

STATE OF COLORADO

Bill Ritter, Jr., Governor

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF WILDLIFE

AN EQUAL OPPORTUNITY EMPLOYER

Thomas E. Remington, Director

6060 Broadway

Denver, Colorado 80216

Telephone: (303) 297-1192

wildlife.state.co.us



*For Wildlife-
For People*

January 14, 2010

Ms. Linda Bassi
Colorado Water Conservation Board
Stream and Lake Protection Section
1313 Sherman Street, Room 723
Denver, Colorado 80203

Re: Colorado Division of Wildlife Instream Flow Recommendations for South Fork of Slater Creek.

Dear Linda,

The purpose of this letter is to formally transmit the Colorado Division of Wildlife's (CDOW) support for Trout Unlimited's (TU) Instream Flow Recommendations for South Fork Slater Creek pursuant to Rule 5n of the Rules Concerning the Colorado Instream Flow and Natural Lake Levels. The CDOW believes that South Fork Slater Creek should be considered for inclusion into the Instream Flow Program (ISFP) because it has a natural environment that can be preserved to a reasonable degree with an instream flow water right. As you know, the State of Colorado's Instream Flow Program (ISFP) was created in 1973 when the Colorado State Legislature recognized "the need to correlate the activities of mankind with some reasonable preservation of the natural environment" (See §37-92-102 (3) C.R.S.). The statute vests the Colorado Water Conservation Board (Board) with the exclusive authority to appropriate and acquire instream flow and natural lake level water rights. In order to encourage other entities to participate in Colorado's ISFP, the statute directs the Board to request instream flow recommendations from other state and federal agencies.

Location and Land Status

The South Fork Slater Creek instream flow recommendations begin at the headwaters of South Fork Slater Creek and extend downstream to the United States Forest Service boundary. The South Fork Slater Creek instream flow recommendation was segmented at the confluence with the West Prong of South Fork Slater Creek. The proposed instream flow segments are located northeast of the Town of Craig. 100% of the proposed segments are located on public lands.

Biological Summary and R2CROSS Analysis

The CDOW and TU worked cooperatively on this recommendation and together have collected stream cross section information, natural environment data, and other data needed to quantify the instream flow needs for these reaches of the South Fork Slater Creek. South Fork Slater Creek is classified as a large stream (between 36 to 59 feet wide) and fishery surveys indicate the stream environment of South Fork Slater Creek supports Colorado River cutthroat trout (*Oncorhynchus clarkii pleuriticus*) and a naturally reproducing brook trout (*Salvelinus fontinalis*) population. The Board staff relies upon the biological expertise of the cooperating agencies to interpret output from the R2CROSS data collected to develop the initial, biologic instream flow recommendation. This initial recommendation is designed to address the unique biologic requirements of each stream without regard to water availability. Three instream flow hydraulic parameters, average depth, percent wetted perimeter, and average velocity are used to develop biologic instream flow recommendations. The CDOW has determined that maintaining these three hydraulic parameters at adequate levels across riffle habitat types, aquatic habitat in pools

DEPARTMENT OF NATURAL RESOURCES, James B. Martin, Executive Director

WILDLIFE COMMISSION, Brad Coors, Chair • Tim Glenn, Vice Chair • Dennis Buechler, Secretary

Members, Jeffrey Crawford • Dorothea Farris • Roy McAnally • John Singletary • Mark Smith • Robert Streeter

Ex Officio Members, James B. Martin and John Stulp

and runs will also be maintained for most life stages of fish and aquatic invertebrates (Nehring 1979; Espegren 1996).

The results of the R2CROSS data collection efforts for the upper segment indicate that an instream flow recommendation of 4.1 cfs, is required to maintain the three principal hydraulic criteria of average depth, average velocity and percent wetted perimeter, and 1.25 cfs, is required to maintain two of the three principal hydraulic criteria. The results of the R2CROSS data collection efforts for the lower segment indicate that an instream flow recommendation of between 14.2 and 38.8 cfs, is required to maintain the three principal hydraulic criteria of average depth, average velocity and percent wetted perimeter, and 5.25 cfs, is required to maintain two of the three principal hydraulic criteria. However, both summer flow recommendations from the R2CROSS analysis were greater than 2.5 times the field measured discharge and were outside the modeling accuracy of R2CROSS. Therefore, TU and CDOW used the sum of the summertime instream flow recommendation from West Prong Slater Creek above the Decker Ditch (4.9 cfs) together with the summertime instream flow recommendation from South Fork Slater Creek upstream of West Prong (4.1 cfs) to recommend a 9.0 cfs instream flow during the summer months for this stream reach. However, these results are only based on the physical and biological data collected to date and do not incorporate any water availability constraints.

Water Availability Analysis and Instream Flow Recommendation

The TU staff conducted a preliminary evaluation of the stream hydrology to determine if water was physically available for an instream flow appropriation based on an aerial apportionment of USGS gage 09245500 on the North Fork of Elkhead Creek, CO. Subsequent to this preliminary analysis, the CWCB completed their geometric mean analysis of daily flows for South Fork Slater Creek. CDOW and TU used the CWCB's water availability analysis to adjust the seasonality and quantities of the R2CROSS instream flow recommendations so that the estimated daily flow of South Fork Slater Creek reasonably exceeds the recommended instream flow amounts. These seasonal adjustments are reflected in the final instream flow recommendations shown below:

Headwaters to West Prong South Fork Slater Creek

- 4.10 cfs (April 1 through June 30)
- 1.25 cfs (July 1 through July 31)
- 0.65 cfs (August 1 through September 15)
- 1.25 cfs (September 16 through March 31)

West Prong South Fork Slater Creek to USFS Boundary

- 9.00 cfs (March 15 through July 15)
- 2.00 cfs (July 16 through August 15)
- 0.80 cfs (August 16 through October 15)
- 5.75 cfs (October 16 through March 14)

Relationship to State Policy

The CDOW supports the Instream Flow Program because the appropriation of instream flow water rights helps the CDOW meet our statutory mission as described in Title 33 of the Colorado Revised Statutes (CRS):

§33-1-101 – “It is the policy of the state of Colorado that the wildlife and their environment are to be protected, preserved, enhanced, and managed for the use, benefit, and enjoyment of the people of this state and its visitors ... that there shall be provided a comprehensive program designed to offer the greatest possible variety of wildlife-related recreational opportunity to the people of this state and its visitors and that, to carry out such program and policy, there shall be a continuous operation of planning, acquisition, and development of wildlife habitats and facilities for wildlife related opportunities.”

§33-2-106 – “(1) The division [of Wildlife] shall establish such programs including acquisition of land or aquatic habitat as are deemed necessary for management of nongame, endangered, or threatened wildlife. (2) ... the division may enter into agreements with federal agencies or political subdivisions of this state or with private persons for administration and management of any area established under this section or utilized for management of nongame, endangered, or threatened wildlife.”

§33-5-101 – “It is declared to be the policy of the state that its fish and wildlife resources, and particularly the fishing waters within the state, are to be protected and preserved from the actions of any state agency to the end that they be available for all time and without change in their natural existing state, except as may be necessary and appropriate after due consideration of all factors involved.”

In addition to meeting the state policy discussed above South Fork Slater Creek satisfies criteria identified by the CWCB for ISF appropriations, including:

- a) The recommendations have broad public support;
- b) The proposed appropriations will have a positive impact on state or local economies;
- c) The recommendations are part of a water acquisition strategy;
- d) The recommendations are part of a collaborative solution to a unique natural resource issue with federal, state or local partners; and
- e) The instream flow amount and timing recommended by TU, CDOW and CWCB staff:
 - Is based upon standard scientific methodology and an accurate R2CROSS analysis;
 - Reflects the amount of water available for appropriation as an instream flow water right; and
 - Is required to preserve the natural environment to a reasonable degree.

TU has provided copies of the field data sheets, the R2CROSS modeling runs, and stream photographs. If you have any questions regarding the provided information or the instream flow recommendations please contact me at (303)-291-7267.

Sincerely,

Mark Uppendahl

Mark Uppendahl
Colorado Division of Wildlife
Instream Flow Program Coordinator

Cc: Grady McNeill, CDOW Resource Support Section Manager – w/o attachments
Jay Skinner, CDOW Water Unit Program Manager – w/o attachments
Dave Graf, CDOW Water Resource Specialist – w/o attachments
Sherman Hebein, CDOW NW Senior Aquatic Biologist – w/o attachments
Ron Velardi, CDOW Northwest Regional Manager - w/o attachments
Boyd Wright, CDOW Aquatic Biologist – w/o attachments
Bill de Vergie, CDOW AWM Area 6 – w/o attachments
Greg Espegren, Trout Unlimited



Greg Espegren
Aquatics Specialist
Colorado Water Project
1320 Pearl Street, Suite 320
Boulder, CO 80302
303.440.2937

January 4, 2010

Ms. Linda Bassi
Mr. Jeff Baessler
Colorado Water Conservation Board
1313 Sherman Street, Room 721
Denver, Colorado 80203

Dear Ms. Bassi and Mr. Baessler,

Trout Unlimited in conjunction with the Colorado Division of Wildlife (CDOW) is formally submitting this instream flow recommendation for the South Fork of Slater Creek, located in Routt County, District 6.

Location and Land Status. The South Fork of Slater Creek (South Fork) originates on the northern flank of the Elkhead Mountains just west of Bears Ears Peaks at an elevation of 9,560 feet. It flows generally northward for 5.7 miles to the Routt National Forest boundary at an elevation of 7,700 feet. The proposed ISF reach covers the 4.6 mile reach from the headwaters to the confluence with West Prong South Fork Slater Creek. This segment is located entirely on Forest Service Land (Fig. 1).

Biological Summary and R2CROSS Analysis. In July and September of 2007, October 2008, and July 2009 TU and CDOW collected stream cross sectional data, natural environment data, and other data needed to quantify instream flow needs (Table 1). Previous survey data collected by CDOW indicated the stream supports healthy populations of Colorado River cutthroat trout, brook trout and mottled sculpin.

Table 1. Summary of R2CROSS datasets

DATE	MEASURED FLOW (cfs)	MODELING RANGE (cfs)	FLOW MEETING 3 CRITERIA	FLOW MEETING 2 CRITERIA
07/10/07	1.1	2.7 – 0.4	<i>Not met in table</i>	1.2
09/05/07	1.0	2.5 – 0.4	<i>8.1</i>	1.3
10/02/08	1.2	2.9 – 0.5	<i>7.7</i>	1.1
07/07/09	2.6	6.4 – 1.0	4.1	1.5
Average of flows within modeling range			4.1	1.25

Note: Table entries appearing in italicized font indicated flows that were either not met in R2CROSS staging table or outside of 0.4 to 2.5 times measured flow R2CROSS modeling window.

Stream cross sectional data were analyzed using the R2CROSS program, and the output was evaluated using the methods described in Nehring (1979) and Espegren (1996). The R2CROSS models how average depth, percent wetted perimeter and average velocity vary with discharge. According to the criteria established by Nehring (1979), the relevant minimum requirements are an average depth of 0.2 feet, a wetted perimeter of 50%, and an average velocity of 1.0 ft/sec. Protecting salmonids during the summer season is accomplished by insuring all three criteria are met while during the winter protection can be accomplished by protecting 2 of three criteria. Thus, the fishery of South Fork Slater Creek can be protected with minimum summer flows of 4.1 cfs and minimum winter flows of 1.25 cfs. TU and CDOW recommend that the CWCB appropriate the following flow amounts to preserve the natural environment of South Fork Slater Creek to a reasonable degree:

- From **April 1 through June 30** a flow appropriation of **4.1 cfs** is recommended to maintain the three principal criteria of average depth, average velocity, and percent wetted perimeter;
- From **July 1 through July 31** a flow appropriation of **1.25 cfs** is recommended to maintain the average depth and wetter perimeter criteria;
- From **August 1 through September 15** a flow appropriation of **0.65 cfs** is recommended based on water availability limitations; and
- From **September 16 through March 31** a flow appropriation of **1.25 cfs** is recommended to maintain the average depth and wetter perimeter criteria.

Water Availability. The preliminary instream flow recommendation we submitted in February 2008 was based on an aerial apportionment of USGS gage 09245500 on the North Fork of Elkhead Creek, CO. Subsequent to that preliminary analysis, the CWCB provided us with a geometric mean analysis of daily flows on South Fork Slater Creek. We used the CWCB's water availability analysis to adjust the seasonality and quantities of the instream flow recommendation so that the estimated daily flow through South Fork Slater Creek typically exceeds the recommended instream flow. These seasonal adjustments are reflected in the final instream flow recommendation above.

Relationship to Existing State Policy. TU and the CDOW are forwarding this stream flow recommendation to the CWCB to meet the State of Colorado's policy "that the wildlife and their environment are to be protected, preserved, enhanced, and managed for the use, benefit, and enjoyment of the people of this state and its visitors ... and that, to carry out such program and policy, there shall be a continuous operation of planning, acquisition, and development of wildlife habitats and facilities for wildlife-related opportunities." C.R.S. 33-1-101(1). Further, the CDOW Strategic Plan states "Healthy aquatic environments are essential to maintain healthy and viable fisheries, and critical for self-sustaining populations. The Division desires to protect and enhance the quality and quantity of aquatic habitats." TU and CDOW recommend that South Fork Slater Creek be considered for inclusion in the Instream Flow Program because doing so would help meet these stated policies. Specifically, establishing minimum flows through this reach would preserve the natural environment of the stream to a reasonable degree.

