Stream: Right Fork Barrel Springs Creek

Executive Summary

Water Division: 5
Water District: 72
CDOW#: 19156
CWCB ID: 08/5/A-001

Segment: Headwaters to the Confluence with Barrel Spring Creek

Upper Terminus: HEADWATERS IN THE VICINITY OF
(Latitude 39° 35’ 49.48”N) (Longitude 108° 40’ 21.47”W)

Lower Terminus: CONFLUENCE WITH BARREL SPRING CREEK
(Latitude 39° 33’ 26.55”N) (Longitude 108° 42’ 25.36”W)

Watershed: Colorado headwaters-Plateau (HUC # 14010005)
Counties: Garfield
Length: 4.0 miles
USGS Quad(s): Calf Canyon
Flow Recommendation: 0.7 cfs (May 1 - August 31)
0.3 cfs (September 1- 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 Right Fork Barrel Springs Creek to the CWCB for inclusion into the Instream Flow Program. Right Fork Barrel Springs 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.

Right Fork Barrel Springs Creek is approximately 4 miles long. It begins on the west flank of Long Point on BLM lands at an elevation of approximately 8100 feet and terminates at the confluence with Barrel Springs Creek at an elevation of approximately 6750 feet. 100% of the land on the 4 mile segment addressed by this report is publicly owned. Right Fork Barrel Springs Creek is located within Garfield County. The total drainage area of the creek is approximately 28.12 square miles. Right Fork Barrel Springs Creek generally flows in a southwesterly direction.

The subject of this report is a segment of Right Fork Barrel Springs Creek beginning at the headwaters and extending downstream to the confluence with Barrel Spring Creek. The proposed segment is located approximately 27 miles north of Fruita. 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 0.7 cfs, summer, and 0.3 cfs, winter, based on its September 28, 2006 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
Headwaters	Confl. with Barrel Spring Creek	4.0	0%	100%

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 "Right Fork Barrel Springs Creek is a high gradient stream, with moderate substrate size. The creek is often confined by a narrow canyon, and it has cut down to bedrock in numerous locations. The riparian community is vigorous in these confined locations, and it is improving rapidly in locations that are not accessible for livestock grazing. The creek provides good pool habitat, but rifles for spawning are a limiting factor for the fish population. Fish surveys have indicated a sizable population of brook trout. BLM intends to work with the Colorado Division of Wildlife to convert this fishery to a Colorado River Cutthroat trout fishery over the long term, because there are multiple factors that could support a viable cutthroat population. These include the isolation of the stream reach, physical barriers that prevent the migration of other fish, water quality issues downstream that prevent fish migration from the Colorado River, and reliable base flows".

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, two 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: Right Fork Barrel Springs Creek R2Cross Summary

			Confidence Intervals	Recommended Flows (cfs)	
Party	**Date**	**Q (cfs)**	**250%-40%**	**Summer (3/3)**	**Winter (2/3)**
BLM	09/28/2006	0.31	0.8 – 0.1	(1)	0.64
BLM	09/28/2006	0.27		(1)	0.70

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

The summer flow recommendation, which meets 2 of 3 criteria and is within the accuracy range of the R2CROSS model is 0.7 cfs. This recommendation was derived by averaging the results of the two data sets. The winter flow recommendation, which is based on water availability limitations, is 0.3 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 **Right Fork Barrel Springs Creek** no such gage is available at the LT. In fact, there is no gage on Right Fork Barrel Springs Creek. It is thus necessary to describe the normal flow regime at the Right Fork Barrel Springs Creek LT through a "representative" gage station. The gage station selected for this was ROAN CREEK NEAR DE BEQUE, CO (USGS 09095000), a gage with a 25 year period of record (POR) collected between 1921 and 1981. The gage is at an elevation of 5380 ft above mean sea level (amsl) and has a drainage area of 321 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 Right Fork Barrel Springs Creek the consumptive portions of these upstream diversions were added back to the measured hydrograph. The resulting adjusted hydrograph was then used on Right Fork Barrel

Springs Creek by multiplying the adjusted Roan Creek discharge values (hydrograph) by the ratio of Right Fork Barrel Springs Creek basin area (28.12 mi^2 above the LT) to Roan Creek near De Beque basin area (321 mi^2). The resulting proportioned hydrograph was then adjusted (decreased) to reflect the existing depletions in Right Fork Barrel Springs Creek due to upstream consumptive irrigation use. The final hydrograph thus represents a distribution of flow over time that has been reduced to reflect existing human uses.

The following hydrograph depicts the mean monthly discharge of Right Fork Barrel Springs Creek (proportioned off Roan Creek near De Beque). Included in the hydrograph are the recommended ISF values. The data used in the creation of this hydrograph are displayed in Table #2.

Fig 1 - Right Fork Barrel Springs Cr (proportioned of Roan Cr near DeBeque) & ISFs

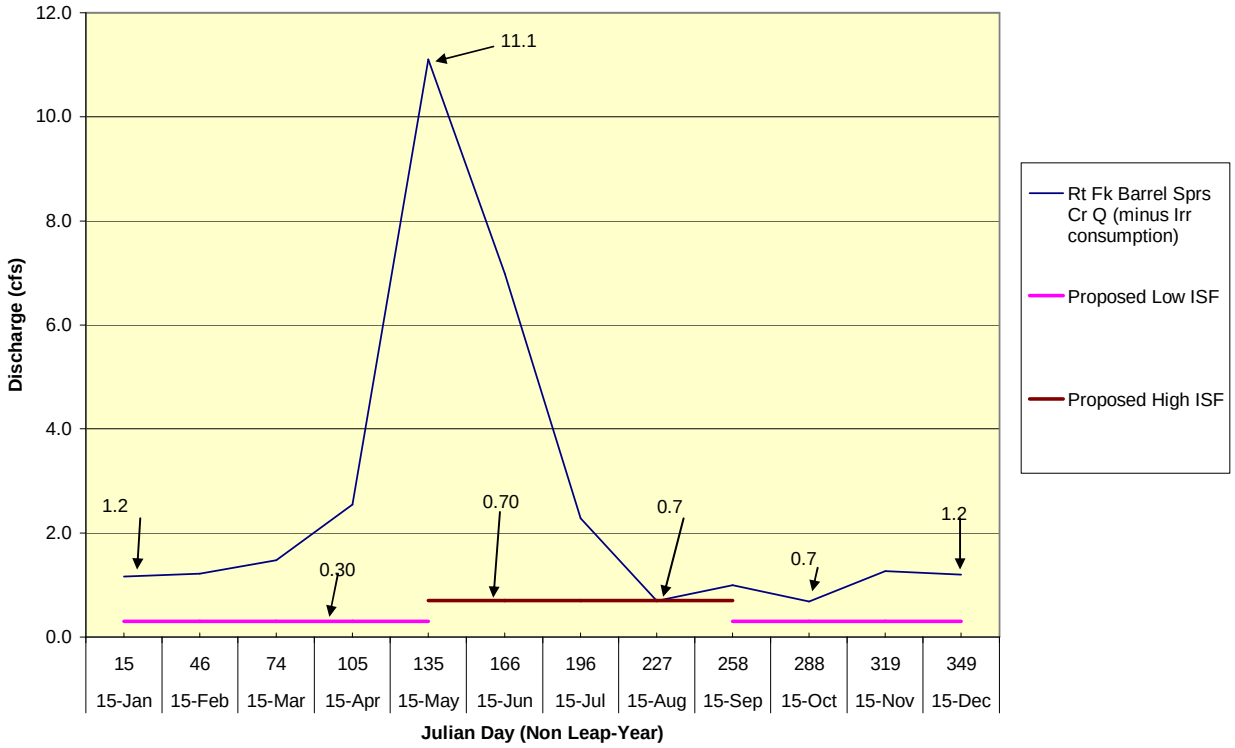


Table 2 – Mean Monthly Discharge and Recommended Instream Flows – Right Fork Barrel Springs Cr.

