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 1.1 mile reach from its confluence with West Prong South Fork Slater Creek to the USFS boundary. This segment is located entirely on Forest Service Land (Fig. 1).

Biological Summary and R2CROSS Analysis. In July and September of 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
07/08/09	9.59	3.8 – 24.0	*38.8*	**6.5**
09/17/09	1.71	0.7 – 4.3	*14.2*	**4.0**
Average of flows within modeling range			**Out of range**	**5.25**

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.

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

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

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.

The R2CROSS data from our two cross sections indicate that the fishery of South Fork Slater Creek can be protected with summer flows between 14.2 and 38.8 cfs and winter flows of 5.25 cfs. However, both summer flow recommendations were greater than 2.5 times the field measured discharge and therefore, were considered outside the modeling accuracy of R2CROSS. Therefore, we 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. 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 **March 15 through July 15** a flow appropriation of **9.0 cfs** is recommended based on maintaining the three principal criteria of average depth, average velocity, and percent wetted perimeter in the two instream flow reaches located just upstream of this reach;

- From **July 16 through August 15** a flow appropriation of **2.0 cfs** is recommended based on water availability limitations;

- From **August 16 through October 15** a flow appropriation of **0.80 cfs** is recommended based on water availability limitations; and

- From **October 16 through March 14** a flow appropriation of **5.25 cfs** is recommended based on maintaining 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

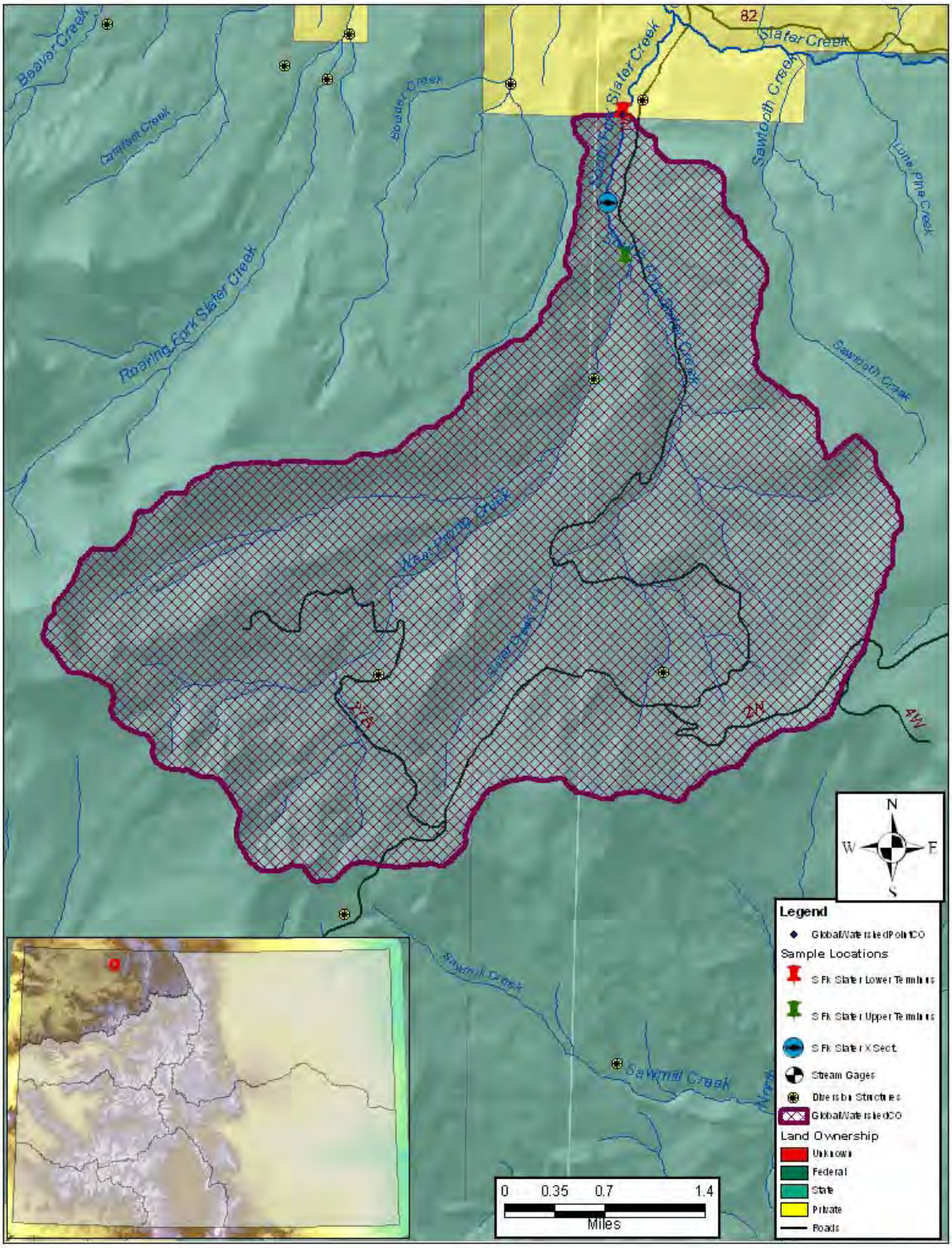

Figure 1. Map of South Fork Slater Creek watershed. Positions of upper and lower termini of the proposed instream flow reach are noted as is the location of the R2CROSS cross section. Additionally, locations known diversion structures are plotted. The watershed's location within Division 6 is indicated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

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1313 Sherman Street, Room 723
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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
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Boyd Wright, CDOW Aquatic Biologist – w/o attachments
Bill de Vergie, CDOW AWM Area 6 – w/o attachments
Greg Espegren, Trout Unlimited

Q = 1.7

3/3 = 14.2

2/3 = 4.0

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

LOCATION INFORMATION

STREAM NAME:	South Fork Slater Creek (Lower) #2
XS LOCATION:	below confl. 40 49' 38.8" 107 17' 48.7"
XS NUMBER:	2
DATE:	17-Sep-09
OBSERVERS:	Uppendahl & Espegren
1/4 SEC:	0
SECTION:	0
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:	0.02163462

INPUT DATA CHECKED BY: .....DATE.....

ASSIGNED TO: .....DATE.....

STREAM NAME: South Fork Slater Creek (Lower) #2
XS LOCATION: below confl. 40 49' 38.8" 107 17' 48.7"
XS NUMBER: 2

DATA POINTS= 37

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL
TS	0.00	0.97		
BS	0.01	1.21		
	0.50	2.11		
	1.90	2.39		
	2.50	2.77		
1 GL	6.70	3.34		
	7.20	4.32		
WL	10.20	4.97	0.00	0.00
	10.90	5.09	0.10	0.20
	11.60	5.20	0.20	0.43
	12.30	5.15	0.20	0.26
	13.00	5.23	0.25	0.74
	13.70	5.11	0.15	0.39
	14.40	5.11	0.15	0.83
	15.10	5.34	0.35	0.64
	15.80	5.15	0.25	0.97
	16.50	5.21	0.25	0.67
	17.20	5.30	0.30	0.25
	17.90	5.29	0.35	0.68
	18.60	5.30	0.35	0.78
	19.30	5.24	0.25	0.87
	20.00	5.12	0.15	0.81
	20.70	5.17	0.20	0.24
	21.40	5.42	0.45	0.18
	22.10	5.25	0.30	0.71
	22.80	5.16	0.20	0.00
	23.50	5.12	0.15	0.15
R	24.20	4.95	0.00	0.00
R	24.90	4.99	0.00	0.00
	25.60	5.07	0.10	0.00
	26.30	5.08	0.10	0.00
WL	28.40	4.95	0.00	0.00
	32.60	4.73		
	35.40	4.05		
1 GL	36.00	3.47		
	38.00	3.22		
BS	39.70	2.79		