Attached, please find copies of the field data sheets, the R2CROSS modeling runs, and stream photographs. If you have any questions regarding the attached information or the instream flow recommendations, please feel free to contact me at (303) 440-2937.

Trout Unlimited thanks the Colorado Division of Wildlife and the Colorado Water Conservation Board Staff for their support in preparing this recommendation.

Sincerely,

Sincerely,



Greg Espegren
Trout Unlimited
Aquatic Specialist

Cc: Jay Skinner, CDOW Water Unit Program Manager – w/o attachments
Mark Uppendahl, CDOW Instream Flow Program Coordinator

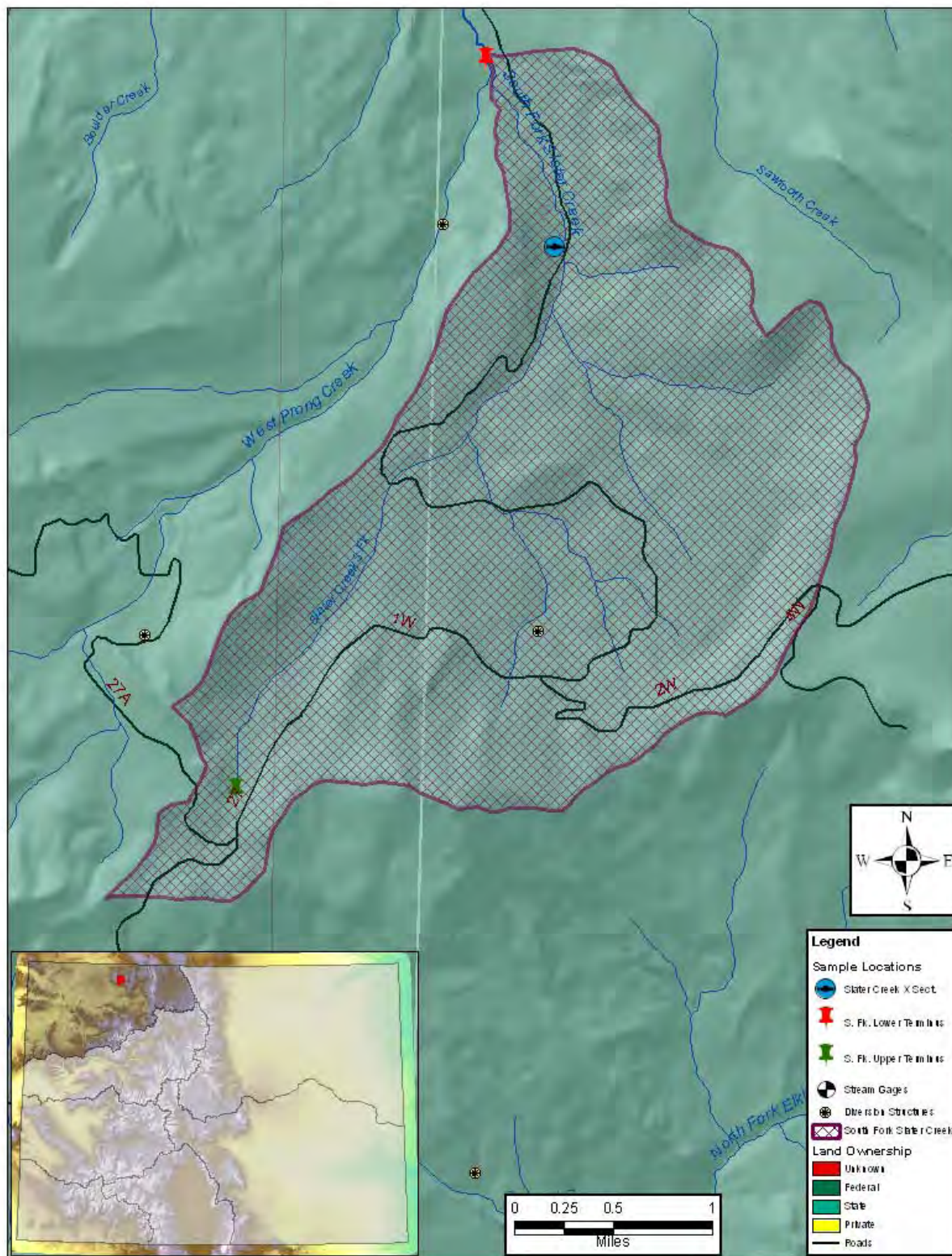


Figure 1. Map of South Fork Slater Creek watershed. Positions of upper and lower termini of the proposed instream flow reach are noted as is the location of the R2CROSS cross section. Additionally, locations known diversion structures are plotted. The watershed's location within Division 6 is indicated by the red box on the inset map of Colorado

#4

COLORADO WATER CONSERVATION BOARD
INSTREAM FLOW / NATURAL LAKE LEVEL PROGRAM
STREAM CROSS-SECTION AND FLOW ANALYSIS

LOCATION INFORMATION

STREAM NAME: S. FK. SLATER CREEK (Upper Site)
XS LOCATION: ~ 50' D/S OF ROAD XING
XS NUMBER: 4

DATE: 7-Jul-09
OBSERVERS: UPPENDAHL & ESPEGREN

1/4 SEC: NW
SECTION: 20
TWP: 10 N
RANGE: 88 W
PM: 6

COUNTY: ROUTT
WATERSHED: SLATER CREEK
DIVISION: 6
DOW CODE: 0

USGS MAP: 0
USFS MAP: 0

SUPPLEMENTAL DATA

*** NOTE ***

Leave TAPE WT and TENSION
at defaults for data collected
with a survey level and rod

TAPE WT: 0.0106
TENSION: 99999

CHANNEL PROFILE DATA

SLOPE: 0.01691176

INPUT DATA CHECKED BY:DATE.....

ASSIGNED TO:DATE.....

STREAM NAME: S. FK. SLATER CREEK (Upper Site)
 XS LOCATION: ~ 50' D/S OF ROAD XING
 XS NUMBER: 4

DATA POINTS= 34

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL
TS	0.00	7.32		
BS	0.01	7.74		
	1.00	8.12		
1 GL	2.00	8.45		
	3.00	8.91		
SWL	4.00	9.16	0.00	0.00
	4.50	9.35	0.20	0.01
	5.00	9.35	0.20	0.12
	5.50	9.35	0.20	0.70
	6.00	9.30	0.15	0.33
	6.50	9.35	0.20	0.51
	7.00	9.35	0.20	0.34
	7.50	9.45	0.30	0.80
	8.00	9.50	0.35	0.90
	8.50	9.50	0.35	0.72
BR	9.00	9.45	0.30	0.00
BR	9.50	9.45	0.30	0.00
	10.00	9.55	0.40	0.48
	10.50	9.50	0.35	1.18
	11.00	9.35	0.20	1.63
	11.50	9.55	0.40	1.19
	12.00	9.40	0.25	1.46
	12.50	9.50	0.35	0.93
	13.00	9.65	0.50	2.00
	13.50	9.60	0.45	1.52
	14.00	9.35	0.20	0.67
	14.40	9.25	0.10	0.23
	15.00	9.20	0.05	0.00
SWL	16.30	9.16	0.00	0.00
	17.00	8.95		
1 GL	17.50	8.72		
	18.00	8.65		
BS	19.30	8.53		
TS	19.31	7.30		

WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.53	0.20	0.10	0.00	0.0%
0.50	0.20	0.10	0.01	0.5%
0.50	0.20	0.10	0.07	2.7%
0.50	0.15	0.08	0.02	1.0%
0.50	0.20	0.10	0.05	2.0%
0.50	0.20	0.10	0.03	1.3%
0.51	0.30	0.15	0.12	4.7%
0.50	0.35	0.18	0.16	6.2%
0.50	0.35	0.18	0.13	4.9%
0.50	0.30	0.15	0.00	0.0%
0.50	0.30	0.15	0.00	0.0%
0.51	0.40	0.20	0.10	3.8%
0.50	0.35	0.18	0.21	8.1%
0.52	0.20	0.10	0.16	6.4%
0.54	0.40	0.20	0.24	9.3%
0.52	0.25	0.13	0.18	7.1%
0.51	0.35	0.18	0.16	6.4%
0.52	0.50	0.25	0.50	19.5%
0.50	0.45	0.23	0.34	13.4%
0.56	0.20	0.09	0.06	2.4%
0.41	0.10	0.05	0.01	0.4%
0.60	0.05	0.05	0.00	0.0%
1.30		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%

TOTALS -----

12.56 0.5 3.01 2.56 100.0%
 (Max.)

Manning's n = 0.0878
 Hydraulic Radius = 0.23988431

STREAM NAME: S. FK. SLATER CREEK (Upper Site)
 XS LOCATION: ~ 50' D/S OF ROAD XING
 XS NUMBER: 4

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	3.01	2.90	-3.8%
8.91	3.01	6.20	105.9%
8.93	3.01	5.92	96.6%
8.95	3.01	5.64	87.3%
8.97	3.01	5.37	78.2%
8.99	3.01	5.10	69.1%
9.01	3.01	4.83	60.2%
9.03	3.01	4.56	51.4%
9.05	3.01	4.30	42.6%
9.07	3.01	4.04	33.9%
9.09	3.01	3.78	25.4%
9.11	3.01	3.52	16.9%
9.12	3.01	3.40	12.7%
9.13	3.01	3.27	8.6%
9.14	3.01	3.15	4.4%
9.15	3.01	3.02	0.3%
9.16	3.01	2.90	-3.8%
9.17	3.01	2.78	-7.8%
9.18	3.01	2.66	-11.7%
9.19	3.01	2.55	-15.5%
9.20	3.01	2.43	-19.2%
9.21	3.01	2.33	-22.8%
9.23	3.01	2.11	-29.8%
9.25	3.01	1.91	-36.7%
9.27	3.01	1.71	-43.4%
9.29	3.01	1.51	-50.0%
9.31	3.01	1.31	-56.5%
9.33	3.01	1.13	-62.6%
9.35	3.01	0.95	-68.5%
9.37	3.01	0.81	-73.0%
9.39	3.01	0.68	-77.4%
9.41	3.01	0.55	-81.6%

WATERLINE AT ZERO

AREA ERROR = 9.151

STREAM NAME: S. FK. SLATER CREEK (Upper Site)
 XS LOCATION: ~ 50' D/S OF ROAD XING
 XS NUMBER: 4

Constant Manning's n

GL = lowest Grassline elevation corrected for sag

STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	8.72	14.91	0.60	0.93	8.96	15.32	100.0%	0.58	13.78	1.54
	8.75	14.78	0.58	0.90	8.50	15.18	99.0%	0.56	12.71	1.49
	8.80	14.56	0.53	0.85	7.77	14.94	97.5%	0.52	11.05	1.42
	8.85	14.34	0.49	0.80	7.04	14.70	95.9%	0.48	9.49	1.35
	8.90	14.13	0.45	0.75	6.33	14.46	94.4%	0.44	8.03	1.27
	8.95	13.83	0.41	0.70	5.63	14.15	92.3%	0.40	6.71	1.19
	9.00	13.47	0.37	0.65	4.95	13.77	89.8%	0.36	5.51	1.11
	9.05	13.10	0.33	0.60	4.29	13.39	87.4%	0.32	4.41	1.03
	9.10	12.73	0.29	0.55	3.64	13.01	84.9%	0.28	3.43	0.94
WL	9.15	12.37	0.24	0.50	3.01	12.63	82.4%	0.24	2.55	0.85
	9.20	10.88	0.22	0.45	2.43	11.13	72.7%	0.22	1.93	0.80
	9.25	10.16	0.19	0.40	1.90	10.40	67.8%	0.18	1.35	0.71
	9.30	9.81	0.14	0.35	1.40	10.03	65.5%	0.14	0.83	0.59
	9.35	6.99	0.14	0.30	0.94	7.19	46.9%	0.13	0.54	0.57
	9.40	6.34	0.10	0.25	0.61	6.51	42.5%	0.09	0.28	0.45
	9.45	4.77	0.07	0.20	0.32	4.89	31.9%	0.07	0.11	0.36
	9.50	2.22	0.06	0.15	0.13	2.29	15.0%	0.06	0.04	0.33
	9.55	0.93	0.06	0.10	0.06	0.96	6.3%	0.06	0.02	0.33
	9.60	0.66	0.02	0.05	0.02	0.67	4.3%	0.02	0.00	0.18