	Julian Day	Rt Fk Barrel Spr Cr (cfs)	Recommended ISFs (cfs)
15-Jan	15	1.2	0.30
15-Feb	46	1.2	0.30
15-Mar	74	1.5	0.30
15-Apr	105	2.5	0.30
30-Apr	120	2.5	0.30
1-May	121	11.1	0.70
15-May	135	11.1	0.70
15-Jun	166	7.0	0.70
15-Jul	196	2.3	0.70
15-Aug	227	0.7	0.70
31-Aug	243	0.7	0.70
1-Sep	244	1.0	0.30
15-Sep	258	1.0	0.30
15-Oct	288	0.7	0.30
15-Nov	319	1.3	0.30
15-Dec	349	1.2	0.30

Existing Water Right Information

Staff has analyzed the water rights tabulation to identify any potential water availability problems. There are no historical diversions or water rights located within this stream reach. Based on this analysis staff has determined that water is available for appropriation on Right Fork Barrel Springs Creek, from the headwaters to the confluence with Barrel Spring Creek, 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:

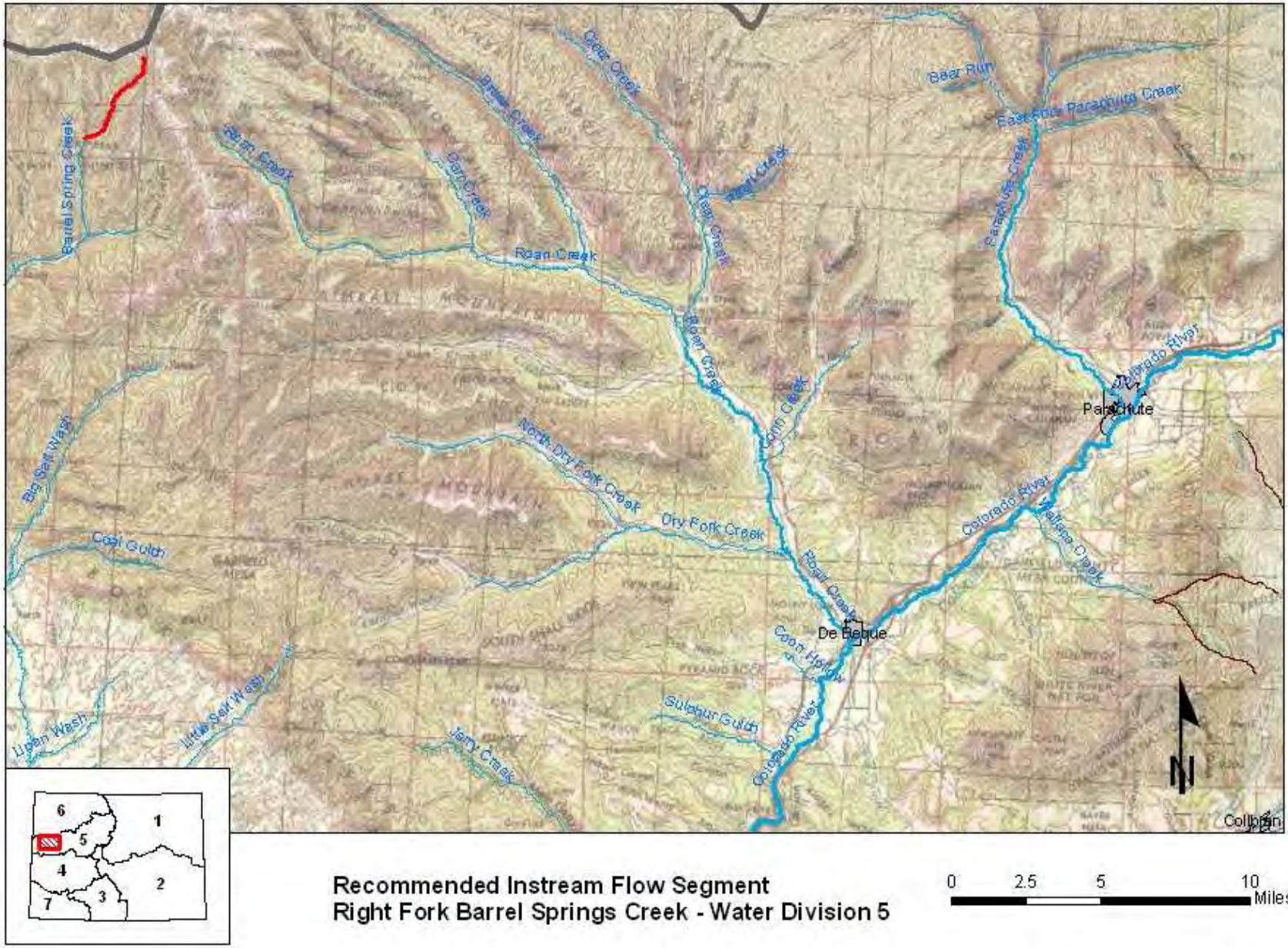
Segment: Headwaters to the Confluence with Barrel Spring Creek

Upper Terminus: HEADWATERS IN THE VICINITY OF
(Latitude 39° 35' 49.48"N) (Longitude 108° 40' 21.47"W)
UTM = 4389485.5 N UTM = 184629.6 E
SW NE S25 T5S R101W 6PM
1670' West of East Section Line; 2260' South of the North Section Line

Lower Terminus: CONFLUENCE WITH BARREL SPRING CREEK
(Latitude 39° 33' 26.55"N) (Longitude 108° 42' 25.36"W)
UTM = 43851991.1 N UTM = 181491.9 E
SE NE S12 T6S R102W 6PM
65' West of the East Section Line; 1550' South of the North Section Line

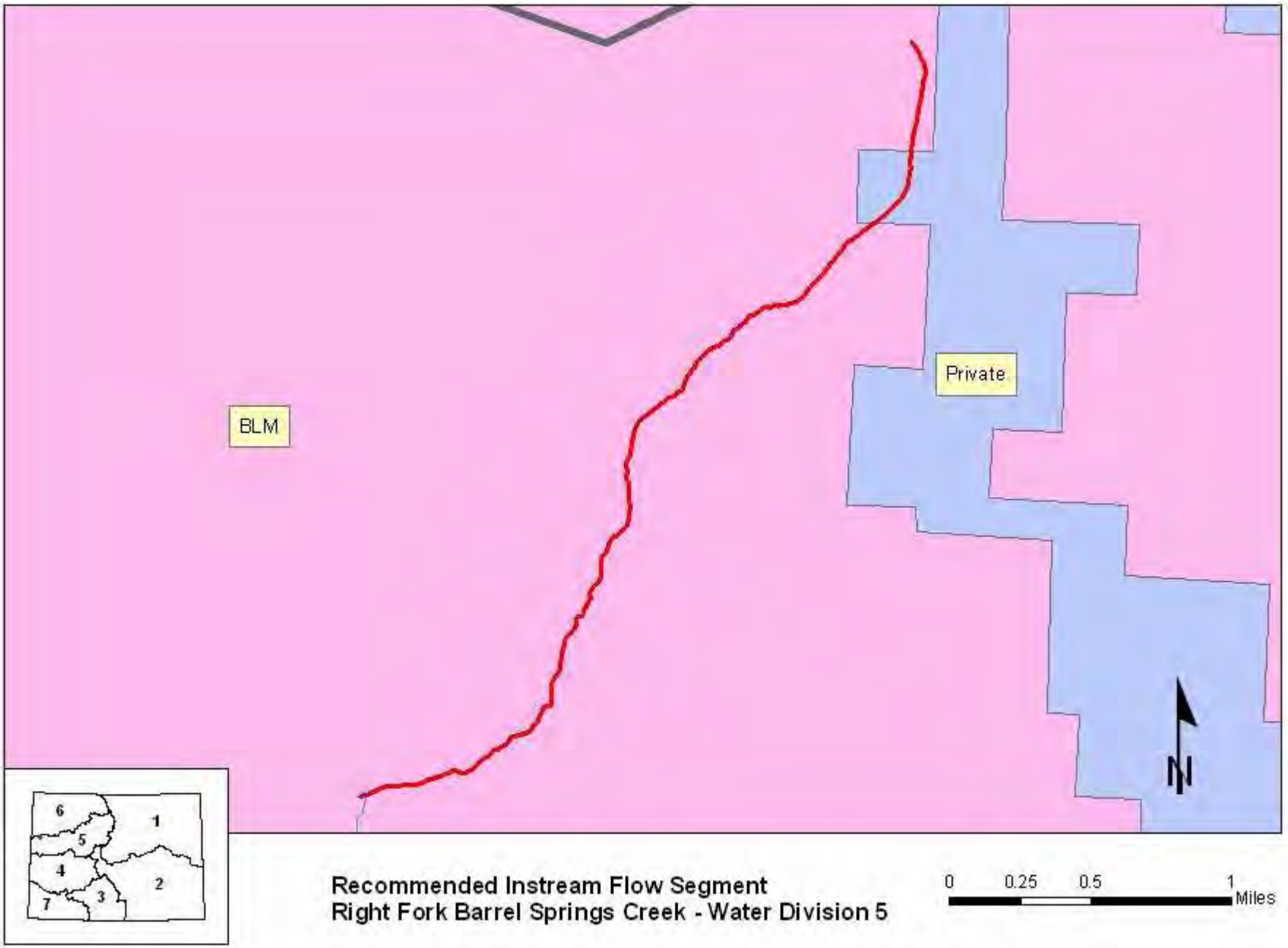
Watershed: Colorado headwaters-Plateau (HUC # 14010005)
Counties: Garfield
Length: 4.0 miles
USGS Quad(s): Calf Canyon
Flow Recommendation: 0.7 cfs (May 1 - August 31)
0.3 cfs (September 1 - April 30)