TOTALS ——————

VALUES COMPUTED FROM RAW FIELD DATA

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		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.71	0.10	0.07	0.01	0.8%
0.71	0.20	0.14	0.06	3.5%
0.70	0.20	0.14	0.04	2.1%
0.70	0.25	0.18	0.13	7.6%
0.71	0.15	0.11	0.04	2.4%
0.70	0.15	0.11	0.09	5.1%
0.74	0.35	0.25	0.16	9.1%
0.73	0.25	0.18	0.17	9.9%
0.70	0.25	0.18	0.12	6.8%
0.71	0.30	0.21	0.05	3.1%
0.70	0.35	0.25	0.17	9.7%
0.70	0.35	0.25	0.19	11.1%
0.70	0.25	0.18	0.15	8.9%
0.71	0.15	0.11	0.09	5.0%
0.70	0.20	0.14	0.03	2.0%
0.74	0.45	0.32	0.06	3.3%
0.72	0.30	0.21	0.15	8.7%
0.71	0.20	0.14	0.00	0.0%
0.70	0.15	0.11	0.02	0.9%
0.72		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.70	0.10	0.07	0.00	0.0%
0.70	0.10	0.14	0.00	0.0%
2.10		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%
17.72	0.45 (Max.)	3.43	1.71	100.0%

Manning's n = 0.1463
Hydraulic Radius= 0.19356571

STREAM NAME: South Fork Slater Creek (Lower) #2
XS LOCATION: below confl. 40 49' 38.8" 107 17' 48.7"
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	3.43	3.38	-1.4%
4.72	3.43	8.57	149.9%
4.74	3.43	8.10	136.2%
4.76	3.43	7.64	122.8%
4.78	3.43	7.19	109.7%
4.80	3.43	6.75	96.8%
4.82	3.43	6.32	84.2%
4.84	3.43	5.89	71.9%
4.86	3.43	5.48	59.8%
4.88	3.43	5.08	48.0%
4.90	3.43	4.68	36.5%
4.92	3.43	4.30	25.3%
4.93	3.43	4.11	19.8%
4.94	3.43	3.92	14.4%
4.95	3.43	3.74	9.0%
4.96	3.43	3.56	3.7%
4.97	3.43	3.38	-1.4%
4.98	3.43	3.21	-6.4%
4.99	3.43	3.04	-11.3%
5.00	3.43	2.88	-16.1%
5.01	3.43	2.72	-20.8%
5.02	3.43	2.56	-25.4%
5.04	3.43	2.26	-34.2%
5.06	3.43	1.97	-42.7%
5.08	3.43	1.69	-50.6%
5.10	3.43	1.44	-58.0%
5.12	3.43	1.20	-65.1%
5.14	3.43	0.97	-71.6%
5.16	3.43	0.78	-77.4%
5.18	3.43	0.61	-82.2%
5.20	3.43	0.47	-86.3%
5.22	3.43	0.36	-89.6%

WATERLINE AT ZERO
AREA ERROR = 4.967

STREAM NAME: South Fork Slater Creek (Lower) #2
XS LOCATION: below confl. 40 49' 38.8" 107 17' 48.7"
XS NUMBER: 2

Constant Manning's n

GL = lowest Grassline elevation corrected for sag
WL = Waterline corrected for variations in field measured water surface elevations and sag

STAGING TABLE

	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	3.47	29.23	1.47	1.95	42.89	30.37	100.0%	1.41	80.66	1.88
	3.97	28.47	1.00	1.45	28.54	29.09	95.8%	0.98	42.10	1.48
	4.02	28.39	0.96	1.40	27.12	28.96	95.4%	0.94	38.78	1.43
	4.07	28.26	0.91	1.35	25.70	28.79	94.8%	0.89	35.61	1.39
	4.12	28.03	0.87	1.30	24.30	28.52	93.9%	0.85	32.62	1.34
	4.17	27.80	0.82	1.25	22.90	28.25	93.0%	0.81	29.74	1.30
	4.22	27.56	0.78	1.20	21.52	27.98	92.2%	0.77	26.98	1.25
	4.27	27.33	0.74	1.15	20.14	27.72	91.3%	0.73	24.33	1.21
	4.32	27.10	0.69	1.10	18.78	27.45	90.4%	0.68	21.79	1.16
	4.37	26.68	0.65	1.05	17.44	27.01	88.9%	0.65	19.46	1.12
	4.42	26.24	0.61	1.00	16.12	26.56	87.5%	0.61	17.26	1.07
	4.47	25.80	0.57	0.95	14.81	26.11	86.0%	0.57	15.17	1.02
	4.52	25.37	0.53	0.90	13.54	25.67	84.5%	0.53	13.20	0.98
	4.57	24.93	0.49	0.85	12.28	25.22	83.0%	0.49	11.35	0.92
	4.62	24.49	0.45	0.80	11.04	24.77	81.6%	0.45	9.63	0.87
	4.67	24.06	0.41	0.75	9.83	24.32	80.1%	0.40	8.03	0.82
	4.72	23.62	0.37	0.70	8.64	23.87	78.6%	0.36	6.55	0.76
	4.77	22.62	0.33	0.65	7.48	22.87	75.3%	0.33	5.30	0.71
	4.82	21.44	0.30	0.60	6.38	21.68	71.4%	0.29	4.21	0.66
	4.87	20.25	0.26	0.55	5.33	20.49	67.5%	0.26	3.25	0.61
	4.92	19.07	0.23	0.50	4.35	19.30	63.5%	0.23	2.41	0.55
WL	4.97	17.56	0.20	0.45	3.43	17.78	58.5%	0.19	1.71	0.50
	5.02	15.62	0.17	0.40	2.60	15.83	52.1%	0.16	1.17	0.45
	5.07	13.88	0.13	0.35	1.87	14.07	46.3%	0.13	0.72	0.39
	5.12	11.67	0.11	0.30	1.23	11.85	39.0%	0.10	0.41	0.33
	5.17	8.55	0.08	0.25	0.71	8.70	28.6%	0.08	0.20	0.28
	5.22	5.41	0.07	0.20	0.37	5.52	18.2%	0.07	0.09	0.25
	5.27	3.58	0.04	0.15	0.15	3.65	12.0%	0.04	0.03	0.18
	5.32	0.86	0.04	0.10	0.04	0.90	3.0%	0.04	0.01	0.18
	5.37	0.36	0.03	0.05	0.01	0.38	1.3%	0.03	0.00	0.13
	5.42	0.02	0.00	0.00	0.00	0.02	0.1%	0.00	0.00	0.02

58
21

3/3 = 14.2
2/3 = 4.0

STREAM NAME: South Fork Slater Creek (Lower) #2
XS LOCATION: below confl. 40 49' 38.8" 107 17' 48.7"
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	1.71	cfs
CALCULATED FLOW (Qc)=	1.71	cfs
(Qm-Qc)/Qm * 100 =	0.2	%
MEASURED WATERLINE (WLm)=	4.97	ft
CALCULATED WATERLINE (WLc)=	4.97	ft
(WLm-WLc)/WLm * 100 =	0.1	%
MAX MEASURED DEPTH (Dm)=	0.45	ft
MAX CALCULATED DEPTH (Dc)=	0.45	ft
(Dm-Dc)/Dm * 100	-0.6	%
MEAN VELOCITY=	0.50	ft/sec
MANNING'S N=	0.146	
SLOPE=	0.02163462	ft/ft
.4 * Qm =	0.7	cfs
2.5 * Qm=	4.3	cfs