186

51

$$\begin{aligned} 3/3 &= 4.1 \\ 2/3 &= 1.5 \end{aligned}$$

STREAM NAME: S. FK. SLATER CREEK (Upper Site)
XS LOCATION: ~ 50' D/S OF ROAD XING
XS NUMBER: 4

SUMMARY SHEET

MEASURED FLOW (Qm)=	2.56 cfs
CALCULATED FLOW (Qc)=	2.55 cfs
(Qm-Qc)/Qm * 100 =	0.4 %
MEASURED WATERLINE (Wlm)=	9.16 ft
CALCULATED WATERLINE (Wlc)=	9.15 ft
(Wlm-Wlc)/Wlm * 100 =	0.1 %
MAX MEASURED DEPTH (Dm)=	0.50 ft
MAX CALCULATED DEPTH (Dc)=	0.50 ft
(Dm-Dc)/Dm * 100	0.2 %
MEAN VELOCITY=	0.85 ft/sec
MANNING'S N=	0.088
SLOPE=	0.01691176 ft/ft
.4 * Qm =	1.0 cfs
2.5 * Qm=	6.4 cfs

RECOMMENDED INSTREAM FLOW:

=====

FLOW (CFS)

PERIOD

=====

=====

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RATIONALE FOR RECOMMENDATION:

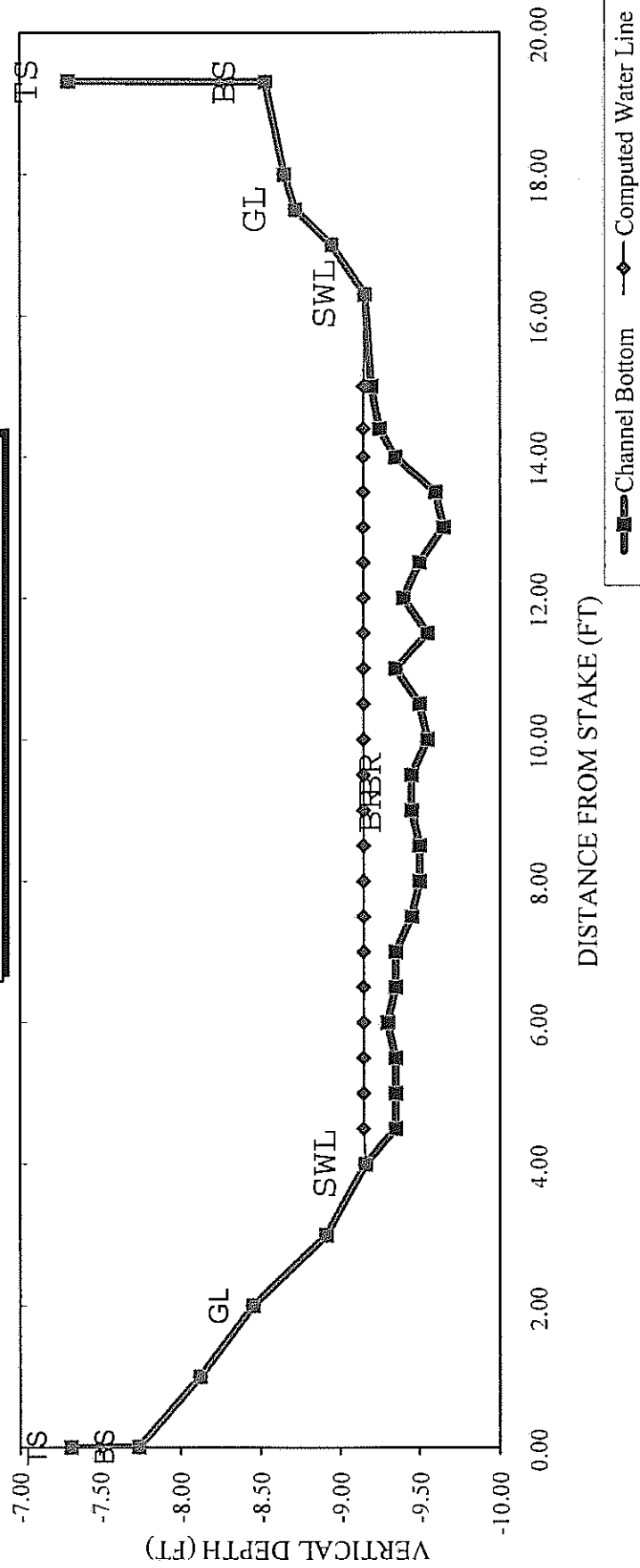
[illegible][illegible]

RECOMMENDATION BY: _____ AGENCY: _____ DATE: _____

CWCB REVIEW BY: _____ DATE: _____

S. FK. SLATER CREEK (Upper Site)

CROSS SECTION DATA ANALYSIS



Data Input & Proofing

STREAM NAME: S. FK. SLATER CREEK (Upper Site)
 XS LOCATION: ~ 50' D/S OF ROAD XING
 XS NUMBER: 4
 DATE: 7/7/2009
 OBSERVERS: UPPENDAHL & ESPEGREN

1/4 SEC: NW
 SECTION: 20
 TWP: 10 N
 RANGE: 88 W
 PM: 6

COUNTY: ROUTT
 WATERSHED: SLATER CREEK
 DIVISION: 6
 DOW CODE:
 USGS MAP:
 USFS MAP:

TAPE WT: 0.0106 lbs / ft
 TENSION: 99999 lbs

SLOPE: 0.016911765 ft / ft

CHECKED BY:DATE.....

ASSIGNED TO:DATE.....

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
Total Data Points = 34								
1	TS	0.00	7.32			0.00	0.00	0.00
	BS	0.01	7.74			0.00	0.00	0.00
		1.00	8.12			0.00	0.00	0.00
	GL	2.00	8.45			0.00	0.00	0.00
		3.00	8.91			0.00	0.00	0.00
	SWL	4.00	9.16	0.00	0.00	0.00	0.00	0.00
		4.50	9.35	0.20	0.01	0.10	0.00	9.15
		5.00	9.35	0.20	0.12	0.10	0.01	9.15
		5.50	9.35	0.20	0.70	0.10	0.07	9.15
		6.00	9.30	0.15	0.33	0.08	0.02	9.15
		6.50	9.35	0.20	0.51	0.10	0.05	9.15
		7.00	9.35	0.20	0.34	0.10	0.03	9.15
		7.50	9.45	0.30	0.80	0.15	0.12	9.15
		8.00	9.50	0.35	0.90	0.18	0.16	9.15
		8.50	9.50	0.35	0.72	0.18	0.13	9.15
	BR	9.00	9.45	0.30	0.00	0.15	0.00	9.15
	BR	9.50	9.45	0.30	0.00	0.15	0.00	9.15
		10.00	9.55	0.40	0.48	0.20	0.10	9.15
		10.50	9.50	0.35	1.18	0.18	0.21	9.15
		11.00	9.35	0.20	1.63	0.10	0.16	9.15
1		11.50	9.55	0.40	1.19	0.20	0.24	9.15
		12.00	9.40	0.25	1.46	0.13	0.18	9.15
		12.50	9.50	0.35	0.93	0.18	0.16	9.15
		13.00	9.65	0.50	2.00	0.25	0.50	9.15
		13.50	9.60	0.45	1.52	0.23	0.34	9.15
		14.00	9.35	0.20	0.67	0.09	0.06	9.15
		14.40	9.25	0.10	0.23	0.05	0.01	9.15
		15.00	9.20	0.05	0.00	0.05	0.00	9.15
	SWL	16.30	9.16	0.00	0.00	0.00	0.00	0.00
		17.00	8.95			0.00	0.00	0.00
1	GL	17.50	8.72			0.00	0.00	0.00
		18.00	8.65			0.00	0.00	0.00
	BS	19.30	8.53			0.00	0.00	0.00
	TS	19.31	7.30			0.00	0.00	0.00

Totals 3.01 2.56



FIELD DATA FOR INSTREAM FLOW DETERMINATIONS



COLORADO WATER
CONSERVATION BOARD

LOCATION INFORMATION

STREAM NAME: <u>South Fork Slater Creek</u>		CROSS-SECTION NO.: <u>4</u>	
CROSS-SECTION LOCATION: <u>50' d/s of road Xing</u>			
<u>40°48' 48.2"</u>		<u>107° 17' 18.9"</u>	
DATE: <u>7/7/09</u>	OBSERVERS: <u>Uppendahl x Espegren</u>		
LEGAL DESCRIPTION:	% SECTION: <u>10W</u>	SECTION: <u>20</u>	TOWNSHIP: <u>10 (N)S</u>
		RANGE: <u>88</u>	E/W: <u>PM: 6</u>
COUNTY: <u>Routt</u>	WATERSHED: <u>Slater Creek</u>	WATER DIVISION: <u>6</u>	DOW WATER CODE:
MAP(S):	USGS:		
	USFS:		

SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: ☒ YES ☐ NO	METER TYPE: <u>Marsh - Mc Birney</u>			
METER NUMBER:	DATE RATED:	CALIB/SPIN: _____ sec	TAPE WEIGHT: _____ lbs/foot	TAPE TENSION: _____ lbs
CHANNEL BED MATERIAL SIZE RANGE:	PHOTOGRAPHS TAKEN: ☒ YES ☐ NO	NUMBER OF PHOTOGRAPHS:		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
(X) Tape @ Stake LB	0.0	
(X) Tape @ Stake RB	0.0	
(1) WS @ Tape LB/RB	0.0	
(2) WS Upstream	<u>33.0</u>	<u>8.57</u>
(3) WS Downstream	<u>35.0</u>	<u>9.72</u>
SLOPE	<u>1.15/68.</u>	

S K E T C H

Sketch of channel profile showing tape line, stakes, and flow direction.

LEGEND:
Stake (X)
Station (1)
Photo (1)
Direction of Flow (← →)

AQUATIC SAMPLING SUMMARY

STREAM ELECTROFISHED: YES/NO	DISTANCE ELECTROFISHED: _____ ft	FISH CAUGHT: YES/NO	WATER CHEMISTRY SAMPLED: YES/NO														
LENGTH - FREQUENCY DISTRIBUTION BY ONE-INCH SIZE GROUPS (1.0-1.9, 2.0-2.9, ETC.)																	
SPECIES (FILL IN)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	>15	TOTAL
AQUATIC INSECTS IN STREAM SECTION BY COMMON OR SCIENTIFIC ORDER NAME:																	

COMMENTS

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: S. Fork Slater Creek				CROSS-SECTION NO.:		DATE: 7/7/09		SHEET 1 OF 1				
BEGINNING OF MEASUREMENT			EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE)			Gage Reading: _____ ft		TIME: 1:40 pm				
Features	Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec)		Area (ft ²)	Discharge (cfs)
									At Point	Mean in Vertical		
TS		0		7.32								
BS		0		7.74								
		1.0		8.12								
		2.0		8.45								
		3.0		8.91								
WL		4.0		9.16	0				0			
		4.5			0.2				0.01			
		5.0			0.2				0.12			
		5.5			0.2				0.70			
		6.0			0.15				0.33			
		6.5			0.2				0.51			
		7.0			0.2				0.34			
		7.5			0.3				0.80			
		8.0			0.35				0.90			
		8.5			0.35				0.72			
BR		9.0			0.3				0.0			
		9.5			0.3				0.0			
		10.0			0.4				0.48			
		10.5			0.35				1.18			
		11.0			0.2				1.63			
		11.5			0.4				1.19			
		12.0			0.25				1.46			
		12.5			0.35				0.93			
		13.0			0.5				2.00			
		13.5			0.45				1.52			
		14.0			0.2				0.67			
		14.4			0.1				0.23			
		15.0			0.05				0			
SWL		16.3		9.16	0				0			
		17.0		8.95								
GL		17.5		8.72								
		18.0		8.65								
BS		19.3		8.53								
TS		19.3		7.30								
TOTALS:												2.56

End of Measurement

Time: 2:13

Gage Reading: _____ ft

CALCULATIONS PERFORMED BY:

CALCULATIONS CHECKED BY:



SFK_Slater_Ck_US_P7070060.JPG
07/07/2009



SFK_Slater_Ck_US_P7070061.JPG
07/07/2009



SFK_Slater_Ck_US_P7070062.JPG
07/07/2009





P1010001.JPG



P1010002.JPG



P1010003.JPG



P1010004.JPG



P1010005.JPG



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COLORADO WATER CONSERVATION BOARD
INSTREAM FLOW / NATURAL LAKE LEVEL PROGRAM
STREAM CROSS-SECTION AND FLOW ANALYSIS

LOCATION INFORMATION

STREAM NAME: S Fk Slater Creek - Top Stake = 5.30
XS LOCATION: 50 ft d/s of road xing. 40 48 48.2; 107 17 18.9
XS NUMBER: 81002

DATE: 2-Oct-08
OBSERVERS: UPPENDAHL & ESPEGREN (TU)

1/4 SEC: NW
SECTION: 20
TWP: 10 N
RANGE: 88 W
PM: 6

COUNTY: Routt
WATERSHED: Slater Creek
DIVISION: 6th
DOW CODE: 23286

USGS MAP: 0
USFS MAP: 0

SUPPLEMENTAL DATA

*** NOTE ***

Leave TAPE WT and TENSION
at defaults for data collected
with a survey level and rod

TAPE WT: 0.0106
TENSION: 99999

CHANNEL PROFILE DATA

SLOPE: 0.01395881

INPUT DATA CHECKED BY:DATE.....