Vicinity Map

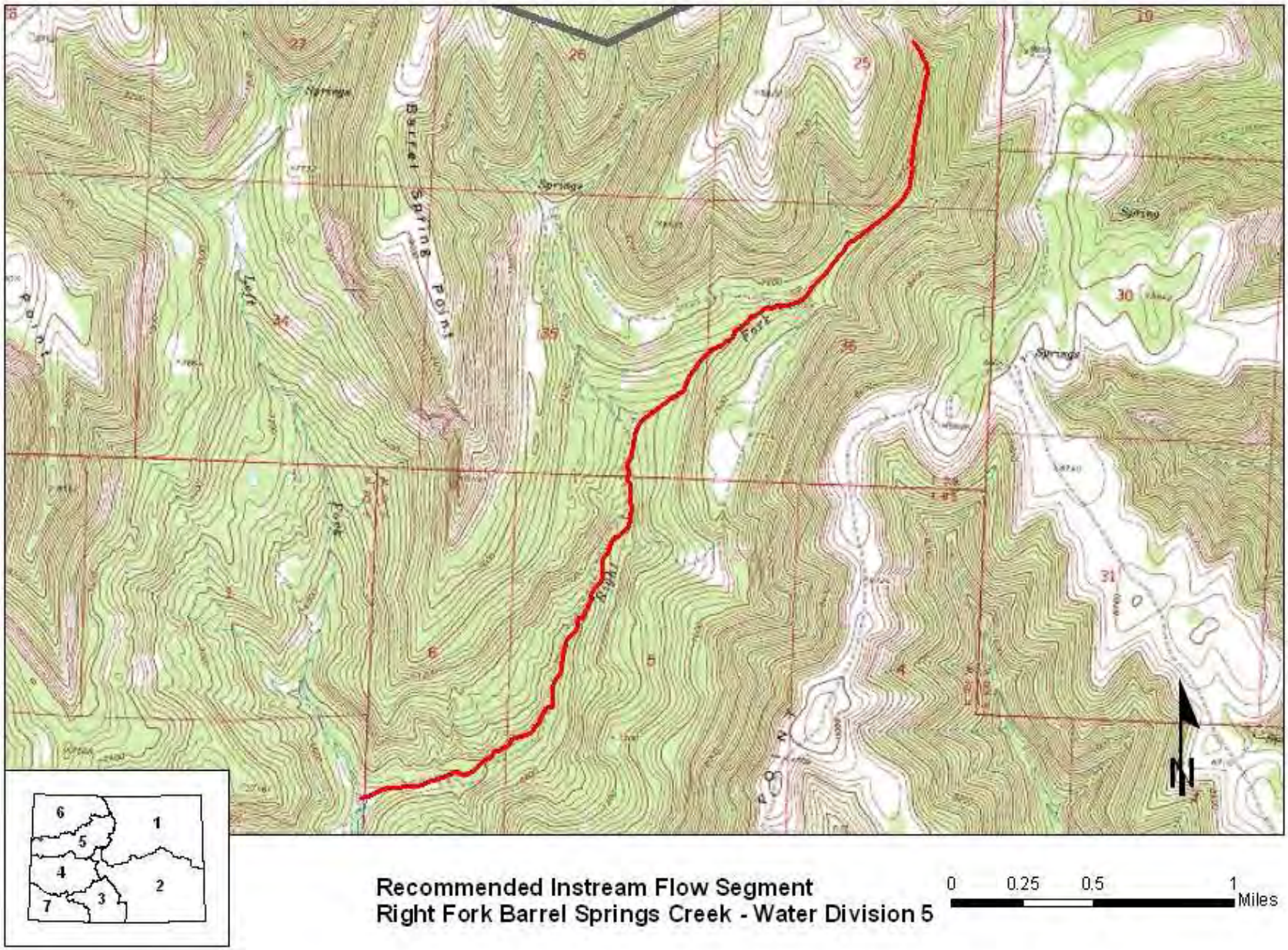


Recommended Instream Flow Segment
Right Fork Barrel Springs Creek - Water Division 5

Land Use Map


BLM
Private
N
6
1
5
4
2
7
3
Recommended Instream Flow Segment
Right Fork Barrel Springs Creek - Water Division 5
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 Ms. Bassi:

The Bureau of Land Management (BLM) is writing this letter to formally communicate its instream flow recommendation for Right Fork Barrel Springs Creek, located in Water Division 5.

Location and Land Status. Right Fork Barrel Springs Creek is tributary to Barrel Springs Creek approximately 27 miles north of Fruita, Colorado. The creek is located within the East Salt Creek watershed. This recommendation covers the stream reach beginning at the headwaters and extends downstream to the confluence with Left Fork Barrel Springs Creek. One hundred percent of the 4.0 mile reach is managed by the BLM.

Biological Summary. Right Fork Barrel Springs Creek is a high gradient stream, with moderate substrate size. The creek is often confined by a narrow canyon, and it has cut down to bedrock in numerous locations. The riparian community is vigorous in these confined locations, and it is improving rapidly in locations that are accessible for livestock grazing. The creek provides good pool habitat, but riffles for spawning are a limiting factor for the fish population. Fishery surveys have indicated a sizable population of brook trout. BLM intends to work with the Colorado Division of Wildlife to convert this fishery to a Colorado River Cutthroat Trout fishery over the long term, because there are multiple factors that could support a viable cutthroat population. These include the isolation of the stream reach, physical barriers that prevent the migration of other fish, water quality issues downstream that prevent fish migration from the Colorado River, and reliable base flows.

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:

- 0.7 cubic feet per second is recommended during the high temperature period from May 1 through August 31. This recommendation is driven by the average depth and wetted perimeter criteria, which is to be expected in a high gradient, confined stream. It is very important to protect a flow rate that provides adequate usable habitat, because the creek is small, and there are numerous sections that are too steep to provide habitat for fish.

- 0.3 cubic feet second is recommended for the base flow period from September 1 through April 30. This recommendation is driven by water availability. The extremely reliable base flow in the creek is provided by a series of springs high in the watershed. This base flow rate provides good habitat in pools and provides sufficient water for passage between pools. This flow rate also prevents stress to the riparian community.