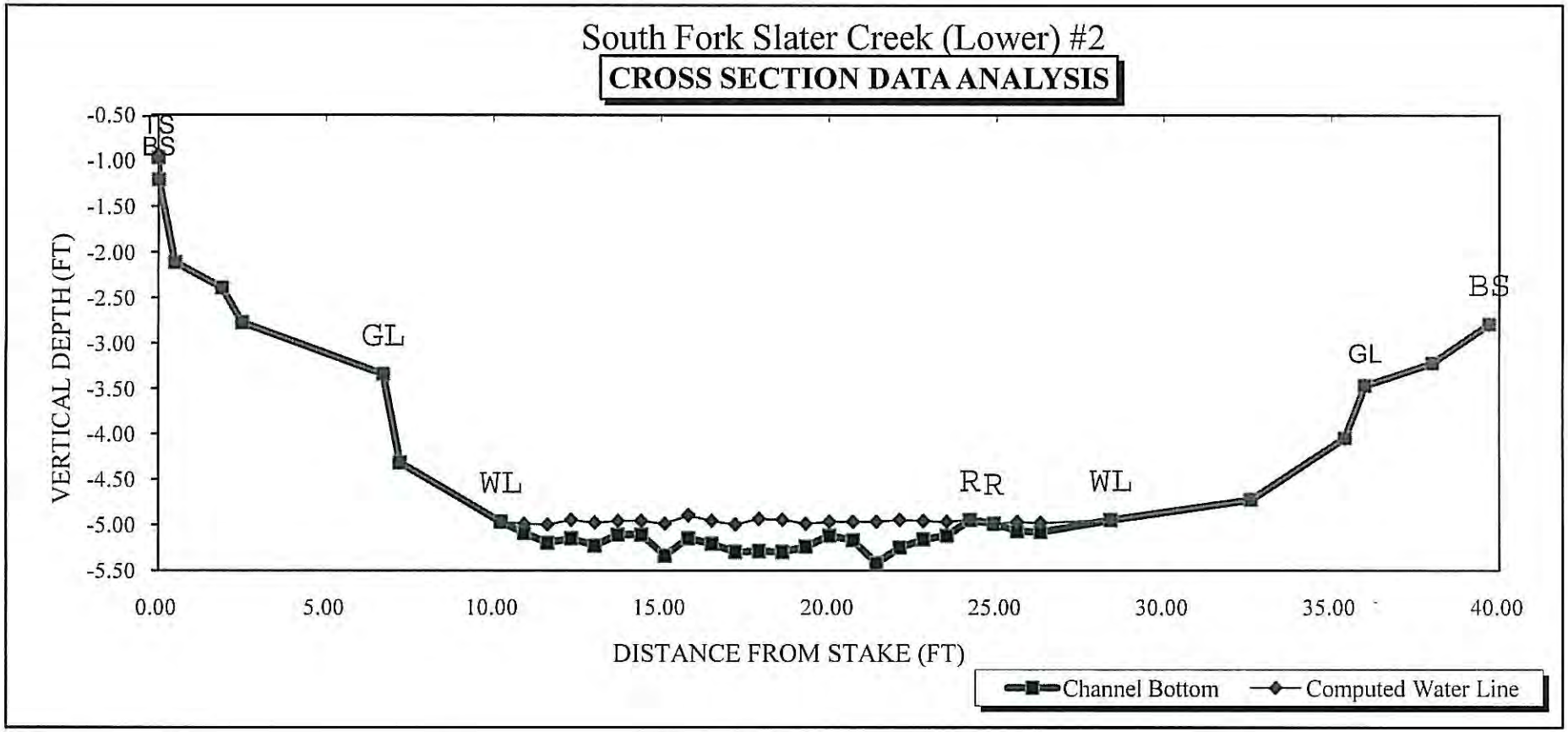
RECOMMENDED INSTREAM FLOW:
==========

FLOW (CFS)	PERIOD
==========	=========
_____	_____
_____	_____
_____	_____
_____	_____

RATIONALE FOR RECOMMENDATION:
==========

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

CWCB REVIEW BY: ..... DATE:.....


South Fork Slater Creek (Lower) #2
CROSS SECTION DATA ANALYSIS
VERTICAL DEPTH (FT)
-0.50
-1.00
-1.50
-2.00
-2.50
-3.00
-3.50
-4.00
-4.50
-5.00
-5.50
TS
BS
GL
WL
RR
WL
GL
BS
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line

Data Input & Proofing

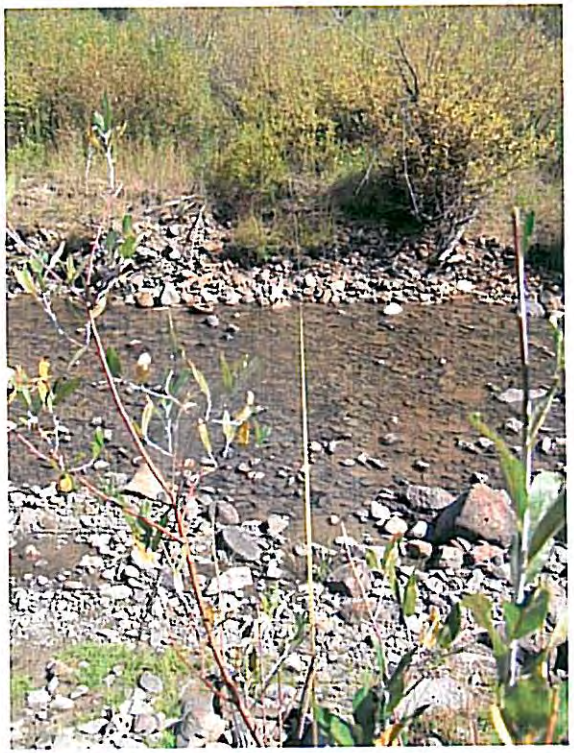
STREAM NAME:	South Fork Slater Creek (Lower) #2
XS LOCATION:	below confl. 40 49' 38.8" 107 17' 48.7"
XS NUMBER:	2
DATE:	9/17/2009
OBSERVERS:	Uppendahl & Espegren
1/4 SEC:	
SECTION:	
TWP:	10 N
RANGE:	88 W
PM:	6
COUNTY:	ROUTT
WATERSHED:	SLATER CREEK
DIVISION:	6
DOW CODE:	
USGS MAP:	
USFS MAP:	
	Level and Rod Survey
TAPE WT:	0.0106 lbs / ft
TENSION:	99999 lbs
SLOPE:	0.021634615 ft / ft

CHECKED BY:.....DATE.....

ASSIGNED TO: .....DATE.....

Total Data Points = 37

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
	TS	0.00	0.97			0.00	0.00	0.00
	BS	0.01	1.21			0.00	0.00	0.00
		0.50	2.11			0.00	0.00	0.00
		1.90	2.39			0.00	0.00	0.00
		2.50	2.77			0.00	0.00	0.00
1	GL	6.70	3.34			0.00	0.00	0.00
		7.20	4.32			0.00	0.00	0.00
	WL	10.20	4.97	0.00	0.00	0.00	0.00	0.00
		10.90	5.09	0.10	0.20	0.07	0.01	4.99
		11.60	5.20	0.20	0.43	0.14	0.06	5.00
		12.30	5.15	0.20	0.26	0.14	0.04	4.95
		13.00	5.23	0.25	0.74	0.18	0.13	4.98
		13.70	5.11	0.15	0.39	0.11	0.04	4.96
		14.40	5.11	0.15	0.83	0.11	0.09	4.96
		15.10	5.34	0.35	0.64	0.25	0.16	4.99
		15.80	5.15	0.25	0.97	0.18	0.17	4.90
		16.50	5.21	0.25	0.67	0.18	0.12	4.96
		17.20	5.30	0.30	0.25	0.21	0.05	5.00
		17.90	5.29	0.35	0.68	0.25	0.17	4.94
		18.60	5.30	0.35	0.78	0.25	0.19	4.95
		19.30	5.24	0.25	0.87	0.18	0.15	4.99
		20.00	5.12	0.15	0.81	0.11	0.09	4.97
		20.70	5.17	0.20	0.24	0.14	0.03	4.97
		21.40	5.42	0.45	0.18	0.32	0.06	4.97
		22.10	5.25	0.30	0.71	0.21	0.15	4.95
		22.80	5.16	0.20	0.00	0.14	0.00	4.96
		23.50	5.12	0.15	0.15	0.11	0.02	4.97
	R	24.20	4.95	0.00	0.00	0.00	0.00	0.00
	R	24.90	4.99	0.00	0.00	0.00	0.00	0.00
		25.60	5.07	0.10	0.00	0.07	0.00	4.97
		26.30	5.08	0.10	0.00	0.14	0.00	4.98
	WL	28.40	4.95	0.00	0.00	0.00	0.00	0.00
		32.60	4.73			0.00	0.00	0.00
		35.40	4.05			0.00	0.00	0.00
1	GL	36.00	3.47			0.00	0.00	0.00
		38.00	3.22			0.00	0.00	0.00
	BS	39.70	2.79			0.00	0.00	0.00
					Totals	3.43	1.71	



COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: S FK SLATER BELOW W PRONG CONFL					CROSS-SECTION NO.: 1
CROSS-SECTION LOCATION: ± 100 YDS D/S W/PRONG CONFL.					
40 49 38.8 107 17 48.7					
DATE: 9/17/09	OBSERVERS: UPPENDAHL, ESPERSEN				
LEGAL DESCRIPTION	¼ SECTION:	SECTION:	TOWNSHIP: N/S	RANGE: E/W	PM:
COUNTY: Routt	WATERSHED: Slater Creek		WATER DIVISION: 6		DOW WATER CODE:
MAP(S):	USGS:				
	USFS:				

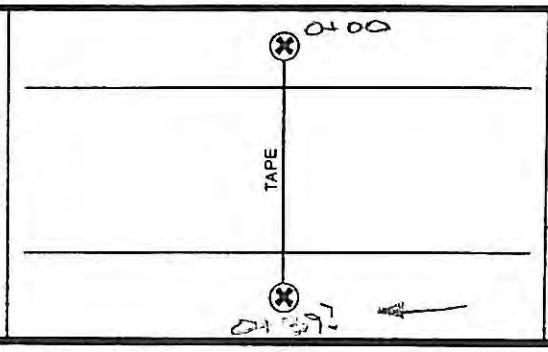
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: (YES)/NO	METER TYPE: Marsh-McBirney			
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)
⊗ Tape @ Stake LB	0.0	
⊗ Tape @ Stake RB	0.0	
① WS @ Tape LB/RB	0.0	
② WS Upstream	31.8	4.64
③ WS Downstream	11.2	5.09
SLOPE	.45/20.8 = 0.022	

SKETCH



LEGEND:
Stake ⊗
Station ①
Photo ◇
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
Fish Seen						1											

AQUATIC INSECTS IN STREAM SECTION BY COMMON OR SCIENTIFIC ORDER NAME:

COMMENTS

FORM #ISF FD 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: SFK SLATER BELOW W/ PRONG CONF.	CROSS-SECTION NO.: 1	DATE: 9/17/02	SHEET 1 OF 1
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT (RIGHT)	Gage Reading: ____ ft	TIME: 1:15

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) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
TOP PIN	0.8		0.91								
	0.90		1.21								
	0.50		2.11								
	1.9		2.39								
	2.5		2.77								
℄	6.7		3.39								
	7.2		4.32								
W	10.2		4.97	0.0				0			
	10.9		5.09	0.10				0.20			
	11.6		5.20	0.20				0.43			
	12.3		5.15	0.30				0.26			
	13.0		5.23	0.25				0.74			
	13.7		5.11	0.15				0.39			
	14.4		5.11	0.15				0.83			
	15.1		5.34	0.35				0.64			
	15.8		5.15	0.25				0.97			
	16.5		5.21	0.25				0.67			
	17.2		5.30	0.30				0.25			
	17.9		5.29	0.35				0.68			
	18.6		5.30	0.35				0.78			
	19.3		5.24	0.25				0.87			
	20.0		5.12	0.15				0.81			
	20.7		5.17	0.20				0.29			
	21.4		5.42	0.45				0.18			
	22.1		5.25	0.30				0.71			
	22.8		5.16	0.20				0.00			
	23.5		5.12	0.15				0.15			
ROCK	24.2		4.95	0.0				—			
" "	24.9		4.99	0.0				—			
	25.6		5.07	0.10				0.00			
	26.3		5.08	0.10				0.00			
W	28.9		4.95	0				0			
	32.6		4.73								
	35.9		4.05								
℄	36.0		3.47								
	38.0		3.22								
PIN	39.7		2.79								
TOTALS:											

End of Measurement	Time: 1:45	Gage Reading: ____ ft	CALCULATIONS PERFORMED BY:	CALCULATIONS CHECKED BY:

Q = 9.7
3/3 = 38.8
2/3 = 6.5

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

LOCATION INFORMATION

STREAM NAME:	S. FK. SLATER CREEK (Lower Site)
XS LOCATION:	~ 600' U/S OF USFS BOUNDARY
XS NUMBER:	1
DATE:	8-Jul-09
OBSERVERS:	UPPENDAHL & ESPEGREN
1/4 SEC:	SE
SECTION:	7
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:	0.01243243

INPUT DATA CHECKED BY: .....DATE.....

ASSIGNED TO: .....DATE.....

STREAM NAME: S. FK. SLATER CREEK (Lower Site)
XS LOCATION: ~ 600' U/S OF USFS BOUNDARY
XS NUMBER: 1

DATA POINTS= 39

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
	TS	0.00	4.35			0.00		0.00	0.00	0.0%
	BS	0.01	4.95			0.00		0.00	0.00	0.0%
1	GL	0.50	5.05			0.00		0.00	0.00	0.0%
		1.00	5.32			0.00		0.00	0.00	0.0%
		1.60	6.21			0.00		0.00	0.00	0.0%
	SWL	8.50	6.78	0.00	0.00	0.00		0.00	0.00	0.0%
		10.00	7.00	0.20	0.53	1.52	0.20	0.25	0.13	1.4%
		11.00	7.00	0.20	0.37	1.00	0.20	0.20	0.07	0.8%
	BR	12.00	7.20	0.40	0.00	1.02	0.40	0.40	0.00	0.0%
		13.00	7.40	0.60	0.71	1.02	0.60	0.60	0.43	4.4%
		14.00	7.40	0.60	0.34	1.00	0.60	0.60	0.20	2.1%
		15.00	7.40	0.60	0.42	1.00	0.60	0.45	0.19	2.0%
		15.50	7.40	0.60	0.60	0.50	0.60	0.30	0.18	1.9%
		16.00	7.35	0.55	1.48	0.50	0.55	0.28	0.41	4.2%
		16.50	7.25	0.45	2.69	0.51	0.45	0.23	0.61	6.3%
		17.00	7.25	0.45	3.23	0.50	0.45	0.23	0.73	7.6%
		17.50	7.30	0.50	2.70	0.50	0.50	0.25	0.68	7.0%
		18.00	7.80	1.00	1.59	0.71	1.00	0.50	0.80	8.3%
		18.50	7.85	1.05	1.18	0.50	1.05	0.53	0.62	6.5%
		19.00	7.80	1.00	0.81	0.50	1.00	0.50	0.41	4.2%
		19.50	7.80	1.00	0.71	0.50	1.00	0.50	0.36	3.7%
		20.00	7.90	1.10	1.41	0.51	1.10	0.55	0.78	8.1%
		20.50	8.00	1.20	1.87	0.51	1.20	0.60	1.12	11.7%
		21.00	7.90	1.10	1.65	0.51	1.10	0.55	0.91	9.5%
		21.50	7.95	1.15	0.90	0.50	1.15	0.58	0.52	5.4%
		22.00	8.00	1.20	0.21	0.50	1.20	0.60	0.13	1.3%
		22.50	7.95	1.15	0.19	0.50	1.15	0.58	0.11	1.1%
	BR	23.00	8.00	1.20	0.00	0.50	1.20	0.90	0.00	0.0%
	BR	24.00	7.80	1.00	0.00	1.02	1.00	1.00	0.00	0.0%
	BR	25.00	7.65	0.85	0.06	1.01	0.85	0.85	0.05	0.5%
	BR	26.00	6.90	0.08	0.19	1.25	0.08	0.08	0.02	0.2%
	BR	27.00	7.85	1.05	0.00	1.38	1.05	1.05	0.00	0.0%
	BR	28.00	7.80	1.00	0.06	1.00	1.00	1.00	0.06	0.6%
	BR	29.00	6.90	0.10	0.00	1.35	0.10	0.10	0.00	0.0%
		30.00	7.00	0.20	0.54	1.00	0.20	0.20	0.11	1.1%
		31.00	6.73	0.00	0.00	1.04		0.00	0.00	0.0%
		33.00	6.32			0.00		0.00	0.00	0.0%
		35.00	5.80			0.00		0.00	0.00	0.0%
1	BS,GL	37.60	5.05			0.00		0.00	0.00	0.0%
	TOTALS ----------					23.87	1.2 (Max.)	14.43	9.59	100.0%