ASSIGNED TO:DATE.....

STREAM NAME: S Fk Slater Creek - Top Stake = 5.30
 XS LOCATION: 50 ft d/s of road xing. 40 48 48.2; 107 17 18.9
 XS NUMBER: 81002

DATA POINTS= 35

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL
BS	0.00	7.36		
1 GL	0.70	7.32		
	1.80	7.60		
	2.30	7.75		
	3.20	8.00		
WL	4.20	8.03	0.00	0.00
	5.30	8.13	0.15	0.00
	5.60	8.15	0.20	0.80
	5.90	8.34	0.35	0.69
	6.20	8.37	0.35	0.60
	6.50	8.40	0.35	0.74
	6.80	8.40	0.40	0.67
BR	7.10	8.30	0.30	1.09
	7.40	8.42	0.40	1.05
	7.70	8.23	0.30	0.75
	8.00	8.38	0.40	0.70
	8.30	8.40	0.40	0.68
	8.80	8.28	0.30	0.71
	9.30	8.30	0.20	0.87
	9.80	8.25	0.25	0.67
	10.30	8.25	0.25	0.34
	10.80	8.14	0.15	0.18
	11.30	8.19	0.15	0.05
	11.80	8.19	0.20	0.00
	12.30	8.10	0.10	0.08
	12.80	8.09	0.10	0.00
	13.30	8.07	0.05	0.00
	13.80	8.15	0.15	0.00
WL	14.30	8.00	0.00	0.00
	15.80	7.82		
	16.80	7.48		
1 GL	17.80	7.00		
	18.30	6.87		
BS	19.30	6.60		
TS	19.31	6.16		

WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
1.10	0.15	0.11	0.00	0.0%
0.30	0.20	0.06	0.05	4.1%
0.36	0.35	0.11	0.07	6.2%
0.30	0.35	0.11	0.06	5.4%
0.30	0.35	0.11	0.08	6.7%
0.30	0.40	0.12	0.08	6.9%
0.32	0.30	0.09	0.10	8.4%
0.32	0.40	0.12	0.13	10.8%
0.36	0.30	0.09	0.07	5.8%
0.34	0.40	0.12	0.08	7.2%
0.30	0.40	0.16	0.11	9.3%
0.51	0.30	0.15	0.11	9.1%
0.50	0.20	0.10	0.09	7.5%
0.50	0.25	0.13	0.08	7.2%
0.50	0.25	0.13	0.04	3.6%
0.51	0.15	0.08	0.01	1.2%
0.50	0.15	0.08	0.00	0.3%
0.50	0.20	0.10	0.00	0.0%
0.51	0.10	0.05	0.00	0.3%
0.50	0.10	0.05	0.00	0.0%
0.50	0.05	0.03	0.00	0.0%
0.51	0.15	0.08	0.00	0.0%
0.52		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%

TOTALS -----

10.36 0.4 2.13 ' 1.17 100.0%
 (Max.)

Manning's n = 0.1116
 Hydraulic Radius= 0.20555337

STREAM NAME: S Fk Slater Creek - Top Stake = 5.30
 XS LOCATION: 50 ft d/s of road xing. 40 48 48.2; 107 17 18.9
 XS NUMBER: 81002

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	2.13	2.02	-5.1%
7.77	2.13	5.11	140.1%
7.79	2.13	4.84	127.4%
7.81	2.13	4.58	114.8%
7.83	2.13	4.31	102.3%
7.85	2.13	4.05	90.1%
7.87	2.13	3.79	78.0%
7.89	2.13	3.54	66.2%
7.91	2.13	3.29	54.6%
7.93	2.13	3.05	43.2%
7.95	2.13	2.81	32.1%
7.97	2.13	2.58	21.1%
7.98	2.13	2.47	15.8%
7.99	2.13	2.35	10.4%
8.00	2.13	2.24	5.2%
8.01	2.13	2.13	0.0%
8.02	2.13	2.02	-5.1%
8.03	2.13	1.92	-9.9%
8.04	2.13	1.82	-14.6%
8.05	2.13	1.72	-19.3%
8.06	2.13	1.62	-23.8%
8.07	2.13	1.53	-28.3%
8.09	2.13	1.34	-36.9%
8.11	2.13	1.18	-44.6%
8.13	2.13	1.03	-51.6%
8.15	2.13	0.89	-58.0%
8.17	2.13	0.77	-63.8%
8.19	2.13	0.66	-69.2%
8.21	2.13	0.56	-73.9%
8.23	2.13	0.46	-78.4%
8.25	2.13	0.37	-82.7%
8.27	2.13	0.29	-86.5%

WATERLINE AT ZERO
 AREA ERROR = 8.005

STREAM NAME: S Fk Slater Creek - Top Stake = 5.30
 XS LOCATION: 50 ft d/s of road xing. 40 48 48.2; 107 17 18.9
 XS NUMBER: 81002

Constant Manning's n

GL = lowest Grassline elevation corrected for sag

STAGING TABLE

WL = Waterline corrected for variations in field measured water surface elevations and sag

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	7.32	16.43	0.72	1.10	11.82	16.89	100.0%	0.70	14.65	1.24
	7.35	16.22	0.69	1.07	11.23	16.67	98.7%	0.67	13.59	1.21
	7.40	15.92	0.66	1.02	10.43	16.35	96.8%	0.64	12.16	1.17
	7.45	15.62	0.62	0.97	9.64	16.03	94.9%	0.60	10.81	1.12
	7.50	15.30	0.58	0.92	8.87	15.69	92.9%	0.57	9.54	1.08
	7.55	14.96	0.54	0.87	8.11	15.34	90.8%	0.53	8.35	1.03
	7.60	14.62	0.50	0.82	7.37	14.98	88.7%	0.49	7.23	0.98
	7.65	14.30	0.46	0.77	6.65	14.65	86.7%	0.45	6.18	0.93
	7.70	13.99	0.42	0.72	5.94	14.32	84.8%	0.41	5.20	0.88
	7.75	13.67	0.38	0.67	5.25	13.99	82.8%	0.38	4.30	0.82
	7.80	13.35	0.34	0.62	4.58	13.65	80.8%	0.34	3.47	0.76
	7.85	12.83	0.31	0.57	3.92	13.12	77.7%	0.30	2.76	0.70
	7.90	12.23	0.27	0.52	3.29	12.52	74.1%	0.26	2.13	0.65
	7.95	11.64	0.23	0.47	2.70	11.91	70.5%	0.23	1.58	0.58
WL	8.00	10.92	0.20	0.42	2.13	11.18	66.2%	0.19	1.11	0.52
	8.05	9.64	0.17	0.37	1.62	9.90	58.6%	0.16	0.76	0.47
	8.10	7.68	0.15	0.32	1.18	7.92	46.9%	0.15	0.52	0.44
	8.15	6.17	0.13	0.27	0.83	6.39	37.8%	0.13	0.34	0.40
	8.20	4.82	0.12	0.22	0.56	5.01	29.7%	0.11	0.20	0.36
	8.25	3.90	0.08	0.17	0.33	4.06	24.0%	0.08	0.10	0.29
	8.30	2.56	0.06	0.12	0.16	2.67	15.8%	0.06	0.04	0.24
	8.35	1.69	0.03	0.07	0.05	1.74	10.3%	0.03	0.01	0.15
	8.40	0.06	0.01	0.02	0.00	0.07	0.4%	0.01	0.00	0.05

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$$3/3 = 7.7 \text{ (E)}$$

$$2/3 = 1.1$$

S Fk Slater Creek - Top Stake = 5.30
50 ft d/s of road xing. 40 48 48.2; 107 17 18.9
81002

SUMMARY SHEET

MEASURED FLOW (Qm)=	1.17	cfs
CALCULATED FLOW (Qc)=	1.11	cfs
(Qm-Qc)/Qm * 100 =	4.9	%
MEASURED WATERLINE (WLm)=	8.02	ft
CALCULATED WATERLINE (WLc)=	8.00	ft
(WLm-WLc)/WLm * 100 =	0.1	%
MAX MEASURED DEPTH (Dm)=	0.40	ft
MAX CALCULATED DEPTH (Dc)=	0.42	ft
(Dm-Dc)/Dm * 100	-3.8	%
MEAN VELOCITY=	0.52	ft/sec
MANNING'S N=	0.112	
SLOPE=	0.01395681	ft/ft
.4 * Qm =	0.5	cfs
2.5 * Qm=	2.9	cfs

RECOMMENDED INSTREAM FLOW:

===== 95 00 00 =====

FLOW (CFS)

===== 44-389
===== 44-389

PERIOD

www.elsevier.com/locate/jmb
www.sciencedirect.com

RATIONALE FOR RECOMMENDATION:

[illegible]

RECOMMENDATION BY: AGENCY: DATE:

CWCB REVIEW BY: DATE:



COLORADO WATER
CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS



LOCATION INFORMATION

STREAM NAME: <u>S.F. SLATER CREEK</u>		CROSS-SECTION NO.: <u>2</u>	
CROSS-SECTION LOCATION: <u>50' d/s of road xing</u>			
<u>40° 48' 48.2"</u> <u>107° 17' R: 9"</u>			
DATE: <u>10/2/08</u>		OBSERVERS: <u>UPPENDAHL / ESPEGREEN</u>	
LEGAL DESCRIPTION:	1/4 SECTION: <u>NW</u>	SECTION: <u>20</u>	TOWNSHIP: <u>10 N/S</u>
		RANGE: <u>88 E(W)</u>	PM: <u>6</u>
COUNTY: <u>ROUIT</u>	WATERSHED: <u>SLATER</u>	WATER DIVISION: <u>6</u>	DOW WATER CODE: <u>23286</u>
MAP(S):	USGS:		
	USFS:		

SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: ☒ YES ☐ NO	METER TYPE: <u>Marsh-McBirney Flo-Mate</u>			
METER NUMBER:	DATE RATED:	CALIB/SPIN: _____ sec	TAPE WEIGHT: _____ lbs/foot	TAPE TENSION: _____ lbs
CHANNEL BED MATERIAL SIZE RANGE:		PHOTOGRAPHS TAKEN: ☒ YES ☐ NO	NUMBER OF PHOTOGRAPHS: <u>2</u>	

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	
⊗ Tape @ Stake RB	0.0	
① WS @ Tape LB/RB	0.0	
② WS Upstream	<u>227</u>	<u>779</u>
③ WS Downstream	<u>210</u>	<u>840</u>
SLOPE	<u>.61 / 43.7 = .01395</u>	

SKETCH

LEGEND:

Stake ⊗

Station ①

Photo ①

Direction of Flow →

AQUATIC SAMPLING SUMMARY

STREAM ELECTROFISHED: YES/NO	DISTANCE ELECTROFISHED: _____ ft	FISH CAUGHT: YES/NO	WATER CHEMISTRY SAMPLED: YES/NO														
LENGTH - FREQUENCY DISTRIBUTION BY ONE-INCH SIZE GROUPS (1.0-1.9, 2.0-2.9, ETC.)																	
SPECIES (FILL IN)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	>15	TOTAL
AQUATIC INSECTS IN STREAM SECTION BY COMMON OR SCIENTIFIC ORDER NAME:																	

COMMENTS

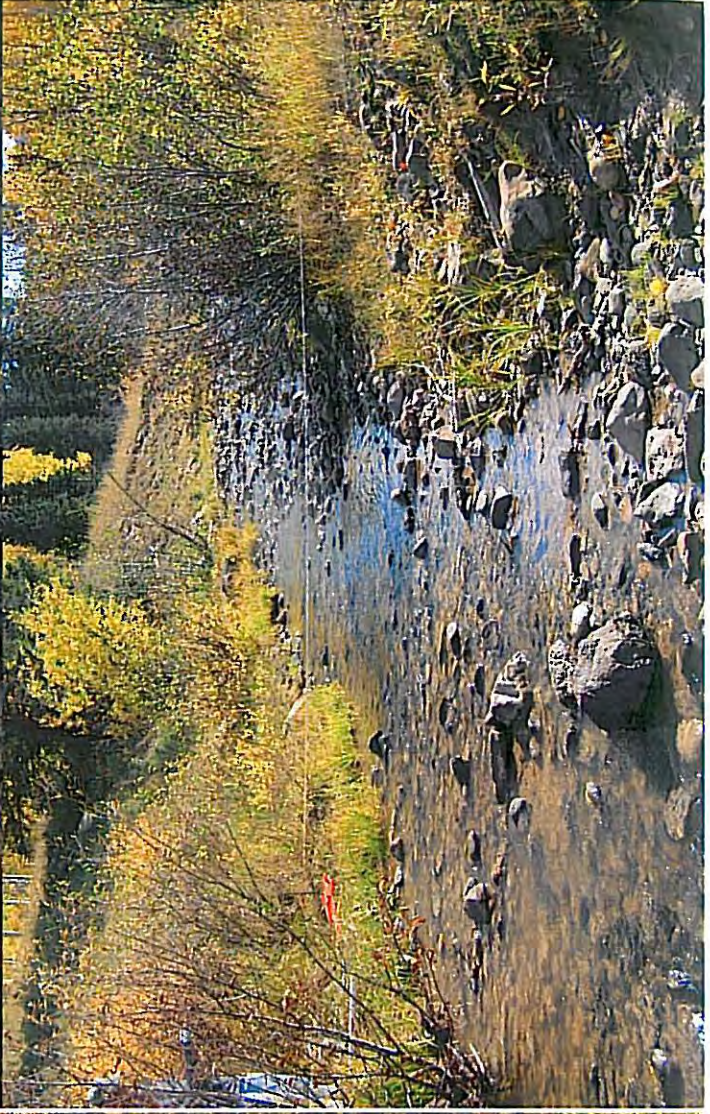
<u>1 FISH OBSERVED (SPECIES?)</u>
<u>Note: Only 1 BM stake on right side of stream looking U/S</u>