Water Availability. There are no historical diversions or water rights located within this stream reach. BLM is not aware of any historical gage information for this stream reach, but there are other gages in the vicinity. BLM does not recommend using the East Salt Creek gage lower in the watershed, because it is heavily affected by return flows from the Grand Valley canal system. BLM also does not recommend using the West Salt Creek gage, because it measures a much larger basin with different aspect and much less influence from groundwater contributions. Instead, BLM recommends using the Roan Creek gage above Clear Creek near Debeque (USGS Gage 09094200), and perform a basin comparison. Even when this comparison is performed, we must bear in mind that this short stream reach is almost completely supported by springs during the base flow season.

Relationship to Management Plans. This stream reach is one of the very few fisheries managed by BLM in the North Desert Area between Interstate 70 and Douglas Pass. Typically, streams in this area have insufficient flow and water quality to support macroinvertebrate communities and fish populations. Accordingly, BLM places a very strong emphasis on managing grazing, transportation routes, and recreation use to maintain and enhance both riparian and fisheries resources in locations with sufficient water to support those resources. BLM's efforts to maintain riparian and fisheries health will be supplemented by an instream flow appropriation. An instream flow appropriation will also provide assurance to the Colorado Division of Wildlife that there will be sufficient flows to support an investment of stocking the creek with Colorado River Cutthroat Trout.

The BLM requests that the Board recognize that this recommendation is based only upon the minimum flows necessary to support cold-water and cool-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 forwarded 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 at 303-239-3940.

Sincerely,

Dennis D. Zachman (ACTING)

for Linda M. Anañia
Deputy State Director
Resources and Fire

cc: Catherine Robertson, Grand Junction FO
Tom Fresques, Glenwood Springs FO

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO WATER CONSERVATION BOARD

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: [illegible]	CROSS-SECTION NO.:
CROSS-SECTION LOCATION: 1/4 mile upstream from confluence w/ [illegible]	
DATE: [illegible]	OBSERVERS: [illegible]
LEGAL DESCRIPTION	¼ SECTION: [illegible] · SECTION: [illegible] · TOWNSHIP: [illegible] N/S (S circled) · RANGE: [illegible] E/W (W circled) · PM: 6th
COUNTY: [illegible] · WATERSHED: [illegible] · WATER DIVISION: [illegible]	DOW WATER CODE: 19156
MAP(S): USGS: Calf Canyon 7.5'	Z 12: [illegible]
MAP(S): USFS:	4381221 [illegible]

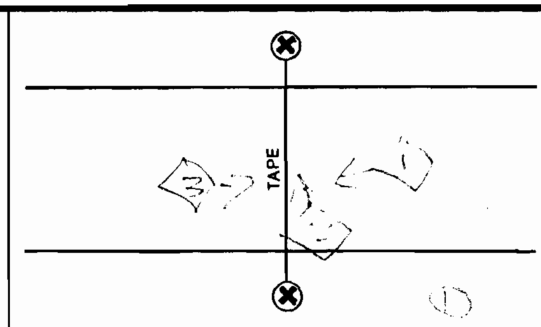
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES/NO (YES circled)	METER TYPE: Marsh-McBirney
METER NUMBER: · DATE RATED:	CALIB/SPIN: ______ sec · TAPE WEIGHT: ______ lbs/foot · TAPE TENSION: ______ lbs
CHANNEL BED MATERIAL SIZE RANGE: gravel & 4" cobbles	PHOTOGRAPHS TAKEN: YES/NO (YES circled) · NUMBER OF PHOTOGRAPHS: 3

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
Tape @ Stake LB	0.0	[illegible]
Tape @ Stake RB	0.0	[illegible]
(1) WS @ Tape LB/RB	0.0	6.42'
(2) WS Upstream	[illegible]	[illegible]
(3) WS Downstream	10.0'	6.70'
SLOPE	[illegible] = 0.0242	

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

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

mayfly, [illegible] - two species

COMMENTS

Water Temp: 48°F

[illegible]: 700

Ph: 7.4

FORM #ISF FD 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Right Fork Round Springs	CROSS-SECTION NO.:	DATE:	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: ___ ft	TIME: 11:30

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)
W	0.5		5.84								
	1.5		6.08								
G	1.7		5.67								
	2.2		5.46								
	2.5		5.55	0.15				0.32			
	2.8		5.71	0.15				0.86			
	3.1		5.58	0.15				1.00			
	3.4		5.56	0.15				1.43			
	3.7		5.56	0.15				1.02			
	4.0		5.51	0.15				0.41			
	4.3		5.41	0.10				0.41			
	4.6		5.41	0.05				0.36			
W	8.8		5.78								
	9.1										
G	9.9		5.54								
WS	9.3		4.38								
TOTALS:											

End of Measurement	Time:	Gage Reading: 2.1 ft	CALCULATIONS PERFORMED BY:	CALCULATIONS CHECKED BY:

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME:					CROSS-SECTION NO.: 2	
CROSS-SECTION LOCATION:						
DATE:	OBSERVERS:					
LEGAL DESCRIPTION	¼ SECTION: SW	SECTION: 6	TOWNSHIP: 6 N/S	RANGE: 101 E/W	PM: 6th	
COUNTY:	WATERSHED:	WATER DIVISION:	DOW WATER CODE: 19156			
MAP(S):	USGS: Calf Canyon 7.5'					
	USFS:					

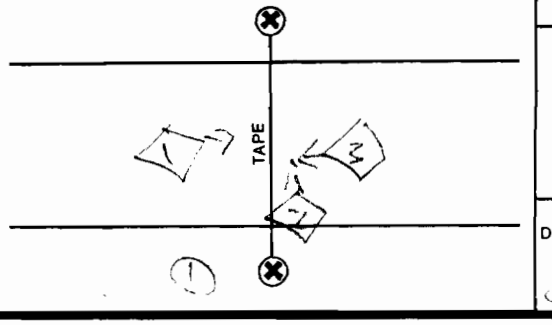
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES / NO	METER TYPE:			
METER NUMBER:	DATE RATED:	CALIB/SPIN: _____ sec	TAPE WEIGHT: _____ lbs/foot	TAPE TENSION: _____ lbs
CHANNEL BED MATERIAL SIZE RANGE:		PHOTOGRAPHS TAKEN: YES/NO	NUMBER OF PHOTOGRAPHS: 3	

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	
⊗ Tape @ Stake RB	0.0	
① WS @ Tape LB/RB	0.0	
② WS Upstream	10.0	0.32
③ WS Downstream	0.0	
SLOPE	[illegible] / 21.0 = 0.026	

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
[illegible]																	
Sucker																	

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

[illegible]

COMMENTS

[illegible]

FORM #ISF FD 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Right Fork Barrel Springs	CROSS-SECTION NO.: 2	DATE: 7-28-06	SHEET 1 OF 1
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: 1.2 ft	TIME: 12 [illegible]

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)
S	2.0		5.68								
G	2.1		5.82								
W	2.0		6.42								
	2.3		6.60	0.10				0.60			
	2.6		6.59	0.10				0.00			
	2.7		6.55	0.10				0.13			
	3.2		6.54	0.10				0.24			
	3.5		6.57	0.10				0.77			
	3.8		6.57	0.10				0.38			
	4.1		6.62	0.15				0.50			
	4.4		6.61	0.20				0.79			
	[illegible]		[illegible]	0.20				0.77			
	5.0		6.70	0.15				0.99			
	5.3		6.61	0.20				[illegible]			
	[illegible]		[illegible]	0.15				0.48			
	5.9		6.59	0.15				0.31			
	[illegible]		6.55	0.10				0.12			
W	6.5		[illegible]								
G	7.8		6.59								
RS	10.4		5.48								
TOTALS:											

End of Measurement	Time: 12:20	Gage Reading: [illegible] 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:	Right Fork Barrel Springs Creek
XS LOCATION:	1/4 mile upstream from confluence with Left Fork
XS NUMBER:	1
DATE:	28-Sep-06
OBSERVERS:	R. Smith, J. Thompson
1/4 SEC:	SW
SECTION:	6
TWP:	6S
RANGE:	101W
PM:	6th
COUNTY:	Mesa
WATERSHED:	Colorado
DIVISION:	5
DOW CODE:	19156
USGS MAP:	Calf Canyon 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:	0.024

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

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

STREAM NAME: Right Fork Barrel Springs Creek
XS LOCATION: 1/4 mile upstream from confluence with Left Fork
XS NUMBER: 1

DATA POINTS= 16

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	5.68	0.00	0.00	0.00		0.00	0.00	0.0%
1	G	1.10	5.82	0.00	0.00	0.00		0.00	0.00	0.0%
	W	2.00	6.47	0.00	0.00	0.00		0.00	0.00	0.0%
		2.30	6.60	0.10	0.00	0.33	0.10	0.03	0.00	0.0%
		2.60	6.59	0.10	0.00	0.30	0.10	0.03	0.00	0.0%
		2.90	6.55	0.10	0.13	0.30	0.10	0.03	0.00	1.3%
		3.20	6.54	0.10	0.24	0.30	0.10	0.03	0.01	2.3%
		3.50	6.59	0.10	0.77	0.30	0.10	0.03	0.02	7.5%
		3.80	6.59	0.10	0.38	0.30	0.10	0.03	0.01	3.7%
		4.10	6.62	0.15	0.50	0.30	0.15	0.05	0.02	7.3%
		4.40	6.64	0.20	0.79	0.30	0.20	0.06	0.05	15.4%
		4.70	6.66	0.20	0.77	0.30	0.20	0.06	0.05	15.0%
		5.00	6.70	0.25	0.80	0.30	0.25	0.08	0.06	19.5%
		5.30	6.64	0.20	0.80	0.31	0.20	0.06	0.05	15.6%
		5.60	6.62	0.15	0.48	0.30	0.15	0.05	0.02	7.0%
		5.90	6.58	0.15	0.30	0.30	0.15	0.05	0.01	4.4%
		6.20	6.55	0.10	0.12	0.30	0.10	0.03	0.00	1.2%
	W	6.50	6.46	0.00	0.00	0.31		0.00	0.00	0.0%
	G	7.80	5.89	0.00	0.00	0.00		0.00	0.00	0.0%
	S	10.40	5.48	0.00	0.00	0.00		0.00	0.00	0.0%
	TOTALS ----------					4.56	0.25 (Max.)	0.60	0.31	100.0%

Manning's n = 0.1158
Hydraulic Radius= 0.131477097

STREAM NAME: Right Fork Barrel Springs Creek
XS LOCATION: 1/4 mile upstream from confluence with Left Fork
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	0.60	0.59	-2.0%
6.22	0.60	1.83	204.4%
6.24	0.60	1.72	186.5%
6.26	0.60	1.61	168.8%
6.28	0.60	1.51	151.4%
6.30	0.60	1.41	134.2%
6.32	0.60	1.30	117.3%
6.34	0.60	1.20	100.6%
6.36	0.60	1.10	84.1%
6.38	0.60	1.01	67.9%
6.40	0.60	0.91	52.0%
6.42	0.60	0.82	36.2%
6.43	0.60	0.77	28.5%
6.44	0.60	0.72	20.8%
6.45	0.60	0.68	13.1%
6.46	0.60	0.63	5.5%
6.47	0.60	0.59	-2.0%
6.48	0.60	0.54	-9.4%
6.49	0.60	0.50	-16.8%
6.50	0.60	0.46	-24.0%
6.51	0.60	0.41	-31.2%
6.52	0.60	0.37	-38.3%
6.54	0.60	0.29	-52.1%
6.56	0.60	0.21	-65.0%
6.58	0.60	0.14	-75.9%
6.60	0.60	0.09	-84.8%
6.62	0.60	0.06	-90.7%
6.64	0.60	0.03	-95.2%
6.66	0.60	0.01	-97.9%
6.68	0.60	0.00	-99.3%
6.70	0.60	0.00	-100.0%
6.72	0.60	0.00	-100.0%

WATERLINE AT ZERO
AREA ERROR = 6.462

STREAM NAME: Right Fork Barrel Springs Creek
XS LOCATION: 1/4 mile upstream from confluence with Left Fork
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"	5.89	6.60	0.57	0.81	3.78	6.97	100.0%	0.54	4.99	1.32
	5.91	6.52	0.56	0.79	3.63	6.88	98.7%	0.53	4.72	1.30
	5.96	6.34	0.52	0.74	3.31	6.67	95.6%	0.50	4.13	1.25
	6.01	6.15	0.49	0.69	3.00	6.46	92.6%	0.46	3.57	1.19
	6.06	5.97	0.45	0.64	2.70	6.25	89.6%	0.43	3.06	1.13
	6.11	5.79	0.41	0.59	2.40	6.04	86.6%	0.40	2.58	1.07
	6.16	5.60	0.38	0.54	2.12	5.83	83.6%	0.36	2.14	1.01
	6.21	5.42	0.34	0.49	1.84	5.62	80.6%	0.33	1.74	0.94
	6.26	5.24	0.30	0.44	1.57	5.41	77.6%	0.29	1.37	0.87
	6.31	5.06	0.26	0.39	1.32	5.20	74.6%	0.25	1.05	0.80
	6.36	4.87	0.22	0.34	1.07	4.99	71.6%	0.21	0.76	0.71
	6.41	4.69	0.18	0.29	0.83	4.78	68.6%	0.17	0.51	0.62
"WL"	6.46	4.50	0.13	0.24	0.60	4.57	65.5%	0.13	0.31	0.51
	6.51	4.23	0.09	0.19	0.38	4.27	61.3%	0.09	0.15	0.40
	6.56	3.34	0.06	0.14	0.18	3.36	48.2%	0.05	0.05	0.29
	6.61	1.63	0.04	0.09	0.06	1.65	23.6%	0.04	0.01	0.22
	6.66	0.47	0.02	0.04	0.01	0.48	6.8%	0.02	0.00	0.14

STREAM NAME: Right Fork Barrel Springs Creek
XS LOCATION: 1/4 mile upstream from confluence with Left Fork
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	0.31	cfs
CALCULATED FLOW (Qc)=	0.31	cfs
(Qm-Qc)/Qm * 100 =	0.1	%
MEASURED WATERLINE (WLm)=	6.47	ft
CALCULATED WATERLINE (WLc)=	6.46	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.25	ft
MAX CALCULATED DEPTH (Dc)=	0.24	ft
(Dm-Dc)/Dm * 100	4.9	%
MEAN VELOCITY=	0.51	ft/sec
MANNING'S N=	0.116	
SLOPE=	0.024	ft/ft
.4 * Qm =	0.1	cfs
2.5 * Qm=	0.8	cfs

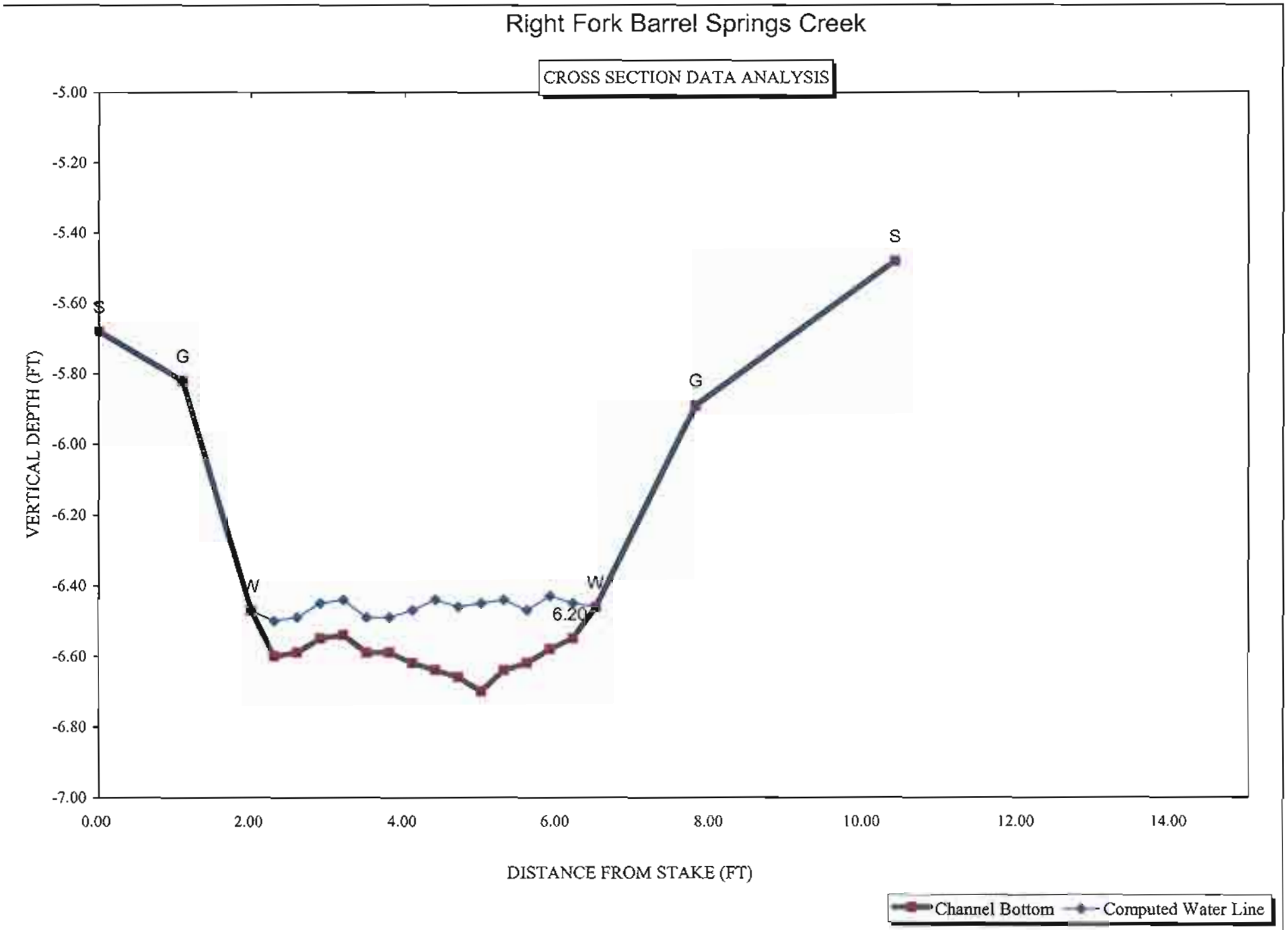
RECOMMENDED INSTREAM FLOW:

FLOW (CFS)	PERIOD

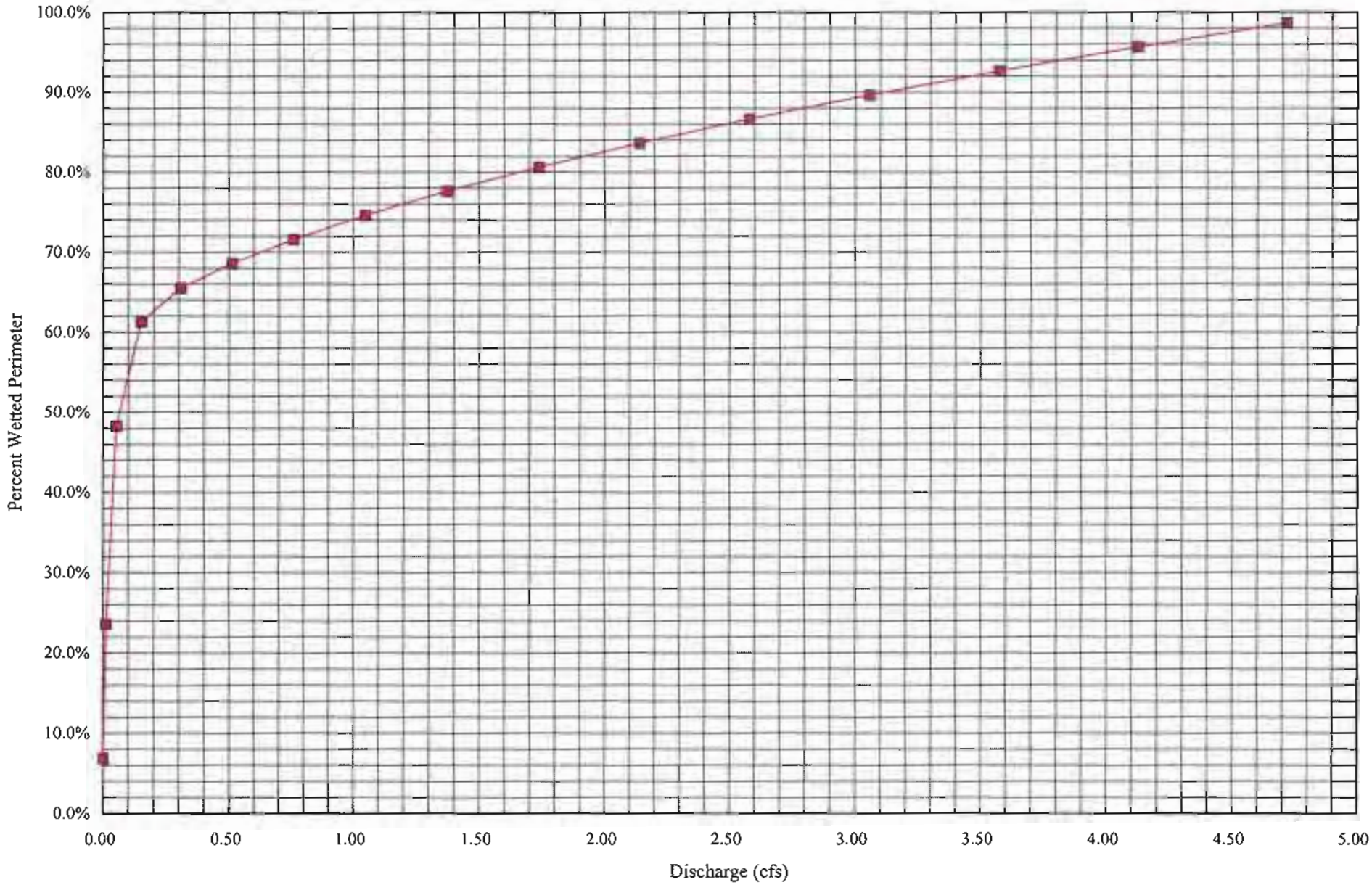
RATIONALE FOR RECOMMENDATION:

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

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


Right Fork Barrel Springs Creek
CROSS SECTION DATA ANALYSIS
-5.00
-5.20
-5.40
-5.60
-5.80
-6.00
-6.20
-6.40
-6.60
-6.80
-7.00
VERTICAL DEPTH (FT)
S
G
W
6.20
W
G
S
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line

Percent Wetted Perimeter vs. Discharge



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

LOCATION INFORMATION

STREAM NAME:	Right Fork Barrel Springs Creek
XS LOCATION:	600 ft. upstream from confluence with Left Fork
XS NUMBER:	2
DATE:	28-Sep-06
OBSERVERS:	R. Smith, J. Thompson
1/4 SEC:	SW
SECTION:	6
TWP:	6S
RANGE:	101W
PM:	6th
COUNTY:	Mesa
WATERSHED:	Colorado
DIVISION:	5
DOW CODE:	19156
USGS MAP:	Calf Canyon 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:	0.027

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

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

STREAM NAME: Right Fork Barrel Springs Creek
XS LOCATION: 600 ft. upstream from confluence with Left Fork
XS NUMBER: 2

DATA POINTS= 20

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	5.12	0.00	0.00	0.00		0.00	0.00	#DIV/0!
1	G	2.60	6.42	0.00	0.00	0.00		0.00	0.00	#DIV/0!
1	G	23.00	6.33	0.00	0.00					
	S	25.70	6.08	0.00	0.00	0.00		0.00	0.00	#DIV/0!
	TOTALS ----------					0.00	0 (Max.)	0.00	0.00	#DIV/0!