Manning's n = 0.1783
Hydraulic Radius= 0.60452372

STREAM NAME: S. FK. SLATER CREEK (Lower Site)
XS LOCATION: ~ 600' U/S OF USFS BOUNDARY
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	14.43	15.42	6.8%
6.51	14.43	21.62	49.8%
6.53	14.43	21.08	46.1%
6.55	14.43	20.56	42.4%
6.57	14.43	20.03	38.8%
6.59	14.43	19.52	35.3%
6.61	14.43	19.01	31.7%
6.63	14.43	18.51	28.3%
6.65	14.43	18.02	24.8%
6.67	14.43	17.53	21.5%
6.69	14.43	17.05	18.1%
6.71	14.43	16.57	14.9%
6.72	14.43	16.34	13.2%
6.73	14.43	16.11	11.6%
6.74	14.43	15.87	10.0%
6.75	14.43	15.65	8.4%
6.76	14.43	15.42	6.8%
6.77	14.43	15.19	5.3%
6.78	14.43	14.97	3.7%
6.79	14.43	14.74	2.2%
6.80	14.43	14.52	0.6%
6.81	14.43	14.30	-0.9%
6.83	14.43	13.86	-3.9%
6.85	14.43	13.43	-7.0%
6.87	14.43	13.00	-9.9%
6.89	14.43	12.57	-12.9%
6.91	14.43	12.15	-15.8%
6.93	14.43	11.73	-18.7%
6.95	14.43	11.33	-21.5%
6.97	14.43	10.94	-24.2%
6.99	14.43	10.55	-26.9%
7.01	14.43	10.18	-29.5%

WATERLINE AT ZERO
AREA ERROR = 6.799

STREAM NAME: S. FK. SLATER CREEK (Lower Site)
XS LOCATION: ~ 600' U/S OF USFS BOUNDARY
XS NUMBER: 1

Constant Manning's n

GL = lowest Grassline elevation corrected for sag
WL = Waterline corrected for variations in field measured water surface elevations and sag

STAGING TABLE

	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	5.05	37.10	1.89	2.95	70.19	39.25	100.0%	1.79	96.08	1.37
	5.80	33.68	1.30	2.20	43.75	35.40	90.2%	1.24	46.82	1.07
	5.85	33.45	1.26	2.15	42.07	35.14	89.5%	1.20	44.08	1.05
	5.90	33.23	1.22	2.10	40.41	34.88	88.9%	1.16	41.41	1.02
	5.95	33.00	1.17	2.05	38.75	34.62	88.2%	1.12	38.81	1.00
	6.00	32.78	1.13	2.00	37.11	34.36	87.6%	1.08	36.29	0.98
	6.05	32.55	1.09	1.95	35.47	34.11	86.9%	1.04	33.84	0.95
	6.10	32.32	1.05	1.90	33.85	33.85	86.2%	1.00	31.46	0.93
	6.15	32.10	1.00	1.85	32.24	33.59	85.6%	0.96	29.15	0.90
	6.20	31.87	0.96	1.80	30.64	33.33	84.9%	0.92	26.92	0.88
	6.25	31.20	0.93	1.75	29.06	32.64	83.2%	0.89	24.99	0.86
	6.30	30.40	0.91	1.70	27.52	31.84	81.1%	0.86	23.21	0.84
	6.35	29.57	0.88	1.65	26.02	31.00	79.0%	0.84	21.52	0.83
	6.40	28.72	0.86	1.60	24.56	30.14	76.8%	0.81	19.91	0.81
	6.45	27.88	0.83	1.55	23.15	29.29	74.6%	0.79	18.39	0.79
	6.50	27.03	0.81	1.50	21.78	28.43	72.4%	0.77	16.94	0.78
	6.55	26.18	0.78	1.45	20.45	27.57	70.3%	0.74	15.56	0.76
	6.60	25.33	0.76	1.40	19.16	26.72	68.1%	0.72	14.26	0.74
	6.65	24.48	0.73	1.35	17.91	25.86	65.9%	0.69	13.03	0.73
	6.70	23.63	0.71	1.30	16.71	25.01	63.7%	0.67	11.87	0.71
	6.75	22.80	0.68	1.25	15.55	24.17	61.6%	0.64	10.77	0.69
WL	6.80	22.11	0.65	1.20	14.43	23.47	59.8%	0.61	9.69	0.67
	6.85	21.59	0.62	1.15	13.34	22.94	58.4%	0.58	8.63	0.65
	6.90	21.07	0.58	1.10	12.27	22.41	57.1%	0.55	7.63	0.62
	6.95	19.87	0.57	1.05	11.25	21.14	53.9%	0.53	6.86	0.61
	7.00	17.66	0.58	1.00	10.28	18.86	48.1%	0.55	6.38	0.62
	7.05	17.23	0.55	0.95	9.41	18.37	46.8%	0.51	5.60	0.59
	7.10	16.81	0.51	0.90	8.56	17.89	45.6%	0.48	4.87	0.57
	7.15	16.38	0.47	0.85	7.73	17.40	44.3%	0.44	4.18	0.54
	7.20	15.96	0.43	0.80	6.92	16.92	43.1%	0.41	3.54	0.51
	7.25	15.05	0.41	0.75	6.13	15.95	40.6%	0.38	3.01	0.49
	7.30	13.86	0.39	0.70	5.41	14.69	37.4%	0.37	2.58	0.48
	7.35	13.14	0.36	0.65	4.74	13.89	35.4%	0.34	2.15	0.45
	7.40	9.66	0.42	0.60	4.10	10.32	26.3%	0.40	2.06	0.50
	7.45	9.43	0.38	0.55	3.62	10.01	25.5%	0.36	1.71	0.47
	7.50	9.21	0.34	0.50	3.16	9.71	24.7%	0.33	1.39	0.44
	7.55	8.98	0.30	0.45	2.70	9.41	24.0%	0.29	1.09	0.40
	7.60	8.76	0.26	0.40	2.26	9.11	23.2%	0.25	0.83	0.37
	7.65	8.54	0.21	0.35	1.83	8.81	22.5%	0.21	0.59	0.33
	7.70	8.04	0.18	0.30	1.41	8.26	21.0%	0.17	0.40	0.29
	7.75	7.55	0.14	0.25	1.02	7.70	19.6%	0.13	0.25	0.24
	7.80	6.60	0.10	0.20	0.66	6.68	17.0%	0.10	0.13	0.20
	7.85	4.01	0.10	0.15	0.39	4.06	10.3%	0.10	0.08	0.20
	7.90	3.52	0.06	0.10	0.20	3.56	9.1%	0.06	0.03	0.14
	7.95	2.29	0.03	0.05	0.06	2.31	5.9%	0.03	0.00	0.08
	8.00	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

10.6

3.51

58

39

3/3 = 38.8

2/3 = 6.5

STREAM NAME: S. FK. SLATER CREEK (Lower Site)
XS LOCATION: ~ 600' U/S OF USFS BOUNDARY
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	9.59	cfs
CALCULATED FLOW (Qc)=	9.69	cfs
(Qm-Qc)/Qm * 100 =	-1.1	%
MEASURED WATERLINE (WLm)=	6.76	ft
CALCULATED WATERLINE (WLc)=	6.80	ft
(WLm-WLc)/WLm * 100 =	-0.7	%
MAX MEASURED DEPTH (Dm)=	1.20	ft
MAX CALCULATED DEPTH (Dc)=	1.20	ft
(Dm-Dc)/Dm * 100	-0.1	%
MEAN VELOCITY=	0.67	ft/sec
MANNING'S N=	0.178	
SLOPE=	0.01243243	ft/ft
.4 * Qm =	3.8	cfs
2.5 * Qm=	24.0	cfs

