Stream: Black Sulphur Creek

Executive Summary

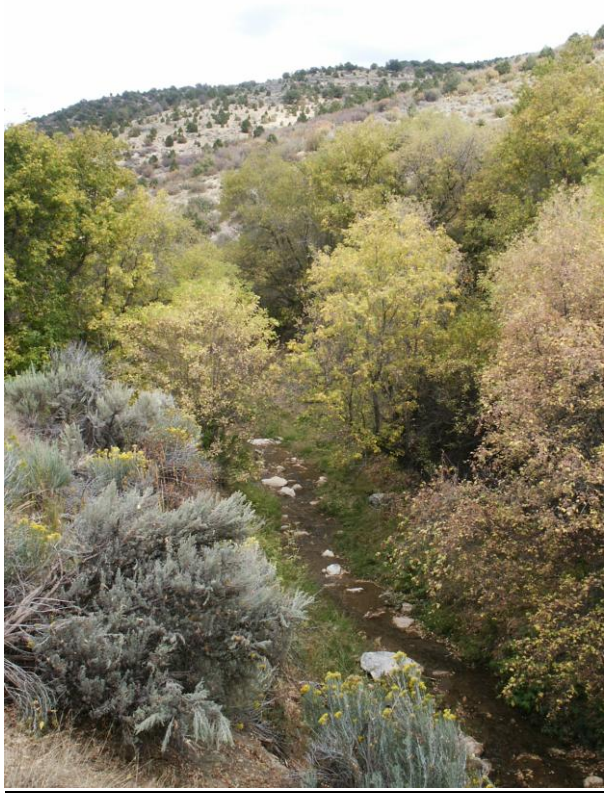
Water Division: 6
Water District: 43
CDOW#: 19213
CWCB ID: 08/6/A-005

Segment: Confluence Canyon Creek to Headgate Duckett Ditch

Upper Terminus: CONFLUENCE WITH CANYON CREEK AT
(Latitude 39° 45’ 41.2”N) (Longitude 108° 28’ 11.06”W)

Lower Terminus: HEADGATE DUCKETT DITCH AT
(Latitude 39° 48’ 52.58”N) (Longitude 108° 25’ 45.34”W)

Watershed: Piceance-Yellow (HUC#: 14050006)
Counties: Rio Blanco
Length: 5.12 miles
USGS Quad(s): Yankee Gulch
Flow Recommendation: 1.6 cfs (May 1 to August 31)
1.2 cfs (September 1 to November 30)
1.0 cfs (December 1 to April 30)



Staff Analysis and Recommendation

Summary

The information contained in this report and the associated instream flow appendices (see CD entitled 2008 Instream Flow Recommendations) forms the basis for staff's instream flow recommendation to be considered by the Board. It is staff's opinion that the information contained in this report is sufficient to support the findings required in Rule 5.40.

Colorado's Instream Flow Program 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 CWCB 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 Instream Flow Program, the statute directs the CWCB to request instream flow recommendations from other state and federal agencies. The Bureau of Land Management (BLM) recommended this segment of Black Sulphur Creek to the CWCB for inclusion into the Instream Flow Program. Black Sulphur Creek is being considered for inclusion into the Instream Flow Program because it has a natural environment that can be preserved to a reasonable degree with an instream flow water right.

Black Sulphur Creek is approximately 19 miles long. It begins on the east flank of Cathedral Bluffs on private land at an elevation of approximately 7000 feet and terminates at the confluence with Piceance Creek at an elevation of approximately 6900 feet. Approximately 65% of the land on the 5.12 mile segment addressed by this report is publicly owned. Black Sulphur Creek is located within Rio Blanco County. The total drainage area of the creek is approximately 18.92 square miles. Black Sulphur Creek generally flows in a northeasterly direction.

The subject of this report is a segment of Black Sulphur Creek beginning at the confluence with Canyon Creek and extending downstream to the headgate of Duckett Ditch. The proposed segment is located approximately 20 miles southwest of Meeker. The staff has received only one recommendation for this segment, from the BLM. The recommendation for this segment is discussed below.

Instream Flow Recommendation(s)

BLM recommended 1.6 cfs, summer, 1.2 cfs, fall, and 1.0 cfs, winter, based on its data collection efforts. The modeling results from this survey effort are within the confidence interval produced by the R2Cross model.

Land Status Review

Upper Terminus	Lower Terminus	Total Length (miles)	Land Ownership	
			% Private	% Public
Headgate of Duckett Ditch	Confluence with Canyon Creek	5.12	35%	65%

100% of the public lands are owned by the BLM.

Biological Data

The BLM has conducted field surveys of the fishery resources on this stream and have found a natural environment that can be preserved. As reported in the letter from BLM to the CWCB "Black Sulphur Creek is a low gradient stream with small substrate and a stable channel. Cover, water temperatures, and food supplies are good for salmonids, but fish habitat is impacted by both natural and human-caused erosion. The stream supports a self-sustaining population of Colorado River Cutthroat Trout. The genetic quality of these trout appears to vary, with some evidence of cross breeding with rainbow trout evident. Because this habitat is remote and separated from other water bodies by physical barriers and diversions that dry up the creek downstream from the proposed reach, the creek has the potential to serve as a reintroduction site for genetically pure Colorado River Cutthroat Trout. The riparian community is vigorous and diverse, providing sufficient cover for maintaining water temperatures suitable for salmonids even during low flow, high temperature periods.

Field Survey Data & Biological Flow Quantification

BLM staff used the R2Cross methodology to quantify the amount of water required to preserve the natural environment to a reasonable degree. The R2Cross method requires that stream discharge and channel profile data be collected in a riffle stream habitat type. Riffles are most easily visualized, as the stream habitat types that would dry up first should streamflow cease. This type of hydraulic data collection consists of setting up a transect, surveying the stream channel geometry, and measuring the stream discharge.

The CWCB staff relied 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).

For this segment of stream, five data sets were collected with the results shown in Table 1 below. Table 1 shows who collected the data (Party), the date the data was collected (Date), the measured discharge at the time of the survey (Q), the accuracy range of the predicted flows based on Manning's Equation (240% and 40% of Q), the summer flow recommendation based on meeting 3 of 3 hydraulic criteria and the winter flow recommendation based upon 2 of 3 hydraulic criteria.

Table 1: Black Sulphur Creek R2Cross Summary

			Confidence Intervals	Recommended Flows (cfs)	
Party	**Date**	**Q (cfs)**	**250%-40%**	**Summer (3/3)**	**Winter (2/3)**
BLM	7/26/2005	1.52	3.8 – 0.6	(1)	1.43
BLM	7/26/2005	2.85	7.1 – 1.1	1.64	1.59
BLM	9/9/2004	0.48	1.2 – 0.2	(1)	0.83
BLM	9/9/2004	0.36	0.9 – 0.1	(1)	(1)
BLM	9/28/1995	1.7	4.2 – 07	1.64	1.21

BLM = Bureau of Land Management
(1) Predicted flow outside of the accuracy range of Manning's Equation.

The summer flow recommendation, which meets 3 of 3 criteria and is within the accuracy range of the R2CROSS model is 1.6 cfs. The fall flow recommendation, which meets 2 of 3 criteria and is within the accuracy range of the R2Cross model is 1.2 cfs. The winter flow recommendation, which was based on water availability limitations, is 1.0 cfs. It is our belief that recommendations that fall outside of the accuracy range of the model, over 250% of the measured discharge or under 40% of the measured discharge may not give an accurate estimate of the necessary instream flow required.

Hydrologic Data and Analysis

After receiving the cooperating agency's biologic recommendation, the CWCB staff conducted an evaluation of the stream hydrology to determine if water was physically available for an instream flow appropriation. This evaluation was done through a computation that is, in essence, a "water balance". In concept a "water balance" computation can be viewed as an accounting exercise. When done in its most rigorous form, the water balance parses precipitation into all the avenues water pursues after it is deposited as rain, snow, or ice. In other words, given a specified amount of water deposition (input), the balance tries to account for all water depletions (losses) until a selected end point is reached. Water losses include depletions due to evaporation and transpiration, deliveries into ground water storage, temporary surface storage, incorporations into plant and animal tissue and so forth. These losses are individually or collectively subtracted from the input to reveal the net amount of stream runoff as represented by the discharge measured by stream gages. Of course, the measured stream flow need not be the end point of interest; indeed, when looking at issues of water use to extinction stream flow measurements may only describe intermediate steps in the complex accounting process that is a water balance carried out to a net value of zero.

In its analysis, CWCB staff has attempted to use this idea of balancing inputs and losses to determine if water is available for the recommended Instream Flow Appropriation. Of course, this analysis must be a practical exercise rather than a lengthy, and costly, scientific investigation. As a result, staff has simplified the process by lumping some variables and employing certain rational and scientifically supportable assumptions. The process may be described through the following description of the steps used to complete the evaluation for this particular stream.

The first step required in determining water availability is a determination of the hydrologic regime at the Lower Terminus (LT) of the recommended ISF reach. In the best case this means looking at the data from a gage at the LT. Further, this data, in the best case, has been collected for a long period of time (the longer the better) including wet and dry periods. In the case of **Black Sulphur Creek** there is a USGS gage record on the creek. However, the gage station is downstream from the LT. The USGS gage is BLACK SULPHUR CREEK NEAR RIO BLANCO, CO (USGS 09306175); it has an available 9 year period of record (POR) collected between 1974 and 1983. The gage is at an approximate elevation of 6,130 ft above mean sea level (amsl) and has a drainage area of 103 mi^2. The hydrograph (plot of discharge over time) produced by this gage includes the consumptive uses of several upstream diversions. To make the measured data transferable to Black Sulphur Creek the consumptive portions of these upstream diversions were added back to the measured hydrograph. The resulting adjusted hydrograph was then used on Black Sulphur Creek by multiplying the adjusted Black Sulphur Creek near Rio Blanco discharge values (hydrograph) by the ratio of Black Sulphur Creek basin area (18.92 mi^2 above the LT) to Black Sulphur Creek near Rio Blanco basin area (103 mi^2). The resulting proportioned hydrograph required no further adjustment because consumptive depletions addressed in the process of adjusting the Black Sulphur Creek near Rio Blanco hydrograph.

The following hydrograph depicts the mean monthly discharge of Bear Creek. Included in the hydrograph are the recommended ISF values. The data used in the creation of this hydrograph are displayed in Table #2.

Figure 1 - Black Sulphur Cr Q (proportioned on Bl Sulphur above gage adjusted for irrigation consumption {added back}) & ISFs

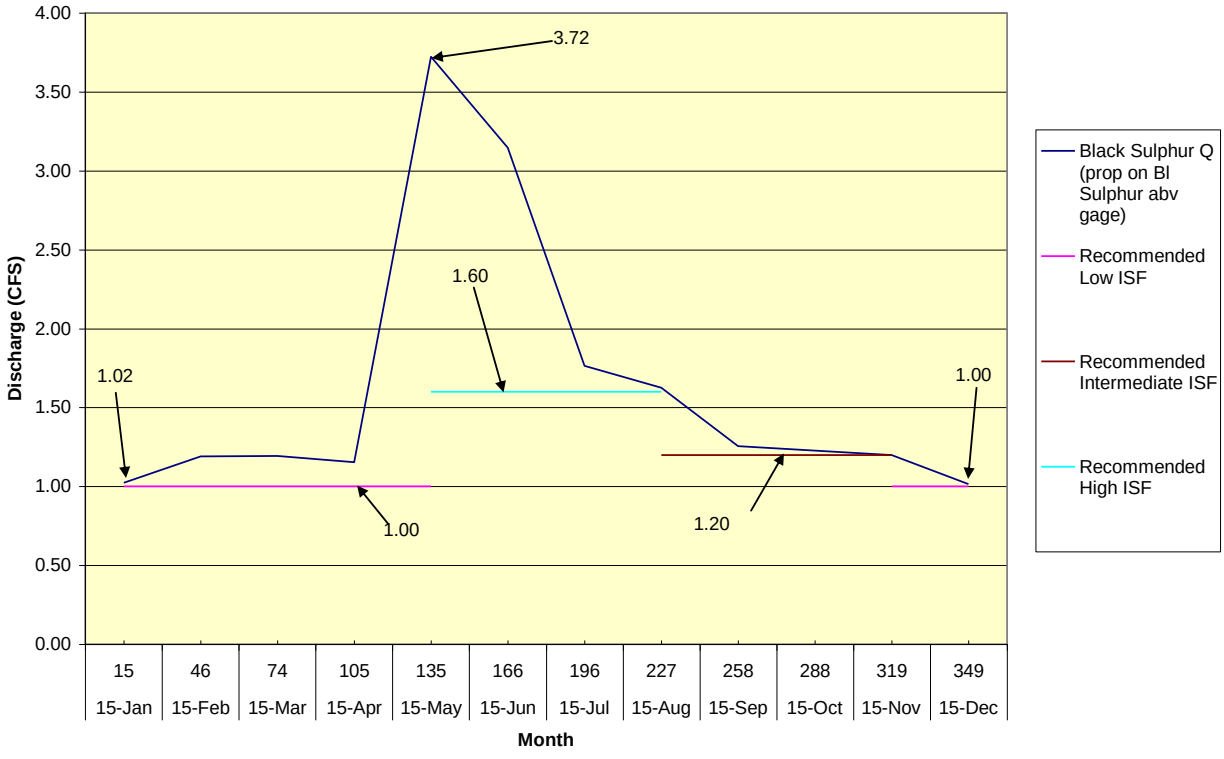


Table 2 – Mean Monthly Discharge and Recommended Instream Flows – Black Sulphur Cr.

	Julian Day	Black Sulphur Creek (cfs)	Recommended ISF (cfs)
15-Jan	15	1.02	1.00
15-Feb	46	1.19	1.00
15-Mar	74	1.19	1.00
15-Apr	105	1.15	1.00
30-Apr	120	1.15	1.00
1-May	121	3.72	1.60
15-May	135	3.72	1.60
15-Jun	166	3.15	1.60
15-Jul	196	1.76	1.60
15-Aug	227	1.63	1.60
31-Aug	243	0.66	1.60
1-Sep	244	1.25	1.20
15-Sep	258	1.25	1.20
15-Oct	288	1.23	1.20
15-Nov	319	1.20	1.20
30-Nov	334	1.20	1.20
1-Dec	335	1.01	1.00
15-Dec	349	1.01	1.00

Existing Water Right Information

Staff has analyzed the water rights tabulation to identify any potential water availability problems. There are no decreed stream diversions within, or upstream of this reach. There are numerous small reservoirs and spring development located in the watersheds that feed Black Sulphur Creek. Based on this analysis staff has determined that water is available for appropriation on Black Sulphur Creek, between the confluence with Canyon Creek and the headgate of Duckett Ditch, to preserve the natural environment to a reasonable degree without limiting or foreclosing the exercise of valid existing water rights.

CWCB Staff's Instream Flow Recommendation
Staff recommends the Board form its intent to appropriate on the following stream reach:

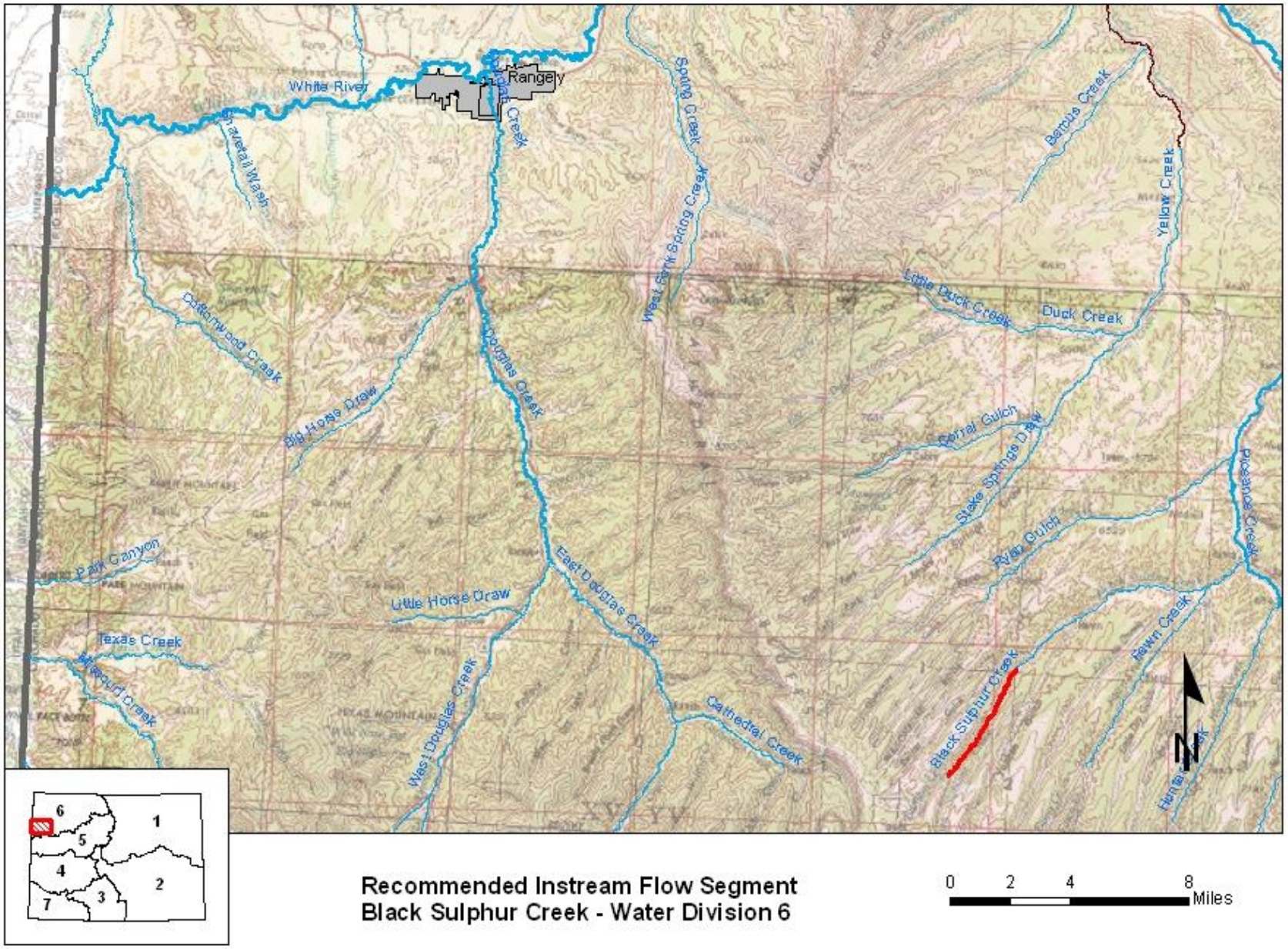
Segment: Headgate Duckett Ditch to Confluence Canyon Creek

Upper Terminus: CONFLUENCE WITH CANYON CREEK AT
(Latitude 39° 45' 41.2"N) (Longitude 108° 28' 11.06"W)
UTM = 4407040.6 N UTM = 202762.6 E
SW NE S26 T3S R99W 6PM
2200' West of the East Section Line; 2040' South of the North Section Line

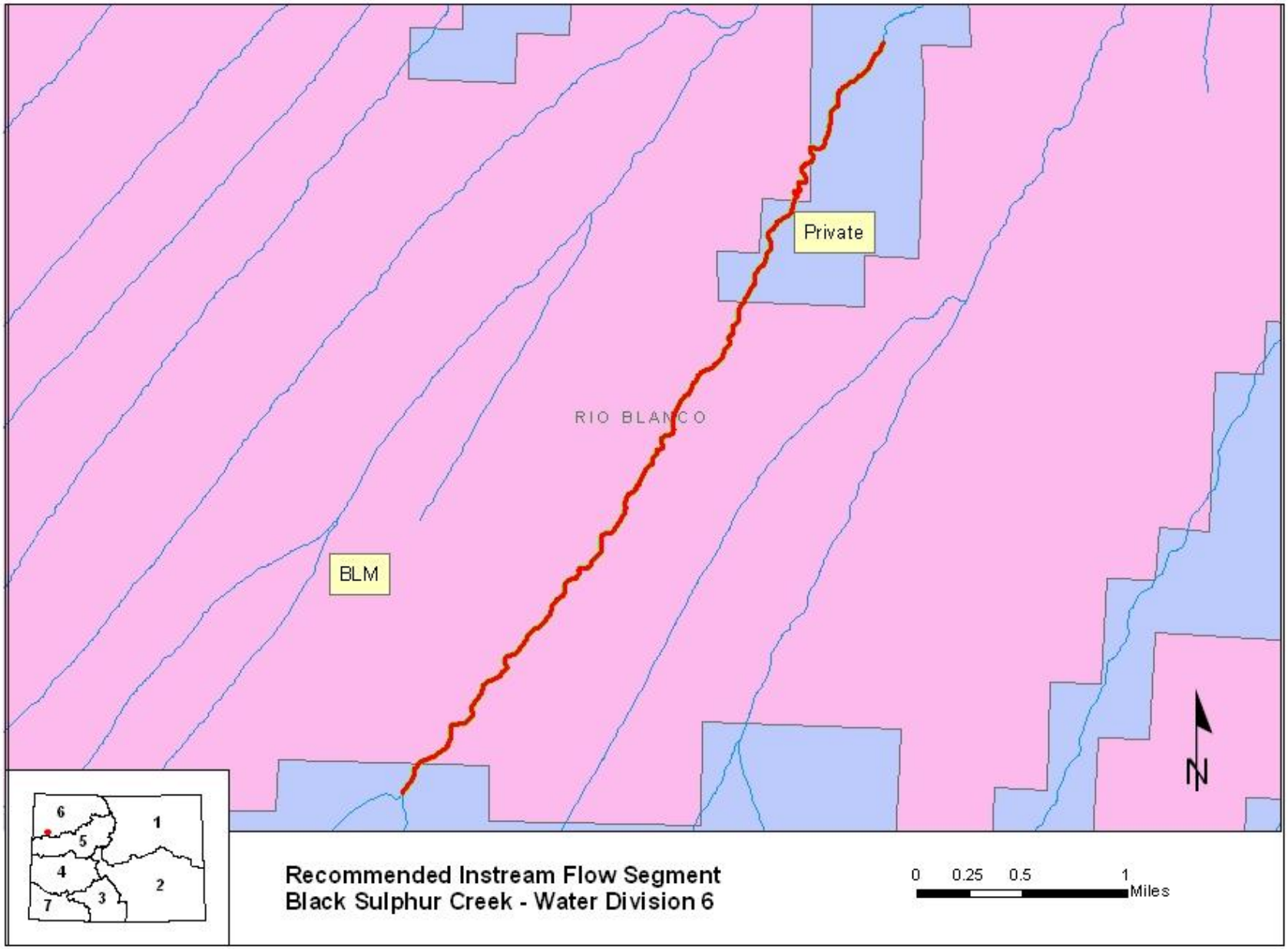
Lower Terminus: HEADGATE DUCKETT DITCH AT
(Latitude 39° 48' 52.58"N) (Longitude 108° 25' 45.34"W)
UTM = 4412809.1 N UTM = 206457.3 E
NE SE S6 T3S R98W 6PM
990' East of the West Section Line; 1420' North of the South Section Line

Watershed: Piceance-Yellow (HUC#: 14050006)
Counties: Rio Blanco
Length: 5.12 miles
USGS Quad(s): Yankee Gulch
Flow Recommendation: 1.6 cfs (May 1 to August 31)
1.2 cfs (September 1 to November 30)
1.0 cfs (December 1 to April 30

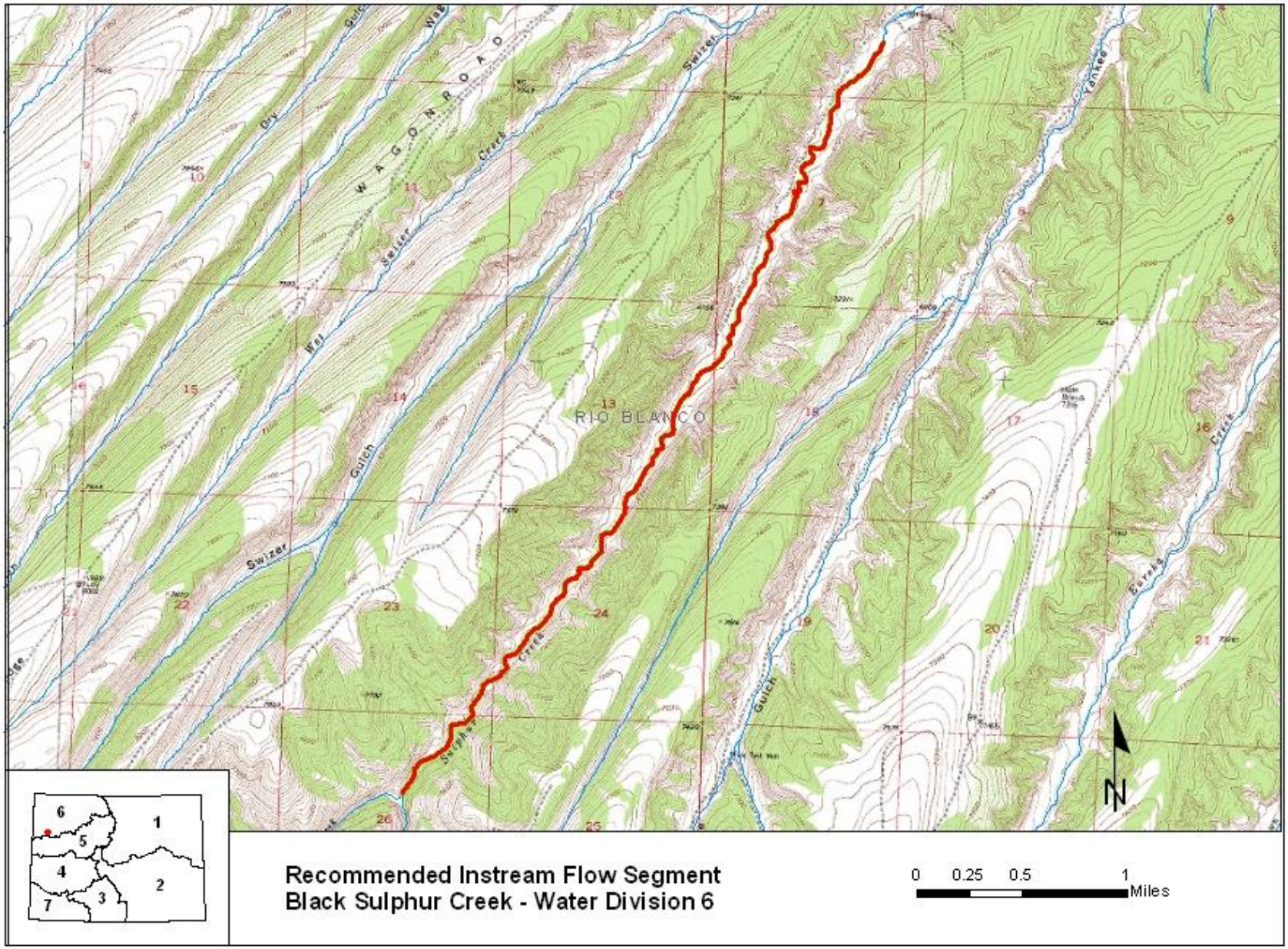
Vicinity Map



Land Use Map


Private
RIO BLANCO
BLM
N
6
1
5
4
2
7
3
Recommended Instream Flow Segment
Black Sulphur Creek - Water Division 6
0 0.25 0.5 1
Miles

Topographic & Water Rights Map



UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
COLORADO STATE OFFICE
2850 YOUNGFIELD STREET
LAKEWOOD, COLORADO 80215-7093

In Reply Refer To:
7250 (CO-932)

DEC 2 6 2007

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

Dear Mr. Merriman:

The Bureau of Land Management (BLM) is writing this letter to formally communicate its instream flow recommendation for Black Sulphur Creek, located in Water Division 6.