Manning's n = #DIV/0!
Hydraulic Radius= #DIV/0!

STREAM NAME: Right Fork Barrel Springs Creek
XS LOCATION: 600 ft. upstream from confluence with Left Fork
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	0.00	21.16	#DIV/0!
-0.25	0.00	22.15	#DIV/0!
-0.23	0.00	22.07	#DIV/0!
-0.21	0.00	21.99	#DIV/0!
-0.19	0.00	21.91	#DIV/0!
-0.17	0.00	21.83	#DIV/0!
-0.15	0.00	21.75	#DIV/0!
-0.13	0.00	21.67	#DIV/0!
-0.11	0.00	21.59	#DIV/0!
-0.09	0.00	21.51	#DIV/0!
-0.07	0.00	21.43	#DIV/0!
-0.05	0.00	21.36	#DIV/0!
-0.04	0.00	21.32	#DIV/0!
-0.03	0.00	21.28	#DIV/0!
-0.02	0.00	21.24	#DIV/0!
-0.01	0.00	21.20	#DIV/0!
0.00	0.00	21.16	#DIV/0!
0.01	0.00	21.12	#DIV/0!
0.02	0.00	21.08	#DIV/0!
0.03	0.00	21.04	#DIV/0!
0.04	0.00	21.00	#DIV/0!
0.05	0.00	20.96	#DIV/0!
0.07	0.00	20.88	#DIV/0!
0.09	0.00	20.80	#DIV/0!
0.11	0.00	20.72	#DIV/0!
0.13	0.00	20.64	#DIV/0!
0.15	0.00	20.57	#DIV/0!
0.17	0.00	20.49	#DIV/0!
0.19	0.00	20.41	#DIV/0!
0.21	0.00	20.33	#DIV/0!
0.23	0.00	20.25	#DIV/0!
0.25	0.00	20.17	#DIV/0!

WATERLINE AT ZERO
AREA ERROR = #DIV/0!

STREAM NAME: Right Fork Barrel Springs Creek
XS LOCATION: 600 ft. upstream from confluence with Left Fork
XS NUMBER: 2

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	6.42	0.00	#DIV/0!	0.00	0.00	0.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
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	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
WL	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Right Fork Barrel Springs Creek
XS LOCATION: 600 ft. upstream from confluence with Left Fork
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	0.00	cfs
CALCULATED FLOW (Qc)=	#DIV/0!	cfs
(Qm-Qc)/Qm * 100 =	#DIV/0!	%
MEASURED WATERLINE (WLm)=	0.00	ft
CALCULATED WATERLINE (WLc)=	#DIV/0!	ft
(WLm-WLc)/WLm * 100 =	#DIV/0!	%
MAX MEASURED DEPTH (Dm)=	0.00	ft
MAX CALCULATED DEPTH (Dc)=	#DIV/0!	ft
(Dm-Dc)/Dm * 100	#DIV/0!	%
MEAN VELOCITY=	#DIV/0!	ft/sec
MANNING'S N=	#DIV/0!	
SLOPE=	0.027	ft/ft
.4 * Qm =	0.0	cfs
2.5 * Qm=	0.0	cfs

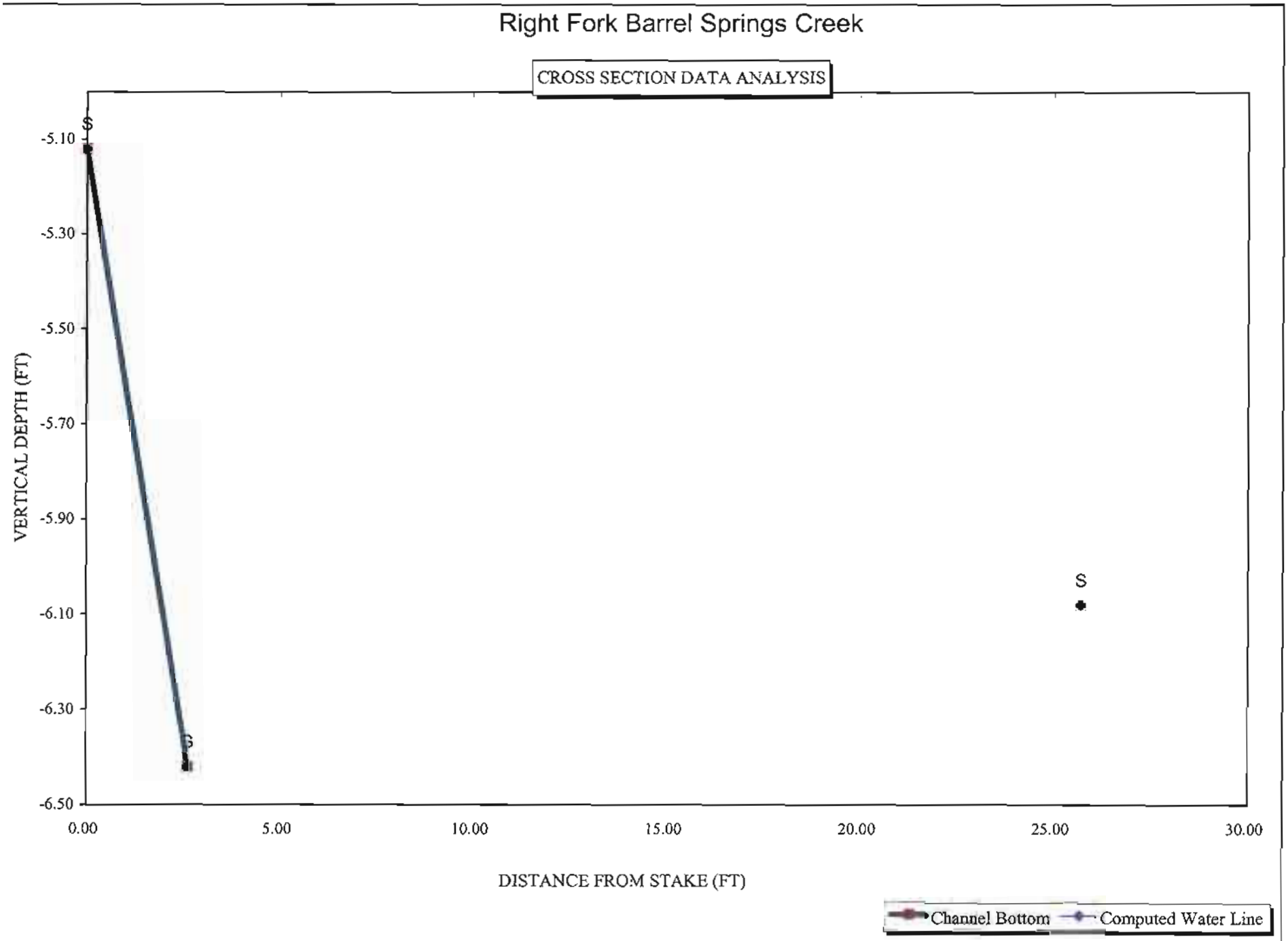
RECOMMENDED INSTREAM FLOW:

FLOW (CFS)	PERIOD

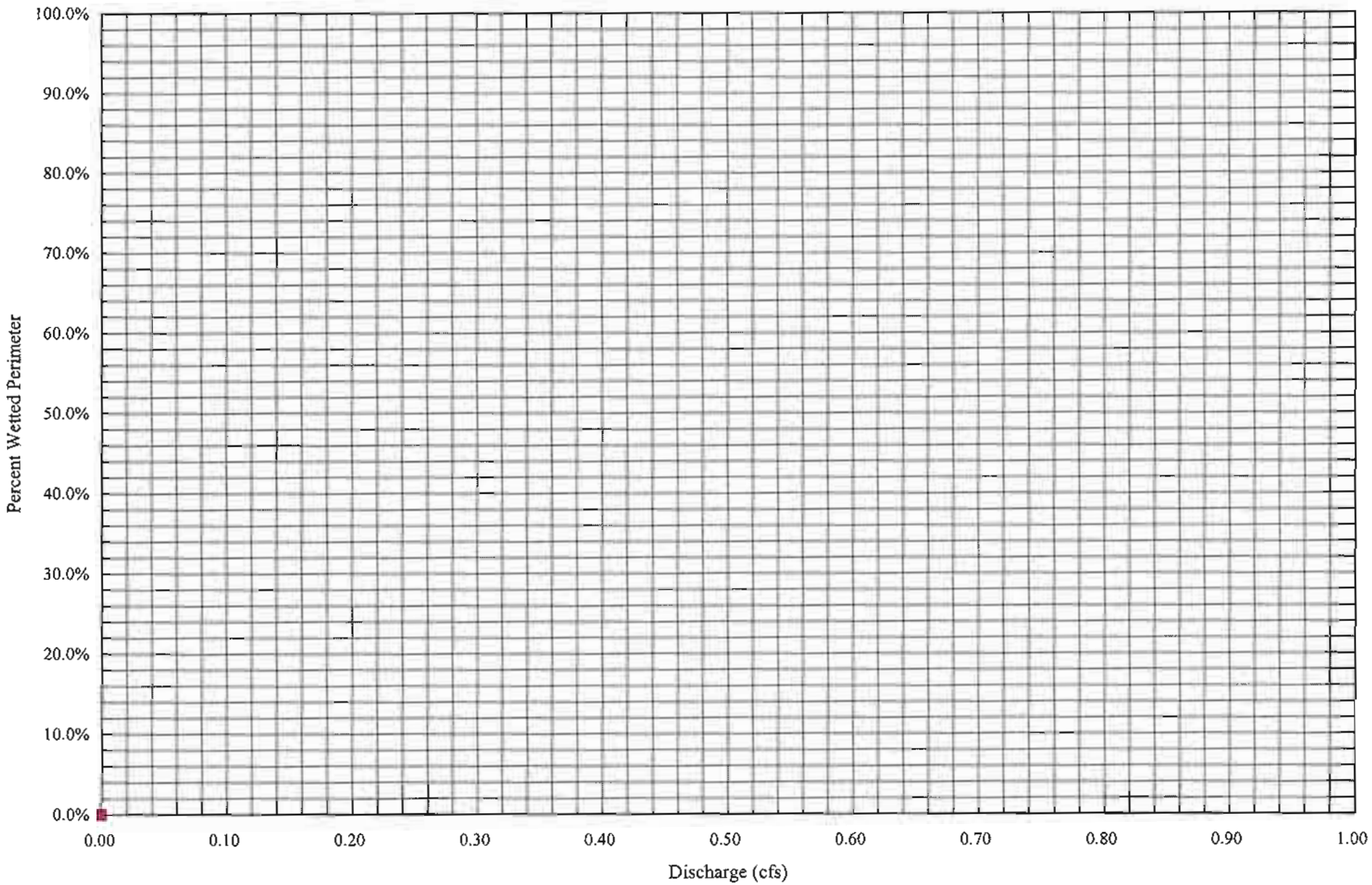
RATIONALE FOR RECOMMENDATION:

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

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


Right Fork Barrel Springs Creek
CROSS SECTION DATA ANALYSIS
VERTICAL DEPTH (FT)
-5.10
-5.30
-5.50
-5.70
-5.90
-6.10
-6.30
-6.50
0.00
5.00
10.00
15.00
20.00
25.00
30.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line

Percent Wetted Perimeter vs. Discharge



Grand Junction Field Office Stream Surveys
September 2006

Right Fork Barrel Springs Creek - Water Code #19156

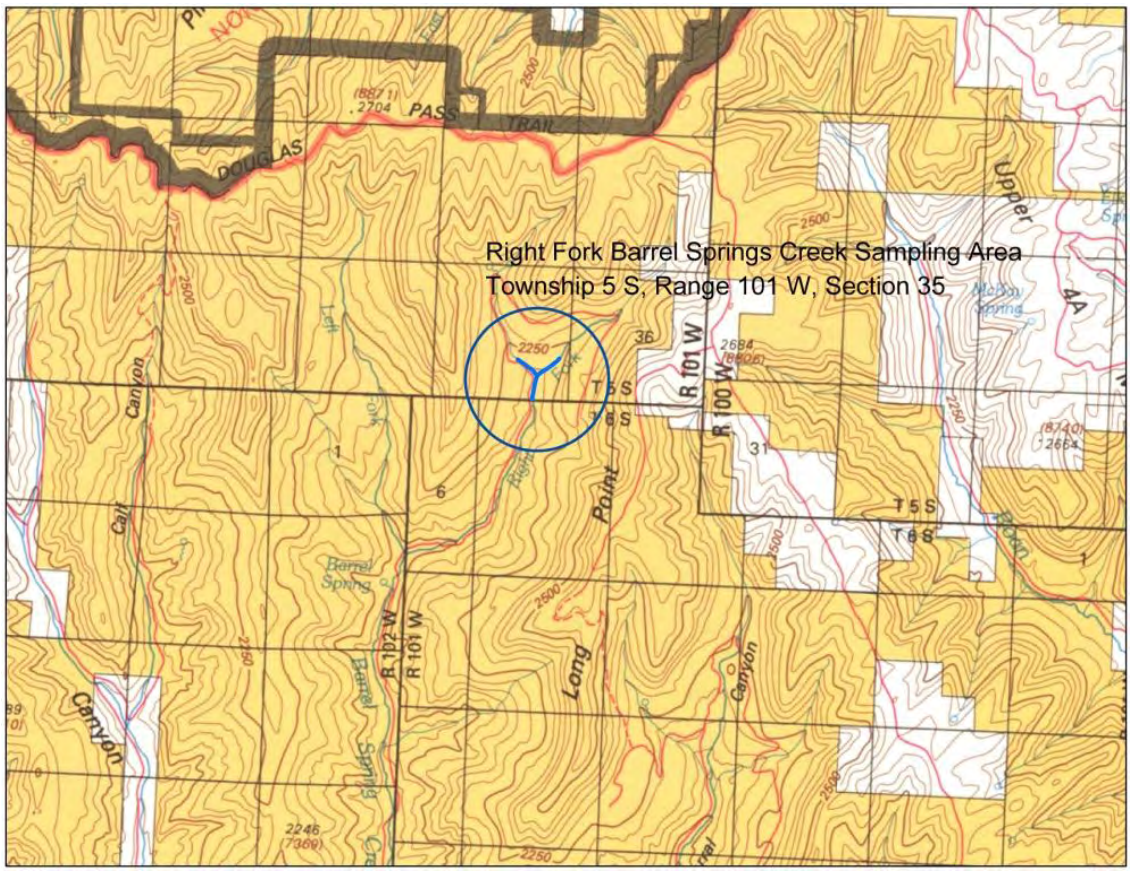
Right Fork Barrel Springs Creek, located near Douglas, north of Fruita, CO and located on BLM lands managed by the Grand Junction Field Office was sampled on September 28, 2006. Right Fork Barrel Springs Creek is tributary to Barrel Springs Creek which is tributary to East Salt Creek that then enters the Colorado River. Presence/absence sampling was done in support of the Colorado BLM in-stream flow program. Sampling was conducted via backpack electro-shocker and approximately 200 feet of stream was sampled. Personnel present were Lynae Rogers, GJFO Range Specialist/Riparian lead, Tom Fresques, BLM West Slope Fisheries Biologist, Roy Smith CSO Water Rights Program Lead, and Jay Thompson CSO Fisheries and Riparian Lead.

A total of approximately 70 fish were collected. All fish were brook trout and they ranged in size from 72mm to 290mm.


28 9 2006


28 9 2006


28 9 2006


Right Fork Barrel Springs Creek Sampling Area
Township 5 S, Range 101 W, Section 35
DOUGLAS
PASS
TRAIL
Upper
Canyon
Point
Long
Canyon
Barrel Spring
R 101 W
R 102 W
T 5 S
T 6 S
36
31
1
6
2250
2500