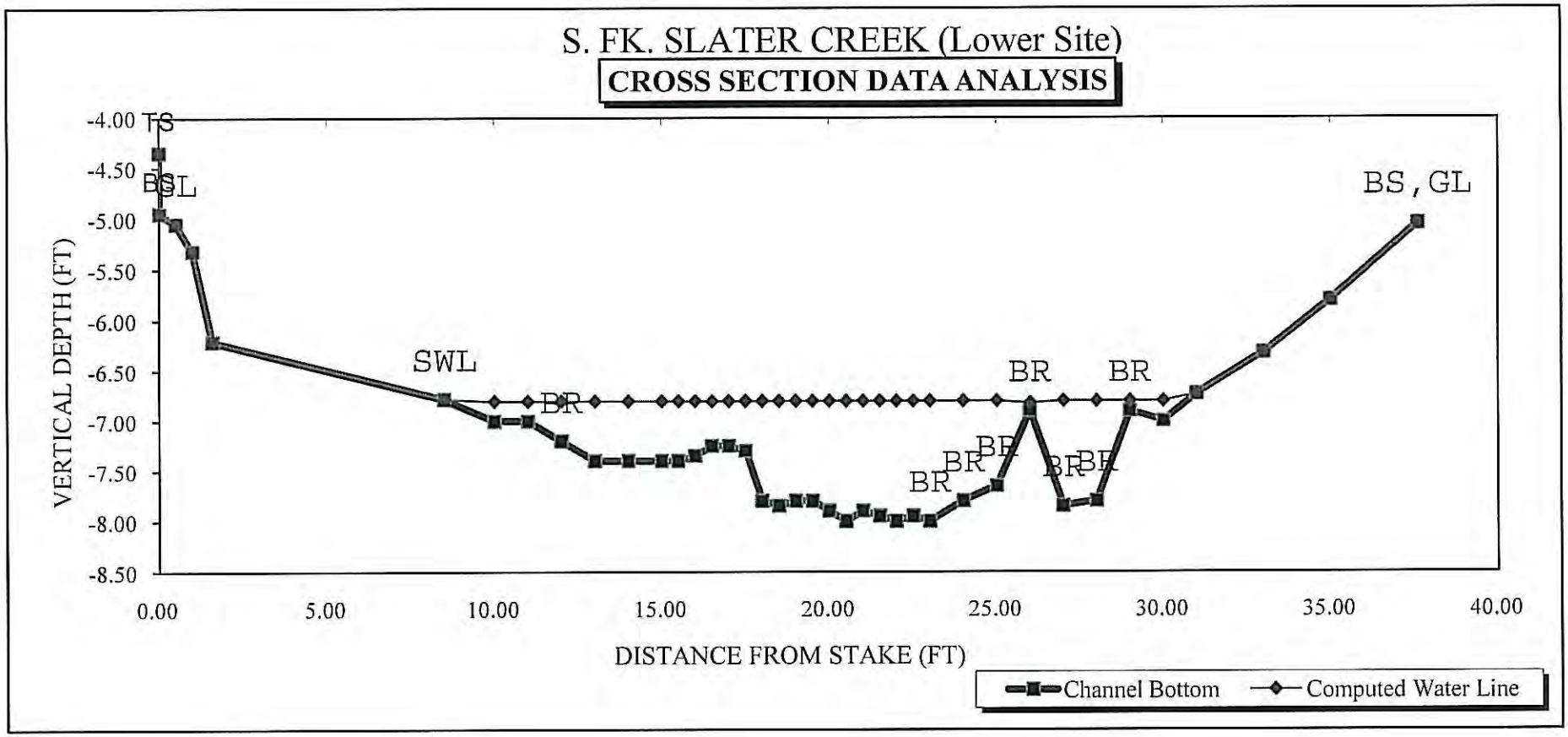
RECOMMENDED INSTREAM FLOW:
==========

FLOW (CFS)	PERIOD
==========	========
_____	_____
_____	_____
_____	_____
_____	_____

RATIONALE FOR RECOMMENDATION:
==========

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

CWCB REVIEW BY: ..... DATE:.....


S. FK. SLATER CREEK (Lower Site)
CROSS SECTION DATA ANALYSIS
VERTICAL DEPTH (FT)
-4.00
-4.50
-5.00
-5.50
-6.00
-6.50
-7.00
-7.50
-8.00
-8.50
TS
BS,GL
SWL
BR
BS,GL
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line

Data Input & Proofing

STREAM NAME: S. FK. SLATER CREEK (Lower Site)
XS LOCATION: ~ 600' U/S OF USFS BOUNDARY
XS NUMBER: 1
DATE: 7/8/2009
OBSERVERS: UPPENDAHL & ESPEGREN

1/4 SEC: SE
SECTION: 7
TWP: 10 N
RANGE: 88 W
PM: 6

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

Level and Rod Survey

TAPE WT: 0.0106 lbs / ft
TENSION: 99999 lbs

SLOPE: 0.012432432 ft / ft

CHECKED BY:.....DATE.....

ASSIGNED TO: .....DATE.....

Total Data Points = 39

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
	TS	0.00	4.35			0.00	0.00	0.00
	BS	0.01	4.95			0.00	0.00	0.00
1	GL	0.50	5.05			0.00	0.00	0.00
		1.00	5.32			0.00	0.00	0.00
		1.60	6.21			0.00	0.00	0.00
	SWL	8.50	6.78	0.00	0.00	0.00	0.00	0.00
		10.00	7.00	0.20	0.53	0.25	0.13	6.80
		11.00	7.00	0.20	0.37	0.20	0.07	6.80
	BR	12.00	7.20	0.40	0.00	0.40	0.00	6.80
		13.00	7.40	0.60	0.71	0.60	0.43	6.80
		14.00	7.40	0.60	0.34	0.60	0.20	6.80
		15.00	7.40	0.60	0.42	0.45	0.19	6.80
		15.50	7.40	0.60	0.60	0.30	0.18	6.80
		16.00	7.35	0.55	1.48	0.28	0.41	6.80
		16.50	7.25	0.45	2.69	0.23	0.61	6.80
		17.00	7.25	0.45	3.23	0.23	0.73	6.80
		17.50	7.30	0.50	2.70	0.25	0.68	6.80
		18.00	7.80	1.00	1.59	0.50	0.80	6.80
		18.50	7.85	1.05	1.18	0.53	0.62	6.80
		19.00	7.80	1.00	0.81	0.50	0.41	6.80
		19.50	7.80	1.00	0.71	0.50	0.36	6.80
		20.00	7.90	1.10	1.41	0.55	0.78	6.80
		20.50	8.00	1.20	1.87	0.60	1.12	6.80
		21.00	7.90	1.10	1.65	0.55	0.91	6.80
		21.50	7.95	1.15	0.90	0.58	0.52	6.80
		22.00	8.00	1.20	0.21	0.60	0.13	6.80
		22.50	7.95	1.15	0.19	0.58	0.11	6.80
	BR	23.00	8.00	1.20	0.00	0.90	0.00	6.80
	BR	24.00	7.80	1.00	0.00	1.00	0.00	6.80
	BR	25.00	7.65	0.85	0.06	0.85	0.05	6.80
	BR	26.00	6.90	0.08	0.19	0.08	0.02	6.82
	BR	27.00	7.85	1.05	0.00	1.05	0.00	6.80
	BR	28.00	7.80	1.00	0.06	1.00	0.06	6.80
	BR	29.00	6.90	0.10	0.00	0.10	0.00	6.80
		30.00	7.00	0.20	0.54	0.20	0.11	6.80
		31.00	6.73	0.00	0.00	0.00	0.00	0.00
		33.00	6.32			0.00	0.00	0.00
		35.00	5.80			0.00	0.00	0.00
1	BS,GL	37.60	5.05			0.00	0.00	0.00
					Totals	14.43	9.59	