Location and Land Status. Black Sulphur Creek is tributary to Piceance Creek near Rock School approximately 20 miles southwest of Meeker. This recommendation covers the stream reach beginning at the confluence with Canyon Creek and extends downstream to the headgate of the Duckett Ditch. Approximately 65% of the 5.12-mile reach is federally owned, while the remaining 35% is privately owned.

Biological Summary. Black Sulphur Creek is a low gradient stream with small substrate and a stable channel. Cover, water temperatures, and food supplies are good for salmonids, but fish habitat is impacted by both natural and human-caused erosion. The stream supports a self-sustaining population of Colorado River Cutthroat Trout. The genetic quality of these trout appears to vary, with some evidence of cross breeding with rainbow trout evident. Because this habitat is remote and separated from other water bodies by physical barriers and diversions that dry up the creek downstream from the proposed reach, the creek has the potential to serve as a reintroduction site for genetically pure Colorado River Cutthroat Trout. The riparian community is vigorous and diverse, providing sufficient cover for maintaining water temperatures suitable for salmonids even during low flow, high temperature periods.

R2Cross Analysis. BLM's data analysis, coordinated with the Division of Wildlife, indicates that the following flows are needed to protect the fishery and natural environment to a reasonable degree:

- 1.6 cubic feet per second is recommended for the high temperature period from May 1 to August 31. This recommendation is driven by the average velocity criteria and wetted

perimeter criteria. Many portions of this reach have large substrate, and it is important to provide adequate velocity and physical habitat in this type of environment for fish spawning and incubation of eggs. Protecting flows during this time period is also important for recharging the alluvial aquifer, which discharges water to the stream and maintains flow levels during later summer.

- 1.2 cubic feet per second is recommended from September 1 through November 30. This recommendation is driven by the average depth criteria. This flow rate will provide good pool habitat, provide sufficient physical habitat in riffles between pools, and will prevent the riparian environment from being seriously stressed during late summer and early fall.

- 1.0 cubic feet per second is recommended from December 1 through April 30. This recommendation is driven by water availability. This flow rate will allow fish to overwinter by providing good water exchange in pool and prevent excessive icing of the physical habitat in riffles.

Water Availability. BLM is not aware of any decreed surface diversions within this reach or upstream of this reach. However, there are numerous small reservoirs and spring developments located in the watersheds that feed Black Sulphur Creek. BLM recommends using the U.S. Geological Survey gage 09306175 (Black Sulphur Creek near Rio Blanco, CO) as an indicator of water availability. This gage is located at the confluence of Black Sulphur Creek and Piceance Creek. Accordingly, a basin apportionment analysis can be performed to determine water availability for this reach, which is located high within the Black Sulphur Creek watershed. An additional indicator of water availability would be diversion records for Duckett Ditch and other diversions located immediately downstream from the proposed reach.

Relationship to Management Plans. The White River Resource Management Plan identifies management of streams supporting coldwater fisheries as a priority for BLM. The plan specifies that BLM will work to improve riparian and aquatic conditions in these streams, and will also work to prevent surface disturbances close to them. In addition, the plan specifies that BLM will work with the Colorado Water Conservation Board to appropriate instream flow water rights to protect these fisheries. This fishery has been maintained because of the remote location of the creek and very low fishing pressure. Under current management plans, this management scenario is likely to continue.

The BLM requests that the Board recognize that this recommendation is based only upon the minimum flows necessary to support cold-water fishery values. BLM may wish to work with the Board and/or through the Colorado water rights system to appropriate flows to optimally protect fish values and to protect other water-dependent values specified in BLM resource management plans. Data sheets, R2Cross output, fishery survey information, and photographs of the cross section were included with BLM's draft recommendation in February 2007.

We thank both the Division of Wildlife and the Water Conservation Board for their cooperation in this effort. If you have any questions regarding our instream flow recommendation, please contact Roy Smith, Water Rights Specialist, at 303-239-3940.

Sincerely,

Dennis D. Zachman (Acting)

for Linda M. Anañia
Deputy State Director
Resources and Fire

cc: Tom Johnson, White River Field Office
Kent Walter, White River Field Office
Bob Lange, White River Field Office
Ed Hollowed, White River Field Office

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Black Sulfur Creek | CROSS-SECTION NO.: 2 (ISF x-2647)

CROSS-SECTION LOCATION: RS7-072605 Zone 12 718431 4406617 elev. 6881

DATE: 7/26/05 | OBSERVERS: Dieterich / Daggett

LEGAL DESCRIPTION | ¼ SECTION: | SECTION: | TOWNSHIP: N/S | RANGE: E/W | PM:

COUNTY: Rio Blanco | WATERSHED: White R. | WATER DIVISION: 6 | DOW WATER CODE:

MAP(S): USGS: | USFS:

SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES / NO | METER TYPE: Pygmy

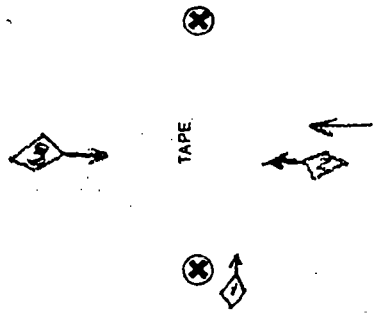
METER NUMBER: | DATE RATED: | CALIB/SPIN: ____ sec | TAPE WEIGHT: surveyed ____ lbs/foot | TAPE TENSION: surveyed ____ lbs

CHANNEL BED MATERIAL SIZE RANGE: | PHOTOGRAPHS TAKEN: (YES) NO | NUMBER OF PHOTOGRAPHS: 3

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	surveyed
⊗ Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB	0.0	5.4/5.38
② WS Upstream	35'	4.66
③ WS Downstream	55'	5.98
SLOPE	1.32/90.0 =	0.0146

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

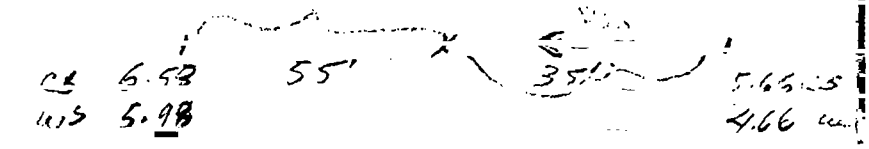
LENGTH - FREQUENCY DISTRIBUTION BY ONE-INCH SIZE GROUPS (1.0-1.9, 2.0-2.9, ETC.)

SPECIES (FILL IN)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	>15	TOTAL
No visibility see previous survey																	

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

COMMENTS

SC 77 pH 6.55
TEMP 21°C



FORM #ISF FD 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: BLACK SULFUR CREEK | CROSS-SECTION NO.: 2 | DATE: 08/26/05 | SHEET ___ OF ___

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) | LEFT / RIGHT | Gage Reading: _____ ft | TIME

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total/Vertical Depth From Tapeline (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Velocity (ft/sec): Time (sec) 40	At Point	Mean in Vertical	Area (ft^2)	Discharge (cfs)
LBP	LB 0.0		2.49								
G/LBF	0.9		3.21								
	3.0		4.52								
	6.0		4.97								
	9.0		5.29								
W	10.4		5.40	0		0					
	10.7		5.38	0.05		0					
	11.0		5.37	0.05		6		.175			
	11.3		5.45	0.05		21		.540			
	11.6		5.47	0.05		16		.418			
	11.9		5.48	0.1		18		.466			
	12.2		5.52	0.1		40		1.00			
	12.5		5.54	0.15		57		1.31			
	12.8		5.67	0.25		77		1.47			
	13.1		5.67	0.25		88		2.18			
	13.4		5.67	0.25		58		1.32			
	13.7		5.65	0.25		39		0.78			
	13.9		5.69	0.30		51		1.26			
	14.1		5.62	0.20		52		1.27			
	14.3		5.67	0.20		56		1.30			
	14.5		5.66	0.25		82		2.03			
	14.7		5.66	0.25		87		2.15			
	14.9		5.64	0.25		102		2.52			
	15.1		5.61	0.20		98		2.42			
	15.4		5.57	0.15		98		2.42			
	15.7		5.65	0.25		88		2.18			
	16.0		5.75	0.35		27		Rock 0.69			
	16.3		5.80	0.40		2		Cut bank Rock			
	16.6		5.76	0.35		0					
W	16.9		5.38	0		0					
G/LBF	17.3		3.21								
	19.0		2.99								
RBP	23.0		2.73								

TOTALS:

Id of Measurement | Time: | Gage Reading: _____ ft | CALCULATIONS PERFORMED BY: | CALCULATIONS CHECKED BY:

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

LOCATION INFORMATION

STREAM NAME:	Black Sulphur Creek
XS LOCATION:	Zone 12 718431 4406617
XS NUMBER:	2
DATE:	26-Jul-05
OBSERVERS:	N. Dieterich, Dagget
1/4 SEC:	0
SECTION:	0
TWP:	0
RANGE:	0
PM:	0
COUNTY:	Rio Blanco
WATERSHED:	White River
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:	0.0146

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

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

STREAM NAME: Black Sulphur Creek
XS LOCATION: Zone 12 718431 4406617
XS NUMBER: 2

DATA POINTS= 32

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
	LBP	0.00	2.49			0.00		0.00	0.00	0.0%
1	GL/LBF	0.90	3.21			0.00		0.00	0.00	0.0%
		3.00	4.52			0.00		0.00	0.00	0.0%
		6.00	4.92			0.00		0.00	0.00	0.0%
		9.00	5.29			0.00		0.00	0.00	0.0%
	W	10.40	5.40	0.00	0.00	0.00		0.00	0.00	0.0%
		10.70	5.38	0.05	0.00	0.30	0.05	0.02	0.00	0.0%
		11.00	5.37	0.05	0.18	0.30	0.05	0.02	0.00	0.2%
		11.30	5.45	0.05	0.54	0.31	0.05	0.01	0.00	0.3%
		11.30	5.47	0.05	0.42	0.02	0.05	0.02	0.01	0.4%
		11.90	5.48	0.10	0.47	0.60	0.10	0.04	0.02	1.4%
		12.20	5.52	0.10	1.00	0.30	0.10	0.03	0.03	2.0%
		12.50	5.54	0.15	1.31	0.30	0.15	0.05	0.06	3.9%
		12.80	5.67	0.25	1.47	0.33	0.25	0.08	0.11	7.2%
		13.10	5.67	0.25	2.18	0.30	0.25	0.08	0.16	10.7%
		13.40	5.67	0.25	1.32	0.30	0.25	0.08	0.10	6.5%
		13.70	5.65	0.25	0.78	0.30	0.25	0.06	0.05	3.2%
		13.90	5.69	0.30	1.26	0.20	0.30	0.06	0.08	5.0%
		14.10	5.62	0.20	1.27	0.21	0.20	0.04	0.05	3.3%
		14.30	5.62	0.20	1.30	0.20	0.20	0.04	0.05	3.4%
		14.50	5.66	0.25	2.03	0.20	0.25	0.05	0.10	6.7%
		14.70	5.66	0.25	2.15	0.20	0.25	0.05	0.11	7.1%
		14.90	5.64	0.25	2.52	0.20	0.25	0.05	0.13	8.3%
		15.10	5.61	0.20	2.42	0.20	0.20	0.05	0.12	7.9%
		15.40	5.57	0.15	2.42	0.30	0.15	0.05	0.11	7.1%
		15.70	5.68	0.25	2.18	0.32	0.25	0.08	0.16	10.7%
	R	16.00	5.75	0.35	0.69	0.31	0.35	0.11	0.07	4.8%
	R	16.30	5.80	0.40	0.00	0.30	0.40	0.12	0.00	0.0%
		16.60	5.76	0.35	0.00	0.30	0.35	0.11	0.00	0.0%
	W	16.90	5.38	0.00	0.00	0.48		0.00	0.00	0.0%
1	GL/LBF	17.30	3.21			0.00		0.00	0.00	0.0%
	RBP	19.00	2.99			0.00		0.00	0.00	0.0%
	TOTALS					6.81	0.4 (Max.)	1.25	1.52	100.0%

Manning's n = 0.0476
Hydraulic Radius= 0.183645809

STREAM NAME: Black Sulphur Creek
XS LOCATION: Zone 12 718431 4406617
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	1.25	1.32	5.6%
5.14	1.25	3.32	165.8%
5.16	1.25	3.14	151.2%
5.18	1.25	2.96	137.0%
5.20	1.25	2.79	123.0%
5.22	1.25	2.62	109.3%
5.24	1.25	2.45	95.8%
5.26	1.25	2.28	82.6%
5.28	1.25	2.12	69.7%
5.30	1.25	1.96	57.0%
5.32	1.25	1.81	44.8%
5.34	1.25	1.66	32.9%
5.35	1.25	1.59	27.2%
5.36	1.25	1.52	21.5%
5.37	1.25	1.45	15.9%
5.38	1.25	1.38	10.6%
5.39	1.25	1.32	5.6%
5.40	1.25	1.26	0.9%
5.41	1.25	1.20	-3.7%
5.42	1.25	1.15	-8.3%
5.43	1.25	1.09	-12.8%
5.44	1.25	1.03	-17.3%
5.46	1.25	0.92	-26.2%
5.48	1.25	0.81	-34.8%
5.50	1.25	0.72	-42.5%
5.52	1.25	0.62	-50.0%
5.54	1.25	0.54	-57.1%
5.56	1.25	0.45	-63.9%
5.58	1.25	0.37	-70.5%
5.60	1.25	0.29	-76.8%
5.62	1.25	0.22	-82.7%
5.64	1.25	0.15	-87.6%

WATERLINE AT ZERO
AREA ERROR = 5.402

STREAM NAME: Black Sulphur Creek
XS LOCATION: Zone 12 718431 4406617
XS NUMBER: 2

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"	3.21	16.40	1.86	2.59	30.50	18.94	100.0%	1.61	158.06	5.18
	4.40	14.27	0.86	1.40	12.22	15.48	81.7%	0.79	39.38	3.22
	4.45	14.18	0.81	1.35	11.51	15.33	80.9%	0.75	35.86	3.12
	4.50	14.09	0.77	1.30	10.80	15.19	80.2%	0.71	32.47	3.01
	4.55	13.81	0.73	1.25	10.10	14.86	78.5%	0.68	29.47	2.92
	4.60	13.43	0.70	1.20	9.42	14.43	76.2%	0.65	26.75	2.84
	4.65	13.05	0.67	1.15	8.76	14.00	73.9%	0.63	24.17	2.76
	4.70	12.66	0.64	1.10	8.12	13.57	71.7%	0.60	21.74	2.68
	4.75	12.28	0.61	1.05	7.49	13.14	69.4%	0.57	19.44	2.59
	4.80	11.89	0.58	1.00	6.89	12.72	67.1%	0.54	17.27	2.51
	4.85	11.51	0.55	0.95	6.30	12.29	64.9%	0.51	15.24	2.42
	4.90	11.12	0.52	0.90	5.74	11.86	62.6%	0.48	13.34	2.33
	4.95	10.72	0.48	0.85	5.19	11.41	60.2%	0.46	11.59	2.23
	5.00	10.31	0.45	0.80	4.67	10.95	57.8%	0.43	9.97	2.14
	5.05	9.89	0.42	0.75	4.16	10.49	55.4%	0.40	8.48	2.04
	5.10	9.48	0.39	0.70	3.68	10.03	53.0%	0.37	7.11	1.93
	5.15	9.06	0.35	0.65	3.21	9.57	50.5%	0.34	5.86	1.82
	5.20	8.65	0.32	0.60	2.77	9.11	48.1%	0.30	4.73	1.71
	5.25	8.23	0.29	0.55	2.35	8.65	45.7%	0.27	3.72	1.58
	5.30	7.76	0.25	0.50	1.95	8.14	43.0%	0.24	2.83	1.45
	5.35	7.12	0.22	0.45	1.58	7.45	39.3%	0.21	2.11	1.34
"WL"	5.40	5.76	0.22	0.40	1.25	6.05	32.0%	0.21	1.65	1.32
	5.45	5.54	0.17	0.35	0.97	5.80	30.6%	0.17	1.11	1.14
	5.50	4.74	0.15	0.30	0.71	4.95	26.2%	0.14	0.73	1.03
	5.55	4.24	0.11	0.25	0.49	4.42	23.4%	0.11	0.42	0.86
	5.60	3.76	0.08	0.20	0.28	3.90	20.6%	0.07	0.19	0.66
	5.65	2.60	0.05	0.15	0.12	2.68	14.2%	0.05	0.06	0.48
	5.70	0.85	0.06	0.10	0.05	0.89	4.7%	0.06	0.03	0.56
	5.75	0.60	0.03	0.05	0.02	0.61	3.2%	0.03	0.01	0.33

0.2 d = 1.43 2/3

50% wp = 5.62 3/3

STREAM NAME: Black Sulphur Creek
XS LOCATION: Zone 12 718431 4406617
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	1.52	cfs
CALCULATED FLOW (Qc)=	1.65	cfs
(Qm-Qc)/Qm * 100 =	-8.1	%
MEASURED WATERLINE (WLm)=	5.39	ft
CALCULATED WATERLINE (WLc)=	5.40	ft
(WLm-WLc)/WLm * 100 =	-0.2	%
MAX MEASURED DEPTH (Dm)=	0.40	ft
MAX CALCULATED DEPTH (Dc)=	0.40	ft
(Dm-Dc)/Dm * 100	0.5	%
MEAN VELOCITY=	1.32	ft/sec
MANNING'S N=	0.048	
SLOPE=	0.0146	ft/ft
.4 * Qm =	0.6	cfs
2.5 * Qm=	3.8	cfs

RECOMMENDED INSTREAM FLOW:

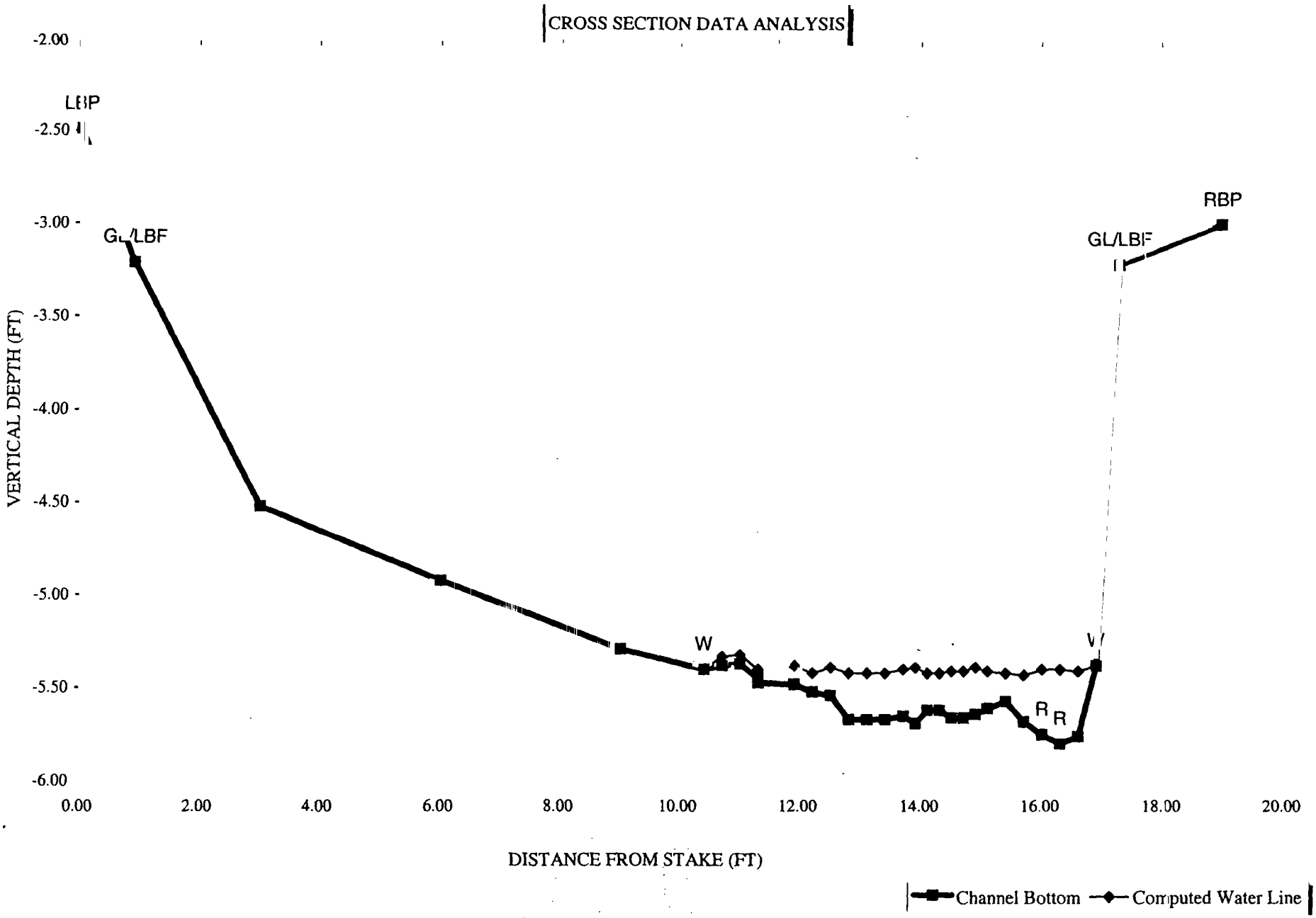
FLOW (CFS)	PERIOD

RATIONALE FOR RECOMMENDATION:

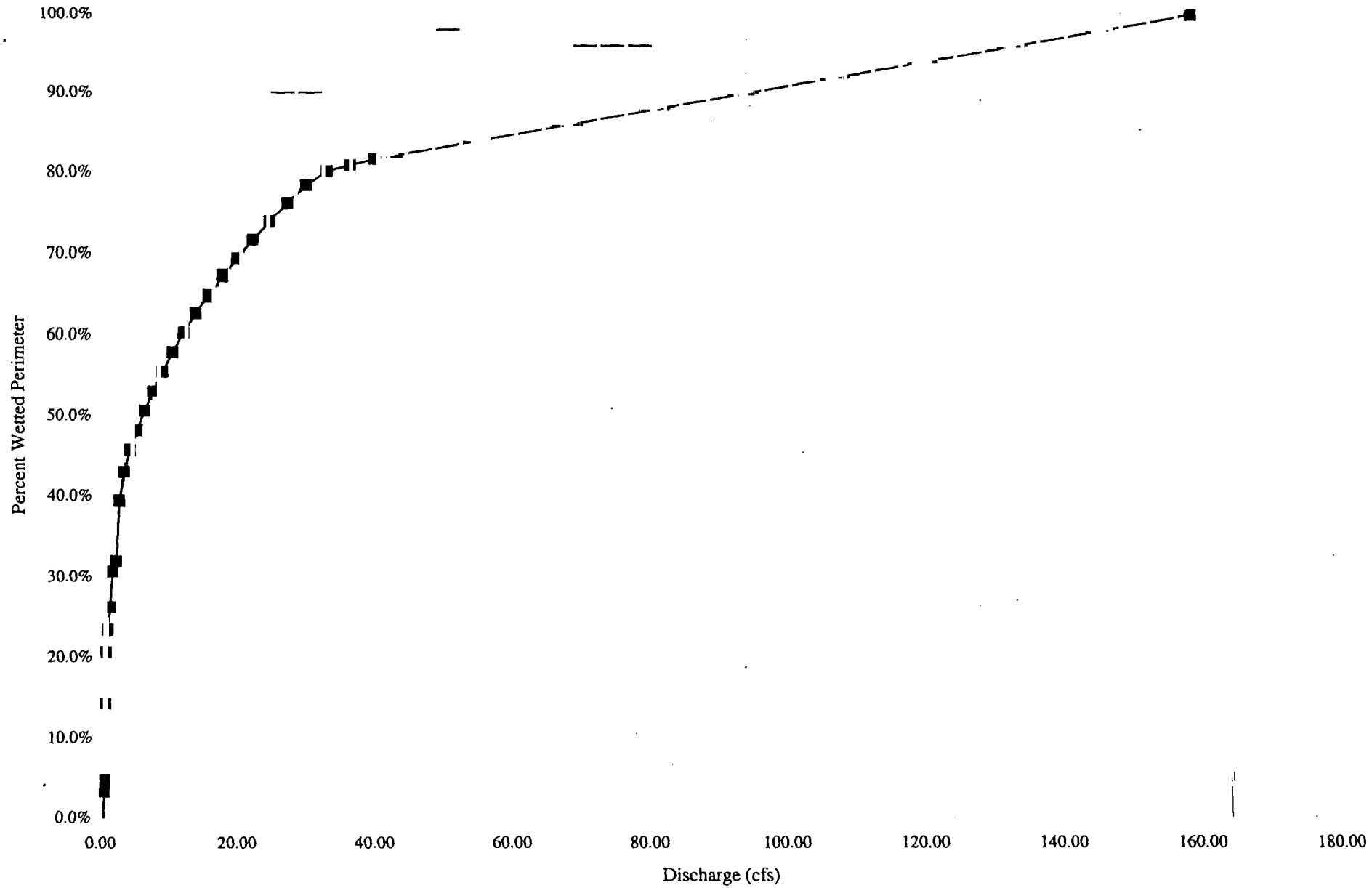
RECOMMENDATION BY: ..... AGENCY..... DATE:.....

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

Black Sulphur Creek



Percent Wetted Perimeter vs. Discharge



COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Black Sulphur Creek

CROSS SECTION LOCATION: at private-public boundary

CROSS-SECTION NO: 2

DATE: 9-9-04 | OBSERVERS: R. Smith, P. Daggett

LEGAL DESCRIPTION: ¼ SECTION: NE | SECTION: 25 | TOWNSHIP: 3 N/S | RANGE: 99 E/W | PM: 6th

COUNTY: Rio Blanco | WATERSHED: White River | WATER DIVISION: 6 | DOW WATER CODE: 19213

MAP(S): USGS: Yankee Gulch 7.5' | USFS:

ZONE 12 NAD 27

F/C 995 m

4404400 m (113)

SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES / NO | METER TYPE: Marsh-McBirney

METER NUMBER: | DATE RATED:

CALIB/SPIN ____ sec | TAPE WEIGHT surveyed lbs/100' | TAPE TENSION surveyed lbs

CHANNEL BED MATERIAL SIZE RANGE: silt to 4" cobbles

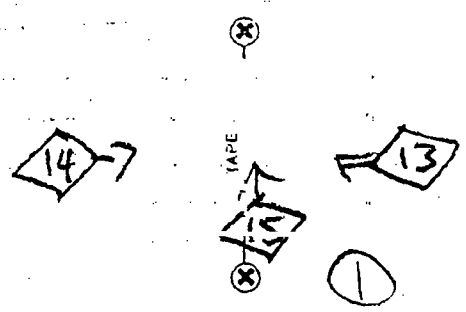
PHOTOGRAPHS TAKEN: YES/NO | NUMBER OF PHOTOGRAPHS: 4

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
Tape & Stake LB	0.0	surveyed
Tape & Stake RB	0.0	surveyed
WS @ Tape LB/RB	0.0	
WS Upstream	15.0'	4.81
WS Downstream	15.0'	5.90

SLOPE: 1.09 / 30.0' = 0.04

SKETCH



LEGEND: Stake, Station, 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
see attached																	

AQUATIC INSECTS IN STREAM SECTION BY COMMON OR SCIENTIFIC ORDER NAME

mayfly, stonefly, caddisfly

COMMENTS

Abundant fish.
Silt is a limiting factor

Ph: 8.6 TDS: 580 Stream Temp = 12.0

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Black Sulphur Creek | CROSS-SECTION NO: 2 | DATE: 9-9-04 | SHEET __ OF __

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM (0.0 AT STAKE) | LEFT / RIGHT | Gage Reading: ____ ft | TIME: 1:30 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)
RS	0.0		5.06								
G	0.6		5.18								
W	1.3		5.72	0.00							
	1.6		5.88	0.20				A			
	1.9		5.98	0.30				0.67			
	2.2		5.92	0.20				1.88			
	2.5		5.89	0.20				1.68			
	2.8		5.87	0.15				1.04			
	3.1		5.88	0.20				0.18			
	3.4		5.90	0.20				0.59			
	3.7		5.84	0.15				0.27			
	4.0		5.83	0.15				0.22			
	4.3		5.86	0.15				0.71			
	4.6		5.82	0.10				0.78			
	4.9		5.85	0.15				0.32			
	5.2		5.82	0.10				0.12			
	5.5		5.85	0.15				1.38			
	5.8		5.79	0.10				0.33			
	6.1		5.80	0.10				0			
W	6.5		5.70	0.00							
G	9.4		5.14								
LS	12.5		4.90								

TOTALS

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

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

LOCATION INFORMATION

STREAM NAME:	Black Sulphur Creek
XS LOCATION:	at private-public boundary
XS NUMBER:	2
DATE:	9-Sep-04
OBSERVERS:	R. Smith, P. Daggett
1/4 SEC:	NE
SECTION:	25
TWP:	3 S
RANGE:	99 W
PM:	6th PM
COUNTY:	Rio Blanco
WATERSHED:	White River
DIVISION:	6
DOW CODE:	19213
USGS MAP:	Yankee Gulch 7.5
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: 0.04

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

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

STREAM NAME: Black Sulphur Creek
XS LOCATION: at private-public boundary
XS NUMBER: 2

DATA POINTS= 22

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
	RS	0.00	5.06			0.00		0.00	0.00	0.0%
1	G	0.60	5.18			0.00		0.00	0.00	0.0%
	W	1.30	5.72	0.00		0.00		0.00	0.00	0.0%
		1.60	5.88	0.20	0.00	0.34	0.20	0.06	0.00	0.0%
		1.90	5.98	0.30	0.67	0.32	0.30	0.09	0.06	12.5%
		2.20	5.92	0.20	1.88	0.31	0.20	0.06	0.11	23.4%
		2.50	5.89	0.20	1.61	0.30	0.20	0.06	0.10	20.0%
		2.80	5.87	0.15	1.04	0.30	0.15	0.05	0.05	9.7%
		3.10	5.88	0.20	0.13	0.30	0.20	0.06	0.01	1.6%
		3.40	5.90	0.20	0.59	0.30	0.20	0.06	0.04	7.3%
		3.70	5.84	0.15	0.27	0.31	0.15	0.05	0.01	2.5%
		4.00	5.83	0.15	0.22	0.30	0.15	0.05	0.01	2.1%
		4.30	5.86	0.15	0.71	0.30	0.15	0.05	0.03	6.6%
		4.60	5.82	0.10	0.78	0.30	0.10	0.03	0.02	4.9%
		4.90	5.85	0.15	0.32	0.30	0.15	0.05	0.01	3.0%
		5.20	5.82	0.10	0.12	0.30	0.10	0.03	0.00	0.7%
		5.50	5.85	0.15	0.38	0.30	0.15	0.05	0.02	3.5%
		5.80	5.79	0.10	0.33	0.31	0.10	0.03	0.01	2.1%
		6.10	5.80	0.10	0.00	0.30	0.10	0.04	0.00	0.0%
	W	6.50	5.70	0.00		0.41		0.00	0.00	0.0%
1	G	9.40	5.14			0.00		0.00	0.00	0.0%
	LS	12.50	4.90			0.00		0.00	0.00	0.0%
	TOTALS ----------					5.30	0.3 (Max.)	0.79	0.48	100.0%

Manning's n = 0.1355
Hydraulic Radius= 0.148159897

STREAM NAME: Black Sulphur Creek
XS LOCATION: at private-public boundary
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	0.79	0.73	-7.0%
5.46	0.79	2.22	183.2%
5.48	0.79	2.09	166.1%
5.50	0.79	1.96	149.3%
5.52	0.79	1.83	132.8%
5.54	0.79	1.70	116.7%
5.56	0.79	1.58	100.9%
5.58	0.79	1.46	85.5%
5.60	0.79	1.34	70.3%
5.62	0.79	1.22	55.5%
5.64	0.79	1.11	41.1%
5.66	0.79	1.00	26.9%
5.67	0.79	0.94	20.0%
5.68	0.79	0.89	13.1%
5.69	0.79	0.83	6.3%
5.70	0.79	0.78	-0.3%
5.71	0.79	0.73	-7.0%
5.72	0.79	0.68	-13.5%
5.73	0.79	0.63	-20.0%
5.74	0.79	0.58	-26.4%
5.75	0.79	0.53	-32.8%
5.76	0.79	0.48	-39.0%
5.78	0.79	0.38	-51.3%
5.80	0.79	0.29	-63.1%
5.82	0.79	0.21	-73.9%
5.84	0.79	0.13	-83.1%
5.86	0.79	0.09	-89.1%
5.88	0.79	0.05	-93.9%
5.90	0.79	0.03	-96.6%
5.92	0.79	0.01	-98.2%
5.94	0.79	0.01	-99.2%
5.96	0.79	0.00	-99.8%

WATERLINE AT ZERO
AREA ERROR = 5.699

STREAM NAME: Black Sulphur Creek
XS LOCATION: at private-public boundary
XS NUMBER: 2

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"	5.18	8.59	0.51	0.80	4.38	8.93	100.0%	0.49	5.97	1.36
	5.20	8.47	0.50	0.78	4.21	8.79	98.5%	0.48	5.65	1.34
	5.25	8.14	0 47	0.73	3.79	8.44	94.6%	0.45	4.88	1.29
	5.30	7.82	0.43	0.68	3.39	8.10	90.7%	0.42	4.17	1.23
	5.35	7.50	0.40	0.63	3.01	7.75	86.9%	0,39	3.52	1.17
	5.40	7.17	0.37	0.58	2.65	7.41	83.0%	0.36	2.92	1.10
	5.45	6.85	0.34	0.53	2.29	7.06	79.1%	0.32	2.38	1.04
	5.50	6.52	0.30	0.48	1.96	6.72	75.3%	0.29	1.89	0.97
	5.55	6.20	0.26	0.43	1.64	6.37	71.4%	0.26	1.46	0.89
	5.60	5.88	0.23	0.38	1.34	6.03	67.5%	0.22	1.08	0.81
	5.65	5.55	0.19	0.33	1.05	5.68	63.6%	0.19	0.75	0.71
"WL"	5.70	5.23	0.15	0.28	0.78	5.33	59.8%	0.15	0.48	0.61
	5.75	4.95	0.11	0.23	0.53	5.03	56.4%	0.11	0.26	0.49
	5.80	4.30	0.07	0.18	0.29	4.37	48.9%	0.07	0.11	0.36
	5.85	2.29	0.05	0.13	0.11	2.33	26.1%	0.05	0.03	0.28
	5.90	0.75	0.04	0.08	0.03	0.77	8.6%	0.04	0.01	0.24
	5.95	0.24	0.02	0.03	0.00	0.25	2.8%	0.01	0.00	0.13

1. 0.2 $\bar{d}$

0.19 0.75
0.20 X
0.23 1.08

$\frac{0.01}{0.04} = \frac{X}{0.33}$ = 0.08 + 0.75 = 0.83 cfs

2. 50% wetted perimeter

0.49 0.11
0.50 X
0.56 0.26

$\frac{0.01}{0.07} = \frac{X}{0.15}$ = 0.02 + 0.11 = 0.13 cfs

3. 1 ft/sec $\bar{v}$

0.97 1.89
1.00 X
1.04 2.38

$\frac{0.03}{0.07} = \frac{X}{0.49}$ = 0.21 + 1.89 = 2.10 cfs

STREAM NAME: Black Sulphur Creek
XS LOCATION: at private-public boundary
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	0.48	cfs
CALCULATED FLOW (Qc)=	0.48	cfs
(Qm-Qc)/Qm * 100 =	0.5	%
MEASURED WATERLINE (WLm)=	5.71	ft
CALCULATED WATERLINE (WLc)=	5.70	ft
(WLm-WLc)/WLm * 100 =	0.2	%
MAX MEASURED DEPTH (Dm)=	0.30	ft
MAX CALCULATED DEPTH (Dc)=	0.28	ft
(Dm-Dc)/Dm * 100	6.5	%
MEAN VELOCITY=	0.61	ft/sec
MANNING'S N=	0.135	
SLOPE=	0.04	ft/ft
.4 * Qm =	0.2	cfs
2.5 * Qm=	1.2	cfs

RECOMMENDED INSTREAM FLOW:

FLOW (CFS)	PERIOD

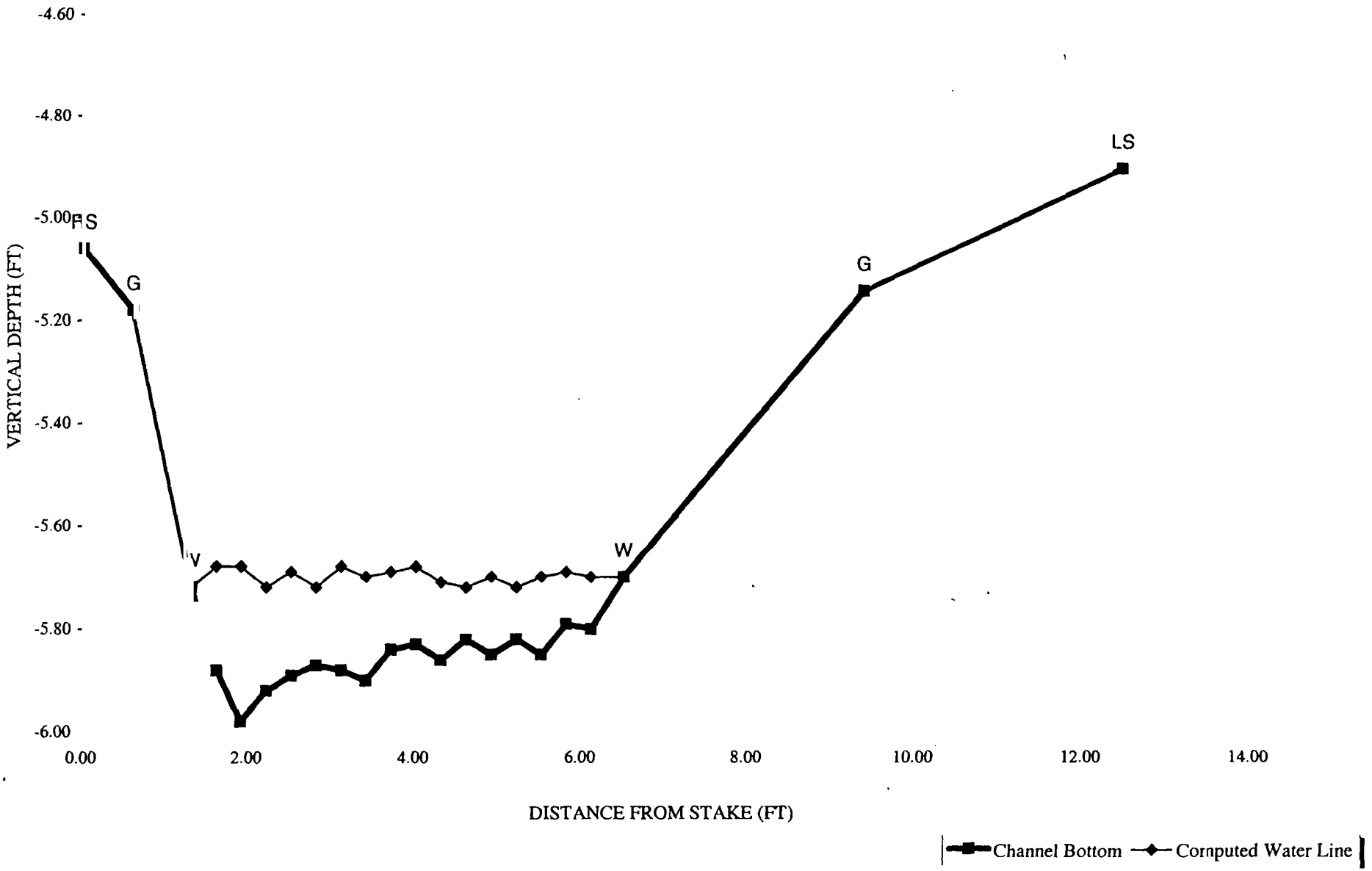
RATIONALE FOR RECOMMENDATION:

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

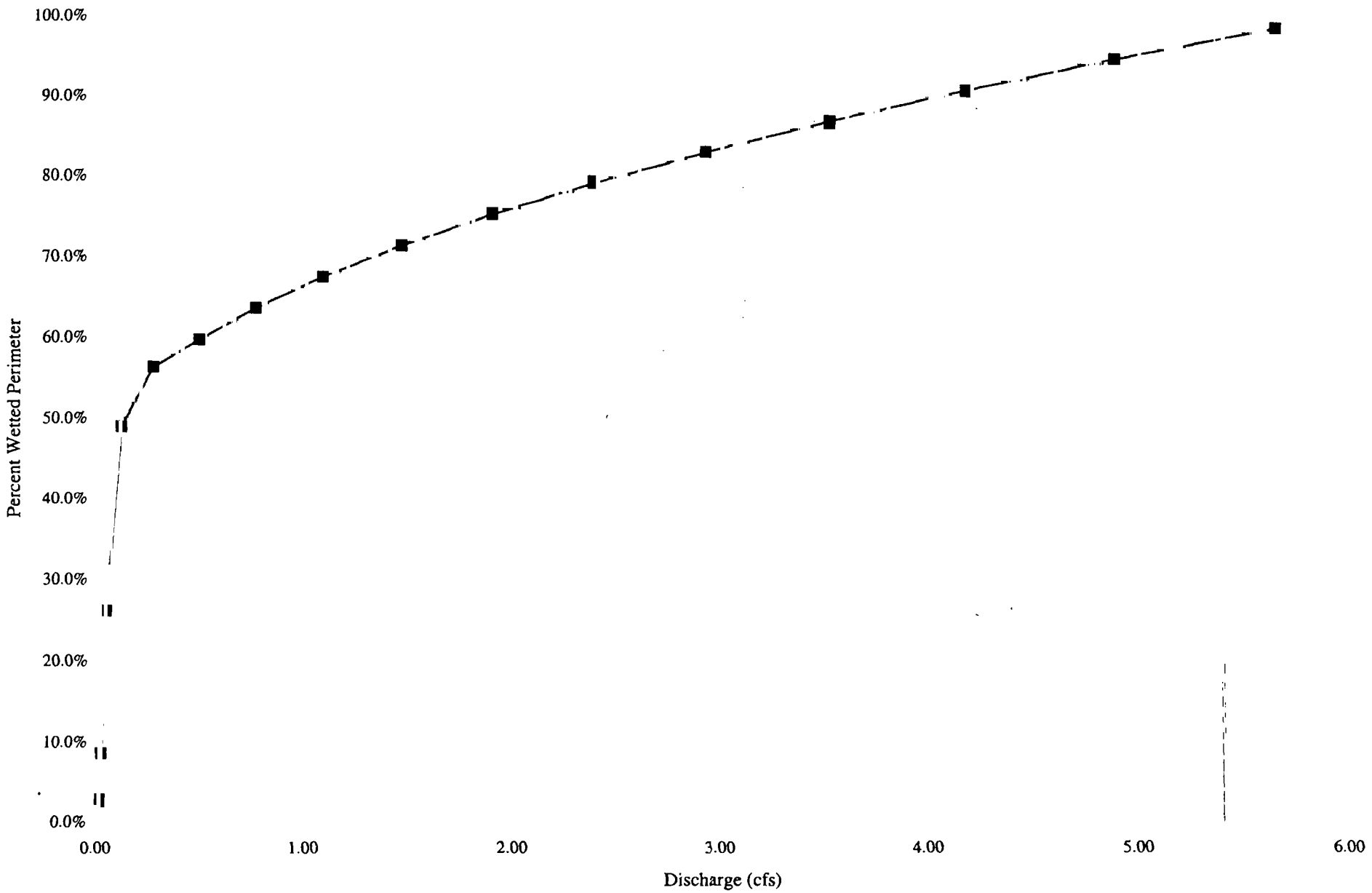
CWCB REVIEW BY: ..... DATE:.....

Black Sulphur Creek

CROSS SECTION DATA ANALYSIS



Percent Wetted Perimeter vs. Discharge



COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Black Sulphur Creek | CROSS-SECTION NO.: 1

CROSS SECTION LOCATION: 2 1/2 miles upstream (road miles) from Equity Oil Co. gate

DATE: 9-28-95 | OBSERVERS: Carol Hollowed, Roy Smith, Paul Daggett

LEGAL DESCRIPTION | ¼ SECTION: NE SE | SECTION: 13 | TOWNSHIP: 3 N(S) | RANGE: 99 E(W) | PM: Sixth

COUNTY: Rio Blanco | WATERSHED: White River | WATER DIVISION: 5 | DOW WATER CODE: 19213

MAP(S) | USGS: Yankee Gulch, CO | USFS:

N 39° 47.223' GPS
W 108° 26.820 location

SUPPLEMENTAL DATA

TAG TAPE SECTION SAME AS DISCHARGE SECTION: (YES) NO | METER TYPE: Ryany

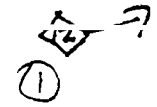
METER NUMBER: standard | DATE RATED: Jan '90 | CALIB/SPIN. ____ sec | TAPE WEIGHT ____ lbs/foot | TAPE TENSION: 15 lbs

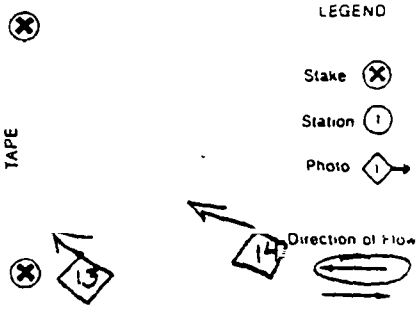
CHANNEL BED MATERIAL SIZE RANGE: sand to 8" cobble | PHOTOGRAPHS TAKEN: (YES) NO | NUMBER OF PHOTOGRAPHS: 3

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	5.12
⊗ Tape @ Stake RB	0.0	5.11
① WS @ Tape LB/RB	0.0	6.94 / 6.95
② WS Upstream	9.8'	6.71
③ WS Downstream	10.0'	7.08
SLOPE	0.37 / 19.8' = 0.01869	

SKETCH





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

Stonefly, Caddisfly - both very large

COMMENTS

Sunny, overcast, warm, breezes, windy

Riparian area in good condition

FORM #ISF ED 1-95

BLKSUL2.WK1
BLKSUL2.PIC

PROOF SHEET

LOCATION INFORMATION

STREAM NAME: Black Sulphur Creek
XS LOCATION: 2.5 road miles us. from Equity Oil C
XS NUMBER: 1

DATE: 9/28/95
OBSERVERS: Carol Hollowed, Roy Smith, Paul Daggett

1/4 SEC: NE SE
SECTION: 13
TWP: 3 S
RANGE: 99 W
PM: 6th

COUNTY: Rio Blanco
WATERSHED: White River
DIVISION: 5
DOW CODE: 19213

USGS MAP: Yankee Gulch
USFS MAP:

SUPPLEMENTAL DATA

TAPE WT: 0.0106
TENSION: 15

CHANNEL PROFILE DATA

SLOPE: 0.01869

INPUT DATA # DATA POINTS= 26

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	TAPE TO WATER
S	0.00	0.10	0.00	0.00	0.00	0.00	0.00
	2.50	0.50	0.00	0.00	0.00	0.00	0.00
1 G	7.00	0.90	0.00	0.00	0.00	0.00	0.00
	8.00	1.10	0.00	0.00	0.00	0.00	0.00
	9.00	1.50	0.00	0.00	0.00	0.00	0.00
	10.40	1.80	0.00	0.00	0.00	0.00	0.00
W	10.50	1.80	0.00	0.00	0.00	0.00	0.00
	11.00	1.85	0.10	0.00	0.05	0.00	1.82
	11.50	1.90	0.20	0.84	0.10	0.08	1.77
	12.00	1.95	0.20	0.90	0.10	0.09	1.82
	12.50	2.00	0.30	0.77	0.15	0.12	1.77
	13.00	2.00	0.25	0.71	0.13	0.09	1.82
	13.50	2.00	0.30	0.56	0.15	0.08	1.77
R	14.00	1.90	0.15	1.14	0.08	0.09	1.82
	14.50	2.05	0.30	2.20	0.15	0.33	1.82
	15.00	2.00	0.30	2.25	0.15	0.34	1.77
	15.50	2.00	0.30	1.59	0.15	0.24	1.77
	16.00	1.95	0.20	1.73	0.10	0.17	1.82
	16.50	1.90	0.20	0.69	0.10	0.07	1.77
	17.00	1.90	0.15	0.00	0.07	0.00	1.82
W	17.40	1.70	0.00	0.00	0.00	0.00	0.00
	18.00	1.30	0.00	0.00	0.00	0.00	0.00
1 G	19.00	0.90	0.00	0.00	0.00	0.00	0.00
	22.00	0.80	0.00	0.00	0.00	0.00	0.00
	26.00	0.60	0.00	0.00	0.00	0.00	0.00
S	28.50	0.20	0.00	0.00	0.00	0.00	0.00
				TOTALS	1.47	1.70	

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

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

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

LOCATION INFORMATION

STREAM NAME: Black Sulphur Creek
XS LOCATION: 2.5 road miles us. from Equity Oil Co. gate
XS NUMBER: 1

DATE: 9/28/95
OBSERVERS: Carol Hollowed, Roy Smith, Paul Daggett

1/4 SEC: NE SE
SECTION: 13
TWP: 3 S
RANGE: 99 W
PM: 6th

COUNTY: Rio Blanco
WATERSHED: White River
DIVISION: 5
DOW CODE: 19213

USGS MAP: Yankee Gulch
USFS MAP:

SUPPLEMENTAL DATA

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

TAPE WT: 0.0106
TENSION: 15

CHANNEL PROFILE DATA

SLOPE: 0.0186

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

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

STREAM NAME: Black Sulphur Creek
XS LOCATION: 2.5 road miles us. from Equity Oil Co. gate
XS NUMBER: 1

INPUT DATA	# DATA POINTS=	26		VALUES COMPUTED FROM RAW FIELD DATA				
FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
S	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
	2.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
1 G	7.00	0.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
	8.00	1.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
	9.00	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
	10.40	1.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
W	10.50	1.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
	11.00	1.85	0.10	0.00	0.50	0.10	0.05	0.00	0.0%
	11.50	1.90	0.20	0.84	0.50	0.20	0.10	0.08	5.0%
	12.00	1.95	0.20	0.90	0.50	0.20	0.10	0.09	5.3%
	12.50	2.00	0.30	0.77	0.50	0.30	0.15	0.12	6.8%
	13.00	2.00	0.25	0.71	0.50	0.25	0.13	0.09	5.2%
	13.50	2.00	0.30	0.56	0.50	0.30	0.15	0.08	5.0%
R	14.00	1.90	0.15	1.14	0.51	0.15	0.08	0.09	5.0%
	14.50	2.05	0.30	2.20	0.52	0.30	0.15	0.33	19.5%
	15.00	2.00	0.30	2.25	0.50	0.30	0.15	0.34	19.9%
	15.50	2.00	0.30	1.59	0.50	0.30	0.15	0.24	14.1%
	16.00	1.95	0.20	1.73	0.50	0.20	0.10	0.17	10.2%
	16.50	1.90	0.20	0.69	0.50	0.20	0.10	0.07	4.1%
	17.00	1.90	0.15	0.00	0.50	0.15	0.07	0.00	0.0%
W	17.40	1.70	0.00	0.00	0.45	0.00	0.00	0.00	0.0%
	18.00	1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
1 G	19.00	0.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
	22.00	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
	26.00	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
S	28.50	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
TOTALS					7.00	0.3 (Max.)	1.47	1.70	100.0%

Manning's n = 0.0621

STREAM NAME: Black Sulphur
XS LOCATION: 2.5 road miles
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
1.57	1.47	3.33	126.9%
1.59	1.47	3.16	115.2%
1.61	1.47	2.99	103.6%
1.63	1.47	2.82	92.2%
1.65	1.47	2.66	80.9%
1.67	1.47	2.49	69.9%
1.69	1.47	2.33	59.0%
1.71	1.47	2.18	48.2%
1.73	1.47	2.02	37.6%
1.75	1.47	1.87	27.2%
1.77	1.47	1.72	17.0%
1.78	1.47	1.64	11.9%
1.79	1.47	1.57	6.9%
1.80	1.47	1.50	1.9%
1.81	1.47	1.42	-3.0%
1.82	1.47	1.35	-7.9%
1.83	1.47	1.28	-12.7%
1.84	1.47	1.21	-17.5%
1.85	1.47	1.14	-22.2%
1.86	1.47	1.07	-26.9%
1.87	1.47	1.00	-31.6%
1.89	1.47	0.87	-40.5%
1.91	1.47	0.75	-49.2%
1.93	1.47	0.62	-57.5%
1.95	1.47	0.51	-65.5%
1.97	1.47	0.39	-73.2%
1.99	1.47	0.30	-79.8%
2.01	1.47	0.21	-85.6%
2.03	1.47	0.14	-90.6%
2.05	1.47	0.08	-94.8%
2.07	1.47	0.03	-98.3%

WATERLINE AT ZERO
AREA ERROR = 1.801

STREAM NAME: Black Sulphur Creek
XS LOCATION: 2.5 road miles us. from Equity Oil Co. gate
XS NUMBER: 1

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 PER (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	0.96	11.95	0.79	1.16	9.42	12.38	100.0%	0.76	25.72	2.73
	1.00	11.67	0.77	1.12	8.98	12.09	97.7%	0.74	24.10	2.68
	1.05	11.30	0.74	1.07	8.40	11.71	94.6%	0.72	22.06	2.62
	1.10	10.93	0.72	1.02	7.85	11.32	91.5%	0.69	20.12	2.56
	1.15	10.57	0.69	0.97	7.31	10.94	88.4%	0.67	18.29	2.50
	1.20	10.30	0.66	0.92	6.79	10.66	86.1%	0.64	16.45	2.42
	1.25	10.05	0.62	0.87	6.28	10.39	83.9%	0.60	14.70	2.34
	1.30	9.81	0.59	0.82	5.78	10.12	81.8%	0.57	13.04	2.25
	1.35	9.56	0.55	0.77	5.30	9.86	79.6%	0.54	11.47	2.16
	1.40	9.35	0.52	0.72	4.83	9.62	77.7%	0.50	9.98	2.07
	1.45	9.15	0.48	0.67	4.36	9.39	75.9%	0.46	8.57	1.96
	1.50	8.95	0.44	0.62	3.91	9.17	74.1%	0.43	7.26	1.85
	1.55	8.75	0.40	0.57	3.47	8.95	72.3%	0.39	6.04	1.74
	1.60	8.47	0.36	0.52	3.04	8.64	69.8%	0.35	4.95	1.63
	1.65	8.16	0.32	0.47	2.62	8.32	67.2%	0.32	3.98	1.52
	1.70	7.86	0.28	0.42	2.22	7.99	64.6%	0.28	3.10	1.39
	1.75	7.55	0.24	0.37	1.84	7.67	62.0%	0.24	2.32	1.26
WL	1.80	7.23	0.20	0.32	1.47	7.33	59.2%	0.20	1.64	1.12
	1.85	6.90	0.16	0.27	1.11	6.98	56.4%	0.16	1.07	0.96
	1.90	6.30	0.12	0.22	0.78	6.36	51.4%	0.12	0.64	0.81
	1.95	5.71	0.08	0.17	0.48	5.76	46.5%	0.08	0.30	0.63
	2.00	4.12	0.06	0.12	0.24	4.16	33.6%	0.06	0.11	0.48
	2.05	2.72	0.02	0.07	0.07	2.74	22.1%	0.02	0.02	0.27
	2.10	0.27	0.01	0.02	0.00	0.27	2.2%	0.01	0.00	0.15

STREAM NAME: Black Sulphur Creek
XS LOCATION: 2.5 road miles us. from Equity Oil Co. gate
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	1.70	cfs
CALCULATED FLOW (Qc)=	1.64	cfs
(Qm-Qc)/Qm * 100 =	3.1	%
MEASURED WATERLINE (WLm)=	1.82	ft
CALCULATED WATERLINE (WLc)=	1.80	ft
(WLm-WLc)/WLm * 100 =	0.9	%
MAX MEASURED DEPTH (Dm)=	0.30	ft
MAX CALCULATED DEPTH (Dc)=	0.32	ft
(Dm-Dc)/Dm * 100	-6.8	%
MEAN VELOCITY=	1.12	ft/sec
MANNING'S N=	0.062	
SLOPE=	0.0186	ft/ft
.4 * Qm =	0.7	cfs
2.5 * Qm=	4.2	cfs

RECOMMENDED INSTREAM FLOW:

FLOW (CFS)	PERIOD

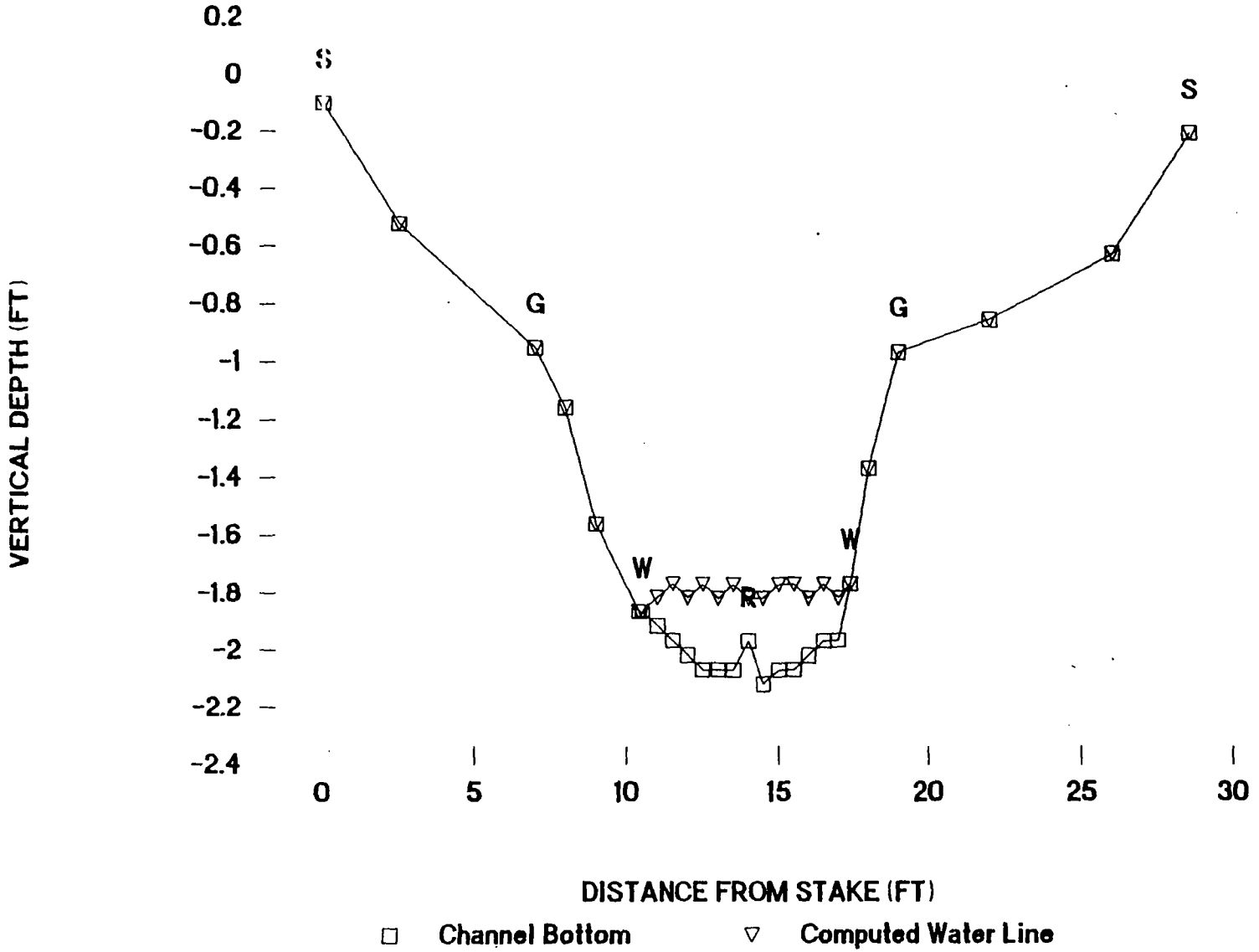
RATIONALE FOR RECOMMENDATION:

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

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

Black Sulphur Creek

CROSS SECTION DATA ANALYSIS



580

COLORADO DIVISION OF WILDLIFE

Length-Weight Data File

Stream Name Black Sulphur Cr.

CDOW Water Code 19213 Date 9 Sept 04

Gear S-R Electroshocka

Effort 700' Station No. –

Species Code	cm Total Length	gms Weight	Species Code	Total Length	Weight	Species Code	Total Length	Weight
CRI X	14.5	30						
CRI X	18.2	72						

Comments: Many fish missed ~10, all salmonids from ~4-12".

CDOW STREAM SURVEY (1991 REVISIO)

LEVEL 2: FIELD SURVEY SUMMARY

STREAM: Black Sulphur Creek SEC#: WATER CODE: 19213 CDOW REGION: NW

SURVEYORS: D. Smith, L. Belmonde DATE OF SURVEY: 9-9-04

SURVEY LOCATION: T 5S R 99W S 25 ELEVATION: STATION #:

UTM ZONE: 12 UTM X: 716996 UTM Y: 4404400

LOCATION DESCRIPTION: at private - BLM boundary

STREAM FLOW PROFILE (Y or N): Y IF YES-DATE AND TYPE

HABITAT EVALUATION (Y or N): N IF YES-DATE AND TYPE

WATER CHEMISTRY ANALYSIS (Y or N): N IF YES-ATTACH SEPARATE ANALYSIS SHEET

FISH PRESENT (Y or N): Y POP. EST. METHOD: STATION LENGTH: 150 (FEET)

AVG. WIDTH: 5 (FEET) TOTAL STATION AREA: 0,017 (ACRES)

FLOW (CFS) AT TIME OF SURVEY: 0.75 cfs METHOD: visual estimate

LIMITING FACTORS TO FISHERY: A7, 9, 10, 11;

COMMENTS:

Many fish escaped - don't use as population estimate,

LENGTH FREQUENCY RECORD (CM)

SPECIES	0 ↓ 2	2 ↓ 4	4 ↓ 6	6 ↓ 8	8 ↓ 10	10 ↓ 12	12 ↓ 14	14 ↓ 16	16 ↓ 18	18 ↓ 20	20 ↓ 22	22 ↓ 24	24 ↓ 26	26 ↓ 28	28 ↓ 30	30 ↓ 32	32 ↓ 34	34 ↓ 36	36 ↓ 38	38 ↓ 40	40 ↓ 42	42 ↓ 44	44 ↓ 46	46 ↓ 48	48 ↓ 50	50 ↓ UP
CRNx								•		•																

SUMMARY INFORMATION

SPECIES	NO. FISH CAUGHT	AVG. LENGTH (CM)	LENGTH RANGE (CM)	AVG. WEIGHT (Grams)	WEIGHT RANGE (Grams)	% TOTAL CATCH	BIOMASS lb/Acre	DENSITY No./Acre	DENSITY Conf. Int.
CRNx	2	16	14-18	51	30-72	100%	X	X	X

COLORADO STREAM SURVEY
(1975 Revision)

Surveyed by: Lowry, Bauman

		CODE
de No.	19213	
te	September 2, 1976	
ction No.		
ream Name	Black Sulphur XX	
Primary Drainage	Piceance	
Major Drainage	White River	
wer terminus	FISHERY	
ocation:	SU-8	
T.	3 South	
R.	98 West	
S.	18	
idth	4 Feet	
levation	6900 Feet	
low (c.f.s.)	.75	
H		
lth		
O		
DTA		
onductivity		
if stream profile obtained		
er terminus		
ocation:	SU-6	
T.	3 South	
R.	99 West	
S.	26	
idth	3 Feet	
levation	7000 Feet	
low	.7 (c.f.s.)	
H		
lth		
O		
DTA		
onductivity		
if stream profile obtained	X	
tion Summary		XXX
ander factor		33
ngth in Miles	2	34
dth in feet		35
reage		36
served flow		37
if inundated by reservoir		38
leage unsectioned	10	39
ties where section is located		XXX
unty	Rio Blanco	40
Miles	3	41
unty		42
Miles		43
unty		44
Miles		45

			CODE
1	Region	NW	4
2	Beaver dams		XX
3	Number (count or estimate)		4
4	Estimated acreage		4
5	Physical stream damage (% of section affected)		XX
6	Bank degredation	20%	4
	Channelization		5
7	Dredging		5
	Mine tailing encroachment		5
	Road encroachment		5
	Accessibility (miles)		XX
8	Surfaced		5
9	Non-surfaced car	2	5
10	4-wheel		5
11	Established trail		5
12	No established trail	4	5
13	Boat only		5
14	No access		6
15	Land Status and mileage		XX
16	USFS		6
17	BLM	2	6
18	Municipal		6
19	Div. of Wild.		6
XXX	Private, no public access	4	6
20	Private, open to public		6
	State Land Board		6
	County		6
21	Mixed small tracts, open		6
22	Mixed small tracts, closed		7
23	Stocking		XX
24	Miles creel size		7
25	Miles fingerling		7
26	Miles fry	X - 1967	7
27	Miles not stocked		7
28	Aquatic Vegetation		XX
29	Filamentous algae (x one)		XX
30	Absent		7
31	Rare	X	7
32	Common		7
XXX	Abundant		7
33	Watercress		XX
34	X if present		7
35	Stream Size classification (x one)		XX
36	Large river ≥ 100'		8
37	River 60-99'		8
38	Large stream 36-59'		8
39	Medium 20-35'		8
XXX	Small 10-19'		8
40	Minor 4-9'	X	8
41	Very small stream < 4'		8
42	Gradient (computer-use elevation & miles)		XX
43	Percent per mile	0.6	8
44			
45			

		Code
ishery Value (X one)		XXXX
None		88
Poor		89
Below average		90
Average		91
Above average	X	92
Excellent		93
ishery Value - limiting factors		XXXX
		94
		95
		96
ISH SAMPLING		XXXX
Lower or only station		XXXX
Elevation		97
Describe or map station location		98

			Code
Sampling method	Shock	99	115
Length - feet	81	100	116
Sampling adequate	X	101	117
Sampling inadequate		102	118
X if scales collected		103	119
Estimated % of fish biomass		XXXX	XXXX
Rough fish		104	120
Game Fish	100%	105	121
Estimated % of rough fish biomass		XXXX	XXXX
Bullheads		106	122
Carp		107	123
Cottids		108	124
Dace		109	125
Minnows		110	126
Suckers		111	127
Sunfish		112	128

	Code
Upper Station	XXXX
Elevation	113
Describe or map station location	114
Combined stations	XXXX
Estimated % of fish biomass	XXXX
Rough fish	129
Game Fish	130
Estimate % of rough fish biomass	XXXX
Bullheads	131
Carp	132
Cottids	133
Dace	134
Minnows	135
Suckers	136
Sunfish	137
No. of game fish 6.0 per mile	138

Length-frequency distribution by one-inch size groups (1.0 - 1.9 etc.)

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	>15	20	Total
LOWER STATION																	
Rainbow																	
Brown																	
Brook																	
Native	100				1	2	4	5	5	4	3	2	2			1	29
Whitefish																	
Total																	
UPPER STATION																	
Rainbow																	
Brown																	
Brook																	
Native																	
Whitefish																	
Total																	
COMBINED STATIONS																	
Rainbow																	
Brown																	
Brook																	
Native																	
Whitefish																	
Total																	

POPULATION ESTIMATE

A	B	C	D	D C		Code
Marked Fish	Fish Captured	Marked Recovery	A X B	Population Estimate	No. ≥ 6.0 (For Station)	139
					Weight ≥ 6.0 (For Station)	140

	Code
Resident game fish size rating	141
Resident game fish density rating	142
Recommended flow from profile	143

Comments and Recommendations

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Black Sulphur Creek | CROSS-SECTION NO.: 2

CROSS SECTION LOCATION: at private-public boundary

DATE: 9-9-04 | OBSERVERS: R. Smith, P. Daggett

LEGAL DESCRIPTION: ¼ SECTION: NE | SECTION: 25 | TOWNSHIP: 3 N/S | RANGE: 99 E/W | PM: 6th

COUNTY: Rio Blanco | WATERSHED: White River | WATER DIVISION: 6 | DOW WATER CODE: 19213

MAP(S): USGS: Yankee Gulch 7.5' | USFS: | Zone 13 NAD27 | 716 995 m | 4404400 m (113)

SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES/NO | METER TYPE: Marsh-McBirney

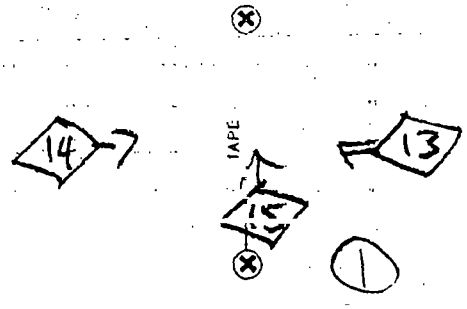
METER NUMBER: | DATE RATED: | CALIB/SPIN ____ sec | TAPE WEIGHT surveyed ____ lbs/foot | TAPE TENSION surveyed ____ lbs

CHANNEL BED MATERIAL SIZE RANGE: silt to 4" cobbles | PHOTOGRAPHS TAKEN: YES/NO | NUMBER OF PHOTOGRAPHS: 4

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	surveyed
⊗ Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB	0.0	
② WS Upstream	15.0'	4.81
③ WS Downstream	15.0'	5.90
SLOPE	1.09 / 30.0' = 0.04	

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
see attached																	

AQUATIC INSECTS IN STREAM SECTION BY COMMON OR SCIENTIFIC ORDER NAME

mayfly, stonefly, caddisfly

COMMENTS

Abundant fish.
Silt is a limiting factor

Ph: 8.6 TDS: 580 Stream Temp = 12.0

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Black Sulphur Creek | CROSS-SECTION NO: 2 | DATE: 9-9-04 | SHEET ___ OF ___

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM (0.0 AT STAKE) | LEFT / RIGHT | Gage Reading: ____ ft | TIME: 1:30 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 (ft²)	Discharge (CFS)
RS	0.0		5.06								
G	0.6		5.~~48~~								
W	1.3		5.72	0.00							
	1.6		5.88	0.20				A			
	1.9		5.98	0.30				0.67			
	2.2		5.92	0.20				1.88			
	2.5		5.89	0.20				1.68			
	2.8		5.87	0.15				1.04			
	3.1		5.88	0.20				0.18			
	3.4		5.90	0.20				0.59			
	3.7		5.84	0.15				0.27			
	4.0		5.83	0.15				0.22			
	4.3		5.86	0.15				0.71			
	4.6		5.82	0.10				0.78			
	4.9		5.85	0.15				0.32			
	5.2		5.82	0.10				0.12			
	5.5		5.85	0.15				0.38			
	5.8		5.79	0.10				0.33			
	6.1		5.80	0.10				0			
W	6.5		5.70	0.00							
G	9.4		5.14								
LS	12.5		4.90								

TOTALS:

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

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

LOCATION INFORMATION

STREAM NAME:	Black Sulphur Creek
XS LOCATION:	at private-public boundary
XS NUMBER:	2
DATE:	9-Sep-04
OBSERVERS:	R. Smith, P. Daggett
1/4 SEC:	NE
SECTION:	25
TWP:	3 S
RANGE:	99 W
PM:	6th PM
COUNTY:	Rio Blanco
WATERSHED:	White River
DIVISION:	6
DOW CODE:	19213
USGS MAP:	Yankee Gulch 7.5
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: 0.04

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

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

STREAM NAME: Black Sulphur Creek
XS LOCATION: at private-public boundary
XS NUMBER: 2

DATA POINTS= 22

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
	RS	0.00	5.06			0.00		0.00	0.00	0.0%
1	G	0.60	5.18			0.00		0.00	0.00	0.0%
	W	1.30	5.72	0.00		0.00		0.00	0.00	0.0%
		1.60	5.88	0.20	0.00	0.34	0.20	0.06	0.00	0.0%
		1.90	5.98	0.30	0.67	0.32	0.30	0.09	0.06	12.5%
		2.20	5.92	0.20	1.88	0.31	0.20	0.06	0.11	23.4%
		2.50	5.89	0.20	1.61	0.30	0.20	0.06	0.10	20.0%
		2.80	5.87	0.15	1.04	0.30	0.15	0.05	0.05	9.7%
		3.10	5.88	0.20	0.13	0.30	0.20	0.06	0.01	1.6%
		3.40	5.90	0.20	0.59	0.30	0.20	0.06	0.04	7.3%
		3.70	5.84	0.15	0.27	0.31	0.15	0.05	0.01	2.5%
		4.00	5.83	0.15	0.22	0.30	0.15	0.05	0.01	2.1%
		4.30	5.86	0.15	0.71	0.30	0.15	0.05	0.03	6.6%
		4.60	5.82	0.10	0.78	0.30	0.10	0.03	0.02	4.9%
		4.90	5.85	0.15	0.32	0.30	0.15	0.05	0.01	3.0%
		5.20	5.82	0.10	0.12	0.30	0.10	0.03	0.00	0.7%
		5.50	5.85	0.15	0.38	0.30	0.15	0.05	0.02	3.5%
		5.80	5.79	0.10	0.33	0.31	0.10	0.03	0.01	2.1%
		6.10	5.80	0.10	0.00	0.30	0.10	0.04	0.00	0.0%
	W	6.50	5.70	0.00		0.41		0.00	0.00	0.0%
1	G	9.40	5.14			0.00		0.00	0.00	0.0%
	LS	12.50	4.90			0.00		0.00	0.00	0.0%
	TOTALS ----------					5.30	0.3 (Max.)	0.79	0.48	100.0%

Manning's n = 0.1355
Hydraulic Radius= 0.148159897

STREAM NAME: Black Sulphur Creek
XS LOCATION: at private-public boundary
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	0.79	0.73	-7.0%
5.46	0.79	2.22	183.2%
5.48	0.79	2.09	166.1%
5.50	0.79	1.96	149.3%
5.52	0.79	1.83	132.8%
5.54	0.79	1.70	116.7%
5.56	0.79	1.58	100.9%
5.58	0.79	1.46	85.5%
5.60	0.79	1.34	70.3%
5.62	0.79	1.22	55.5%
5.64	0.79	1.11	41.1%
5.66	0.79	1.00	26.9%
5.67	0.79	0.94	20.0%
5.68	0.79	0.89	13.1%
5.69	0.79	0.83	6.3%
5.70	0.79	0.78	-0.3%
5.71	0.79	0.73	-7.0%
5.72	0.79	0.68	-13.5%
5.73	0.79	0.63	-20.0%
5.74	0.79	0.58	-26.4%
5.75	0.79	0.53	-32.8%
5.76	0.79	0.48	-39.0%
5.78	0.79	0.38	-51.3%
5.80	0.79	0.29	-63.1%
5.82	0.79	0.21	-73.9%
5.84	0.79	0.13	-83.1%
5.86	0.79	0.09	-89.1%
5.88	0.79	0.05	-93.9%
5.90	0.79	0.03	-96.6%
5.92	0.79	0.01	-98.2%
5.94	0.79	0.01	-99.2%
5.96	0.79	0.00	-99.8%

WATERLINE AT ZERO
AREA ERROR = 5.699

STREAM NAME: Black Sulphur Creek
XS LOCATION: at private-public boundary
XS NUMBER: 2

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"	5.18	8.59	0.51	0.80	4.38	8.93	100.0%	0.49	5.97	1.36
	5.20	8.47	0.50	0.78	4.21	8.79	98.5%	0.48	5.65	1.34
	5.25	8.14	0.47	0.73	3.79	8.44	94.6%	0.45	4.88	1.29
	5.30	7.82	0.43	0.68	3.39	8.10	90.7%	0.42	4.17	1.23
	5.35	7.50	0.40	0.63	3.01	7.75	86.9%	0.39	3.52	1.17
	5.40	7.17	0.37	0.58	2.65	7.41	83.0%	0.36	2.92	1.10
	5.45	6.85	0.34	0.53	2.29	7.06	79.1%	0.32	2.38	1.04
	5.50	6.52	0.30	0.48	1.96	6.72	75.3%	0.29	1.89	0.97
	5.55	6.20	0.26	0.43	1.64	6.37	71.4%	0.26	1.46	0.89
	5.60	5.88	0.23	0.38	1.34	6.03	67.5%	0.22	1.08	0.81
	5.65	5.55	0.19	0.33	1.05	5.68	63.6%	0.19	0.75	0.71
"WL"	5.70	5.23	0.15	0.28	0.78	5.33	59.8%	0.15	0.48	0.61
	5.75	4.95	0.11	0.23	0.53	5.03	56.4%	0.11	0.26	0.49
	5.80	4.30	0.07	0.18	0.29	4.37	48.9%	0.07	0.11	0.36
	5.85	2.29	0.05	0.13	0.11	2.33	26.1%	0.05	0.03	0.28
	5.90	0.75	0.04	0.08	0.03	0.77	8.6%	0.04	0.01	0.24
	5.95	0.24	0.02	0.03	0.00	0.25	2.8%	0.01	0.00	0.13

1. $0.2\bar{v}$

0.19	0.75	
0.20	X	
0.23	1.08	

$\frac{0.01}{0.04} \quad \frac{X}{0.33}$ $= 0.08 + 0.75 =$ 0.83 cfs

2. 50% wetted perimeter

0.49	0.11
0.50	X
0.56	0.26

$\frac{0.01}{0.07} \quad \frac{X}{0.15}$ $= 0.02 + 0.11 =$ 0.13 cfs

3. $1\ ft/sec\ \bar{v}$

0.97	1.89
1.00	X
1.04	2.38

$\frac{0.03}{0.07} \quad \frac{X}{0.49}$ $= 0.21 + 1.89 =$ 2.10 cfs

STREAM NAME: Black Sulphur Creek
XS LOCATION. at private-public boundary
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	0.48	cfs
CALCULATED FLOW (Qc)=	0.48	cfs
(Qm-Qc)/Qm * 100 =	0.5	%
MEASURED WATERLINE (WLm)=	5.71	ft
CALCULATED WATERLINE (WLc)=	5.70	ft
(WLm-WLc)/WLm * 100 =	0.2	%
MAX MEASURED DEPTH (Dm)=	0.30	ft
MAX CALCULATED DEPTH (Dc)=	0.28	ft
(Dm-Dc)/Dm * 100	6.5	%
MEAN VELOCITY=	0.61	ft/sec
MANNING'S N=	0.135	
SLOPE=	0.04	ft/ft
.4 * Qm =	0.2	cfs
2.5 * Qm=	1.2	cfs

RECOMMENDED INSTREAM FLOW:

FLOW (CFS)	PERIOD

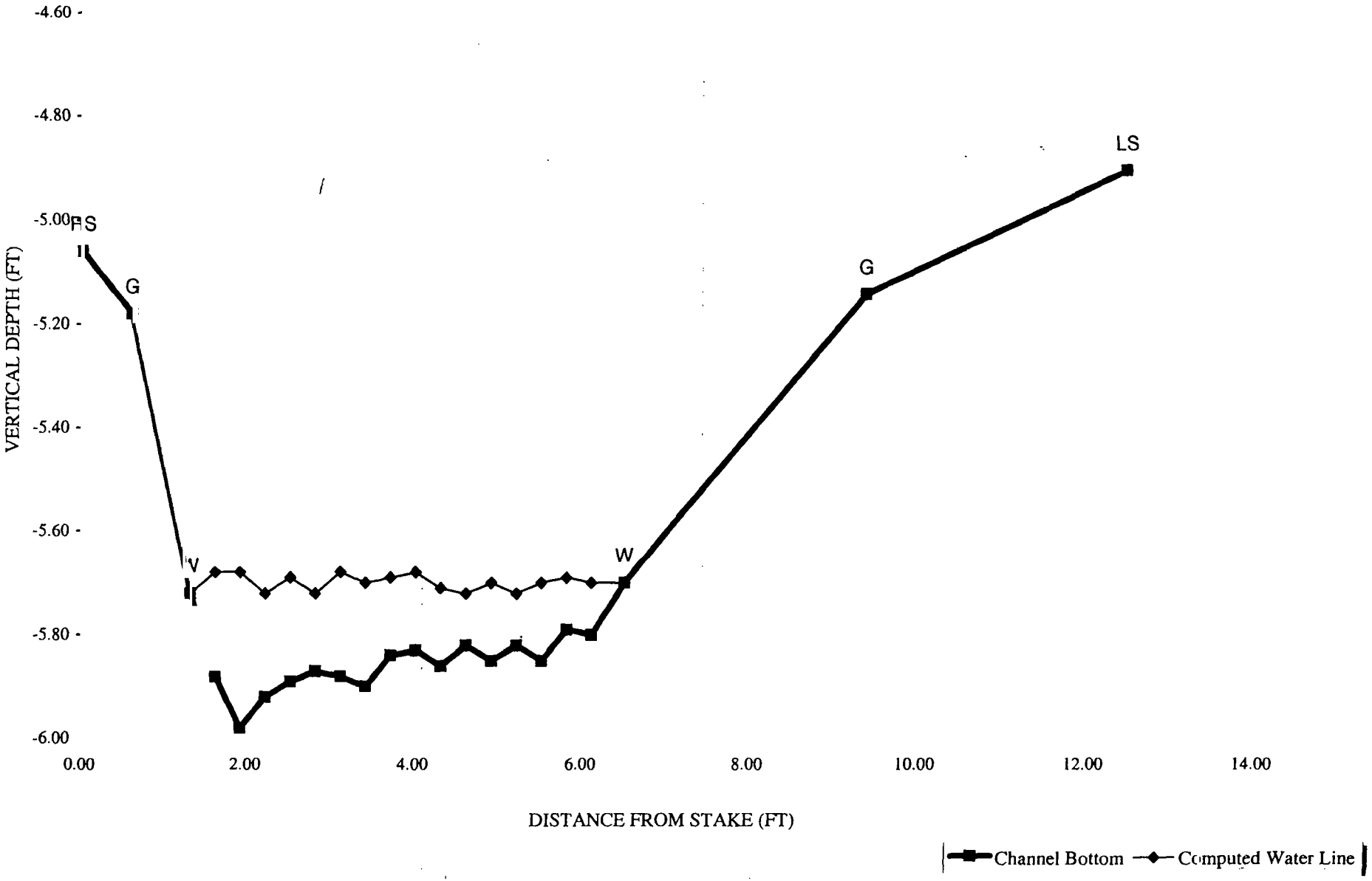
RATIONALE FOR RECOMMENDATION:

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

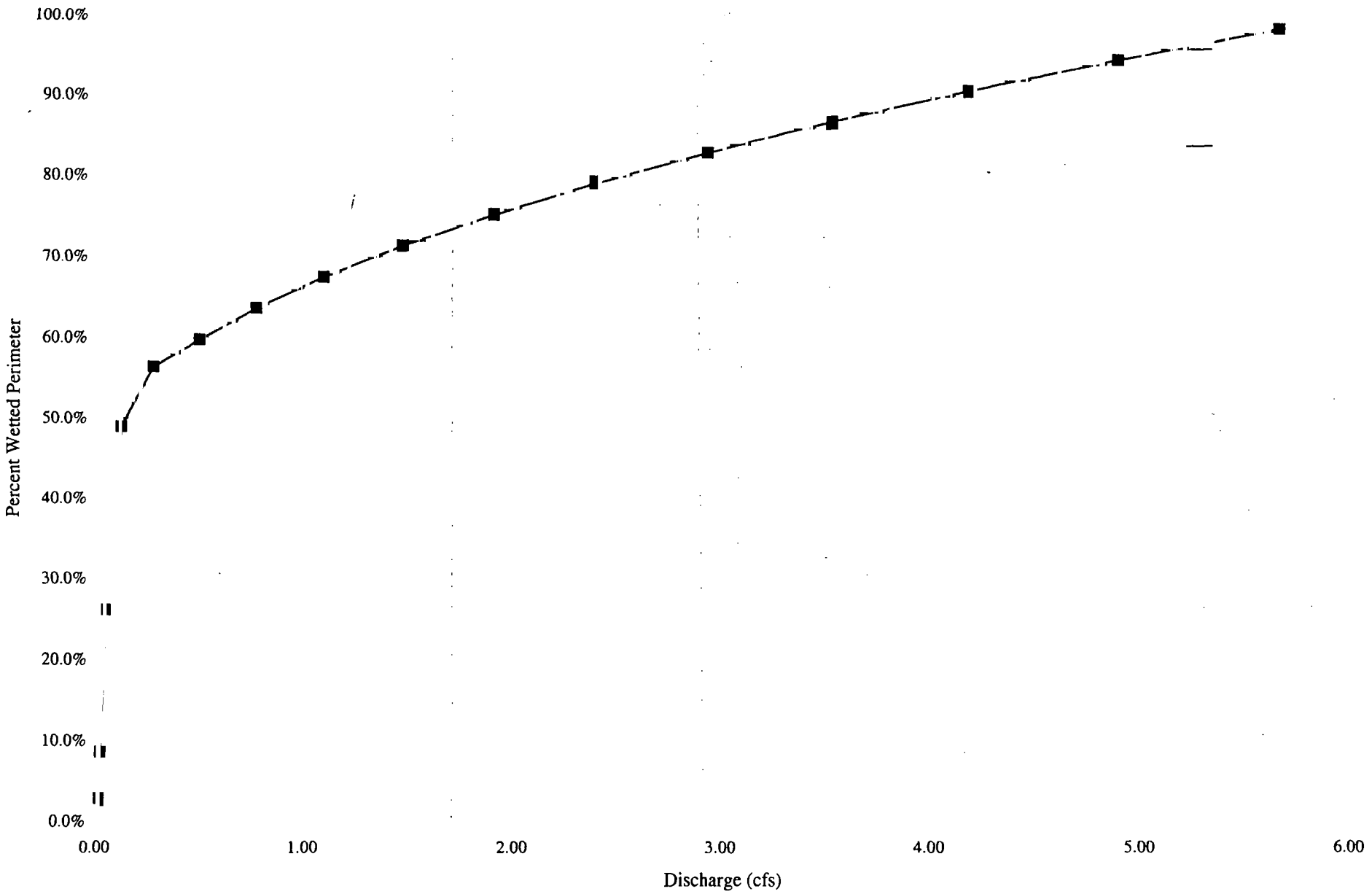
CWCB REVIEW BY: ..... DATE:.....

Black Sulphur Creek

CROSS SECTION DATA ANALYSIS



Percent Wetted Perimeter vs. Discharge



COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Black Sulphur Creek | CROSS-SECTION NO: 1

CROSS-SECTION LOCATION: 250 downstream from private - public boundary

DATE: 9-9-04 | OBSERVERS: R. Smith, P. Daggett

LEGAL DESCRIPTION | ¼ SECTION: NE | SECTION: 25 | TOWNSHIP: 3 N/S | RANGE: 99 E/W | PM: 6th

COUNTY: Rio Blanco | WATERSHED: White River | WATER DIVISION: 6 | DOW WATER CODE: 19213

MAP(S) | USGS: Yankee Gulch 7.5' | USFS:

NAD27 717091 m 4404435 m

SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: (YES) NO | METER TYPE: Marsh-McBirney

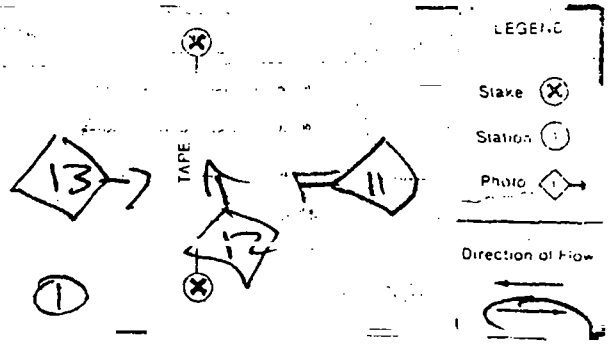
METER NUMBER: | DATE RATED: | CALIB/SPIN ____ sec | TAPE WEIGHT: surveyed lbs/foot | TAPE TENSION: surveyed lbs

CHANNEL BED MATERIAL SIZE RANGE: silt to 4" cobbles | PHOTOGRAPHS TAKEN: (YES) NO | NUMBER OF PHOTOGRAPHS: 3

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	surveyed
⊗ Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB	0.0	5.59/5.59
② WS Upstream	15.0'	5.42
③ WS Downstream	15.0'	5.82
SLOPE	0.40/30.0' = 0.01	

SKETCH



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
see attached																	

AQUATIC INSECTS IN STREAM SECTION BY COMMON OR SCIENTIFIC ORDER NAME

mayfly, caddisfly, stonefly

COMMENTS

pH = 8.6 TDS = 580 Stream Temp = 12°C

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Black Sulphur Creek | CROSS-SECTION NO: 1 | DATE: 9-09-04 | SHEET __ OF __

BEGINNING OF MEASUREMENT: EDGE OF WATER LOOKING DOWNSTREAM (0.0 AT STAKE) | LEFT / RIGHT | Gage Reading: 0.2 ft | TIME: 12:45

Features (Stake (S), Grassline (G), Waterline (W), Rock (R))	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Ins: (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft²)	Discharge (cfs)
LS	0.0		4.42								
G	1.0		5.20								
	2.0		5.50								
W	2.8		5.59	Ø				Ø			
	3.3		5.60	Ø				Ø			
	3.8		5.69	0.1				0.12			
	4.3		5.74	0.15				0.16			
	4.8		5.67	0.05				0.10			
	5.1		5.72	0.1				0.72			
	5.4		5.74	0.15				1.11			
	5.7		5.75	0.15				1.19			
	6.0		5.72	0.1				0.52			
	6.3		5.76	0.15				1.20			
	6.7		5.78	0.20				0.59			
	7.0		5.75	0.15				0.44			
	7.3		5.73	0.15				1.05			
	7.6		5.72	0.15				0.06			
	8.1		5.68	0.10				0.19			
	8.6		5.73	0.15				0.15			
	9.1		5.71	0.10				0.04			
W	9.7		5.69	Ø				Ø			
G	13.0		5.24								
RS	17.5		4.65								
TOTALS											

End of Measurement | Time: 1:05 | Gage Reading: 0.2 ft | CALCULATIONS PERFORMED BY: | CALCULATIONS CHECKED BY:

Data Input & Proofing

STREAM NAME: |Black Sulphur Creek
XS LOCATION: |250' downstream from private-public boundary
XS NUMBER: |1
DATE: |9/9/04
OBSERVERS: |R. Smith, P. Daggett

1/4 SEC: |NE
SECTION: |25
TWP: |3 S
RANGE: |99 W
PM: |6th PM

COUNTY: |Rio Blanco
WATERSHED: |White River
DIVISION: |6
DOW CODE: |19213
USGS MAP: |Yankee Gulch 7.5
USFS MAP: |

| Level and Rod Survey |
TAPE WT: |0.0106 lbs / ft
TENSION: |99999 lbs

SLOPE: | 0.01|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 = 23					
	LS	0.00	4.42			0.00	0.00	0.00
1	G	1.00	5.20			0.00	0.00	0.00
		2.00	5.50			0.00	0.00	0.00
	W	2.80	5.50	0.00	0.00	0.00	0.00	0.00
		3.30	5.60	0.00	0.00	0.00	0.00	0.00
		3.80	5.69	0.10	0.13	0.05	0.01	5.59
		4.30	5.74	0.15	0.16	0.08	0.01	5.59
		4.80	5.67	0.05	0.10	0.02	0.00	5.62
		5.10	5.72	0.10	0.72	0.03	0.02	5.62
		5.40	5.74	0.15	1.11	0.05	0.05	5.59
		5.70	5.75	0.15	1.19	0.05	0.05	5.60
		6.00	5.72	0.10	0.52	0.03	0.02	5.62
		6.30	5.76	0.15	1.20	0.05	0.06	5.61
		6.70	5.78	0.20	0.59	0.07	0.04	5.58
		7.00	5.75	0.15	0.44	0.05	0.02	5.60
		7.30	5.73	0.15	1.05	0.05	0.05	5.58
		7.60	5.72	0.15	0.06	0.06	0.00	5.57
		8.10	5.68	0.10	0.19	0.05	0.01	5.58
		8.60	5.73	0.15	0.15	0.08	0.01	5.58
		9.10	5.71	0.10	0.04	0.06	0.00	5.61
	W	9.70	5.59	0.00	0.00	0.00	0.00	0.00
1	G	13.00	5.24			0.00	0.00	0.00
	RS	17.50	4.65			0.00	0.00	0.00

| | Totals| | 0.75| | 0.36|

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

LOCATION INFORMATION

STREAM NAME:	Black Sulphur Creek
XS LOCATION:	250' downstream from private-public boundary
XS NUMBER:	1
DATE:	9-Sep-04
OBSERVERS:	R. Smith, P. Daggett
1/4 SEC:	NE
SECTION:	25
TWP:	3 S
RANGE:	99 W
PM:	6th PM
COUNTY:	Rio Blanco
WATERSHED:	White River
DIVISION:	6
DOW CODE:	19213
USGS MAP:	Yankee Gulch 7.5
USFS MAP:	0

SUPPLEMENTAL DATA

		*** NOTE ***
		Leave TAPE WT and TENSION
		at defaults for data collected
TAPE WT:	0.0106	with a survey level and rod
TENSION:	99999	

CHANNEL PROFILE DATA

SLOPE:	0.01

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

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

STREAM NAME: Black Sulphur Creek
XS LOCATION: 250' downstream from private-public boundary
XS NUMBER: 1

DATA POINTS= 23

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
	LS	0.00	4.42			0.00		0.00	0.00	0.0%
1	G	1.00	5.20			0.00		0.00	0.00	0.0%
		2.00	5.50			0.00		0.00	0.00	0.0%
	W	2.80	5.59	0.00	0.00	0.00		0.00	0.00	0.0%
		3.30	5.60	0.00	0.00	0.00		0.00	0.00	0.0%
		3.80	5.69	0.10	0.13	0.51	0.10	0.05	0.01	1.8%
		4.30	5.74	0.15	0.16	0.50	0.15	0.08	0.01	3.3%
		4.80	5.67	0.05	0.10	0.50	0.05	0.02	0.00	0.6%
		5.10	5.72	0.10	0.72	0.30	0.10	0.03	0.02	6.0%
		5.40	5.74	0.15	1.11	0.30	0.15	0.05	0.05	13.9%
		5.70	5.75	0.15	1.19	0.30	0.15	0.05	0.05	14.9%
		6.00	5.72	0.10	0.52	0.30	0.10	0.03	0.02	4.3%
		6.30	5.76	0.15	1.20	0.30	0.15	0.05	0.06	17.5%
		6.70	5.78	0.20	0.59	0.40	0.20	0.07	0.04	11.5%
		7.00	5.75	0.15	0.44	0.30	0.15	0.05	0.02	5.5%
		7.30	5.73	0.15	1.05	0.30	0.15	0.05	0.05	13.2%
		7.60	5.72	0.15	0.06	0.30	0.15	0.06	0.00	1.0%
		8.10	5.68	0.10	0.19	0.50	0.10	0.05	0.01	2.6%
		8.60	5.73	0.15	0.15	0.50	0.15	0.08	0.01	3.1%
		9.10	5.71	0.10	0.04	0.50	0.10	0.06	0.00	0.6%
	W	9.70	5.59	0.00	0.00	0.61		0.00	0.00	0.0%
1	G	13.00	5.24			0.00		0.00	0.00	0.0%
	RS	17.50	4.65			0.00		0.00	0.00	0.0%
	TOTALS ----------					6.44	0.2 (Max.)	0.75	0.36	100.0%

Manning's n = 0.0736
Hydraulic Radius= 0.116004254

STREAM NAME: Black Sulphur Creek
XS LOCATION: 250' downstream from private-public boundary
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	0.75	0.75	0.1%
5.35	0.75	2.96	295.4%
5.37	0.75	2.75	267.6%
5.39	0.75	2.54	240.4%
5.41	0.75	2.35	214.0%
5.43	0.75	2.15	188.2%
5.45	0.75	1.97	163.1%
5.47	0.75	1.78	138.7%
5.49	0.75	1.61	115.0%
5.51	0.75	1.43	91.9%
5.53	0.75	1.27	69.8%
5.55	0.75	1.11	48.6%
5.56	0.75	1.03	38.4%
5.57	0.75	0.96	28.5%
5.58	0.75	0.89	18.7%
5.59	0.75	0.82	9.3%
5.60	0.75	0.75	0.1%
5.61	0.75	0.68	-8.5%
5.62	0.75	0.62	-16.8%
5.63	0.75	0.56	-25.0%
5.64	0.75	0.50	-33.1%
5.65	0.75	0.44	-41.0%
5.67	0.75	0.33	-56.5%
5.69	0.75	0.22	-71.1%
5.71	0.75	0.12	-83.6%
5.73	0.75	0.05	-93.0%
5.75	0.75	0.02	-97.7%
5.77	0.75	0.00	-99.5%
5.79	0.75	0.00	-100.0%
5.81	0.75	0.00	-100.0%
5.83	0.75	0.00	-100.0%
5.85	0.75	0.00	-100.0%

WATERLINE AT ZERO
AREA ERROR = 5.595

STREAM NAME: Black Sulphur Creek
XS LOCATION: 250' downstream from private-public boundary
XS NUMBER: 1

Constant Manning's n

STAGING TABLE

"GL" = lowest Grassline elevation corrected for sag
"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"	5.24	11.87	0.35	0.54	4.13	11.97	100.0%	0.35	4.10	0.99
	5.25	11.80	0.34	0.53	4.07	11.91	99.4%	0.34	4.02	0.99
	5.30	11.16	0.31	0.48	3.50	11.26	94.0%	0.31	3.24	0.93
	5.35	10.53	0.28	0.43	2.95	10.61	88.6%	0.28	2.54	0.86
	5.40	9.89	0.25	0.38	2.44	9.96	83.2%	0.25	1.93	0.79
	5.45	9.25	0.21	0.33	1.97	9.31	77.8%	0.21	1.41	0.72
	5.50	8.61	0.18	0.28	1.52	8.67	72.4%	0.18	0.96	0.63
	5.55	7.72	0.14	0.23	1.11	7.77	64.9%	0.14	0.61	0.55
"WL"	5.60	6.62	0.11	0.18	0.75	6.66	55.6%	0.11	0.35	0.47
	5.65	5.87	0.07	0.13	0.44	5.91	49.3%	0.07	0.16	0.36
	5.70	4.65	0.04	0.08	0.17	4.67	39.0%	0.04	0.04	0.22
	5.75	1.08	0.02	0.03	0.02	1.08	9.1%	0.02	0.00	0.13

1. $0.2\,\bar{d}$

0.18 0.96 0.02 X
0.20 X 0.03 0.45
0.21 1.41

$= 0.30 + 0.96 =$ 1.26 CFS

2. 50% wetted perimeter

0.49 0.16 0.01 X
0.50 X 0.07 0.19
0.56 0.35

$= 0.03 + 0.16 =$ 0.19 cfs

3. $\bar{V} < 1$ Ft/sec

STREAM NAME: Black Sulphur Creek
XS LOCATION: 250' downstream from private-public boundary
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	0.36	cfs
CALCULATED FLOW (Qc)=	0.35	cfs
(Qm-Qc)/Qm * 100 =	2.2	%
MEASURED WATERLINE (WLm)=	5.60	ft
CALCULATED WATERLINE (WLc)=	5.60	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.20	ft
MAX CALCULATED DEPTH (Dc)=	0.18	ft
(Dm-Dc)/Dm * 100	7.6	%
MEAN VELOCITY=	0.47	ft/sec
MANNING'S N=	0.074	
SLOPE=	0.01	ft/ft
.4 * Qm =	0.1	cfs
2.5 * Qm=	0.9	cfs

RECOMMENDED INSTREAM FLOW:

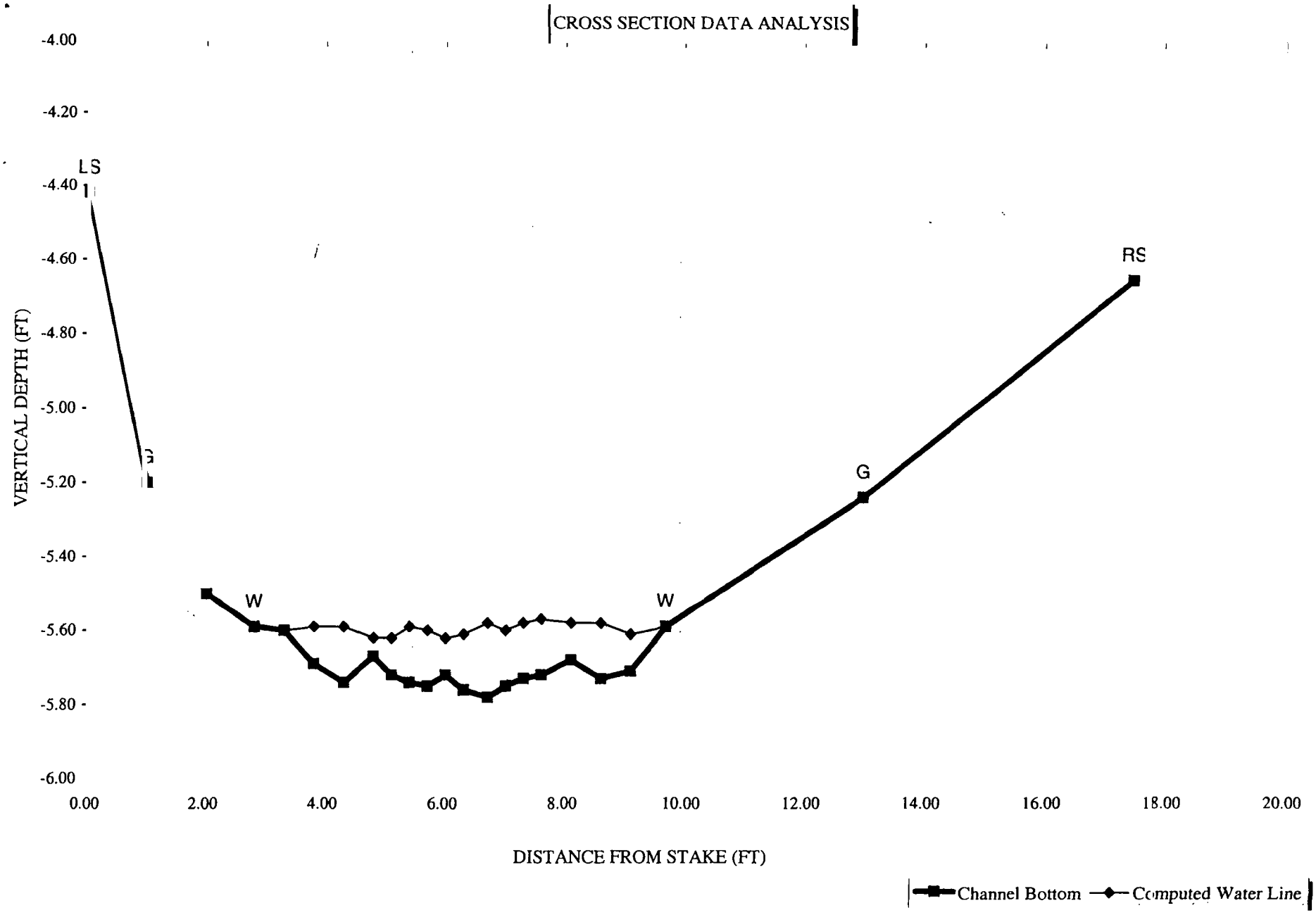
FLOW (CFS)	PERIOD

RATIONALE FOR RECOMMENDATION:

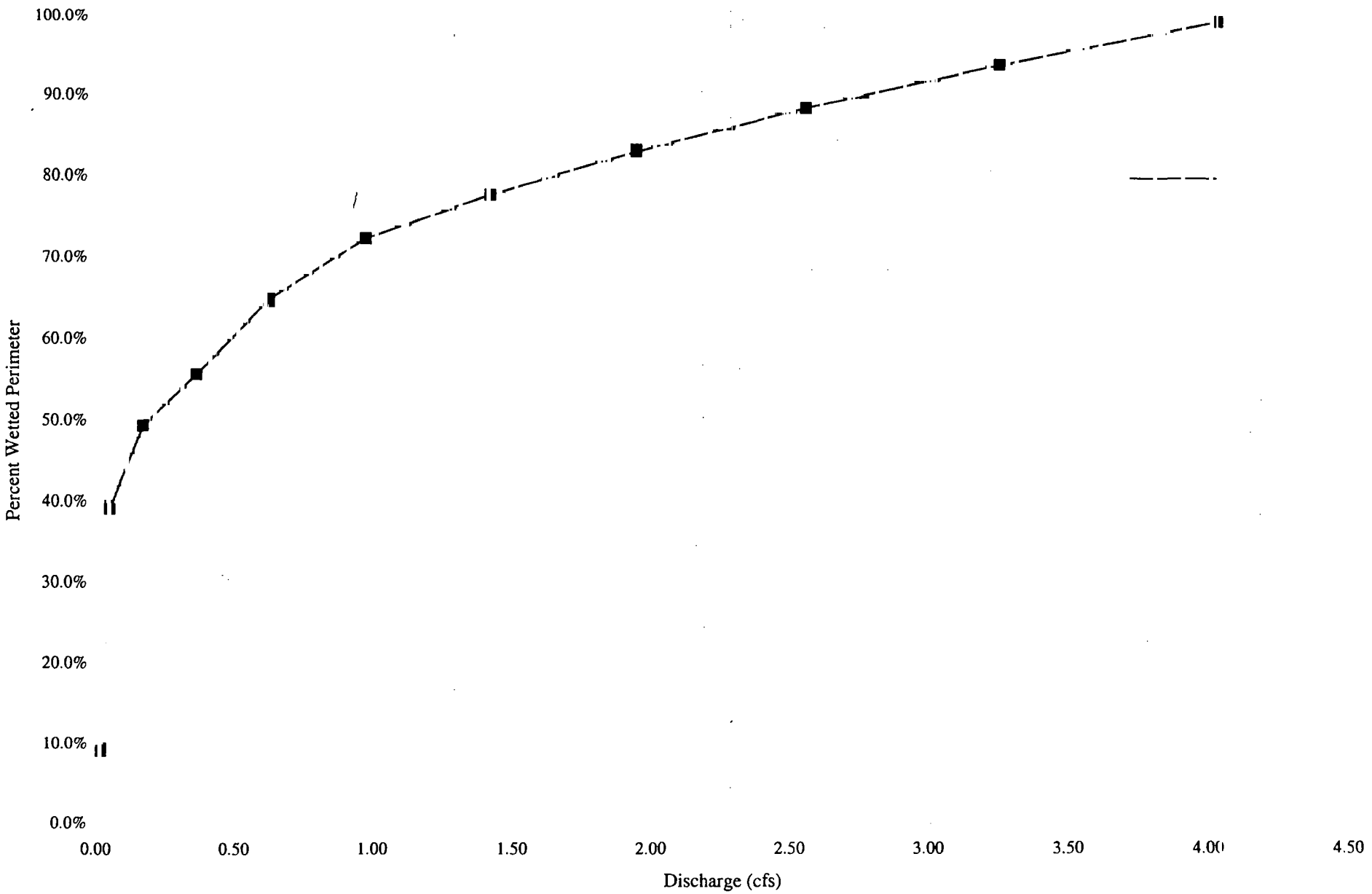
RECOMMENDATION BY: ..... AGENCY..... DATE:.....

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

Black Sulphur Creek



Percent Wetted Perimeter vs. Discharge



COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Black Sulphur Creek | CROSS-SECTION NO.: 1

CROSS-SECTION LOCATION: 2 1/2 miles upstream (road miles) from Equity

0.1 Co. gate

DATE: 9-28-95 | OBSERVERS: Carol Hollowed, Roy Smith, Paul Daggett

LEGAL DESCRIPTION | SECTION: NE SE | SECTION: 13 | TOWNSHIP: 3 N/S | RANGE: 99 E/W | PM: Sixth

COUNTY: Rio Blanco | WATERSHED: White River | WATER DIVISION: 5 | DOW WATER CODE: 19213

MAP(S) | USGS: Yankee Gulch, CO | USFS:

N 39° 47.223' GPS
W 108° 26.820 location

SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: (YES) / NO | METER TYPE: Pygmy

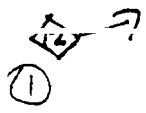
METER NUMBER: standard | DATE RATED: Jan '96 | CALIB/SPIN. ____ sec | TAPE WEIGHT ____ lbs/foot | TAPE TENSION: 15 lbs

CHANNEL BED MATERIAL SIZE RANGE: sand to 8" cobble | PHOTOGRAPHS TAKEN: (YES)/NO | NUMBER OF PHOTOGRAPHS: 3

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	5.12
⊗ Tape @ Stake RB	0.0	5.11
① WS @ Tape LB/RB	0.0	6.94 / 6.95
② WS Upstream	9.8'	6.71
③ WS Downstream	10.0'	7.08
SLOPE	0.37 / 19.8' = 0.01869	

SKETCH



TAPE

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

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

Stoneflies, Caddisflies - both very large

COMMENTS

Snow overcast, warm, sprinkles, windy

Riparian area in good condition

FORM #ISF FD 1-85

BLKSUL2.WR1
BLKSUL2.PIC

PROOF SHEET

LOCATION INFORMATION

INPUT DATA # DATA POINTS= 26

		FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	TAPE TO WATER
STREAM NAME:	Black Sulphur Creek								
XS LOCATION:	2.5 road miles us. from Equity Oil C								
XS NUMBER:	1	S	0.00	0.10	0.00	0.00	0.00	0.00	0.00
			2.50	0.50	0.00	0.00	0.00	0.00	0.00
DATE:	9/28/95	1 G	7.00	0.90	0.00	0.00	0.00	0.00	0.00
OBSERVERS:	Carol Hollowed, Roy Smith, Paul Daggett		8.00	1.10	0.00	0.00	0.00	0.00	0.00
			9.00	1.50	0.00	0.00	0.00	0.00	0.00
1/4 SEC:	NE SE		10.40	1.80	0.00	0.00	0.00	0.00	0.00
SECTION:	13	W	10.50	1.80	0.00	0.00	0.00	0.00	0.00
TWP:	3 S		11.00	1.85	0.10	0.00	0.05	0.00	1.82
RANGE:	99 W		11.50	1.90	0.20	0.84	0.10	0.08	1.77
PM:	6th		12.00	1.95	0.20	0.90	0.10	0.09	1.82
			12.50	2.00	0.30	0.77	0.15	0.12	1.77
COUNTY:	Rio Blanco		13.00	2.00	0.25	0.71	0.13	0.09	1.82
WATERSHED:	White River		13.50	2.00	0.30	0.56	0.15	0.08	1.77
DIVISION:	5	R	14.00	1.90	0.15	1.14	0.08	0.09	1.82
DOW CODE:	19213		14.50	2.05	0.30	2.20	0.15	0.33	1.82
			15.00	2.00	0.30	2.25	0.15	0.34	1.77
USGS MAP:	Yankee Gulch		15.50	2.00	0.30	1.59	0.15	0.24	1.77
USFS MAP:			16.00	1.95	0.20	1.73	0.10	0.17	1.82
			16.50	1.90	0.20	0.69	0.10	0.07	1.77
SUPPLEMENTAL DATA			17.00	1.90	0.15	0.00	0.07	0.00	1.82
		W	17.40	1.70	0.00	0.00	0.00	0.00	0.00
			18.00	1.30	0.00	0.00	0.00	0.00	0.00
TAPE WT:	0.0106	1 G	19.00	0.90	0.00	0.00	0.00	0.00	0.00
TENSION:	15		22.00	0.80	0.00	0.00	0.00	0.00	0.00
			26.00	0.60	0.00	0.00	0.00	0.00	0.00
CHANNEL PROFILE DATA		S	28.50	0.20	0.00	0.00	0.00	0.00	0.00
SLOPE:	0.01869								
						TOTALS	1.47	1.70	

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

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

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

LOCATION INFORMATION

STREAM NAME: Black Sulphur Creek
XS LOCATION: 2.5 road miles us. from Equity Oil Co. gate
XS NUMBER: 1

DATE: 9/28/95
OBSERVERS: Carol Hollowed, Roy Smith, Paul Daggett

1/4 SEC: NE SE
SECTION: 13
TWP: 3 S
RANGE: 99 W
PM: 6th

COUNTY: Rio Blanco
WATERSHED: White River
DIVISION: 5
DOW CODE: 19213

USGS MAP: Yankee Gulch
USFS MAP:

SUPPLEMENTAL DATA

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

TAPE WT: 0.0106
TENSION: 15

CHANNEL PROFILE DATA

SLOPE: 0.0186

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

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

STREAM NAME: Black Sulphur Creek
XS LOCATION: 2.5 road miles us. from Equity Oil Co. gate
XS NUMBER: 1

INPUT DATA		# DATA POINTS= 26			VALUES COMPUTED FROM RAW FIELD DATA				
FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
S	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
	2.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
1 G	7.00	0.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
	8.00	1.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
	9.00	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
	10.40	1.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
W	10.50	1.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
	11.00	1.85	0.10	0.00	0.50	0.10	0.05	0.00	0.0%
	11.50	1.90	0.20	0.84	0.50	0.20	0.10	0.08	5.0%
	12.00	1.95	0.20	0.90	0.50	0.20	0.10	0.09	5.3%
	12.50	2.00	0.30	0.77	0.50	0.30	0.15	0.12	6.8%
	13.00	2.00	0.25	0.71	0.50	0.25	0.13	0.09	5.2%
	13.50	2.00	0.30	0.56	0.50	0.30	0.15	0.08	5.0%
R	14.00	1.90	0.15	1.14	0.51	0.15	0.08	0.09	5.0%
	14.50	2.05	0.30	2.20	0.52	0.30	0.15	0.33	19.5%
	15.00	2.00	0.30	2.25	0.50	0.30	0.15	0.34	19.9%
	15.50	2.00	0.30	1.59	0.50	0.30	0.15	0.24	14.1%
	16.00	1.95	0.20	1.73	0.50	0.20	0.10	0.17	10.2%
	16.50	1.90	0.20	0.69	0.50	0.20	0.10	0.07	4.1%
	17.00	1.90	0.15	0.00	0.50	0.15	0.07	0.00	0.0%
W	17.40	1.70	0.00	0.00	0.45	0.00	0.00	0.00	0.0%
	18.00	1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
1 G	19.00	0.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
	22.00	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
	26.00	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
S	28.50	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
TOTALS					7.00	0.3 (Max.)	1.47	1.70	100.0%

Manning's n = 0.0621

STREAM NAME: Black Sulphur
XS LOCATION: 2.5 road miles
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
1.57	1.47	3.33	126.9%
1.59	1.47	3.16	115.2%
1.61	1.47	2.99	103.6%
1.63	1.47	2.82	92.2%
1.65	1.47	2.66	80.9%
1.67	1.47	2.49	69.9%
1.69	1.47	2.33	59.0%
1.71	1.47	2.18	48.2%
1.73	1.47	2.02	37.6%
1.75	1.47	1.87	27.2%
1.77	1.47	1.72	17.0%
1.78	1.47	1.64	11.9%
1.79	1.47	1.57	6.9%
1.80	1.47	1.50	1.9%
1.81	1.47	1.42	-3.0%
1.82	1.47	1.35	-7.9%
1.83	1.47	1.28	-12.7%
1.84	1.47	1.21	-17.5%
1.85	1.47	1.14	-22.2%
1.86	1.47	1.07	-26.9%
1.87	1.47	1.00	-31.6%
1.89	1.47	0.87	-40.5%
1.91	1.47	0.75	-49.2%
1.93	1.47	0.62	-57.5%
1.95	1.47	0.51	-65.5%
1.97	1.47	0.39	-73.2%
1.99	1.47	0.30	-79.8%
2.01	1.47	0.21	-85.6%
2.03	1.47	0.14	-90.6%
2.05	1.47	0.08	-94.8%
2.07	1.47	0.03	-98.3%

WATERLINE AT ZERO
AREA ERROR = 1.801

STREAM NAME: Black Sulphur Creek
XS LOCATION: 2.5 road miles us. from Equity Oil Co. gate
XS NUMBER: 1

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 PER (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	0.96	11.95	0.79	1.16	9.42	12.38	100.0%	0.76	25.72	2.73
	1.00	11.67	0.77	1.12	8.98	12.09	97.7%	0.74	24.10	2.68
	1.05	11.30	0.74	1.07	8.40	11.71	94.6%	0.72	22.06	2.62
	1.10	10.93	0.72	1.02	7.85	11.32	91.5%	0.69	20.12	2.56
	1.15	10.57	0.69	0.97	7.31	10.94	88.4%	0.67	18.29	2.50
	1.20	10.30	0.66	0.92	6.79	10.66	86.1%	0.64	16.45	2.42
	1.25	10.05	0.62	0.87	6.28	10.39	83.9%	0.60	14.70	2.34
	1.30	9.81	0.59	0.82	5.78	10.12	81.8%	0.57	13.04	2.25
	1.35	9.56	0.55	0.77	5.30	9.86	79.6%	0.54	11.47	2.16
	1.40	9.35	0.52	0.72	4.83	9.62	77.7%	0.50	9.98	2.07
	1.45	9.15	0.48	0.67	4.36	9.39	75.9%	0.46	8.57	1.96
	1.50	8.95	0.44	0.62	3.91	9.17	74.1%	0.43	7.26	1.85
	1.55	8.75	0.40	0.57	3.47	8.95	72.3%	0.39	6.04	1.74
	1.60	8.47	0.36	0.52	3.04	8.64	69.8%	0.35	4.95	1.63
	1.65	8.16	0.32	0.47	2.62	8.32	67.2%	0.32	3.98	1.52
	1.70	7.86	0.28	0.42	2.22	7.99	64.6%	0.28	3.10	1.39
	1.75	7.55	0.24	0.37	1.84	7.67	62.0%	0.24	2.32	1.26
WL	1.80	7.23	0.20	0.32	1.47	7.33	59.2%	0.20	1.64	1.12
	1.85	6.90	0.16	0.27	1.11	6.98	56.4%	0.16	1.07	0.96
	1.90	6.30	0.12	0.22	0.78	6.36	51.4%	0.12	0.64	0.81
	1.95	5.71	0.08	0.17	0.48	5.76	46.5%	0.08	0.30	0.63
	2.00	4.12	0.06	0.12	0.24	4.16	33.6%	0.06	0.11	0.48
	2.05	2.72	0.02	0.07	0.07	2.74	22.1%	0.02	0.02	0.27
	2.10	0.27	0.01	0.02	0.00	0.27	2.2%	0.01	0.00	0.15

STREAM NAME: Black Sulphur Creek
XS LOCATION: 2.5 road miles us. from Equity Oil Co. gate
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	1.70	cfs
CALCULATED FLOW (Qc)=	1.64	cfs
(Qm-Qc)/Qm * 100 =	3.1	%
MEASURED WATERLINE (WLm)=	1.82	ft
CALCULATED WATERLINE (WLc)=	1.80	ft
(WLm-WLc)/WLm * 100 =	0.9	%
MAX MEASURED DEPTH (Dm)=	0.30	ft
MAX CALCULATED DEPTH (Dc)=	0.32	ft
(Dm-Dc)/Dm * 100	-6.8	%
MEAN VELOCITY=	1.12	ft/sec
MANNING'S N=	0.062	
SLOPE=	0.0186	ft/ft
.4 * Qm =	0.7	cfs
2.5 * Qm=	4.2	cfs

RECOMMENDED INSTREAM FLOW:

FLOW (CFS)	PERIOD

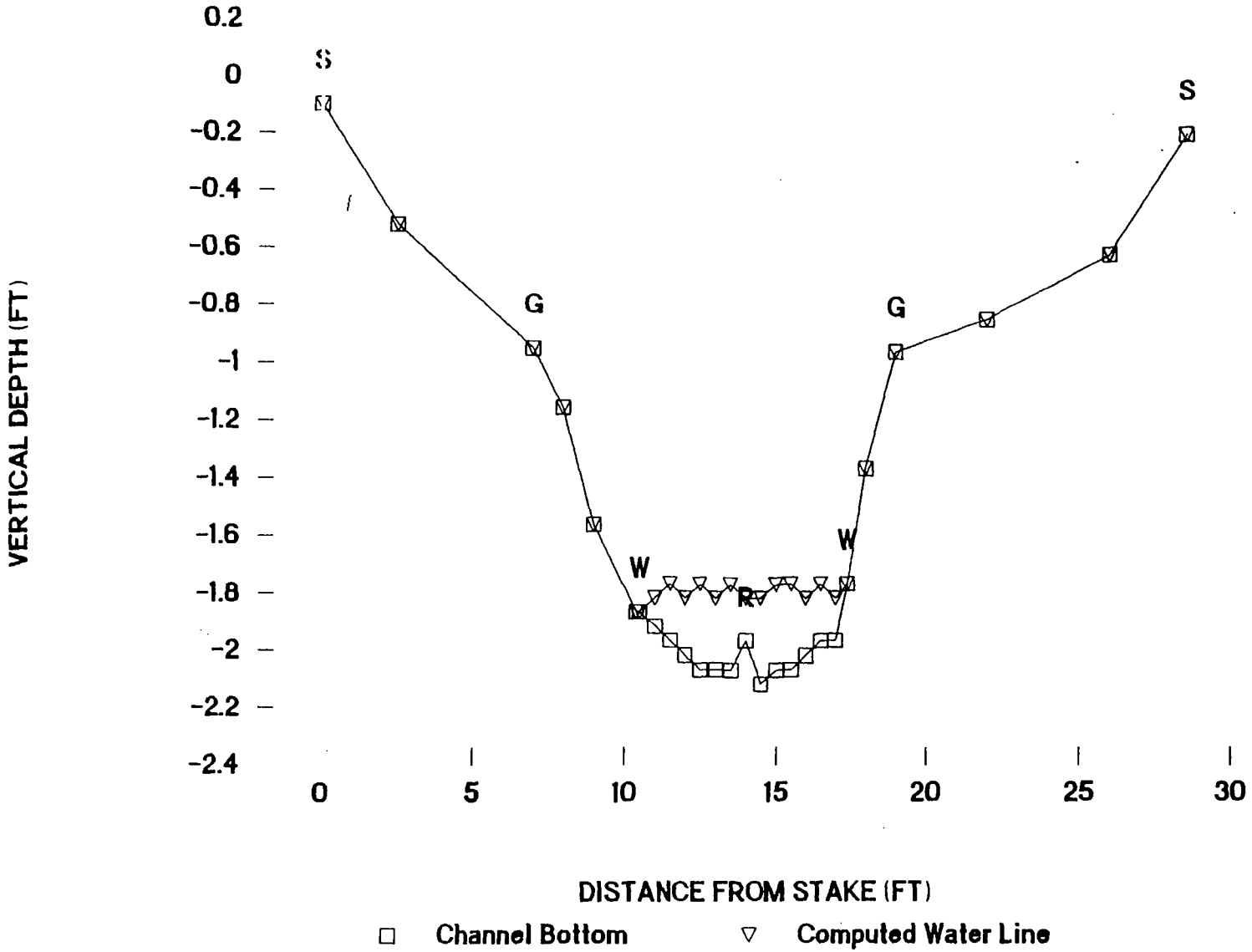
RATIONALE FOR RECOMMENDATION:

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

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

Black Sulphur Creek

CROSS SECTION DATA ANALYSIS



(1975 Revision)

rveyed by: ___ Lowry, Bauman

		CODE			CODE
de No.	19213	1	Region	NW	4
te	September 2, 1976	2	Beaver dams		XX
ction No.		3	Number (count or estimate)		4
ream Name	Black Sulphur XX	4	Estimated acreage		4
Primary Drainage	Piceance	5	Physical stream damage (% of section affected)		XX
Major Drainage	White River	6	Bank degredation	20%	4
ver terminus	FISHERY		Channelization		5
ocation:	SU-8	7	Dredging		5
			Mine tailing encroachment		5
			Road encroachment		5
			Accessibility (miles)		XX
T.	3 South	8	Surfaced		5
R.	98 West	9	Non-surfaced car	2	5
S.	18	10	4-wheel		5
Width	4 Feet	11	Established trail		5
Elevation	6900 Feet	12	No established trail	4	5
Flow (c.f.s.)	.75	13	Boat only		5
pH		14	No access		6
ghth		15	Land Status and mileage		XX
IO		16	USFS		6
EDTA		17	BLM	2	6
Conductivity		18	Municipal		6
if stream profile obtained		19	Div. of Wild.		6
er terminus		XXX	Private, no public access	4	6
ocation:	SU-6	20	Private, open to public		6
			State Land Board		6
			County		6
T.	3 South	21	Mixed small tracts, open		7
R.	99 West	22	Mixed small tracts, closed		7
S.	26	23	Stocking		XX
Width	3 Feet	24	Miles creel size		7
Elevation	7000 Feet	25	Miles fingerling		7
Flow	.7 (c.f.s.)	26	Miles fry	X - 1967	7
pH		27	Miles not stocked		7
ghth		28	Aquatic Vegetation		XX
IO		29	Filamentous algae (x one)		XX
EDTA		30	Absent		7
Conductivity		31	Rare	X	7
if stream profile obtained	X	32	Common		7
tion Summary		XXX	Abundant		7
eander factor		33	Watercress		XX
ength in Miles	2	34	X if present		7
idth in feet		35	Stream Size classification (x one)		XX
creage		36	Large river ≥ 100'		8
bserved flow		37	River 60-99'		8
if inundated by reservoir		38	Large stream 36-59'		8
Cleage unsectioned	10	39	Medium 20-35'		8
ities where section is located		XXX	Small 10-19'		8
ounty	Rio Blanco	40	Minor 4-9'	X	8
Miles	3	41	Very small stream < 4'		8
ounty		42	Gradient (computer-use elevation & miles)		XX
Miles		43	Percent per mile	0.6	8
ounty		44			
Miles		45			

		Code
Fishery Value (X one)		XXXX
None		88
Poor		89
Below average		90
Average		91
Above average	X	92
Excellent		93
Fishery Value - limiting factors		XXXX
		94
		95
		96
FISH SAMPLING		XXXX
Lower or only station		XXXX
Elevation		97
Describe or map station location		98

		Code
Upper Station		XXXX
Elevation		113
Describe or map station location		114

Sampling method	Shock	99
Length - feet	81	100
Sampling adequate	X	101
Sampling inadequate		102
X if scales collected		103
Estimated % of fish biomass		XXXX
Rough fish		104
Game Fish	100%	105
Estimated % of rough fish biomass		XXXX
Bullheads		106
Carp		107
Cottids		108
Dace		109
Minnows		110
Suckers		111
Sunfish		112

	Code
Sampling method	115
Length - feet	116
Sampling adequate	117
Sampling inadequate	118
X if scales collected	119
Estimated % of fish biomass	XXXX
Rough fish	120
Game fish	121
Estimated % of rough fish biomass	XXXX
Bullheads	122
Carp	123
Cottids	124
Dace	125
Minnows	126
Suckers	127
Sunfish	128
Combined stations	XXXX
Estimated % of fish biomass	XXXX
Rough fish	129
Game Fish	130
Estimate % of rough fish biomass	XXXX
Bullheads	131
Carp	132
Cottids	133
Dace	134
Minnows	135
Suckers	136
Sunfish	137
No. of game fish 6.0 per mile	138

Length-frequency distribution by one-inch size groups (1.0 - 1.9 etc.)

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	>15	20	Total
LOWER STATION																	
Rainbow																	
Brown																	
Brook																	
Native					1	2	4	5	5	4	3	2	2			1	29
Whitefish																	
Total																	
UPPER STATION																	
Rainbow																	
Brown																	
Brook																	
Native																	
Whitefish																	
Total																	
COMBINED STATIONS																	
Rainbow																	
Brown																	
Brook																	
Native																	
Whitefish																	
Total																	

POPULATION ESTIMATE

A	B	C	D	D C		Code
Marked Fish	Fish Captured	Marked Recovery	$A \bar{X} B$	Population Extimate	No. $\geq$ 6.0 (For Station)	139
					Weight $\geq$ 6.0 (For Station)	140

	Code
Resident game fish size rating	141
Resident game fish density rating	142
Recommended flow from profile	143

Comments and Recommendations

'72-'73 FISHERIES INVENTORY / 1041 RELATED DATA

Stream Code 19213

'72-'73 Inventory S - _____

Stream Name Black Sulphur Creek

Percent Open to Public ('72 Inventory) _____,

1041 Form A

Quality of Water _____,
Pool-riffle Ratio _____,
Temperature of Water _____,
Clarity of Water _____,
Fish Food Supply _____,
Condition of Fish _____, No Data
Legal Access _____,
Physical Access* _____,
Aesthetic Value _____,
Meanders Value _____,
Improvement Potential _____,

'72 Inventory

Stocking Status _____, (regularly, occasionally, rarely or never)
Population Status _____, (normal, over-populated, under-populated)

☐ MINIMUM STREAM FLOW DATA

SB-97 Computer run Step A

Maximum Channel Width _____,
Maximum Wetted Perimeter _____,
Maximum Depth _____,

"Filed on" Blue book

Decreed Flow _____,

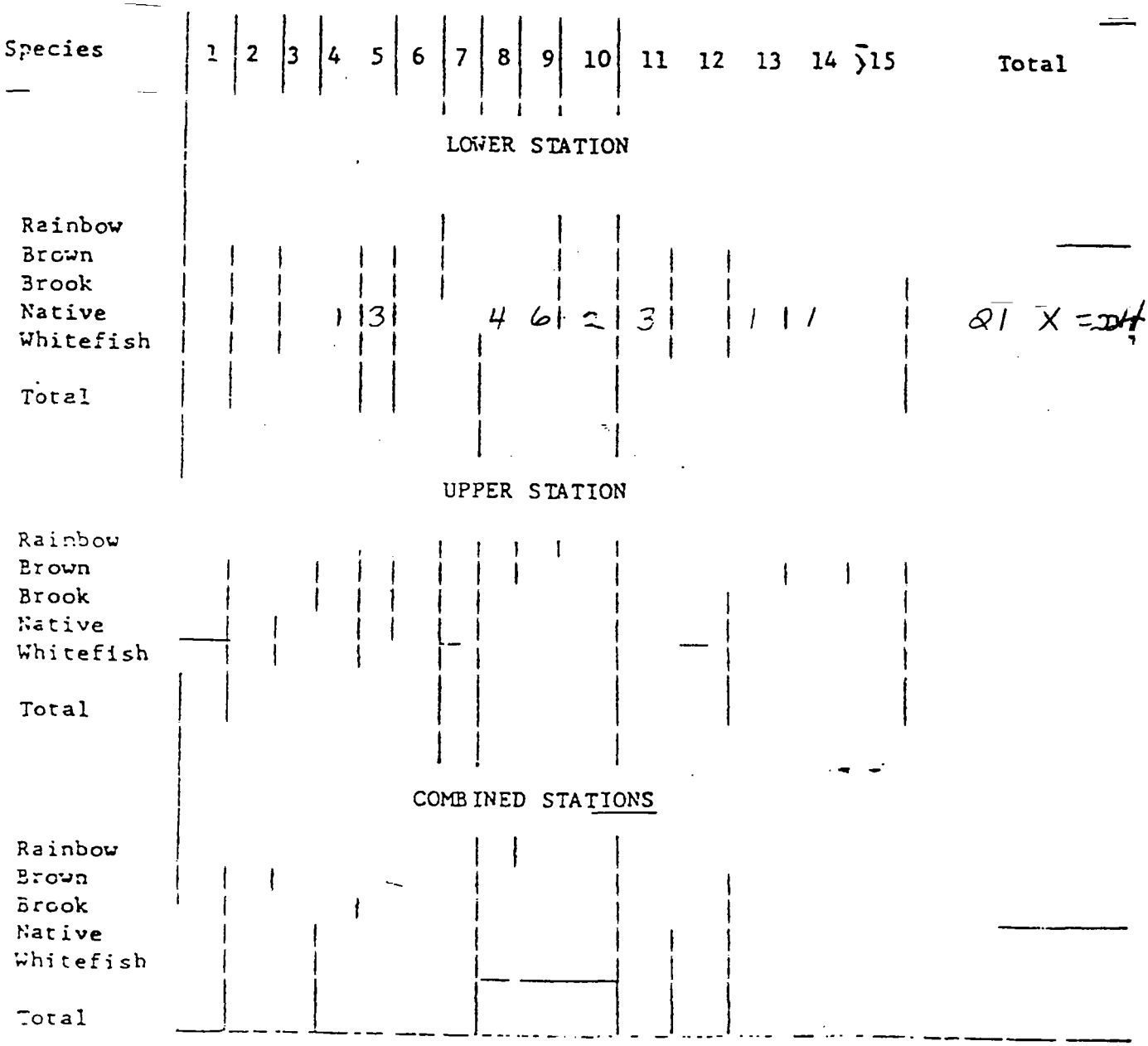
Initial Month _____,
Initial Day _____,
Initial Year _____*

BLACK SOLFO ck (Pacific) 1983

T35 R98W sec 6 (by UTM organic)

19213 1981 data is included

Length-frequency distribution by one-inch size groups (1.0 - 1.9 etc.)



(22)

Black Sulpher Cr

19213

SURVEY OF RIPARIAN AND AQUATIC COMMUNITIES AND COLLECTION OF WATER FLOW DATA WITHIN THE PICEANCE BASIN WILDLIFE HABITAT AREA AND PORTIONS OF THE WHITE RIVER AND ROAN CREEK DRAINAGE

Colorado Division of Wildlife

10/15/77

Project Personnel:

Field Technicians - Mike Bauman, Gayle Hayley, Dave Lowry, Tom Pysto

Ass't Supervisors - Walt Burkhard, Bill Clark

Project Coordinator & Field Supervisor - Ron Krager

	Drainage	(1) Maximum Flow C.F.S.	Relative Stream Width	Trout Species	Dist. (2)	Mean Width	Dominent Species	Condition (3)	Trend (4)	Adjacent Habitat	Improvements Recommended
PICEANCE CREEK	Hunter Cr.	.3	18"	Brook Rainbow	R R	5'	Poa sp.	Poor	Declining	Sagebrush	
	Fawn Cr.	.5	4"	Rainbow	C	10'	Willow	Fair+	Stable	Sagebrush Service-berry	
	Eureka Cr.	.5	1'	None		2.5'	Poa sp. Willow	Fair	Stable	Sagebrush Service-berry	
	Yankee Gulch	.1	5"	None		4'	Poa sp.	Poor	Stable-	Sagebrush	
	Canyon Cr.	.14	3'	Cutthroat	C	20'	Willow Box Elder	Fair	Stable	Sagebrush Service-berry	Recreation
	Ryan Gulch	.2	18"	None		6'	Aspen	Poor+	Declining	Sagebrush Service-berry	Spring Improvement
	Wagonroad Gulch	.1	1'	None		6'	Aspen	Poor+	Stable	Sagebrush Service-berry	Spring Improvement
	Black Sulphur Cr.	.75	6'	Cut-throat Rainbow	C C	15'	Willow Box Elder Golden Rod	Fair	Stable	Sagebrush	Stream Fishery Waterfowl
	Dry Fork Cr.	1.0	3'	None		22'		Fair	Stable	Sagebrush	
	Piceance Cr.	30.6	10'	Rainbow Brown	C R	15'	Poa sp.	Fair	Stable	Sagebrush	Water Fowl
	Yellow Cr.	1.33	5'	None		6'	Bulrush	Fair	Stable	Sagebrush	Spring Improvement
	ig Duck Cr.	.3	1'	None		4'	Poa sp.	Poor	Declining	Sagebrush	
	Left Fork Stake Springs	1.1	1'	None		7'	Poa sp.	Fair-	Declining	Sagebrush Service-berry	
YELLOW CREEK	Stake Springs	1.25	2'	None		10'	Bulrush	Fair-	Stable-	Sagebrush	
	Corral Gulch	.25	1'	None		2'	Poa sp.	Poor	Declining	Sagebrush	
	Box Elder Gulch	.3	1'	None		4'	Poa sp.	Poor	Declining	Sagebrush	
	KU Gulch	.25	2'	None		8'	Aspen Service-berry	Fair	Declining	Service-berry Aspen Blue Spruce	
	Water Gulch	1.1	1'	None		5'	Poa sp.	Poor	Declining	Sagebrush	

TABLE 3 RECOMMENDED WATER FLOWS

	Stream	Location	Required C.F.S. (1)	Degradation Level C.F.S. (2)	Flow Measured (3)	Comments
	Black Sulfur Creek	2S 97W Sec.20 SW	10.0	6.0	10.04	High irrigation us
	Bl[redacted]ulfur	3S 99W Sec.26 NE1/4	1.0	.5	.66	
	Stewart	3S 96W Sec. 9 NW	1.5	.5	1.53	
PICEANCE CREEK	Yellow Cr.	2N 98W Sec.15 NW	2.5	1.3	1.33	No fishery
PICEANCE CREEK	Willow Cr.	2S 97W Sec.35 NE	4.0	1.6	4.06	
PICEANCE CREEK	Piceanca Cr.	1N 97W Sec.11 SE	18.0	6.0	30.60	Low flows in summer due to high irrigation us
PARACHUTE CREEK	Fawn Cr.	2S 97W Sec.20 SW	3.5	2.0	3.44	
PARACHUTE CREEK	Northwater	5S 95W Sec.12 SW1/4	2.0	1.0	1.81	
PARACHUTE CREEK	Northwater	5S 94W Sec.18 SE1/4	2.0	1.0	1.35	
PARACHUTE CREEK	E. Middle Fork	5S 95W Sec.12 SW1/4	3.0	1.5	2.43	
PARACHUTE CREEK	Trappers Cr.	5S 95W Sec.12 SW1/4	1.0	.8	.29	
PARACHUTE CREEK	E. Parachute	6S 95W Sec. 4 NE	3.0	1.8	2.39	
PARACHUTE CREEK	E. Parchute	5S 94W Sec.33 SW	3.0	1.5	1.33	
ROAN CREEK	Brush Creek	5S 99W Sec. 6 SE	1.5	.9	.88	
ROAN CREEK	Brush Creek	5S 99W Sec. 6 NW	--	1.0	.37	No fishery
ROAN CREEK	Brush Creek	5S 99W Sec. 7 SE	1.5	.5	.48	
ROAN CREEK	Brush Creek	5S 99W Sec.12 NW	1.0	.5	.41	
ROAN CREEK	Clear Cr.	5S 99W Sec.12 SE	2.5	2.0	1.34	

Table 4. Minimum stream flow filing recommendation to be submitted to Colorado Water Conservation Board.

Water Division	Stream	County	Upper Point				Lower Point				c.f.s.	Apprx. length (miles)	Fishery	Remarks
			Range	Township	Section	Quarter Section	Range	Township	Section	Quarter Section				
5	East Fork Parachute Cr.	Garfield	94W	5S	26	W½	95W	6S	4	NW¼ (East Fork Falls)	3.0	8.0	Brown, Cutthroat	Potential impact from oil shale development
5	Northwater Cr.	Garfield	94W	5S	16	W½	95W	5S	12	SW¼ (Confluence with Trappers Cr.)	2.0	4.0	Endangered Colo. River Cutthroat	
5	Trappers Cr	Garfield	94W	5S	7	NE¼	95W	5S	12	SW¼ (Confluence with Northwater Cr.)	1.0	2.5	Endangered Colo. River Cutthroat	
5	East Middle Fork Parachute Cr.	Garfield	95W (Confluence Trappers and Northwater)	5S	12	SW¼	95W	5S	16	NE¼ (East Middle Fork Falls)	3.0	2.5	Cutthroat	
6	Black Sulfur	Rio Blanco	99W	4S	16	SW¼	99W	3S	26	NE¼ (Confluence with Canyon Cr.)	1.0	6.0	Rainbow, Cutthroat	Beaver ponds
6	Canyon Cr.	Rio Blanco	99W	3S	34	SW¼	99W	3S	26	NE¼ (Confluence with Black Sulfur CR.)	1.0	2.5	Cutthroat	Beaver ponds

Project Number - 2

Project Category - Stream Fishery

Primary Drainage - Black Sulphur Creek

Legal Description - T. 3S., R. 99 W., Section 24

Land Status - Bureau of Land Management

Photo Numbers - Roll 6, Print 14

Quadrangle - Yankee Gulch

Access - A good dirt road exists, but there is a locked gate on private land at the junction of Black Sulphur Creek and Swizer Gulch. The gate is approximately one mile below public land.

Present Site Description:

This section contains many newly constructed beaver dams. The stream banks are ten feet high in places and eroded. Access to the stream is difficult due to the adjacent habitat composed of sagebrush and greasewood, at times over six feet high and very dense. Willows are dense in the stream bottom. Fish were not observed in the ponds although fish were present two miles upstream and four miles downstream from the ponds.

Recommendations:

Stocking of trout into the ponds could create a good stream fishery. Additional bank and stream cover would be beneficial and could be provided by planting willows and placing logs or large rocks in the ponds. Public access would have to be obtained from the oil company controlling the access to the area.

Project Number - 10

Project Category - Waterfowl

Primary Drainage - Black Sulphur Creek

Legal Description - T. 4S., R. 99W, Section 16

Land Status - Private land with Division of Wildlife easement

Photo Numbers - N/A

Quadrangle - Razorback Ridge

Access - Four-wheel drive road from Figure Four Springs.

Present Site Description:

The stream contains several inactive beaver dams which are silting-in but are still used by waterfowl. The water flow is less than one-fourth c.f.s. The habitat along the stream is declining due to cattle overgrazing and trampling of stream banks. Sagebrush and aspen stands make up the adjacent habitat on the moderately steep sidehills.

Recommendations:

To create a better waterfowl habitat the ponds should be fenced off from cattle use. Water troughs for livestock could be provided below the poinds. A better marsh above the existing ponds could be created by building two check dams to spread out the water. Cover plantings would be beneficial.

STOCKING AND [illegible] SAMPLING DATA

STREAM CODE 19213

STOCKING

STOCK 79-83 0 YRS

STOCKYRS N N N N N

SPECIES-SIZE STOCKED:

FISH SAMPLING -- -- 83

SAMPLE DATE: 09 / 02 / 76

METHODS: ELEC

	SPECIES	#TAKEN	AVG. LENGTH (cm)	RANGE (cm)	AVG. WT (g)	RANGE (g)	%TOTAL CATCH
1.	~~ALGN~~	29	23.7	13-51			~~100~~
2.	CRN	21	22.4	10-36			100
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							
11.							
12.							
13.							
14.							
15.							

CDOW STREAM SURVEY (1991 REVISION)
LEVEL 2: FIELD SURVEY SUMMARY

STREAM: Black Sulphur Creek SEC#: WATER CODE: 19213 CDOW REGION: NW
SURVEYORS: D. Smith, L. Belmonde DATE OF SURVEY: 9-9-04
SURVEY LOCATION: T [redacted] R 99W S 25 ELEVATION: STATION #:
UTM ZONE: 12 UTM X: 716996 UTM Y: 4404400
LOCATION DESCRIPTION: at private - BLM boundary

STREAM FLOW PROFILE (Y or N): Y IF YES-DATE AND TYPE
HABITAT EVALUATION (Y or N): N IF YES-DATE AND TYPE
WATER CHEMISTRY ANALYSIS (Y or N): N IF YES-ATTACH SEPARATE ANALYSIS SHEET

FISH PRESENT (Y or N): Y POP. EST. METHOD: STATION LENGTH: 150 (FEET)
AVG. WIDTH: 5 (FEET) TOTAL STATION AREA: 0.017 (ACRES)
FLOW (CFS) AT TIME OF SURVEY: 0.75 cfs METHOD: visual estimate
LIMITING FACTORS TO FISHERY: A 7, 9, 10, 11;
COMMENTS:
Many fish escaped - don't use as population estimate.

LENGTH FREQUENCY RECORD (CM)

SPECIES	0↓2	2↓4	4↓6	6↓8	8↓10	10↓12	12↓14	14↓16	16↓18	18↓20	20↓22	22↓24	24↓26	26↓28	28↓30	30↓32	32↓34	34↓36	36↓38	38↓40	40↓42	42↓44	44↓46	46↓48	48↓50	50↓UP
CRNx								•		•																

SUMMARY INFORMATION

SPECIES	NO. FISH CAUGHT	AVG. LENGTH (CM)	LENGTH RANGE (CM)	AVG. WEIGHT (Grams)	WEIGHT RANGE (Grams)	% TOTAL CATCH	BIOMASS lb/Acre	DENSITY No./Acre	DENSITY Conf. Int.
CRNx	2	16	14-18	51	30-72	100%	X	X	X

580

COLORADO DIVISION OF WILDLIFE

Length-Weight Data File

Stream Name Black Sullivan Cr. CDOW Water Code 19213 Date 9 Sept 04

Gear S-R Electrofishing Effort 700' Station No. –

Species Code	Total Length (cm)	Weight (gms)	Species Code	Total Length	Weight	Species Code	Total Length	Weight
CRI X	14.5	30						
CRI X	18.2	72						

Comments: Many fish missed ~10, all salmonids from ~4-12".

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

(pt. BS1 7/26

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Black Sulfur Cr.

CROSS-SECTION NO.: 1

CROSS-SECTION LOCATION: Ubgt. BS1072605 Zone 12 718476 4406706

DATE: 7/26/05 | OBSERVERS: Dieterich / Durant

LEGAL DESCRIPTION | ¼ SECTION: | SECTION: | TOWNSHIP: N/S | RANGE: E/W | PM:

COUNTY: Rio Blanco | WATERSHED: White | WATER DIVISION: 6 | DOW WATER CODE:

MAP(S): USGS: Zone 12 718476 4406706 elev. 6470' ASL

USFS:

SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES / NO | METER TYPE: Pygmy

METER NUMBER: | DATE RATED: 00 | CALIB/SPIN: 60 sec | TAPE WEIGHT: surveyed lbs/foot | TAPE TENSION: surveyed lbs

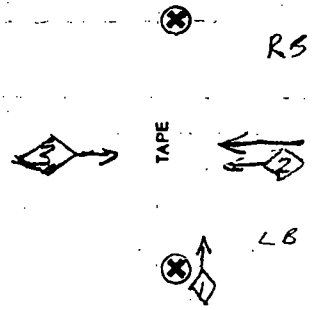
CHANNEL BED MATERIAL SIZE RANGE: 4 | PHOTOGRAPHS TAKEN: YES/NO | NUMBER OF PHOTOGRAPHS: 3

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	surveyed
⊗ Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB	0.0	6.46 / 6.46
② WS Upstream	70	5.9
③ WS Downstream	30	6.77

SLOPE | 0.87/100 = 0.0087

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
see previous survey																	

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

COMMENTS

pH - 6.55

SC - 790 u

TEMP - 22

LS

LB - 16.

LI 6.77 30'

TAPE X 70'

US

5.25 CA

5.99 W

FORM #ISF FD 1-85

26 – (10,3) 6,2 LBF 18,3 RBF

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: BLACK SULFUR CREEK | CROSS-SECTION NO: 1 | DATE: 07/26/05 | SHEET __ OF __

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM. (0.0 AT STAKE) | LEFT / RIGHT | Gage Reading: ____ ft | TIME

	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	40 sec Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
LB	LB			4.03								
		2.0		4.51								
		4.0		4.93								
		5.0		5.23								
G/LBF		6.0 LBF		5.38								
		7.0		5.90								
		8.0		6.40								
W		9.0 LWE		6.46	0		0	40	0			—
		9.3		6.53	0.09		0	1	0			0
		9.6		6.53	0.09		0	↓	0			0
		9.9		6.59	0.13		5		0.151			
		10.2		6.60	0.14		16		0.391			
		10.5		6.66	0.20		31		0.752			
		10.8		6.68	0.22		37		0.992			
		11.1		7.00	0.54		47		0.992			
		11.4		7.03	0.57		50		1.23			
		11.7		6.66	0.20		36		0.992			
		12.0		6.88	0.42		42		0.992			
		12.3		7.01	0.55		36		0.992			
		12.6		6.90	0.44		46		1.23			
		12.9		6.86	0.40		54		1.23			
		13.2		6.74	0.36		61		1.47			
		13.5		6.89	0.37		60		1.47			
		13.8		6.94	0.48		70		1.75			
		14.1		7.00	0.54		72		1.80			
		14.4		6.98	0.52		57		1.40			
		14.7		6.97	0.51		62		1.47			
		15.0		6.87	0.41		38		0.992			
		15.3		6.81	0.35		47		1.23			
		15.6		6.85	0.39		35		0.900			
		15.9		6.64	0.18		16		0.391			
		16.2		6.61	0.15		1		0			
		16.5		6.48	0.02		0		0			
		16.8		6.47	0.01		0		0			
W		17.0 RWE		6.46	0		0		0			
		17.5		6.14								
G/RBF		18.5 RBF		5.38								
		20.0		5.05								
		21.0		4.71								
RB		23.0		3.66								

TOTALS:

CALCULATIONS PERFORMED BY:

CALCULATIONS CHECKED BY:

Data Input & Proofing

STREAM NAME: |Black Sulphur Creek
XS LOCATION: |Zone 12 718476 4406706
XS NUMBER: |1
DATE: |7/26/05
OBSERVERS: |N. Dieterich, Dagget

1/4 SEC: |
SECTION: |
TWP: |
RANGE: |
PM: |

COUNTY: |Rio Blanco
WATERSHED: |White River
DIVISION: |6
DOW CODE: |
USGS MAP: |
USFS MAP: |

TAPE WT: |0.0106 | Level and Rod Survey | lbs / ft
TENSION: |99999 lbs

SLOPE: | 0.0087 |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 = 39						
	LB	0.00	4.03			0.00	0.00	0.00
		2.00	4.51			0.00	0.00	0.00
		4.00	4.93			0.00	0.00	0.00
		5.00	5.23			0.00	0.00	0.00
1	GL/LBF	6.00	5.38			0.00	0.00	0.00
		7.00	5.90			0.00	0.00	0.00
		8.00	6.40			0.00	0.00	0.00
	W	9.00	6.46	0.00	0.00	0.00	0.00	0.00
		9.30	6.53	0.09	0.00	0.03	0.00	6.44
		9.60	6.53	0.09	0.00	0.03	0.00	6.44
		9.90	6.59	0.13	0.15	0.04	0.01	6.46
		10.20	6.60	0.14	0.39	0.04	0.02	6.46
		10.50	6.66	0.20	0.75	0.06	0.05	6.46
		10.80	6.68	0.22	0.99	0.07	0.07	6.46
		11.10	7.00	0.54	0.99	0.16	0.16	6.46
		11.40	7.03	0.57	1.23	0.17	0.21	6.46
		11.70	6.66	0.20	0.99	0.06	0.06	6.46
		12.00	6.88	0.42	0.99	0.13	0.12	6.46
		12.30	7.01	0.55	0.99	0.17	0.16	6.46
		12.60	6.90	0.44	1.23	0.13	0.16	6.46
		12.90	6.86	0.40	1.23	0.12	0.15	6.46
		13.20	6.84	0.36	1.47	0.11	0.16	6.48
		13.50	6.85	0.37	1.47	0.11	0.16	6.48
		13.80	6.94	0.48	1.75	0.14	0.25	6.46
		14.10	7.00	0.54	1.80	0.16	0.29	6.46
		14.40	6.98	0.52	1.40	0.16	0.22	6.46
		14.70	6.97	0.51	1.47	0.15	0.22	6.46
		15.00	6.87	0.41	0.99	0.12	0.12	6.46
		15.30	6.81	0.35	1.23	0.11	0.13	6.46
		15.60	6.85	0.39	0.90	0.12	0.11	6.46
		15.90	6.64	0.18	0.39	0.05	0.02	6.46
		16.20	6.61	0.15	0.00	0.05	0.00	6.46
		16.50	6.48	0.02	0.00	0.01	0.00	6.46
		16.80	6.42	0.01	0.00	0.00	0.00	6.41
	W	17.00	6.46	0.00	0.00	0.00	0.00	0.00
		17.50	6.17			0.00	0.00	0.00
1	GL/RBF	18.50	5.38			0.00	0.00	0.00
		20.00	5.05			0.00	0.00	0.00
		21.00	4.71			0.00	0.00	0.00
					Totals	2.48	2.85	

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

LOCATION INFORMATION

STREAM NAME:	Black Sulphur Creek
XS LOCATION:	Zone 12 718476 4406706
XS NUMBER:	1
DATE:	26-Jul-05
OBSERVERS:	N. Dieterich, Dagget
1/4 SEC:	0
SECTION:	0
TWP:	0
RANGE:	0
PM:	0
COUNTY:	Rio Blanco
WATERSHED:	White River
DIVISION:	6
DOW CODE:	0
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

TAPE WT:	0.0106
TENSION:	99999

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

CHANNEL PROFILE DATA

SLOPE:	0.0087

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

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

STREAM NAME: Black Sulphur Creek
XS LOCATION: Zone 12 718476 4406706
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
LB	0.00	4.03			0.00		0.00	0.00	0.0%
	2.00	4.51			0.00		0.00	0.00	0.0%
	4.00	4.93			0.00		0.00	0.00	0.0%
	5.00	5.23			0.00		0.00	0.00	0.0%
1 GL/LBF	6.00	5.38			0.00		0.00	0.00	0.0%
	7.00	5.90			0.00		0.00	0.00	0.0%
	8.00	6.40			0.00		0.00	0.00	0.0%
W	9.00	6.46	0.00	0.00	0.00		0.00	0.00	0.0%
	9.30	6.53	0.09	0.00	0.31	0.09	0.03	0.00	0.0%
	9.60	6.53	0.09	0.00	0.30	0.09	0.03	0.00	0.0%
	9.90	6.59	0.13	0.15	0.31	0.13	0.04	0.01	0.2%
	10.20	6.60	0.14	0.39	0.30	0.14	0.04	0.02	0.6%
	10.50	6.66	0.20	0.75	0.31	0.20	0.06	0.05	1.6%
	10.80	6.68	0.22	0.99	0.30	0.22	0.07	0.07	2.3%
	11.10	7.00	0.54	0.99	0.44	0.54	0.16	0.16	5.6%
	11.40	7.03	0.57	1.23	0.30	0.57	0.17	0.21	7.4%
	11.70	6.66	0.20	0.99	0.48	0.20	0.06	0.06	2.1%
	12.00	6.88	0.42	0.99	0.37	0.42	0.13	0.12	4.4%
	12.30	7.01	0.55	0.99	0.33	0.55	0.17	0.16	5.7%
	12.60	6.90	0.44	1.23	0.32	0.44	0.13	0.16	5.7%
	12.90	6.86	0.40	1.23	0.30	0.40	0.12	0.15	5.2%
	13.20	6.84	0.36	1.47	0.30	0.36	0.11	0.16	5.6%
	13.50	6.85	0.37	1.47	0.30	0.37	0.11	0.16	5.7%
	13.80	6.94	0.48	1.75	0.31	0.48	0.14	0.25	8.8%
	14.10	7.00	0.54	1.80	0.31	0.54	0.16	0.29	10.2%
	14.40	6.98	0.52	1.40	0.30	0.52	0.16	0.22	7.7%
	14.70	6.97	0.51	1.47	0.30	0.51	0.15	0.22	7.9%
	15.00	6.87	0.41	0.99	0.32	0.41	0.12	0.12	4.3%
	15.30	6.81	0.35	1.23	0.31	0.35	0.11	0.13	4.5%
	15.60	6.85	0.39	0.90	0.30	0.39	0.12	0.11	3.7%
	15.90	6.64	0.18	0.39	0.37	0.18	0.05	0.02	0.7%
	16.20	6.61	0.15	0.00	0.30	0.15	0.05	0.00	0.0%
	16.50	6.48	0.02	0.00	0.33	0.02	0.01	0.00	0.0%
	16.80	6.42	0.01	0.00	0.31	0.01	0.00	0.00	0.0%
W	17.00	6.46	0.00	0.00	0.20		0.00	0.00	0.0%
	17.50	6.17			0.00		0.00	0.00	0.0%
1 GL/RBF	18.50	5.38			0.00		0.00	0.00	0.0%
	20.00	5.05			0.00		0.00	0.00	0.0%
	21.00	4.71			0.00		0.00	0.00	0.0%
TOTALS ----------					8.61	0.57 (Max.)	2.48	2.85	100.0%

Manning's n = 0.0528
Hydraulic Radius= 0.288490683

STREAM NAME: Black Sulphur Creek
XS LOCATION: Zone 12 718476 4406706
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	2.48	2.48	-0.2%
6.21	2.48	4.78	92.5%
6.23	2.48	4.59	84.6%
6.25	2.48	4.39	76.8%
6.27	2.48	4.20	69.1%
6.29	2.48	4.01	61.4%
6.31	2.48	3.82	53.8%
6.33	2.48	3.63	46.2%
6.35	2.48	3.44	38.7%
6.37	2.48	3.26	31.2%
6.39	2.48	3.08	23.8%
6.41	2.48	2.89	16.5%
6.42	2.48	2.81	13.0%
6.43	2.48	2.72	9.5%
6.44	2.48	2.64	6.2%
6.45	2.48	2.56	2.9%
6.46	2.48	2.48	-0.2%
6.47	2.48	2.40	-3.2%
6.48	2.48	2.33	-6.2%
6.49	2.48	2.26	-9.2%
6.50	2.48	2.18	-12.1%
6.51	2.48	2.11	-15.1%
6.53	2.48	1.97	-20.8%
6.55	2.48	1.83	-26.2%
6.57	2.48	1.70	-31.5%
6.59	2.48	1.57	-36.7%
6.61	2.48	1.45	-41.6%
6.63	2.48	1.33	-46.3%
6.65	2.48	1.22	-50.7%
6.67	2.48	1.12	-55.0%
6.69	2.48	1.02	-59.1%
6.71	2.48	0.92	-63.0%

WATERLINE AT ZERO
AREA ERROR = 6.459

STREAM NAME: Black Sulphur Creek
XS LOCATION: Zone 12 718476 4406706
XS NUMBER: 1

Constant Manning's n

STAGING TABLE

"GL" = lowest Grassline elevation corrected for sag
"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"	5.38	12.50	1.12	1.65	14.05	13.71	100 0%	1.03	37.54	2.67
	5 46	12.25	1.07	1.57	13.07	13 41	97.8%	0.97	33 76	2.58
	5.51	12.09	1.03	1.52	12 46	13 22	96.4%	0.94	31.48	2.53
	5.56	11.93	0.99	1.47	11.86	13.03	95.1%	0.91	29.27	2.47
	5.61	11.77	0.96	1.42	11.27	12 84	93.7%	0.88	27.14	2.41
	5.66	11.61	0.92	1.37	10.69	12.65	92.3%	0.84	25.08	2.35
	5.71	11.45	0 88	1.32	10.11	12.46	90.9%	0.81	23.10	2.28
	5.76	11.29	0.85	1.27	9 54	12.27	89.5%	0.78	21.19	2 22
	5.81	11 13	0.81	1.22	8.98	12.08	88.2%	0.74	19.35	2.16
	5.86	10.97	0.77	1.17	8.43	11.90	86 8%	0.71	17.59	2.09
	5.91	10.81	0.73	1.12	7.88	11.71	85.4%	0.67	15.91	2.02
	5.96	10.65	0.69	1.07	7.35	11.51	84.0%	0.64	14.30	1.95
	6.01	10.48	0.65	1.02	6.82	11.32	82.6%	0.60	12.77	1.87
	6.06	10.32	0.61	0.97	6.30	11.13	81.2%	0.57	11.32	1.80
	6.11	10.16	0.57	0.92	5.79	10.94	79.8%	0.53	9.94	1.72
	6.16	9.99	0.53	0.87	5.28	10.74	78.4%	0.49	8.64	1.64
	6.21	9.81	0.49	0.82	4.79	10.54	76.9%	0.45	7.43	1.55
	6.26	9.63	0.45	0.77	4.30	10.32	75.3%	0.42	6.30	1.47
	6.31	9.44	0.41	0.72	3.82	10.11	73.8%	0.38	5.25	1.37
	6 36	9.25	0 36	0.67	3.36	9.90	72.2%	0.34	4.29	1.28
	6.41	8.93	0.32	0.62	2.90	9.55	69.7%	0.30	3.44	1.19
"WL"	6.46	7.61	0.33	0.57	2 48	8.21	59.9%	0.30	2.94	1.18
	6.51	7.22	0.29	0.52	2.11	7.81	57.0%	0.27	2.32	1.10
	6.56	6.57	0.27	0.47	1.77	7.14	52.1%	0.25	1.83	1.04
	6.61	5.96	0.24	0.42	1.45	6.52	47.5%	0.22	1.41	0.97
	6.66	5.38	0.22	0.37	1.17	5.93	43.2%	0.20	1.05	0.89
	6.71	4.87	0.19	0.32	0.92	5.34	39.0%	0.17	0.75	0.81
	6.76	4.64	0.15	0.27	0.68	5.04	36.7%	0 14	0 47	0.69
	6.81	4.42	0.10	0.22	0 46	4.74	34 6%	0.10	0.25	0.55
	6.86	3.02	0.09	0.17	0.26	3.26	23.8%	0.08	0.13	0.49
	6.91	2.17	0.06	0.12	0.14	2.33	17.0%	0.06	0.05	0.40
	6 96	1.48	0 03	0.07	0.04	1.56	11 4%	0.03	0.01	0.24
	7.01	0.22	0.01	0.02	0 00	0.23	1.7%	0.01	0.00	0.12

1 fps = 1.59 2/3

50% WP = 1.41 3/3

STREAM NAME: Black Sulphur Creek
XS LOCATION: Zone 12 718476 4406706
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	2.85	cfs
CALCULATED FLOW (Qc)=	2 94	cfs
(Qm-Qc)/Qm * 100 =	-3.2	%
MEASURED WATERLINE (WLm)=	6 46	ft
CALCULATED WATERLINE (WLc)=	6 46	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.57	ft
MAX CALCULATED DEPTH (Dc)=	0 57	ft
(Dm-Dc)/Dm * 100	-0.1	%
MEAN VELOCITY=	1.18	ft/sec
MANNING'S N=	0.053	
SLOPE=	0.0087	ft/ft
.4 * Qm =	1.1	cfs
2.5 * Qm=	7.1	cfs

RECOMMENDED INSTREAM FLOW.

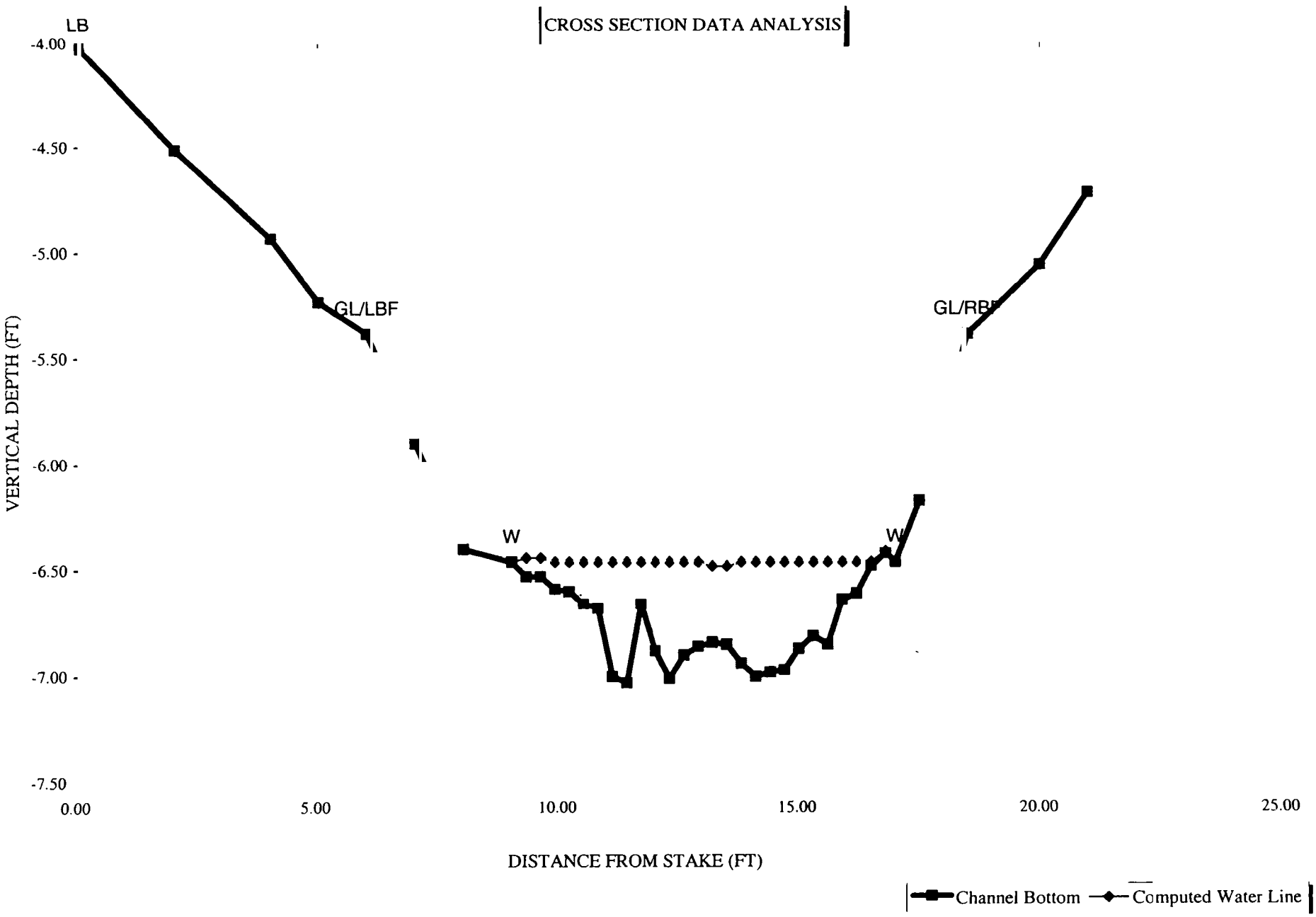
FLOW (CFS)	PERIOD

RATIONALE FOR RECOMMENDATION:

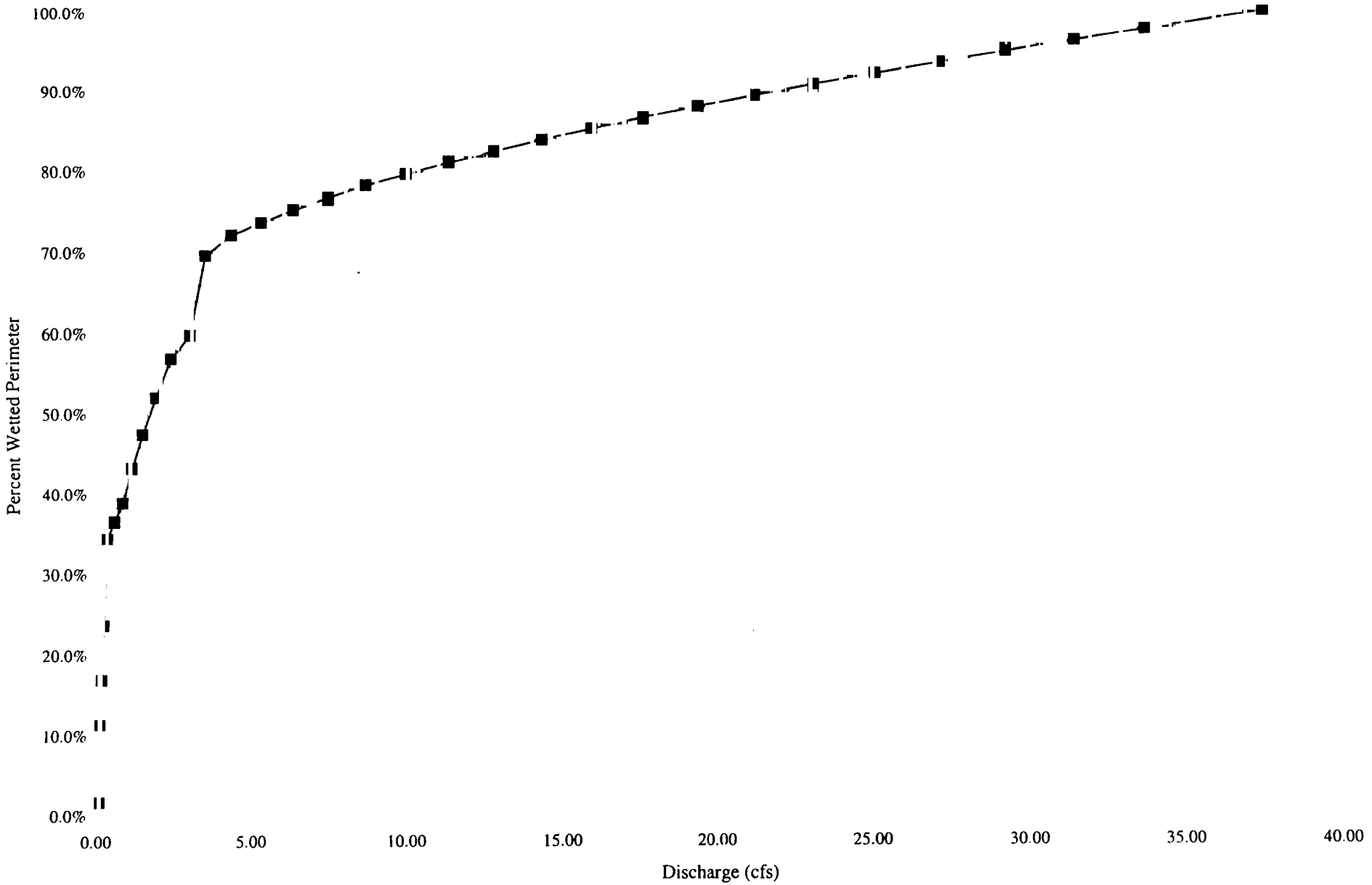
RECOMMENDATION BY: ..... AGENCY..... DATE:.....

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

Black Sulphur Creek



Percent Wetted Perimeter vs. Discharge



Monthly Streamflow Statistics for Colorado

USGS 09306175 BLACK SULPHUR CREEK NEAR RIO BLANCO, CO.

Available data for this site

Rio Blanco County, Colorado
Hydrologic Unit Code 14050006
Latitude 39°52'17", Longitude 108°17'13" NAD27
Drainage area 103.00 square miles
Gage datum 6,130.00 feet above sea level NGVD29

Output formats

HTML table of all data
Tab-separated data
Reselect output format

YEAR	Monthly mean streamflow, in ft^3/s											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1975	7.31	8.19	8.63	6.88	5.50	14.8	11.3	9.29	8.09	9.65	9.29	9.16
1976	7.95	8.54	7.83	6.91	7.72	8.52	7.45	8.95	5.87	6.63	8.65	7.00
1977	6.28	7.18	6.92	3.94	3.14	1.55	2.51	3.70	3.35	3.56	3.87	3.70
1978	2.96	3.52	4.23	3.13	1.56	1.38	1.35	1.26	.82	3.43	5.69	5.20
1979	4.96	6.20	6.57	5.35	20.7	20.2	9.64	12.4	5.28	4.39	6.56	5.49
1980	6.25	8.47	6.52	5.51	34.4	19.7	9.46	4.33	5.12	9.27	6.55	4.31
1981	6.08	5.39	5.03	4.33	1.81	1.73	3.19	1.55	1.58	3.98	5.09	4.81
1982	4.09	5.55	5.29	4.85	2.83	4.33	4.27	6.88	9.20	8.31	6.52	4.47
1983	4.24	5.29	7.44	8.98	88.6	61.4	20.0	22.7	11.9			
Mean of monthly streamflows	5.57	6.48	6.50	5.54	18.5	14.8	7.69	7.90	5.69	6.15	6.53	5.52

Questions about data Colorado NWISWeb Data Inquiries
Feedback on this website Colorado NWISWeb Maintainer
Top
Explanation of terms