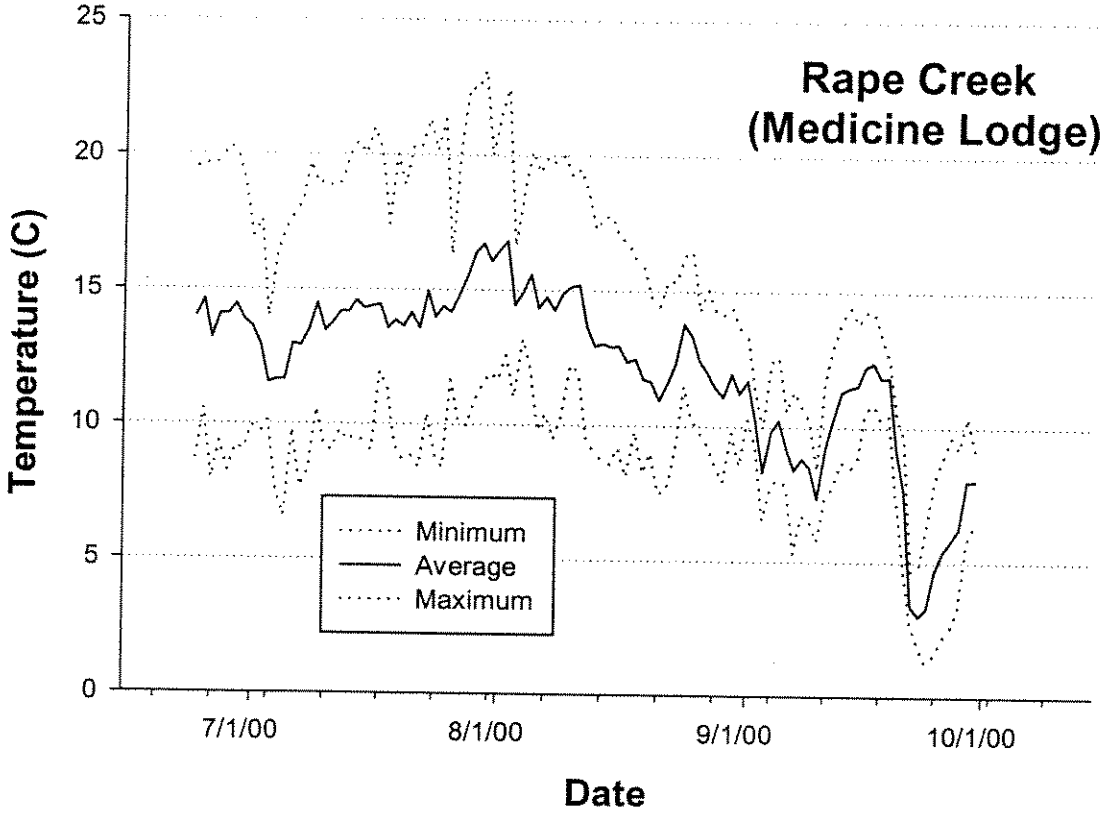

Figure 15. Minimum, maximum, and average daily water temperatures in Rape Creek during the summer of 2000.

Acknowledgements

The Bureau of Land Management, Dillon Field Office provided funding through a Challenge Cost Share agreement with Montana State University and Montana Fish, Wildlife and Parks to collect these data. The Montana Cooperative Fishery Research Unit located at Montana State University provided administrative support. Matt Sloat and David Barnes assisted with the fieldwork. Private landowners along the sample streams graciously provided access to the streams through their lands.

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Appendix A – Fin Samples Submitted for Genetic Analyses

STREAM	MILE	Latdec	Longdec	N	Tot N	DATE	DRAINAGE	Paymen
CABIN CREEK	3			5		6/20/2000	BIG SHEEP	BLM
CABIN CREEK	11	44.6331	112.975	6		6/20/2000	BIG SHEEP	BLM
CABIN CREEK	11.5	44.637	112.98	5		6/20/2000	BIG SHEEP	BLM
CABIN CREEK	12	44.6363	112.99	7		6/20/2000	BIG SHEEP	BLM
CABIN CREEK	12.5	44.6391	112.998	5		6/20/2000	BIG SHEEP	BLM
CABIN CREEK	13	44.6374	113.008	5	31	6/20/2000	BIG SHEEP	BLM
MEADOW CREEK	8	44.5086	112.957	5		7/17/2000	BIG SHEEP	BLM
MEADOW CREEK	8.5	44.5092	112.969	4		7/17/2000	BIG SHEEP	BLM
MEADOW CREEK	9	44.5076	112.979	4		7/17/2000	BIG SHEEP	BLM
MEADOW CREEK	9.5	44.5078	112.971	5		7/18/2000	BIG SHEEP	BLM
MEADOW CREEK	10	44.5066	112.997	6		7/18/2000	BIG SHEEP	BLM
MEADOW CREEK	10.5	44.5EBT	113.EBT	3	27	7/18/2000	BIG SHEEP	BLM
TRIB TO CABIN CREEK	0.5	44.6393	112.983	3		6/20/2000	BIG SHEEP	BLM
N FK DIVIDE CREEK	1	44.8213	113.291	4		7/18/2000	HORSE PRAIRIE	BLM
N FK DIVIDE CREEK	1.5	44.8184	113.298	7		7/18/2000	HORSE PRAIRIE	BLM
N FK DIVIDE CREEK	2	44.8163	113.307	10		7/18/2000	HORSE PRAIRIE	BLM
N FK DIVIDE CREEK	2.5	44.8196	113.313	5	26	7/18/2000	HORSE PRAIRIE	BLM
CRAVER CREEK	0.5	44.6865	113.004	2		7/19/2000	MEDICINE LODGE	BLM
CRAVER CREEK	1	44.6773	113.004	7		7/19/2000	MEDICINE LODGE	BLM
CRAVER CREEK	1.5	44.6715	113.011	5	14	7/19/2000	MEDICINE LODGE	BLM

Appendix B – Summary of Fish Capture Information

Appendix B. Number of fish captured in first electrofishing pass (number per 100 m of stream length captured in first pass) in BLM streams by stream, stream kilometer (mile), date, and species (012 = westslope cutthroat trout and 003 = brook trout) during 2000.

Stream	Mile	Km	Date	Section length (m)	Species	Catch during Pass 1			Catch per 100 m		
						< 75 mm	75-149 mm	150 + mm	< 75 mm	75-149 mm	150 + mm
CABIN CR	11.0	17.7	6/20/2000	60	012	2	2	6	3.3	3.3	10.0
CABIN CR	11.5	18.5	6/20/2000	60	012	1	5	2	1.7	8.3	3.3
CABIN CR	12.0	19.3	6/20/2000	100	012		9	10		9.0	10.0
CABIN CR	12.5	20.1	6/20/2000	65	012	2	4	2	3.1	6.2	3.1
CABIN CR	13.0	20.9	6/20/2000	65	012	2	8	6	3.1	12.3	9.2
CABIN CR	13.5	21.7	6/20/2000	92	012			3			3.3
CABIN CR	14.0	22.5	6/20/2000	60	None captured						
TRIB TO CABIN CR	0.5	0.8	6/20/2000	45	012	3			6.7		
KATE CR	0.7	1.1	6/21/2000	53	003		2	2		3.8	3.8
KATE CR	1.0	1.6	6/21/2000	50	003		2	2		4.0	4.0
KATE CR	2.0	3.2	6/21/2000	50	003		7	4		14.0	8.0
KATE CR	3.0	4.8	6/21/2000	65	003		2			3.1	
KATE CR	4.0	6.4	6/21/2000	50	012			1			2.0
KATE CR	4.5	7.2	6/21/2000		Spot shocked and captured 1 fry and 1 WCT						
N FK DIVIDE CR	1.0	1.6	7/18/2000	50	012		3	1		6.0	2.0
N FK DIVIDE CR	1.5	2.4	7/18/2000	50	012		3	4		6.0	8.0
N FK DIVIDE CR	2.0	3.2	7/18/2000	100	012	5	9	5	5.0	9.0	5.0
N FK DIVIDE CR	2.5	4.0	7/19/2000	50	012		1	4		2.0	8.0
N FK DIVIDE CR	3.5	5.6	7/19/2000	50	012	4	11	1	8.0	22.0	2.0
N FK DIVIDE CR	4.0	6.4	7/20/2000	75	012	2	12	6	2.7	16.0	8.0
N FK DIVIDE CR	4.5	7.2	7/20/2000		None captured						
MEADOW CR	7.5	12.1	7/17/2000	50	None captured						
MEADOW CR	8.0	12.9	7/17/2000	75	012	1	15	13	1.3	20.0	17.3

Stream	Mile	Km	Date	Section length (m)	Species	Catch during Pass 1			Catch per 100 m		
						< 75 mm	75-149 mm	150 + mm	< 75 mm	75-149 mm	150 + mm
MEADOW CR	8.5	13.7	7/18/2000	50	012		1	3		2.0	6.0
MEADOW CR	9.0	14.5	7/17/2000	50	012	1		3	2.0		6.0
MEADOW CR	9.5	15.3	7/17/2000	55	012			5			9.1
MEADOW CR	10.0	16.1	7/18/2000	102	012		2	4		2.0	3.9
MEADOW CR	10.5	16.9	7/18/2000	52	012		1	2		1.9	3.8
MEADOW CR	11.0	17.7	7/18/2000	75	None captured						
CRAVER CR	0.5	0.8	7/19/2000	75	003			4			5.3
CRAVER CR	0.5	0.8	7/19/2000	75	012		1	1		1.3	1.3
CRAVER CR	1.0	1.6	7/18/2000	75	003		2	4		2.7	5.3
CRAVER CR	1.0	1.6	7/18/2000	75	012		1	6		1.3	8.0
CRAVER CR	1.5	2.4	7/19/2000	77	003	1	8	8	1.3	10.4	10.4
CRAVER CR	1.5	2.4	7/19/2000	77	012		2	3		2.6	3.9
CRAVER CR	2.5	4.0	7/19/2000	75	None captured						
CRAVER CR	3.0	4.8	7/19/2000		None captured						