STREAM NAME: S. FK. SLATER CREEK (Lower Site)
XS LOCATION: ~ 600' U/S OF USFS BOUNDARY
XS NUMBER: 1

Thorne-Zevenbergen D84 Correction Applied
Estimated D84 = 2.11

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

Velocity based on test of R/D84>1

	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	5.05	37.10	1.89	2.95	70.19	39.25	100.0%	1.79	224.66	3.20
	5.80	33.68	1.30	2.20	43.75	35.40	90.2%	1.24	76.75	1.75
	5.85	33.45	1.26	2.15	42.07	35.14	89.5%	1.20	70.37	1.67
	5.90	33.23	1.22	2.10	40.41	34.88	88.9%	1.16	64.36	1.59
	5.95	33.00	1.17	2.05	38.75	34.62	88.2%	1.12	58.70	1.51
	6.00	32.78	1.13	2.00	37.11	34.36	87.6%	1.08	53.40	1.44
	6.05	32.55	1.09	1.95	35.47	34.11	86.9%	1.04	48.43	1.37
	6.10	32.32	1.05	1.90	33.85	33.85	86.2%	1.00	43.78	1.29
	6.15	32.10	1.00	1.85	32.24	33.59	85.6%	0.96	39.45	1.22
	6.20	31.87	0.96	1.80	30.64	33.33	84.9%	0.92	35.41	1.16
	6.25	31.20	0.93	1.75	29.06	32.64	83.2%	0.89	32.18	1.11
	6.30	30.40	0.91	1.70	27.52	31.84	81.1%	0.86	29.29	1.06
	6.35	29.57	0.88	1.65	26.02	31.00	79.0%	0.84	26.61	1.02
	6.40	28.72	0.86	1.60	24.56	30.14	76.8%	0.81	24.13	0.98
	6.45	27.88	0.83	1.55	23.15	29.29	74.6%	0.79	21.82	0.94
	6.50	27.03	0.81	1.50	21.78	28.43	72.4%	0.77	19.67	0.90
	6.55	26.18	0.78	1.45	20.45	27.57	70.3%	0.74	17.67	0.86
	6.60	25.33	0.76	1.40	19.16	26.72	68.1%	0.72	15.82	0.83
	6.65	24.48	0.73	1.35	17.91	25.86	65.9%	0.69	14.11	0.79
	6.70	23.63	0.71	1.30	16.71	25.01	63.7%	0.67	12.53	0.75
	6.75	22.80	0.68	1.25	15.55	24.17	61.6%	0.64	11.08	0.71
WL	6.80	22.11	0.65	1.20	14.43	23.47	59.8%	0.61	9.69	0.67
	6.85	21.59	0.62	1.15	13.34	22.94	58.4%	0.58	8.38	0.63
	6.90	21.07	0.58	1.10	12.27	22.41	57.1%	0.55	7.18	0.59
	6.95	19.87	0.57	1.05	11.25	21.14	53.9%	0.53	6.28	0.56
	7.00	17.66	0.58	1.00	10.28	18.86	48.1%	0.55	5.69	0.55
	7.05	17.23	0.55	0.95	9.41	18.37	46.8%	0.51	4.83	0.51
	7.10	16.81	0.51	0.90	8.56	17.89	45.6%	0.48	4.06	0.47
	7.15	16.38	0.47	0.85	7.73	17.40	44.3%	0.44	3.38	0.44
	7.20	15.96	0.43	0.80	6.92	16.92	43.1%	0.41	2.77	0.40
	7.25	15.05	0.41	0.75	6.13	15.95	40.6%	0.38	2.27	0.37
	7.30	13.86	0.39	0.70	5.41	14.69	37.4%	0.37	1.86	0.34
	7.35	13.14	0.36	0.65	4.74	13.89	35.4%	0.34	1.49	0.31
	7.40	9.66	0.42	0.60	4.10	10.32	26.3%	0.40	1.29	0.32
	7.45	9.43	0.38	0.55	3.62	10.01	25.5%	0.36	1.03	0.28
	7.50	9.21	0.34	0.50	3.16	9.71	24.7%	0.33	0.80	0.25
	7.55	8.98	0.30	0.45	2.70	9.41	24.0%	0.29	0.60	0.22
	7.60	8.76	0.26	0.40	2.26	9.11	23.2%	0.25	0.45	0.20
	7.65	8.54	0.21	0.35	1.83	8.81	22.5%	0.21	0.32	0.17
	7.70	8.04	0.18	0.30	1.41	8.26	21.0%	0.17	0.21	0.15
	7.75	7.55	0.14	0.25	1.02	7.70	19.6%	0.13	0.13	0.13
	7.80	6.60	0.10	0.20	0.66	6.68	17.0%	0.10	0.07	0.11
	7.85	4.01	0.10	0.15	0.39	4.06	10.3%	0.10	0.03	0.07
	7.90	3.52	0.06	0.10	0.20	3.56	9.1%	0.06	0.01	0.06
	7.95	2.29	0.03	0.05	0.06	2.31	5.9%	0.03	0.00	0.04
	8.00	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

SFK_Slater_Ck_US_P7080064.JPG
07/08/2009

SFK_Slater_Ck_US_P7080065.JPG
07/08/2009

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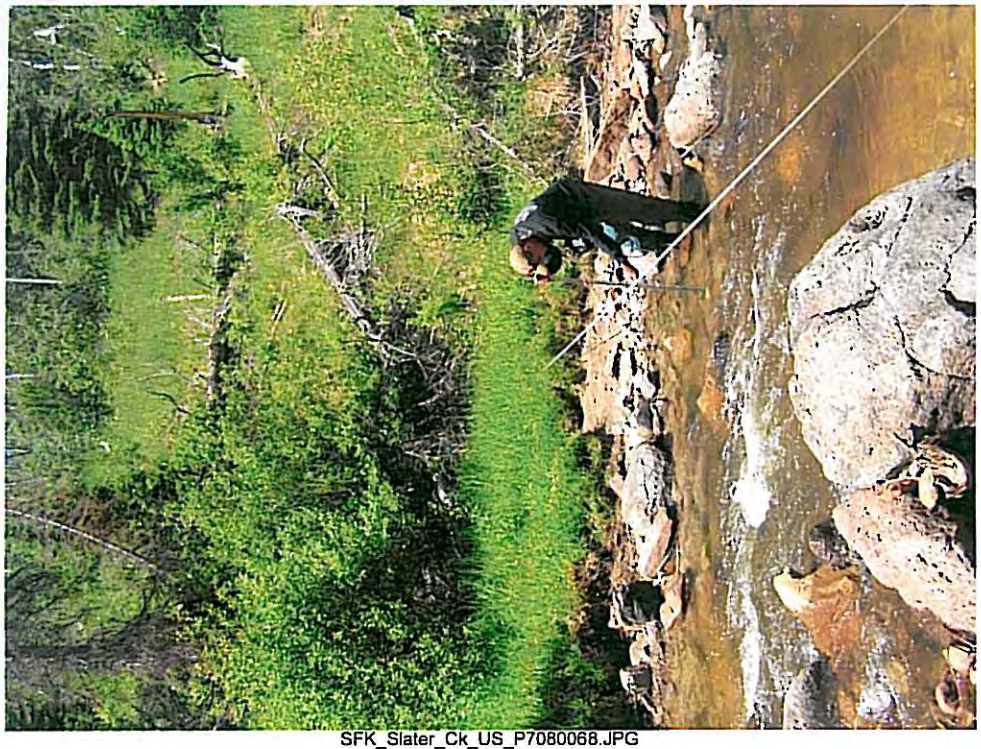
07/08/2009