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: <u>S.F. SLATER CREEK</u>				CROSS-SECTION NO.: <u>2</u>		DATE: <u>10/2/08</u>		SHEET <u>1</u> OF <u>1</u>				
BEGINNING OF MEASUREMENT		EDGE OF WATER LOOKING DOWNSTREAM: <u>(LEFT)</u> RIGHT			Gage Reading: <u> </u> ft		TIME: <u>2:55 PM</u>					
Features	Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft) <i>Reverse stake Distance</i> <i>to match previous</i>	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec)		Area (ft ²)	Discharge (cfs)
									At Point	Mean in Vertical		
TOP STAKE		0	19.3	616								
GROUND		0	19.3	660								
		1	18.3	687								
		1	17.8	700								
		2	16.8	748								
		3	15.8	782								
W		5	14.3	800	0				0			
R		5	13.8	815	0.15				0.1			
		6	13.3	807	0.05				0.1			
		6	12.8	809	0.10				0.1			
		7	12.3	810	0.10				0.08			
		7	11.8	819	0.20				0.1			
		8	11.3	819	0.15				0.05			
		8	10.8	814	0.15				0.18			
		9	10.3	825	0.25				0.34			
		9	9.8	825	0.25				0.67			
		10	9.3	830	0.20				0.87			
		10	8.7	828	0.30				0.71			
		11	8.3	840	0.40				0.68			
		11	8.0	838	0.40				0.70			
		11	7.7	823	0.30				0.75			
		11	7.4	842	0.40				1.05			
		12	7.1	830	0.30				1.09			
		12	6.8	840	0.40				0.67			
		12	6.5	840	0.35				0.74			
		13	6.2	837	0.35				0.60			
		13	5.9	834	0.35				0.69			
		13	5.6	815	0.20				0.80			
		14	5.3	813	0.15				0.1			
W		15	4.2	803	0				0.1			
		16	3.2	800								
		17	2.3	775								
		17	1.8	760								
		18	0.7	732								
GROUND STAKE		19	0	736								
TOTALS:												

End of Measurement	Time: <u>3:27</u>	Gage Reading: <u> </u> ft	CALCULATIONS PERFORMED BY:	CALCULATIONS CHECKED BY:
--------------------	-------------------	------------------------------	----------------------------	--------------------------

**South Fork Slater Creek
50' d/s of Road Xing
NW S20 T10N R88W 6PM**



#2

COLORADO WATER CONSERVATION BOARD
INSTREAM FLOW / NATURAL LAKE LEVEL PROGRAM
STREAM CROSS-SECTION AND FLOW ANALYSIS

LOCATION INFORMATION

STREAM NAME: S Fk Slater Creek - 2007 #2
XS LOCATION: 50 ft d/s of road xing. 40 48 48.2; 107 17 18.9
XS NUMBER: 70905

DATE: 5-Sep-07
OBSERVERS: UPPENDAHL & ROACH (TU)

1/4 SEC: NW
SECTION: 20
TWP: 10 N
RANGE: 88 W
PM: 6

COUNTY: Routt
WATERSHED: Slater Creek
DIVISION: 6th
DOW CODE: 0

USGS MAP: 0
USFS MAP: 0

SUPPLEMENTAL DATA

*** NOTE ***

Leave TAPE WT and TENSION
at defaults for data collected
with a survey level and rod

TAPE WT: 0.0106
TENSION: 99999

CHANNEL PROFILE DATA

SLOPE: 0.01880734

INPUT DATA CHECKED BY:DATE.....

ASSIGNED TO:DATE.....

STREAM NAME: S Fk Slater Creek - 2007 #2
 XS LOCATION: 50 ft d/s of road xing. 40 48 48.2; 107 17 18.9
 XS NUMBER: 70905

DATA POINTS= 35

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL
TS	0.00	4.80		
1 BS/GL	0.01	5.55		
	1.00	5.90		
	1.90	6.09		
WL	2.00	6.25	0.00	0.00
	2.50	6.30	0.10	0.00
	3.00	6.35	0.15	0.07
	3.50	6.40	0.20	0.10
	4.00	6.35	0.15	0.17
	4.50	6.35	0.15	0.24
	5.00	6.45	0.25	0.32
	5.50	6.40	0.20	0.32
BR	6.00	6.45	0.25	0.00
	6.50	6.40	0.20	0.71
	7.00	6.50	0.30	0.59
	7.50	6.40	0.20	0.31
	8.00	6.30	0.10	0.40
	8.50	6.45	0.25	1.24
	9.00	6.35	0.20	1.32
	9.50	6.40	0.20	1.56
	10.00	6.40	0.20	0.90
	10.50	6.40	0.20	0.72
	11.00	6.45	0.25	0.40
	11.50	6.30	0.10	0.14
	12.00	6.35	0.15	0.07
	12.50	6.35	0.15	0.04
	13.00	6.30	0.05	0.00
WL	13.50	6.25	0.00	0.00
	13.80	6.15		
	15.00	6.00		
1 GL	17.00	5.76		
	17.50	5.46		
	18.00	5.16		
BS	19.30	4.86		
TS	19.31	4.42		

WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.50	0.10	0.05	0.00	0.0%
0.50	0.15	0.08	0.01	0.5%
0.50	0.20	0.10	0.01	1.0%
0.50	0.15	0.08	0.01	1.3%
0.50	0.15	0.08	0.02	1.8%
0.51	0.25	0.13	0.04	4.0%
0.50	0.20	0.10	0.03	3.2%
0.50	0.25	0.13	0.00	0.0%
0.50	0.20	0.10	0.07	7.1%
0.51	0.30	0.15	0.09	8.9%
0.51	0.20	0.10	0.03	3.1%
0.51	0.10	0.05	0.02	2.0%
0.52	0.25	0.13	0.16	15.5%
0.51	0.20	0.10	0.13	13.2%
0.50	0.20	0.10	0.16	15.6%
0.50	0.20	0.10	0.09	9.0%
0.50	0.20	0.10	0.07	7.2%
0.50	0.25	0.13	0.05	5.0%
0.52	0.10	0.05	0.01	0.7%
0.50	0.15	0.08	0.01	0.5%
0.50	0.15	0.08	0.00	0.3%
0.50	0.05	0.03	0.00	0.0%
0.50		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%

TOTALS -----

11.62 0.3 2.00 1.00 100.0%

(Max.)

Manning's n = 0.1262
 Hydraulic Radius = 0.172065719

STREAM NAME: S Fk Slater Creek - 2007 #2
 XS LOCATION: 50 ft d/s of road xing. 40 48 48.2; 107 17 18.9
 XS NUMBER: 70905

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	2.00	1.45	-27.5%
6.00	2.00	4.51	125.6%
6.02	2.00	4.24	112.2%
6.04	2.00	3.98	99.0%
6.06	2.00	3.72	86.1%
6.08	2.00	3.47	73.5%
6.10	2.00	3.22	61.1%
6.12	2.00	2.98	48.9%
6.14	2.00	2.74	36.9%
6.16	2.00	2.50	25.0%
6.18	2.00	2.26	13.2%
6.20	2.00	2.03	1.5%
6.21	2.00	1.91	-4.4%
6.22	2.00	1.80	-10.2%
6.23	2.00	1.68	-16.0%
6.24	2.00	1.57	-21.7%
6.25	2.00	1.45	-27.5%
6.26	2.00	1.34	-33.2%
6.27	2.00	1.22	-38.8%
6.28	2.00	1.11	-44.3%
6.29	2.00	1.01	-49.7%
6.30	2.00	0.90	-55.0%
6.32	2.00	0.70	-65.1%
6.34	2.00	0.51	-74.3%
6.36	2.00	0.36	-82.2%
6.38	2.00	0.23	-88.6%
6.40	2.00	0.12	-94.0%
6.42	2.00	0.06	-97.1%
6.44	2.00	0.02	-99.0%
6.46	2.00	0.01	-99.6%
6.48	2.00	0.00	-99.9%
6.50	2.00	0.00	-100.0%

WATERLINE AT ZERO

AREA ERROR = 6.203

STREAM NAME: S Fk Slater Creek - 2007 #2
 XS LOCATION: 50 ft d/s of road xing. 40 48 48.2; 107 17 18.9
 XS NUMBER: 70905

Constant Manning's n

GL = lowest Grassline elevation corrected for sag

STAGING TABLE

WL = Waterline corrected for variations in field measured water surface elevations and sag

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	5.76	16.40	0.49	0.74	8.12	16.69	100.0%	0.49	8.10	1.00
	5.80	15.92	0.47	0.70	7.43	16.21	97.1%	0.46	7.13	0.96
	5.85	15.36	0.43	0.65	6.65	15.64	93.7%	0.42	6.06	0.91
	5.90	14.80	0.40	0.60	5.89	15.06	90.2%	0.39	5.09	0.86
	5.95	14.15	0.37	0.55	5.17	14.40	86.3%	0.36	4.21	0.82
	6.00	13.49	0.33	0.50	4.48	13.74	82.3%	0.33	3.42	0.76
	6.05	12.86	0.30	0.45	3.82	13.10	78.5%	0.29	2.71	0.71
	6.10	12.27	0.26	0.40	3.19	12.50	74.9%	0.26	2.07	0.65
	6.15	11.85	0.22	0.35	2.59	12.05	72.2%	0.21	1.50	0.58
WL	6.20	11.67	0.17	0.30	2.00	11.83	70.9%	0.17	0.99	0.49
	6.25	11.45	0.12	0.25	1.42	11.57	69.3%	0.12	0.57	0.40
	6.30	10.39	0.08	0.20	0.87	10.51	63.0%	0.08	0.27	0.31
	6.35	7.29	0.06	0.15	0.41	7.38	44.2%	0.06	0.10	0.23
	6.40	3.66	0.03	0.10	0.11	3.72	22.3%	0.03	0.02	0.16
	6.45	0.47	0.02	0.05	0.01	0.48	2.9%	0.02	0.00	0.13

168
58

3/3 = 8.1
 2/3 = 1.3

S Fk Slater Creek - 2007 #2
50 ft d/s of road xing. 40 48 48.2; 107 17 18.9
70905

SUMMARY SHEET

MEASURED FLOW (Qm)=	1.00 cfs
CALCULATED FLOW (Qc)=	0.99 cfs
(Qm-Qc)/Qm * 100 =	1.2 %
MEASURED WATERLINE (Wlm)=	6.25 ft
CALCULATED WATERLINE (Wlc)=	6.20 ft
(Wlm-Wlc)/Wlm * 100 =	0.8 %
MAX MEASURED DEPTH (Dm)=	0.30 ft
MAX CALCULATED DEPTH (Dc)=	0.30 ft
(Dm-Dc)/Dm * 100	0.8 %
MEAN VELOCITY=	0.49 ft/sec
MANNING'S N=	0.126
SLOPE=	0.01860734 ft/ft
.4 * Qm =	0.4 cfs
2.5 * Qm=	2.5 cfs

RECOMMENDED INSTREAM FLOW:

=====

FLOW (CFS)

PERIOD

$$\begin{array}{ccccccc} \text{—} & \text{—} & \text{—} & \text{—} & \text{—} & \text{—} & \text{—} \\ \text{—} & \text{—} & \text{—} & \text{—} & \text{—} & \text{—} & \text{—} \end{array}$$

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Age Group	Percentage
18-24	10%
25-34	20%
35-44	25%
45-54	20%
55-64	15%
65-74	10%
75-84	5%
85+	5%

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035 1036 1037 1038 1039 1040 1

RATIONALE FOR RECOMMENDATION:

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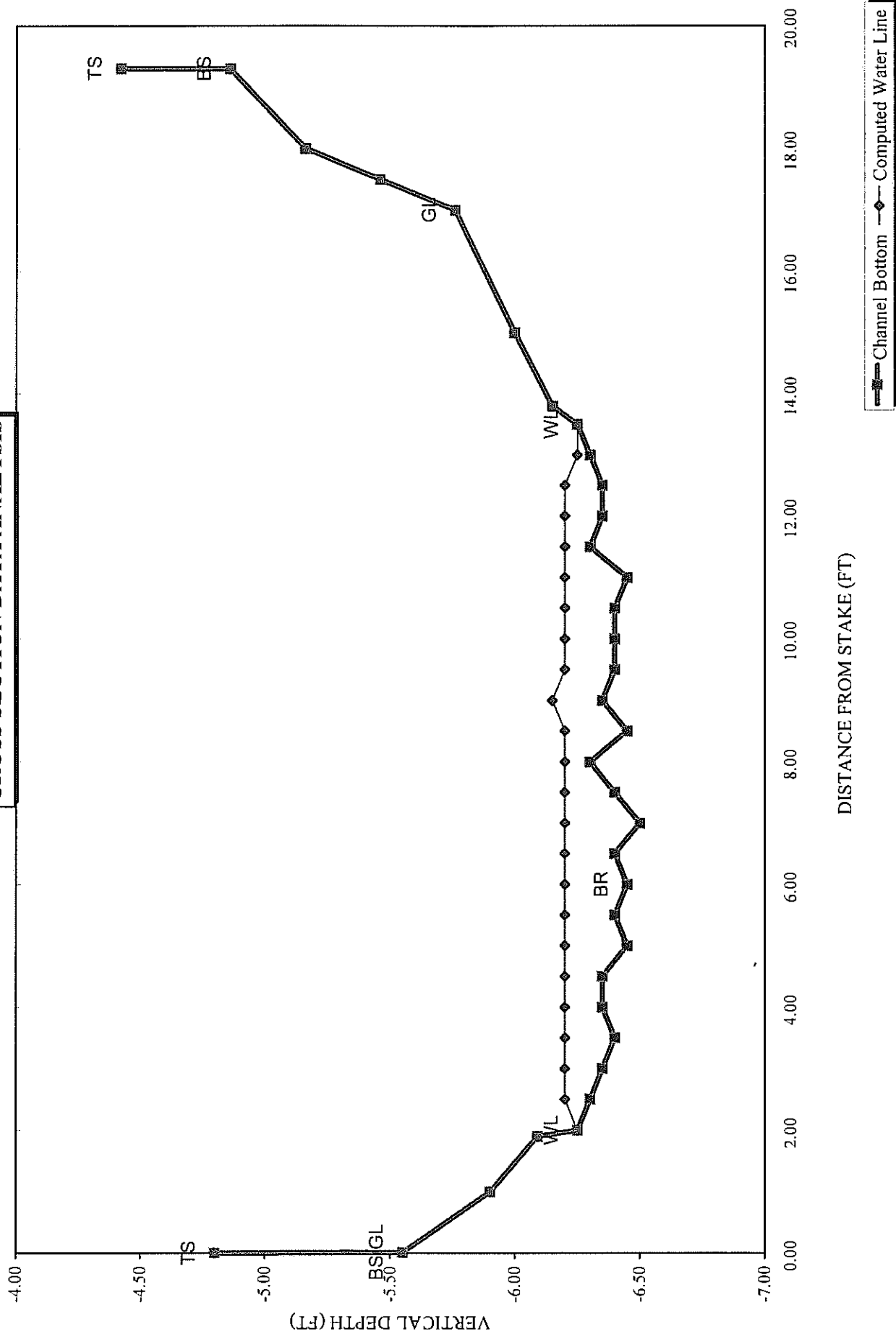
[illegible]

RECOMMENDATION BY: _____ AGENCY: _____ DATE: _____

CWCB REVIEW BY: _____ DATE: _____

S Fk Slater Creek - 2007 #2

CROSS SECTION DATA ANALYSIS



Data Input & Proofing

STREAM NAME: S Fk Slater Creek - 2007 #2
 XS LOCATION: 50 ft d/s of road xing. 40 48 48.2; 107 17 18.9
 XS NUMBER: 70905
 DATE: 9/5/2007
 OBSERVERS: UPPENDAHL & ROACH (TU)
 1/4 SEC: NW
 SECTION: 20
 TWP: 10 N
 RANGE: 88 W
 PM: 6
 COUNTY: Routt
 WATERSHED: Slater Creek
 DIVISION: 6th
 DOW CODE:
 USGS MAP:
 USFS MAP:
 TAPE WT: 0.0106 lbs / ft
 TENSION: 99999 lbs
 SLOPE: 0.018807339 ft / ft

CHECKED BY:DATE.....

ASSIGNED TO:DATE.....

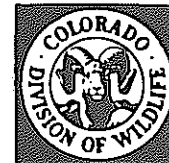
GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
Total Data Points = 35								
1	TS	0.00	4.80			0.00	0.00	0.00
	BS/GL	0.01	5.55			0.00	0.00	0.00
		1.00	5.90			0.00	0.00	0.00
		1.90	6.09			0.00	0.00	0.00
	WL	2.00	6.25	0.00	0.00	0.00	0.00	0.00
		2.50	6.30	0.10	0.00	0.05	0.00	6.20
		3.00	6.35	0.15	0.07	0.08	0.01	6.20
		3.50	6.40	0.20	0.10	0.10	0.01	6.20
		4.00	6.35	0.15	0.17	0.08	0.01	6.20
	BR	4.50	6.35	0.15	0.24	0.08	0.02	6.20
		5.00	6.45	0.25	0.32	0.13	0.04	6.20
		5.50	6.40	0.20	0.32	0.10	0.03	6.20
		6.00	6.45	0.25	0.00	0.13	0.00	6.20
		6.50	6.40	0.20	0.71	0.10	0.07	6.20
		7.00	6.50	0.30	0.59	0.15	0.09	6.20
		7.50	6.40	0.20	0.31	0.10	0.03	6.20
		8.00	6.30	0.10	0.40	0.05	0.02	6.20
		8.50	6.45	0.25	1.24	0.13	0.16	6.20
		9.00	6.35	0.20	1.32	0.10	0.13	6.15
		9.50	6.40	0.20	1.56	0.10	0.16	6.20
	WL	10.00	6.40	0.20	0.90	0.10	0.09	6.20
		10.50	6.40	0.20	0.72	0.10	0.07	6.20
		11.00	6.45	0.25	0.40	0.13	0.05	6.20
		11.50	6.30	0.10	0.14	0.05	0.01	6.20
		12.00	6.35	0.15	0.07	0.08	0.01	6.20
		12.50	6.35	0.15	0.04	0.08	0.00	6.20
		13.00	6.30	0.05	0.00	0.03	0.00	6.25
		13.50	6.25	0.00	0.00	0.00	0.00	0.00
		13.80	6.15			0.00	0.00	0.00
		15.00	6.00			0.00	0.00	0.00
1	GL	17.00	5.76			0.00	0.00	0.00
		17.50	5.46			0.00	0.00	0.00
		18.00	5.16			0.00	0.00	0.00
	BS	19.30	4.86			0.00	0.00	0.00
	TS	19.31	4.42			0.00	0.00	0.00

Totals	2.00	1.00
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$$\begin{aligned}
 TS_1 &= 5.36 \\
 TS_2 &= 4.42 \\
 \Delta &= 0.88
 \end{aligned}$$



FIELD DATA FOR INSTREAM FLOW DETERMINATIONS



COLORADO WATER
CONSERVATION BOARD

LOCATION INFORMATION

STREAM NAME: S. FR Slater Creek		2007-01		CROSS-SECTION NO.: 2007-02	
CROSS-SECTION LOCATION: 50' d/s of rd xing		40 48 48.5		107 17 18.9	
DATE: 9/5/07	OBSERVERS: Upendahl / Loeck				
LEGAL DESCRIPTION	% SECTION: NW	SECTION: 20	TOWNSHIP: 10 N S	RANGE: 88 E W	PM: 6
COUNTY: Routt	WATERSHED: Slater Creek		WATER DIVISION:		DOW WATER CODE:
MAP(S):	USGS:				
	USFS:				

SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES/NO	METER TYPE: Marsh-McBirney Flo-Mate				
METER NUMBER:	DATE RATED:	CALIB/SPIN: sec	TAPE WEIGHT: lbs/foot	TAPE TENSION: lbs	
CHANNEL BED MATERIAL SIZE RANGE:			PHOTOGRAPHS TAKEN: YES/NO	NUMBER OF PHOTOGRAPHS:	

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)	SKETCH 	LEGEND: Stake (X) Station (I) Photo (I) Direction of Flow (← →)
(X) Tape @ Stake LB	0.0			
(X) Tape @ Stake RB	0.0			
(1) WS @ Tape LB/RB	0.0	6.20 / 6.20		
(2) WS Upstream	11.2	6.14		
(3) WS Downstream	32.4	6.96		
SLOPE	.92 / 43.6			

AQUATIC SAMPLING SUMMARY

STREAM ELECTROFISHED: YES/NO	DISTANCE ELECTROFISHED: ft	FISH CAUGHT: YES/NO	WATER CHEMISTRY SAMPLED: YES/NO															
LENGTH - FREQUENCY DISTRIBUTION BY ONE-INCH SIZE GROUPS (1.0-1.9, 2.0-2.9, ETC.)																		
SPECIES (FILL IN)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	>15	TOTAL	
Fish seen CRT																		
near conf l w/																		
West Prong ck.																		
AQUATIC INSECTS IN STREAM SECTION BY COMMON OR SCIENTIFIC ORDER NAME:																		

COMMENTS

Rain night before / cool temp Notes only 1 bench mark stake on Right side (4/5)
--

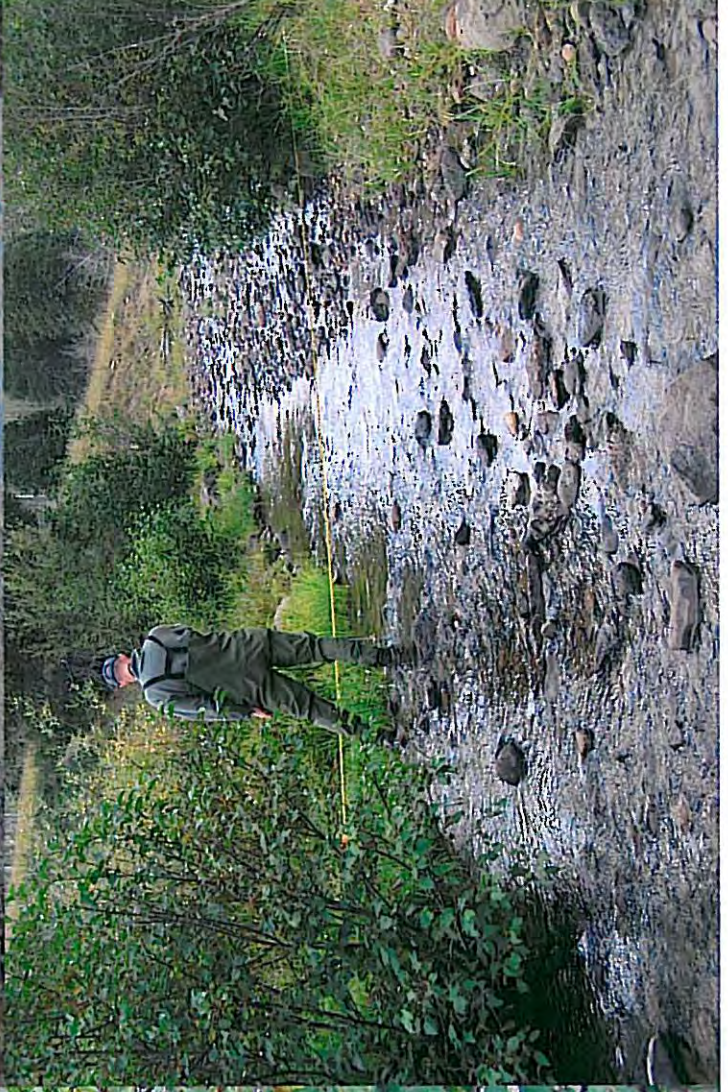
$$\begin{array}{r} 5.30 \\ 4.42 \\ \hline 88 \end{array}$$

3

South Fork Slater Creek

50' d/s of Road Xing

NW S20 T10N R88W 6PM



#1

COLORADO WATER CONSERVATION BOARD
INSTREAM FLOW / NATURAL LAKE LEVEL PROGRAM
STREAM CROSS-SECTION AND FLOW ANALYSIS

LOCATION INFORMATION

STREAM NAME: S. Fk Slater Creek
XS LOCATION: 50 ft d/s of road xing. 40 48 48.2; 107 17 18.9
XS NUMBER: 071007-002

DATE: 10-Jul-07
OBSERVERS: Uppendahl, H. Skinner

1/4 SEC: NW
SECTION: 20
TWP: 10 N
RANGE: 88 W
PM: 6

COUNTY: Routt
WATERSHED: Slater Creek
DIVISION: 6
DOW CODE: 0

USGS MAP: 0
USFS MAP: 0

SUPPLEMENTAL DATA

*** NOTE ***

Leave TAPE WT and TENSION
at defaults for data collected
with a survey level and rod

TAPE WT: 0.0106
TENSION: 99999

CHANNEL PROFILE DATA

SLOPE: 0.01513043

INPUT DATA CHECKED BY:DATE.....

ASSIGNED TO:DATE.....

STREAM NAME: S. Fk Slater Creek
 XS LOCATION: 50 ft d/s of road xing. 40 48 48.2; 107 17 18.9
 XS NUMBER: 071007-002

DATA POINTS= 32

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL
TS	0.00	5.59		
1 BS/GL	0.01	6.73		
	0.50	6.80		
	1.00	6.85		
	1.50	6.90		
	2.00	7.00		
WL	2.90	7.15	0.00	0.00
	3.50	7.25	0.10	0.00
	4.00	7.15	0.00	0.01
	4.50	7.35	0.20	0.00
	5.00	7.30	0.20	0.07
	5.50	7.35	0.25	0.59
	6.00	7.45	0.30	0.30
	6.50	7.35	0.25	0.72
	7.00	7.35	0.25	0.62
	7.50	7.25	0.20	0.34
	8.00	7.40	0.30	0.19
	8.50	7.40	0.30	1.13
	9.00	7.50	0.40	0.81
	9.50	7.40	0.30	1.24
	10.00	7.45	0.30	1.15
	10.50	7.40	0.15	0.13
	11.00	7.40	0.20	0.00
	11.50	7.15	0.05	0.24
	12.00	7.30	0.15	0.00
	12.50	7.25	0.10	0.00
	13.00	7.30	0.15	0.00
WL	13.50	7.15	0.00	0.00
	15.00	6.90		
1 GL	16.90	6.70		
BS	19.30	5.71		
TS	19.31	5.30		

WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00	0.10	0.06	0.00	0.0%
0.51		0.00	0.00	0.0%
0.54	0.20	0.10	0.00	0.0%
0.50	0.20	0.10	0.01	0.7%
0.50	0.25	0.13	0.07	6.9%
0.51	0.30	0.15	0.05	4.2%
0.51	0.25	0.13	0.09	8.5%
0.50	0.25	0.13	0.08	7.3%
0.51	0.20	0.10	0.03	3.2%
0.52	0.30	0.15	0.03	2.7%
0.50	0.30	0.15	0.17	16.0%
0.51	0.40	0.20	0.16	15.3%
0.51	0.30	0.15	0.19	17.5%
0.50	0.30	0.15	0.17	16.3%
0.50	0.15	0.08	0.01	0.9%
0.50	0.20	0.10	0.00	0.0%
0.56	0.05	0.03	0.01	0.6%
0.52	0.15	0.08	0.00	0.0%
0.50	0.10	0.05	0.00	0.0%
0.50	0.15	0.08	0.00	0.0%
0.52		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%

TOTALS

10.85 0.4 2.08 1.06 100.0%
 (Max.)

Manning's n = 0.1191
 Hydraulic Radius = 0.191771701

STREAM NAME: S. Fk Slater Creek
 XS LOCATION: 50 ft d/s of road xing. 40 48 48.2; 107 17 18.9
 XS NUMBER: 071007-002

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	2.08	1.88	-9.6%
6.90	2.08	4.90	135.6%
6.92	2.08	4.63	122.7%
6.94	2.08	4.37	110.0%
6.96	2.08	4.11	97.6%
6.98	2.08	3.86	85.3%
7.00	2.08	3.61	73.3%
7.02	2.08	3.36	61.5%
7.04	2.08	3.12	49.9%
7.06	2.08	2.88	38.6%
7.08	2.08	2.65	27.5%
7.10	2.08	2.43	16.6%
7.11	2.08	2.31	11.2%
7.12	2.08	2.20	5.9%
7.13	2.08	2.09	0.7%
7.14	2.08	1.99	-4.5%
7.15	2.08	1.88	-9.6%
7.16	2.08	1.78	-14.7%
7.17	2.08	1.67	-19.6%
7.18	2.08	1.57	-24.4%
7.19	2.08	1.47	-29.1%
7.20	2.08	1.38	-33.8%
7.22	2.08	1.19	-42.7%
7.24	2.08	1.02	-51.2%
7.26	2.08	0.85	-59.2%
7.28	2.08	0.70	-66.5%
7.30	2.08	0.56	-73.0%
7.32	2.08	0.44	-78.9%
7.34	2.08	0.33	-84.1%
7.36	2.08	0.24	-88.5%
7.38	2.08	0.16	-92.3%
7.40	2.08	0.09	-95.8%

WATERLINE AT ZERO

AREA ERROR = 7.131

STREAM NAME: S. Fk Slater Creek
 XS LOCATION: 50 ft d/s of road xing. 40 48 48.2; 107 17 18.9
 XS NUMBER: 071007-002

Constant Manning's n

GL = lowest Grassline elevation corrected for sag

STAGING TABLE

WL = Waterline corrected for variations in field measured water surface elevations and sag

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	6.73	16.61	0.45	0.77	7.47	16.91	100.0%	0.44	6.65	0.89
	6.73	16.58	0.45	0.77	7.45	16.89	99.9%	0.44	6.62	0.89
	6.78	15.76	0.42	0.72	6.64	16.06	95.0%	0.41	5.65	0.85
	6.83	14.84	0.40	0.67	5.87	15.14	89.5%	0.39	4.79	0.82
	6.88	13.86	0.37	0.62	5.16	14.16	83.7%	0.36	4.03	0.78
	6.93	13.16	0.34	0.57	4.48	13.44	79.5%	0.33	3.31	0.74
	6.98	12.61	0.30	0.52	3.84	12.88	76.2%	0.30	2.63	0.68
	7.03	12.02	0.27	0.47	3.22	12.29	72.7%	0.26	2.03	0.63
	7.08	11.42	0.23	0.42	2.64	11.68	69.1%	0.23	1.50	0.57
WL	7.13	10.82	0.19	0.37	2.08	11.07	65.5%	0.19	1.05	0.50
	7.18	9.91	0.16	0.32	1.56	10.12	59.9%	0.15	0.69	0.44
	7.23	8.80	0.12	0.27	1.09	8.97	53.0%	0.12	0.41	0.38
	7.28	7.15	0.10	0.22	0.69	7.27	43.0%	0.09	0.22	0.32
	7.33	5.38	0.07	0.17	0.38	5.46	32.3%	0.07	0.10	0.26
	7.38	3.79	0.04	0.12	0.16	3.83	22.7%	0.04	0.03	0.18
	7.43	1.25	0.02	0.07	0.03	1.27	7.5%	0.02	0.00	0.12
	7.48	0.19	0.01	0.02	0.00	0.19	1.1%	0.01	0.00	0.07

$$3/3 = ?$$

$$2/3 = 1.2$$

S. Fk Slater Creek
50 ft d/s of road xing. 40 48 48.2; 107 17 18.9
071007-002

SUMMARY SHEET

MEASURED FLOW (Qm)=	1.06 cfs
CALCULATED FLOW (Qc)=	1.05 cfs
(Qm-Qc)/Qm * 100 =	1.4 %
MEASURED WATERLINE (WLm)=	7.15 ft
CALCULATED WATERLINE (WLc)=	7.13 ft
(WLm-WLc)/WLm * 100 =	0.3 %
MAX MEASURED DEPTH (Dm)=	0.40 ft
MAX CALCULATED DEPTH (Dc)=	0.37 ft
(Dm-Dc)/Dm * 100	7.8 %
MEAN VELOCITY=	0.50 ft/sec
MANNING'S N=	0.119
SLOPE=	0.01513043 ft/ft
.4 * Qm =	0.4 cfs
2.5 * Qm=	2.7 cfs

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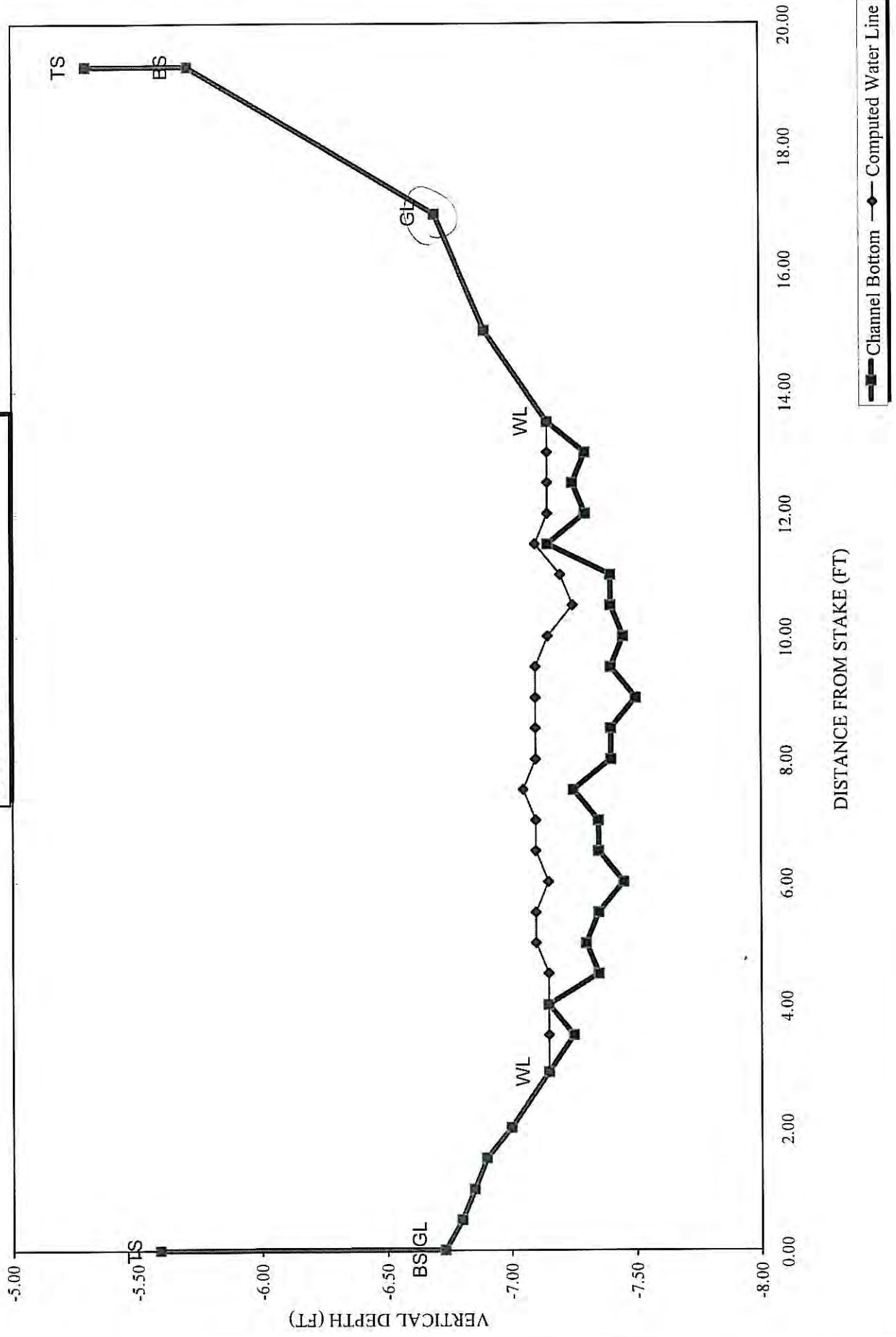
[illegible]

RECOMMENDATION BY: AGENCY..... DATE:.....

CWCB REVIEW BY: DATE:

S. Fk Slater Creek

CROSS SECTION DATA ANALYSIS



Data Input & Proofing

STREAM NAME: S Fk Slater Creek - 2007 #1
 XS LOCATION: 50 ft d/s of road xing. 40 48 48.2; 107 17 18.9
 XS NUMBER: 071007-002
 DATE: 7/10/2007
 OBSERVERS: Uppendahl, H. Skinner

1/4 SEC: NW
 SECTION: 20
 TWP: 10 N
 RANGE: 88 W
 PM: 6

COUNTY: Routt
 WATERSHED: Slater Creek
 DIVISION: 6th
 DOW CODE:
 USGS MAP:
 USFS MAP:

TAPE WT: 0.0106 lbs / ft
 TENSION: 99999 lbs

SLOPE: 0.015130435 ft / ft

CHECKED BY:DATE.....

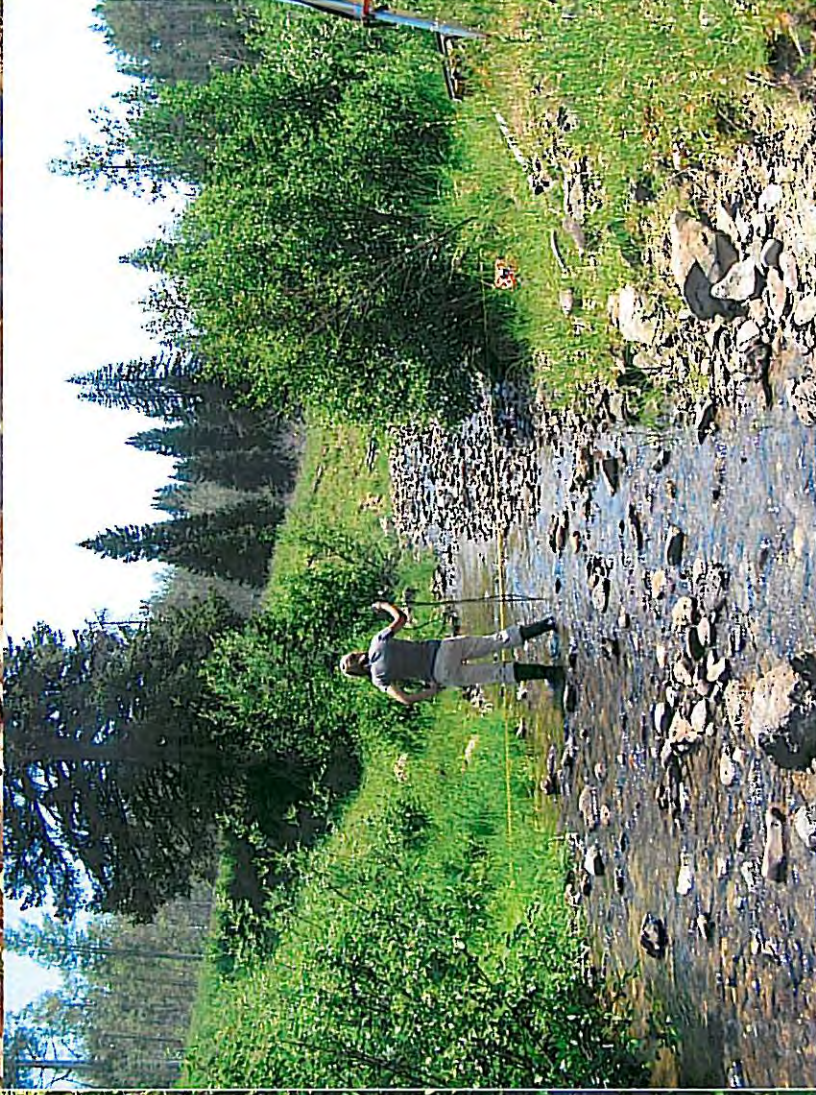
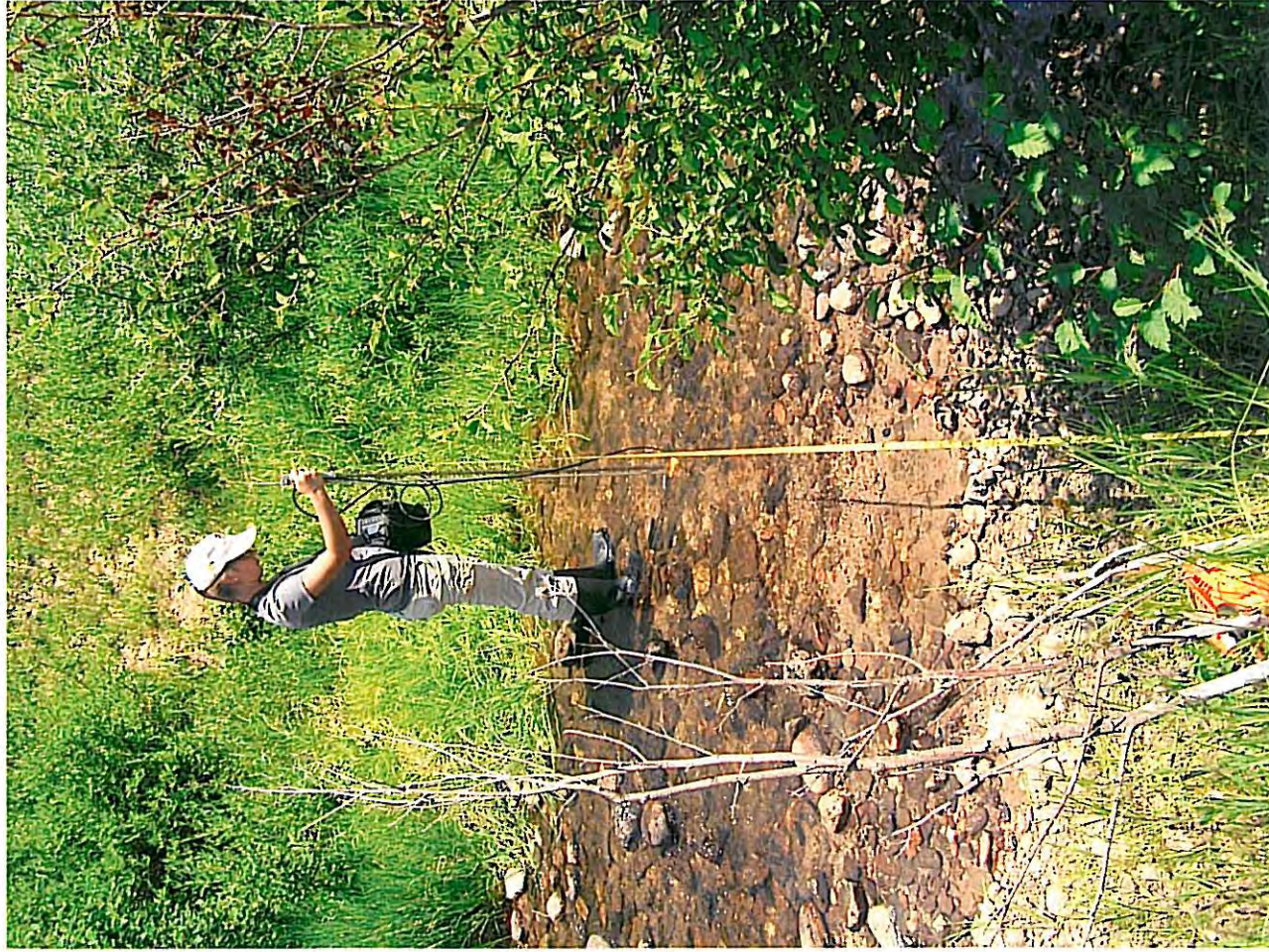
ASSIGNED TO:DATE.....

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
Total Data Points = 32								
1	TS	0.00	5.59			0.00	0.00	0.00
	BS/GL	0.01	6.73			0.00	0.00	0.00
		0.50	6.80			0.00	0.00	0.00
		1.00	6.85			0.00	0.00	0.00
		1.50	6.90			0.00	0.00	0.00
		2.00	7.00			0.00	0.00	0.00
	WL	2.90	7.15	0.00	0.00	0.00	0.00	0.00
		3.50	7.25	0.10	0.00	0.06	0.00	7.15
		4.00	7.15	0.00	0.01	0.00	0.00	0.00
		4.50	7.35	0.20	0.00	0.10	0.00	7.15
		5.00	7.30	0.20	0.07	0.10	0.01	7.10
		5.50	7.35	0.25	0.59	0.13	0.07	7.10
		6.00	7.45	0.30	0.30	0.15	0.05	7.15
		6.50	7.35	0.25	0.72	0.13	0.09	7.10
		7.00	7.35	0.25	0.62	0.13	0.08	7.10
		7.50	7.25	0.20	0.34	0.10	0.03	7.05
		8.00	7.40	0.30	0.19	0.15	0.03	7.10
		8.50	7.40	0.30	1.13	0.15	0.17	7.10
		9.00	7.50	0.40	0.81	0.20	0.16	7.10
		9.50	4.40	0.30	1.24	0.15	0.19	4.10
		10.00	7.45	0.30	1.15	0.15	0.17	7.15
		10.50	7.40	0.15	0.13	0.08	0.01	7.25
		11.00	7.40	0.20	0.00	0.10	0.00	7.20
		11.50	7.15	0.05	0.24	0.03	0.01	7.10
		12.00	7.30	0.15	0.00	0.08	0.00	7.15
		12.50	7.25	0.10	0.00	0.05	0.00	7.15
		13.00	7.30	0.15	0.00	0.08	0.00	7.15
	WL	13.50	7.15	0.00	0.00	0.00	0.00	0.00
		15.00	6.90			0.00	0.00	0.00
	GL	16.90	6.70			0.00	0.00	0.00
	BS	19.30	5.71			0.00	0.00	0.00
	TS	19.31	5.30			0.00	0.00	0.00
Totals						2.08	1.06	

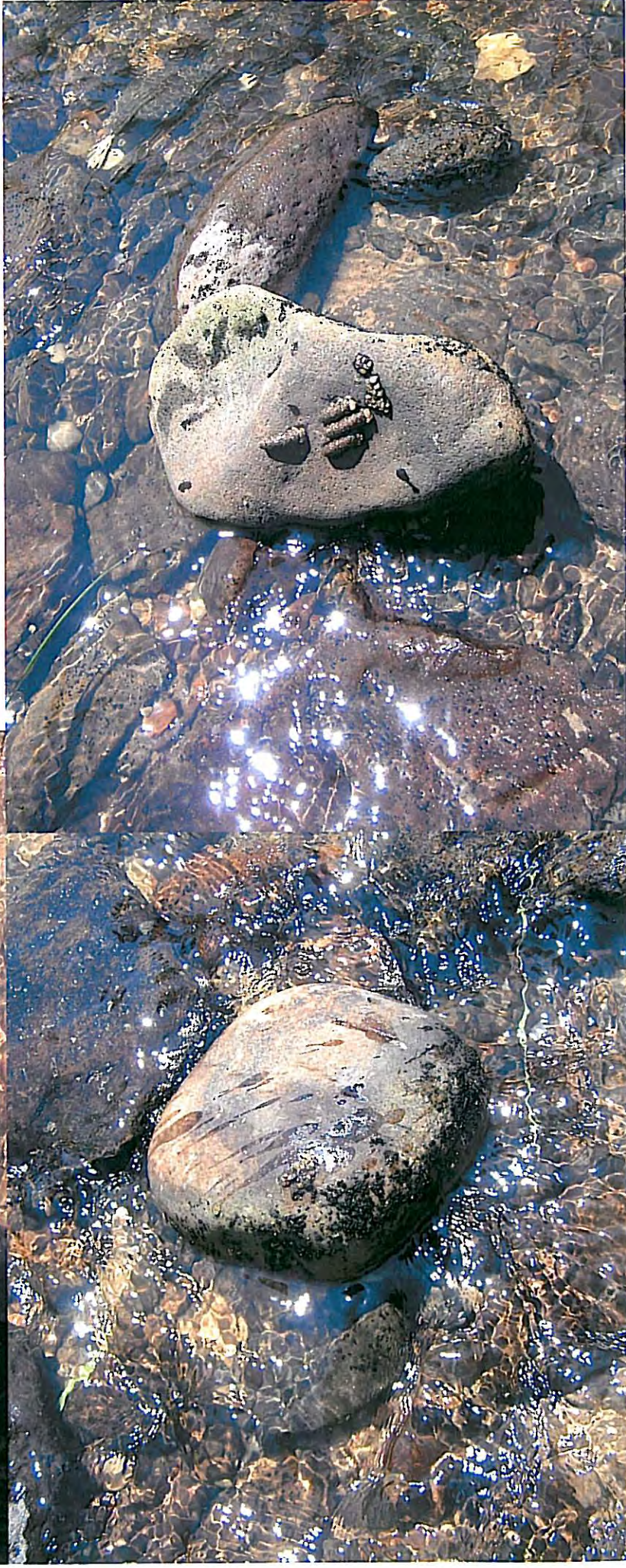
South Fork Slater Creek

50' d/s of Road Xing

NW S20 T10N R88W 6PM



South Fork Slater Creek
50' d/s of Road Xing
NW S20 T10N R88W 6PM



DISCHARGE/CROSS SECTION NOTES

STREAM NAME: <u>S. FK slate - CK</u>				CROSS-SECTION NO.: <u>1</u>		DATE: <u>3/10/27</u>		SHEET <u>1</u> OF <u>1</u>				
BEGINNING OF MEASUREMENT			EDGE OF WATER LOOKING DOWNSTREAM: <u>LEFT</u> <u>RIGHT</u>			Gage Reading: <u> </u> ft		TIME: <u>13:15</u>				
Features	Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec)		Area (ft ²)	Discharge (cfs)
									At Point	Mean in Vertical		
TS		0		5.59								
BS		0.11		6.73								
		5		6.80								
		1.0		6.85								
		1.5		6.90								
		2.0		7.00								
WL		2.9		7.15	0							
		3.5		7.25	.10							
		4.0		7.15	0					.01		
		4.5		7.35	.20					0		
		5.0		7.30	.20					.07		
		5.5		7.35	.25					.59		
		6.0		7.45	.30					.30		
		6.5		7.35	.25					.72		
		7.0		7.35	.25					.62		
		7.5		7.75	.20					.34		
		8.0		7.40	.30					.19		
		8.5		7.40	.30					1.13		
		9.0		7.50	.40					.81		
		9.5		7.40	.30					1.24		
		10.0		7.45	.30					1.15		
		10.5		7.40	.15					.13		
		11.0		7.40	.20					0		
		11.5		7.15	.05					.24		
		12.0		7.30	.15					0		
		12.5		7.25	.10					0		
		13		7.30	.15					0		
WL		13.5		7.15	0					0		
		15.0		6.90								
BL		16.9		6.70								
BS		19.3		5.71								
TS		19.31		5.30								
TOTALS:												
End of Measurement		Time:	Gage Reading: <u> </u> ft		CALCULATIONS PERFORMED BY:				CALCULATIONS CHECKED BY:			