SFK_Slater_Ck_US_P7080067.JPG
07/08/2009



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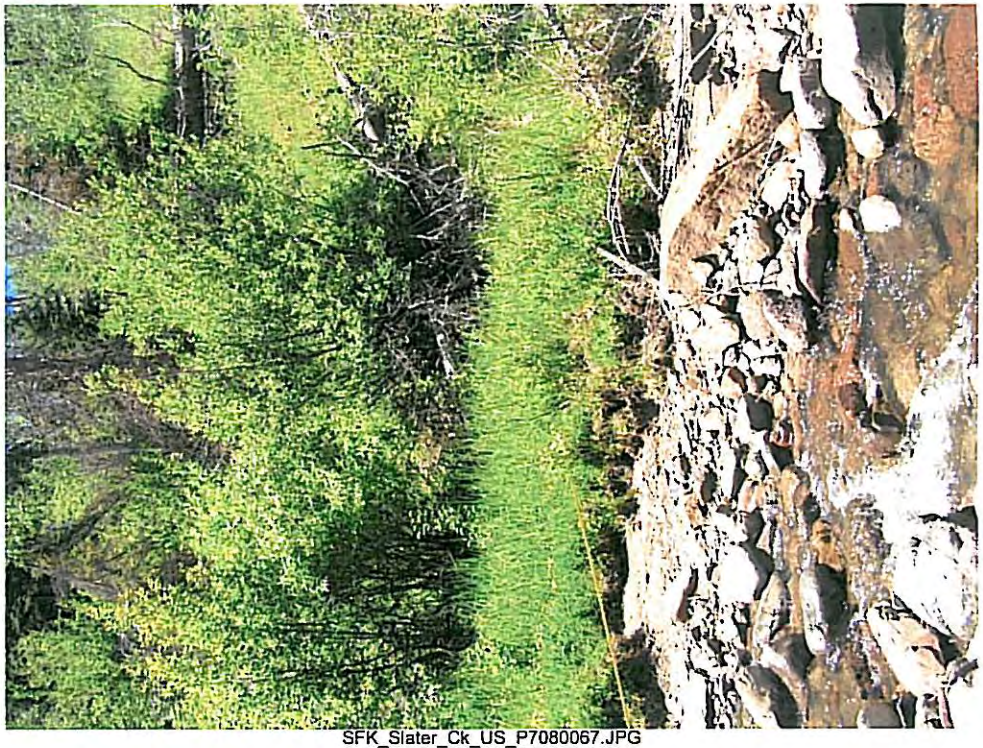

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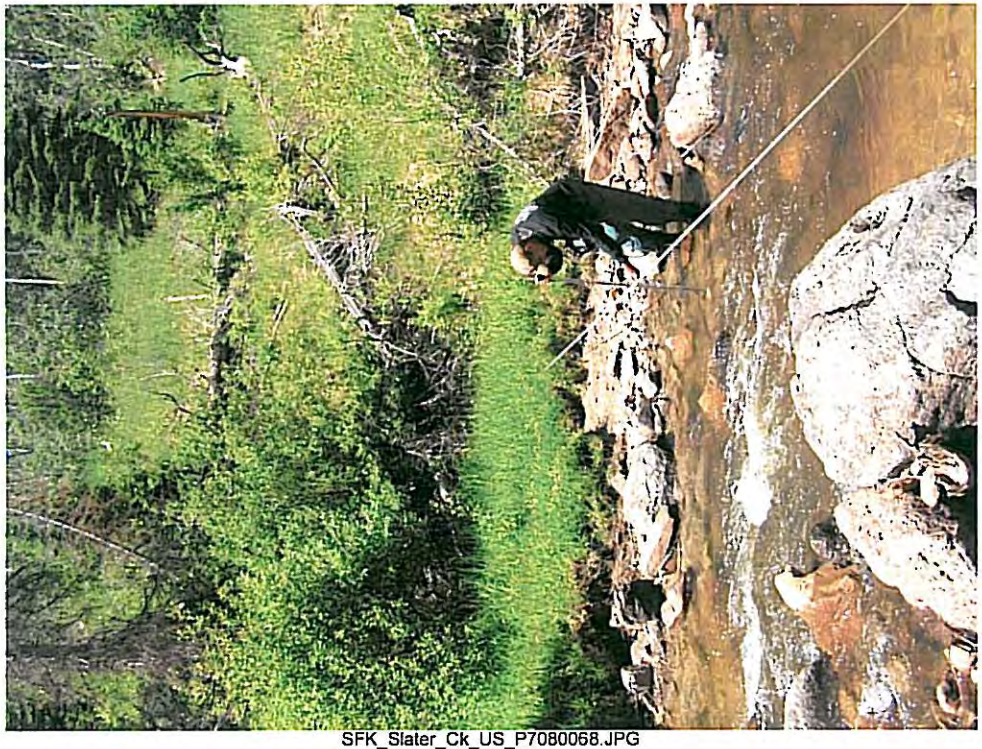


SFK_Slater_Ck_US_P7080068.JPG
07/08/2009

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

5.03

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: South Fork Slater Creek / upstream Forest Service boundary						CROSS-SECTION NO.:
CROSS-SECTION LOCATION: 40° 50' 24.5" 107° 17' 50.1"						
DATE: 7/8/09	OBSERVERS: Uppendahl x Espegren					
LEGAL DESCRIPTION	¼ SECTION: SE	SECTION: 7	TOWNSHIP: 10 (N)/S	RANGE: 88 E(W)	PM: 6	
COUNTY: ROUTT	WATERSHED: SLATER CK	WATER DIVISION: 6	DOW WATER CODE:			
MAP(S):	USGS:					
	USFS:					

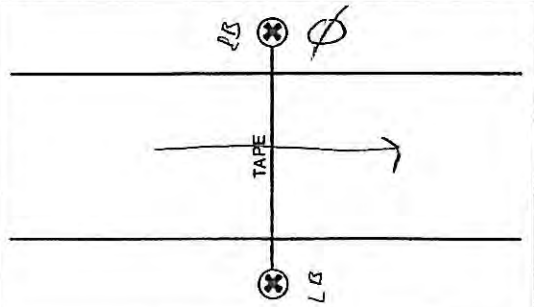
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: (YES)/NO	METER TYPE: Marsh - McBirney			
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	5.5	6.72
(3) WS Downstream	13.0	6.95
SLOPE	.23 / 18.5 =	

SKETCH



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:

Caddis Flies

COMMENTS

FORM #ISF FD 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: South Fork Slater Creek	CROSS-SECTION NO.:	DATE: 7/8/09	SHEET 1 OF 1
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) (LEFT) RIGHT	Gage Reading: ____ ft	TIME: 12:32 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) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
TS	0		4.35								
BS	0		4.95								
GL	0.5		5.05								
	1.0		5.32								
	1.6		6.21								
SWL	8.5		6.78								
	10.0			0.2				0.53			
	11.0			0.2				0.37			
	12.0			0.4				0 (Behind rock)			
	13.0			0.6				0.71			
	14.0			0.6				0.34			
	15.0			0.6				0.42			
	15.5			0.6				0.60			
	16.0			0.55				1.48			
	16.5			0.45				2.69			
	17.0			0.45				3.23			
	17.5			0.5				2.70			
	18.0			1.0				1.59			
	18.5			1.05				1.18			
	19.0			1.0				0.81			
	19.5			1.0				0.71			
	20.0			1.1				1.41			
	20.5			1.2				1.87			
	21.0			1.1				1.65			
	21.5			1.15				0.90			
	22.0			1.2				0.21			
	22.5			1.15				0.19			
	23.0			1.2				0			
	24.0			1.0				0			
	25.0			0.85				0.06			
	26.0			0.08				0.19			
	27.0			1.05				0			
	28.0			1.0				0.06			
	29.0			0.1				0			
	30.0			0.2				0.54			
SWL	31.0		6.73								
	33.0		6.32								
	35.0		5.80								
GL (TR)	37.6		5.05								
NO stake											
TOTALS:											9.59

End of Measurement	Time: 1:02	Gage Reading: ____ ft	CALCULATIONS PERFORMED BY:	CALCULATIONS CHECKED BY: