

Stream: South Fork Slater Creek (Lower Segment)

Executive Summary

Water Division: 6

Water District: 54

CDOW#: 23286

CWCB ID: 10/6/A-006

Segment: Confluence with West Prong SF Slater Creek to Confluence with Slater Creek

Upper Terminus: CONFLUENCE WITH WEST PRONG SOUTH FORK SLATER CREEK
(Latitude 40° 49' 36.96"N) (Longitude 107° 17' 46.86"W)

Lower Terminus: CONFLUENCE WITH SLATER CREEK
(Latitude 40° 51' 6.41"N) (Longitude 107° 17' 26.38"W)

Watershed: Little Snake (HUC#: 14050003)

Counties: Routt

Length: 1.98 miles

USGS Quad: Buck Point

Flow Recommendation:

9.0 cfs	(March 15 – July 15)
2.0 cfs	(July 16 – August 15)
0.8 cfs	(August 16 – October 15)
5.25 cfs	(October 16 – March 14)



Staff Analysis and Recommendation

Summary

The information contained in this report and the associated instream flow file folder 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 Colorado Division of Wildlife (CDOW) and Trout Unlimited (TU) recommended this segment of South Fork Slater Creek to the CWCB for inclusion into the Instream Flow Program. South Fork Slater 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.

South Fork Slater Creek originates on the northern flank of the Elkhead Mountains just west of Bears Ears Peaks at an elevation of 9,560 feet. It flows generally northward for 7.1 miles through the Routt National Forest to its confluence with the Slater Creek at an elevation of 7,700. Approximately 54% the land on the 1.96 mile segment addressed by this report is publicly owned. South Fork Slater Creek is located within Routt County and has a total drainage area of the creek is approximately 16.64 square miles.

The subject of this report is a segment of South Fork Slater Creek beginning at the confluence with West Prong South Fork Slater Creek and extending downstream to the confluence with Slater Creek. The proposed segment is located approximately 21.5 miles northeast of Craig. Staff has received one joint recommendation for this segment, from the CDOW and TU. The recommendation for this segment is discussed below.

Instream Flow Recommendation

CDOW & TU recommended 9.0 cfs (March 15 – July 15), 2.0 cfs (July 16 – August 15), 0.8 cfs (August 16 – October 15) and 5.25 cfs (October 16 – March 14) based on their data collection efforts and CWCB staff's water availability analysis.

Land Status Review

Upper Terminus	Lower Terminus	Total Length (miles)	Land Ownership	
			% Private	% Public
Confluence w/ West Prong SF Slater Creek	Confluence w/ Slater Creek	1.96	46%	54%

100% of the public lands are managed by the USFS.

Biological Data

In July and September of 2009 TU and CDOW collected stream cross sectional data, natural environment data, and other data needed to quantify instream flow needs. Previous survey data collected by CDOW indicated the stream supports healthy populations of Colorado River cutthroat trout, brook trout and molted sculpin.

Field Survey Data

TU and CDOW 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. .

Biological Flow Recommendation

The CWCBB 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: Data

Party	Date	Q	250%-40%	Summer (3/3)	Winter (2/3)
CDOW/TU	7/8/2009	9.59	24.0 – 3.8	38.8*	6.5
CDOW/TU	9/17/2009	1.71	4.3 – 0.7	14.2*	4.0

* Values are outside of the range of the R2Cross model.

The R2Cross data from the two cross sections indicate that the fishery of this segment of SF Slater Creek can be protected with summer flows between 14.2 and 38.8 cfs and winter flow of 5.25 cfs. However, the summer flow recommendations were greater than 2.5 times the field measured discharge and therefore, were considered outside of the modeling accuracy of R2Cross. The recommenders used the sum of the summertime instream flow recommendation from West Prong Slater Creek above Decker Ditch (4.9 cfs) together with the summertime

instream flow recommendation from the SF Slater Creek upstream of the confluence with West Prong South Fork Slater Creek (4.1 cfs) to recommend a 9.0 cfs instream flow during the summer months. The winter flow recommendation, which meets 2 or 3 criteria and is within the accuracy range of the R2Cross model is 5.25 cfs. These recommendations were derived by averaging the results of the two data sets.

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 together 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 **South Fork Slater Cr - Lower** no such gage is available at the LT. In fact, there is no gage on South Fork Slater Cr - Lower. It is thus necessary to describe the normal flow regime at Chaparral Creek above the LT through a "representative" gage station. The gage station selected for this purpose was NORTH FORK ELKHEAD CREEK NEAR ELKHEAD, CO (USGS 09245500); it has a period of record (POR) of 15 years collected between 1958 and 1973. The gage is at an elevation of 7,005.00 ft above mean sea level (amsl) and has a drainage area of 21.0 mi². The hydrograph (plot of discharge over time) produced from this gage includes the consumptive uses of numerous diversions. However, the existence of these diversions does not preclude use of the data from the gage. To make the measured data transferable to South Fork Slater Cr - Lower above the LT, the consumptive portions of these diversions were added back to the measured hydrograph. The resulting "adjusted" hydrograph could then be used on South

Fork Slater Cr - Lower above the LT by multiplying the “adjusted” gage discharge values by an area ratio; specifically, the area of South Fork Slater Cr - Lower above the LT (16.64 mi²) to North Fork Elkhead Creek Near Elkhead, CO (21.00 mi²). The resulting proportioned hydrograph was itself “adjusted” (decreased) to reflect the consumptive irrigation depletions and out-of-basin diversions upstream of the LT. The final hydrograph thus represents a distribution of flow over time that has been reduced to reflect existing human uses.

{The Following discussion is based upon the US Geological Survey’s *Techniques of Water-Resources Investigations Series, Book 4: Hydrologic Analysis and Interpretation, Chapter A3: Statistical Methods in Water Resources* (Chapter 3: Describing Uncertainty) by D.R. Helsel and R. M. Hirsch. This technical reference provides the scientific background and guidance important to the systematic interpretation of hydrologic data. The document is available online and is a valuable aid to understanding and interpreting the analyses described here.}

The next step in producing a representation of the discharge at South Fork Slater Cr - Lower is to compute the Geometric Mean of the area-prorated “adjusted” data values from the North Fork Elkhead Creek Near Elkhead, CO hydrograph. This step is of value because of the inherent statistical weaknesses found in any collection of data intended to measure natural stream discharge. Without getting into the details of statistical theory, it is worth noting that a set of discharge measurements is inherently inaccurate, no matter how well collected, due to the difficulties attendant to data collection, especially hydrologic data. To give deference to this fact and to increase the value of the hydrograph product of this analysis, the Geometric Means of the data were computed and plotted along with the 95% Confidence Intervals about the data. The resultant hydrograph, including recommended Instream Flow values, is displayed in figure 1 with the data displayed in Table 2.

Figure 1

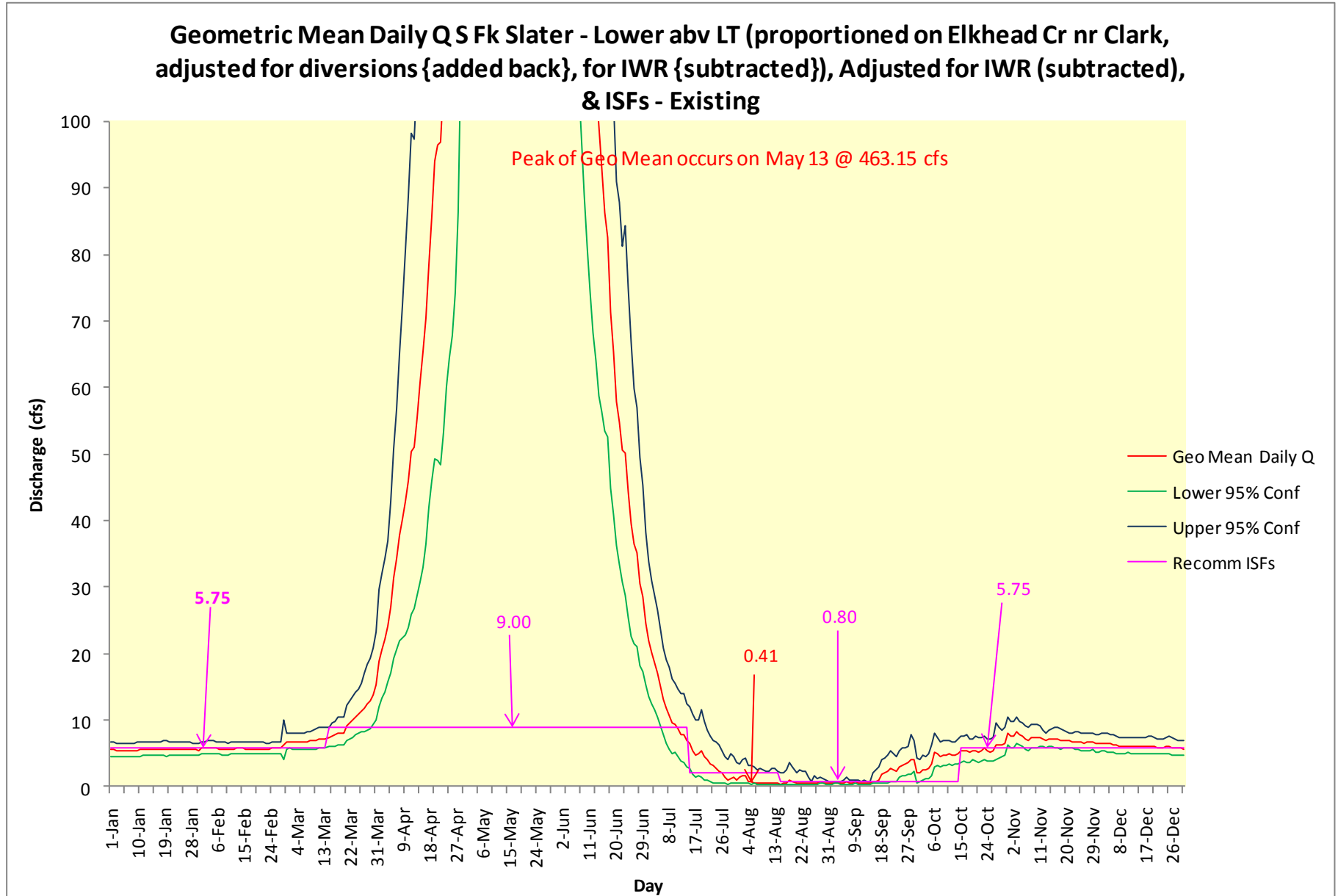


Table 2. Geometric Mean Discharge and Recommended Instream Flows			
Date	Existing ISF	Recommended ISF	Proportioned Adjusted GM (abv gage) Adj (-) for Irr & OoB in S Fk Slater Cr – Lower Cr abv LT
1-Jan		5.25	5.52
2-Jan		5.25	5.52
3-Jan		5.25	5.45
4-Jan		5.25	5.45
5-Jan		5.25	5.41
6-Jan		5.25	5.44
7-Jan		5.25	5.45
8-Jan		5.25	5.40
9-Jan		5.25	5.40
10-Jan		5.25	5.47
11-Jan		5.25	5.58
12-Jan		5.25	5.60
13-Jan		5.25	5.62
14-Jan		5.25	5.62
15-Jan		5.25	5.62
16-Jan		5.25	5.64
17-Jan		5.25	5.61
18-Jan		5.25	5.66
19-Jan		5.25	5.64
20-Jan		5.25	5.64
21-Jan		5.25	5.61
22-Jan		5.25	5.65
23-Jan		5.25	5.64
24-Jan		5.25	5.59
25-Jan		5.25	5.62
26-Jan		5.25	5.62
27-Jan		5.25	5.61
28-Jan		5.25	5.62
29-Jan		5.25	5.58
30-Jan		5.25	5.51
31-Jan		5.25	5.50
1-Feb		5.25	5.77
2-Feb		5.25	5.79
3-Feb		5.25	5.85
4-Feb		5.25	5.88
5-Feb		5.25	5.84
6-Feb		5.25	5.79
7-Feb		5.25	5.72
8-Feb		5.25	5.65
9-Feb		5.25	5.65
10-Feb		5.25	5.63
11-Feb		5.25	5.69
12-Feb		5.25	5.70

13-Feb	5.25	5.76
14-Feb	5.25	5.77
15-Feb	5.25	5.76
16-Feb	5.25	5.72
17-Feb	5.25	5.69
18-Feb	5.25	5.70
19-Feb	5.25	5.71
20-Feb	5.25	5.70
21-Feb	5.25	5.72
22-Feb	5.25	5.70
23-Feb	5.25	5.66
24-Feb	5.25	5.66
25-Feb	5.25	5.73
26-Feb	5.25	5.77
27-Feb	5.25	5.79
28-Feb	5.25	5.81
29-Feb	5.25	6.30
1-Mar	5.25	6.76
2-Mar	5.25	6.80
3-Mar	5.25	6.78
4-Mar	5.25	6.73
5-Mar	5.25	6.68
6-Mar	5.25	6.70
7-Mar	5.25	6.73
8-Mar	5.25	6.82
9-Mar	5.25	6.87
10-Mar	5.25	6.93
11-Mar	5.25	7.00
12-Mar	5.25	7.09
13-Mar	5.25	7.15
14-Mar	5.25	7.20
15-Mar	9.0	7.32
16-Mar	9.0	7.55
17-Mar	9.0	7.78
18-Mar	9.0	8.05
19-Mar	9.0	8.00
20-Mar	9.0	8.13
21-Mar	9.0	9.24
22-Mar	9.0	9.65
23-Mar	9.0	10.00
24-Mar	9.0	10.49
25-Mar	9.0	10.85
26-Mar	9.0	11.27
27-Mar	9.0	11.89
28-Mar	9.0	12.35
29-Mar	9.0	12.98
30-Mar	9.0	13.79
31-Mar	9.0	15.24
1-Apr	9.0	18.95

2-Apr	9.0	20.69
3-Apr	9.0	22.15
4-Apr	9.0	24.10
5-Apr	9.0	27.10
6-Apr	9.0	31.36
7-Apr	9.0	34.23
8-Apr	9.0	37.76
9-Apr	9.0	40.32
10-Apr	9.0	42.93
11-Apr	9.0	46.03
12-Apr	9.0	50.45
13-Apr	9.0	50.96
14-Apr	9.0	55.37
15-Apr	9.0	60.68
16-Apr	9.0	65.30
17-Apr	9.0	70.41
18-Apr	9.0	78.32
19-Apr	9.0	85.56
20-Apr	9.0	94.08
21-Apr	9.0	96.49
22-Apr	9.0	96.93
23-Apr	9.0	105.79
24-Apr	9.0	116.94
25-Apr	9.0	118.47
26-Apr	9.0	117.21
27-Apr	9.0	122.30
28-Apr	9.0	131.90
29-Apr	9.0	163.12
30-Apr	9.0	185.27
1-May	9.0	228.58
2-May	9.0	258.46
3-May	9.0	286.22
4-May	9.0	299.07
5-May	9.0	300.87
6-May	9.0	310.79
7-May	9.0	358.47
8-May	9.0	369.02
9-May	9.0	379.46
10-May	9.0	415.89
11-May	9.0	445.62
12-May	9.0	462.79
13-May	9.0	463.15
14-May	9.0	431.79
15-May	9.0	428.22
16-May	9.0	444.09
17-May	9.0	446.04
18-May	9.0	432.50
19-May	9.0	435.98
20-May	9.0	417.95

21-May	9.0	416.62
22-May	9.0	403.27
23-May	9.0	370.22
24-May	9.0	345.47
25-May	9.0	322.77
26-May	9.0	310.03
27-May	9.0	301.73
28-May	9.0	280.53
29-May	9.0	267.21
30-May	9.0	257.49
31-May	9.0	245.13
1-Jun	9.0	224.68
2-Jun	9.0	218.34
3-Jun	9.0	210.07
4-Jun	9.0	193.12
5-Jun	9.0	178.28
6-Jun	9.0	167.46
7-Jun	9.0	161.57
8-Jun	9.0	159.24
9-Jun	9.0	146.12
10-Jun	9.0	137.29
11-Jun	9.0	131.19
12-Jun	9.0	120.20
13-Jun	9.0	111.95
14-Jun	9.0	105.67
15-Jun	9.0	99.29
16-Jun	9.0	92.97
17-Jun	9.0	86.24
18-Jun	9.0	82.58
19-Jun	9.0	71.30
20-Jun	9.0	65.46
21-Jun	9.0	57.95
22-Jun	9.0	54.78
23-Jun	9.0	50.65
24-Jun	9.0	50.05
25-Jun	9.0	44.47
26-Jun	9.0	39.64
27-Jun	9.0	36.43
28-Jun	9.0	35.19
29-Jun	9.0	30.64
30-Jun	9.0	28.49
1-Jul	9.0	24.67
2-Jul	9.0	21.86
3-Jul	9.0	20.09
4-Jul	9.0	18.71
5-Jul	9.0	17.15
6-Jul	9.0	15.06
7-Jul	9.0	13.22
8-Jul	9.0	11.71

9-Jul	9.0	10.70
10-Jul	9.0	9.63
11-Jul	9.0	9.45
12-Jul	9.0	8.72
13-Jul	9.0	7.89
14-Jul	9.0	7.77
15-Jul	9.0	6.87
16-Jul	2.0	6.45
17-Jul	2.0	5.48
18-Jul	2.0	4.80
19-Jul	2.0	5.05
20-Jul	2.0	5.36
21-Jul	2.0	4.50
22-Jul	2.0	4.07
23-Jul	2.0	3.51
24-Jul	2.0	3.18
25-Jul	2.0	2.65
26-Jul	2.0	2.33
27-Jul	2.0	2.14
28-Jul	2.0	1.49
29-Jul	2.0	1.02
30-Jul	2.0	1.14
31-Jul	2.0	1.40
1-Aug	2.0	1.03
2-Aug	2.0	1.36
3-Aug	2.0	1.71
4-Aug	2.0	1.68
5-Aug	2.0	0.82
6-Aug	2.0	0.70
7-Aug	2.0	0.61
8-Aug	2.0	0.59
9-Aug	2.0	0.63
10-Aug	2.0	0.60
11-Aug	2.0	0.54
12-Aug	2.0	0.56
13-Aug	2.0	0.62
14-Aug	2.0	0.63
15-Aug	2.0	0.53
16-Aug	0.80	0.41
17-Aug	0.80	0.52
18-Aug	0.80	0.56
19-Aug	0.80	1.07
20-Aug	0.80	0.67
21-Aug	0.80	0.54
22-Aug	0.80	0.58
23-Aug	0.80	0.55
24-Aug	0.80	0.56
25-Aug	0.80	0.46
26-Aug	0.80	0.45

27-Aug	0.80	0.58
28-Aug	0.80	0.60
29-Aug	0.80	0.68
30-Aug	0.80	0.62
31-Aug	0.80	0.55
1-Sep	0.80	0.57
2-Sep	0.80	0.58
3-Sep	0.80	0.61
4-Sep	0.80	0.62
5-Sep	0.80	0.53
6-Sep	0.80	0.61
7-Sep	0.80	0.67
8-Sep	0.80	0.49
9-Sep	0.80	0.63
10-Sep	0.80	0.68
11-Sep	0.80	0.58
12-Sep	0.80	0.56
13-Sep	0.80	0.58
14-Sep	0.80	0.58
15-Sep	0.80	0.57
16-Sep	0.80	0.75
17-Sep	0.80	0.75
18-Sep	0.80	1.07
19-Sep	0.80	1.76
20-Sep	0.80	2.05
21-Sep	0.80	2.29
22-Sep	0.80	2.65
23-Sep	0.80	2.52
24-Sep	0.80	2.31
25-Sep	0.80	3.06
26-Sep	0.80	3.30
27-Sep	0.80	3.33
28-Sep	0.80	3.54
29-Sep	0.80	4.10
30-Sep	0.80	4.07
1-Oct	0.80	2.05
2-Oct	0.80	2.11
3-Oct	0.80	2.58
4-Oct	0.80	2.58
5-Oct	0.80	2.84
6-Oct	0.80	3.52
7-Oct	0.80	5.09
8-Oct	0.80	4.95
9-Oct	0.80	4.62
10-Oct	0.80	4.71
11-Oct	0.80	4.84
12-Oct	0.80	4.84
13-Oct	0.80	4.74
14-Oct	0.80	4.79

15-Oct	0.80	4.99
16-Oct	5.25	5.43
17-Oct	5.25	5.47
18-Oct	5.25	5.44
19-Oct	5.25	5.17
20-Oct	5.25	5.42
21-Oct	5.25	5.43
22-Oct	5.25	5.28
23-Oct	5.25	5.37
24-Oct	5.25	5.73
25-Oct	5.25	5.39
26-Oct	5.25	5.26
27-Oct	5.25	5.38
28-Oct	5.25	6.34
29-Oct	5.25	6.22
30-Oct	5.25	6.26
31-Oct	5.25	6.55
1-Nov	5.25	8.11
2-Nov	5.25	7.62
3-Nov	5.25	7.58
4-Nov	5.25	8.31
5-Nov	5.25	7.82
6-Nov	5.25	7.58
7-Nov	5.25	7.21
8-Nov	5.25	7.00
9-Nov	5.25	7.30
10-Nov	5.25	7.43
11-Nov	5.25	7.45
12-Nov	5.25	7.37
13-Nov	5.25	7.16
14-Nov	5.25	6.88
15-Nov	5.25	7.20
16-Nov	5.25	7.22
17-Nov	5.25	7.12
18-Nov	5.25	7.21
19-Nov	5.25	6.96
20-Nov	5.25	7.00
21-Nov	5.25	6.99
22-Nov	5.25	6.86
23-Nov	5.25	6.81
24-Nov	5.25	6.81
25-Nov	5.25	6.71
26-Nov	5.25	6.67
27-Nov	5.25	6.57
28-Nov	5.25	6.63
29-Nov	5.25	6.67
30-Nov	5.25	6.71
1-Dec	5.25	6.45
2-Dec	5.25	6.39

3-Dec	5.25	6.52
4-Dec	5.25	6.52
5-Dec	5.25	6.41
6-Dec	5.25	6.40
7-Dec	5.25	6.32
8-Dec	5.25	6.19
9-Dec	5.25	6.04
10-Dec	5.25	6.04
11-Dec	5.25	6.10
12-Dec	5.25	6.15
13-Dec	5.25	6.13
14-Dec	5.25	6.13
15-Dec	5.25	6.12
16-Dec	5.25	6.10
17-Dec	5.25	6.05
18-Dec	5.25	6.07
19-Dec	5.25	6.12
20-Dec	5.25	6.16
21-Dec	5.25	6.09
22-Dec	5.25	5.94
23-Dec	5.25	5.90
24-Dec	5.25	5.92
25-Dec	5.25	6.01
26-Dec	5.25	6.03
27-Dec	5.25	5.90
28-Dec	5.25	5.80
29-Dec	5.25	5.75
30-Dec	5.25	5.75
31-Dec	5.25	5.71

Existing Water Right Information

Staff has analyzed the water rights tabulation and contacted the Division Engineer Office (DEO) to identify any potential water availability problems. There are no decreed surface diversions within this reach of stream. Staff has determined that water is available for appropriation on South Fork Slater Creek, between the confluence with West Prong South Fork Slater Creek and the confluence with Slater 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: Confluence with West Prong SF Slater Creek to Confluence with Slater Creek

Upper Terminus: CONFLUENCE WITH WEST PRONG SOUTH FORK SLATER CREEK

(Latitude 40° 49' 36.96"N) (Longitude 107° 17' 46.86"W)

UTM North: 4522082.96 UTM North: 306361.60

SW NW S17 T10N R88W 6th PM

150' East of the West Section Line; 2610' South of the North Section Line

Lower Terminus: CONFLUENCE WITH SLATER CREEK

(Latitude 40° 51' 6.41"N) (Longitude 107° 17' 26.38"W)

UTM North: 4524828.95 UTM North: 306913.54

SE SW S5 T10N R88W 6th PM

1720' East of the West Section Line; 1180' North of the South Section Line

Watershed: Little Snake (HUC#: 14050003)

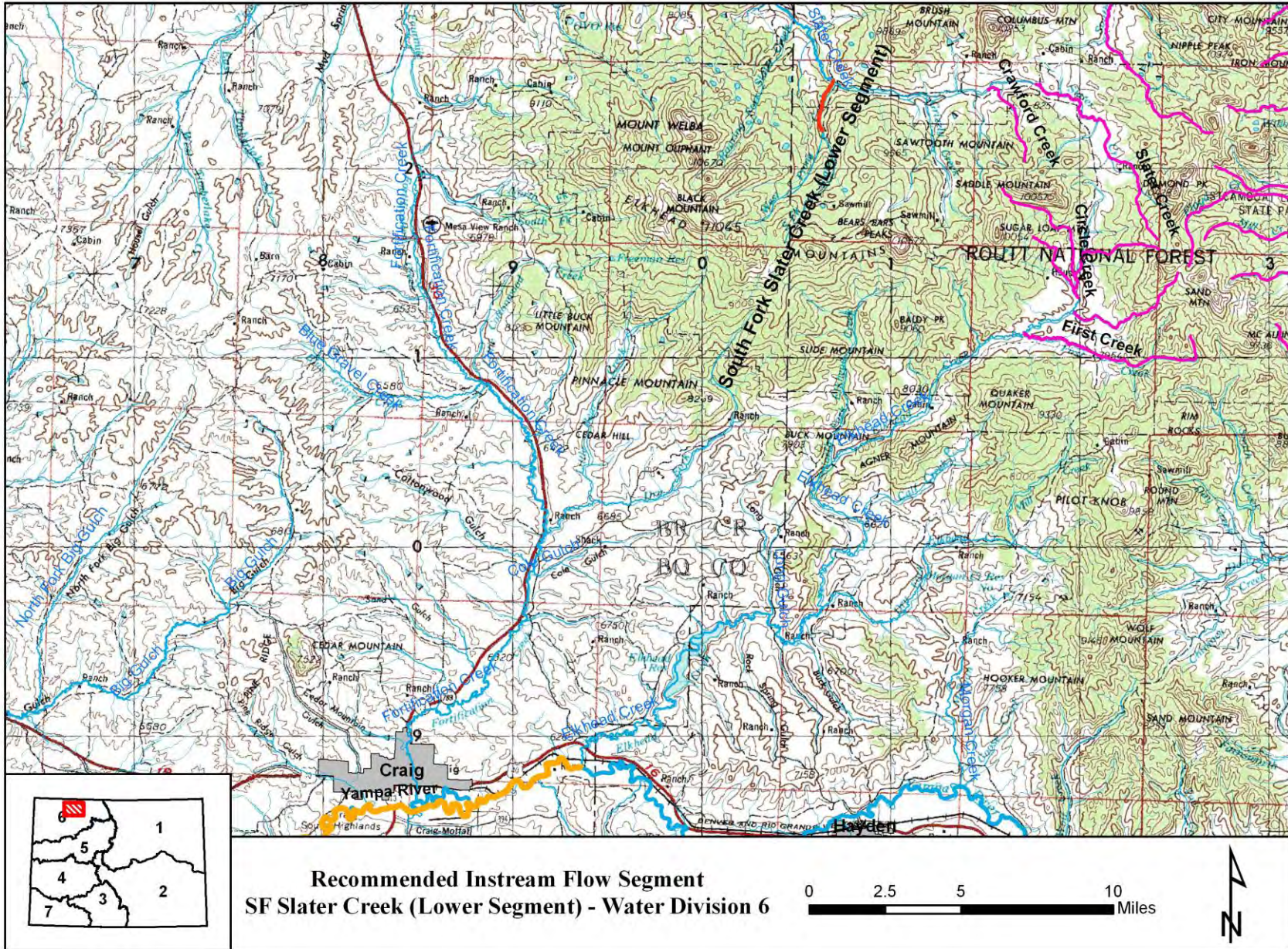
Counties: Routt

Length: 1.98 miles

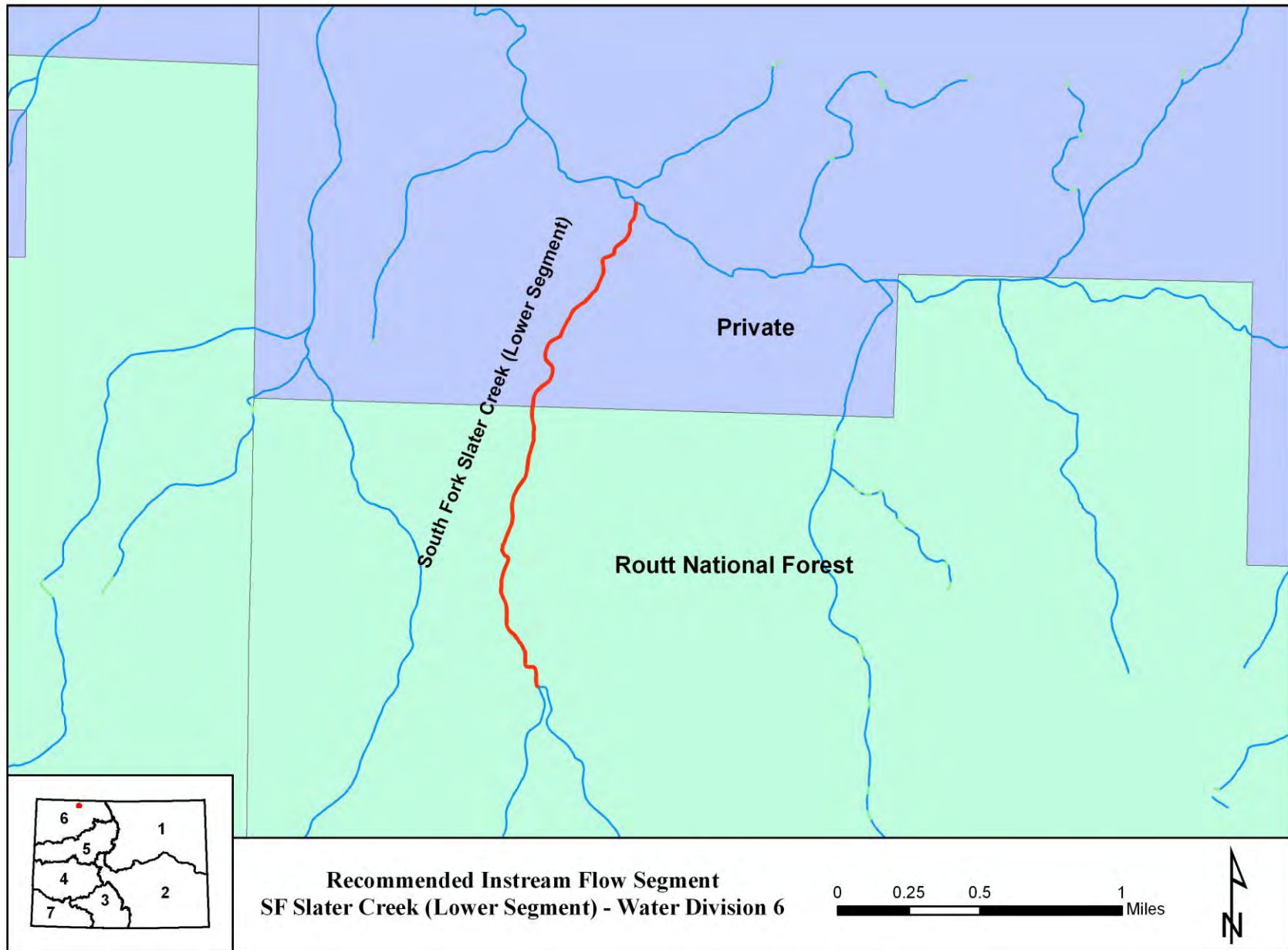
USGS Quad: Buck Point

Flow Recommendation: 9.0 cfs (March 15 – July 15)
2.0 cfs (July 16 – August 15)
0.8 cfs (August 16 – October 15)
5.75 cfs (October 16 – March 14)

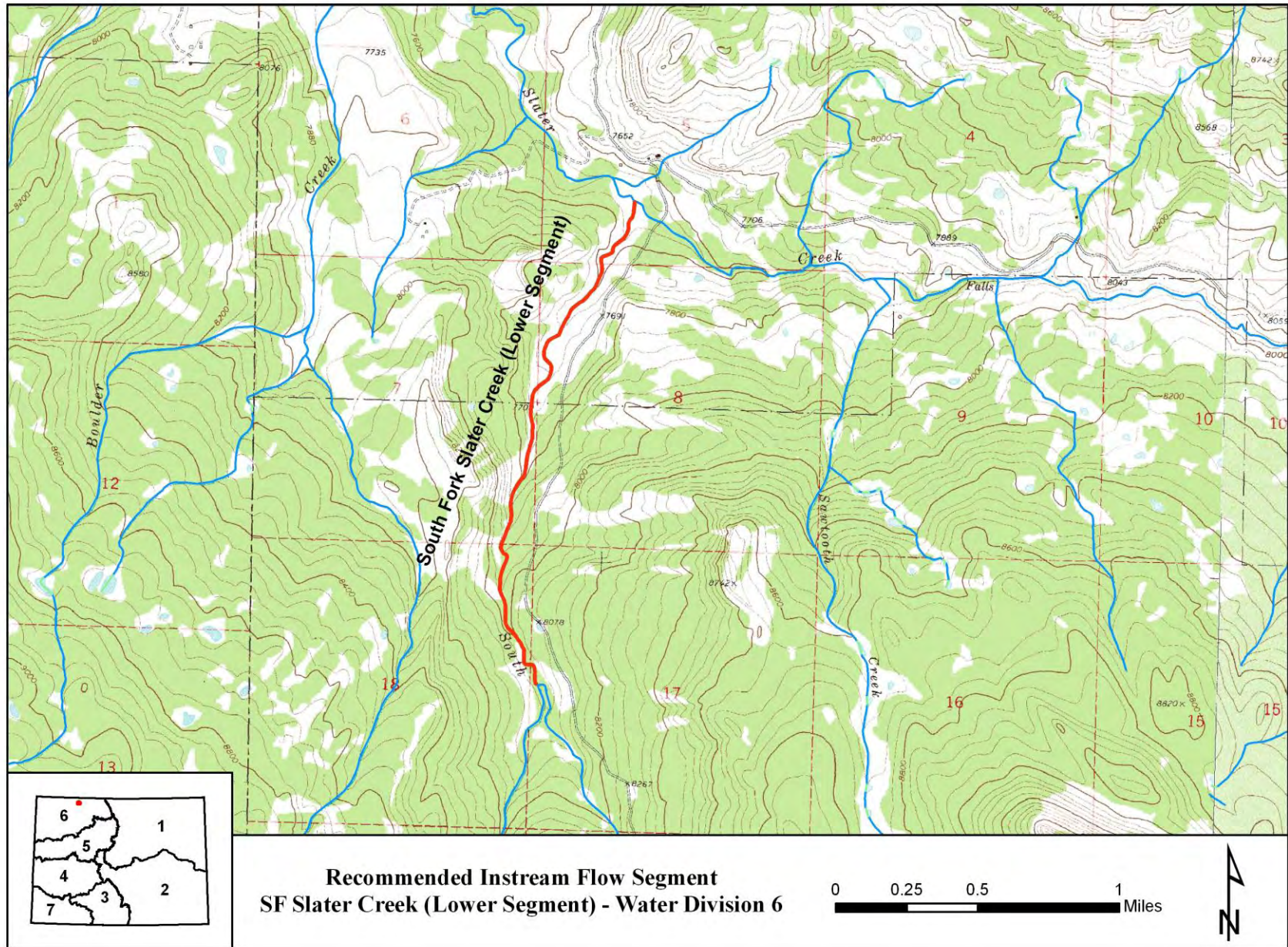
Vicinity Map



Land Use Map



Topographic and Water Rights Map





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

January 4, 2010

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

Dear Ms. Bassi and Mr. Baessler,

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

Location and Land Status. The South Fork of Slater Creek (South Fork) originates on the northern flank of the Elkhead Mountains just west of Bears Ears Peaks at an elevation of 9,560 feet. It flows generally northward for 5.7 miles to the Routt National Forest boundary at an elevation of 7,700 feet. The proposed ISF reach covers the 1.1 mile reach from its confluence with West Prong South Fork Slater Creek to the USFS boundary. This segment is located entirely on Forest Service Land (Fig. 1).

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

Table 1. Summary of R2CROSS datasets

DATE	MEASURED FLOW (cfs)	MODELING RANGE (cfs)	FLOW MEETING 3 CRITERIA	FLOW MEETING 2 CRITERIA
07/08/09	9.59	3.8 – 24.0	<i>38.8</i>	6.5
09/17/09	1.71	0.7 – 4.3	<i>14.2</i>	4.0
Average of flows within modeling range			Out of range	5.25

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

Stream cross sectional data were analyzed using the R2CROSS program, and the output was evaluated using the methods described in Nehring (1979) and Espegren (1996). The R2CROSS models how average depth, percent wetted perimeter and average velocity vary with discharge. According to the criteria established by Nehring (1979), the relevant minimum requirements are an average depth of 0.2 feet, a wetted perimeter of 50%, and an average velocity of 1.0 ft/sec. Protecting salmonids during the summer season is accomplished by insuring all three criteria are met while during the winter protection can be accomplished by protecting 2 of three criteria.

The R2CROSS data from our two cross sections indicate that the fishery of South Fork Slater Creek can be protected with summer flows between 14.2 and 38.8 cfs and winter flows of 5.25 cfs. However, both summer flow recommendations were greater than 2.5 times the field measured discharge and therefore, were considered outside the modeling accuracy of R2CROSS. Therefore, we used the sum of the summertime instream flow recommendation from West Prong Slater Creek above the Decker Ditch (4.9 cfs) together with the summertime instream flow recommendation from South Fork Slater Creek upstream of West Prong (4.1 cfs) to recommend a 9.0 cfs instream flow during the summer months for this stream reach. TU and CDOW recommend that the CWCB appropriate the following flow amounts to preserve the natural environment of South Fork Slater Creek to a reasonable degree:

- From **March 15 through July 15** a flow appropriation of **9.0 cfs** is recommended based on maintaining the three principal criteria of average depth, average velocity, and percent wetted perimeter in the two instream flow reaches located just upstream of this reach;
- From **July 16 through August 15** a flow appropriation of **2.0 cfs** is recommended based on water availability limitations;
- From **August 16 through October 15** a flow appropriation of **0.80 cfs** is recommended based on water availability limitations; and
- From **October 16 through March 14** a flow appropriation of **5.25 cfs** is recommended based on maintaining the average depth and wetter perimeter criteria.

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

Relationship to Existing State Policy. TU and the CDOW are forwarding this stream flow recommendation to the CWCB to meet the State of Colorado's policy "that the wildlife and their environment are to be protected, preserved, enhanced, and managed for the use, benefit, and enjoyment of the people of this state and its visitors ... and that, to carry out such program and policy, there shall be a continuous operation of planning, acquisition, and development of wildlife habitats and facilities for wildlife-related opportunities." C.R.S. 33-1-101(1). Further,

the CDOW Strategic Plan states “Healthy aquatic environments are essential to maintain healthy and viable fisheries, and critical for self-sustaining populations. The Division desires to protect and enhance the quality and quantity of aquatic habitats.” TU and CDOW recommend that South Fork Slater Creek be considered for inclusion in the Instream Flow Program because doing so would help meet these stated policies. Specifically, establishing minimum flows through this reach would preserve the natural environment of the stream to a reasonable degree.

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

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

Sincerely,

Sincerely,



Greg Espegren
Trout Unlimited
Aquatic Specialist

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

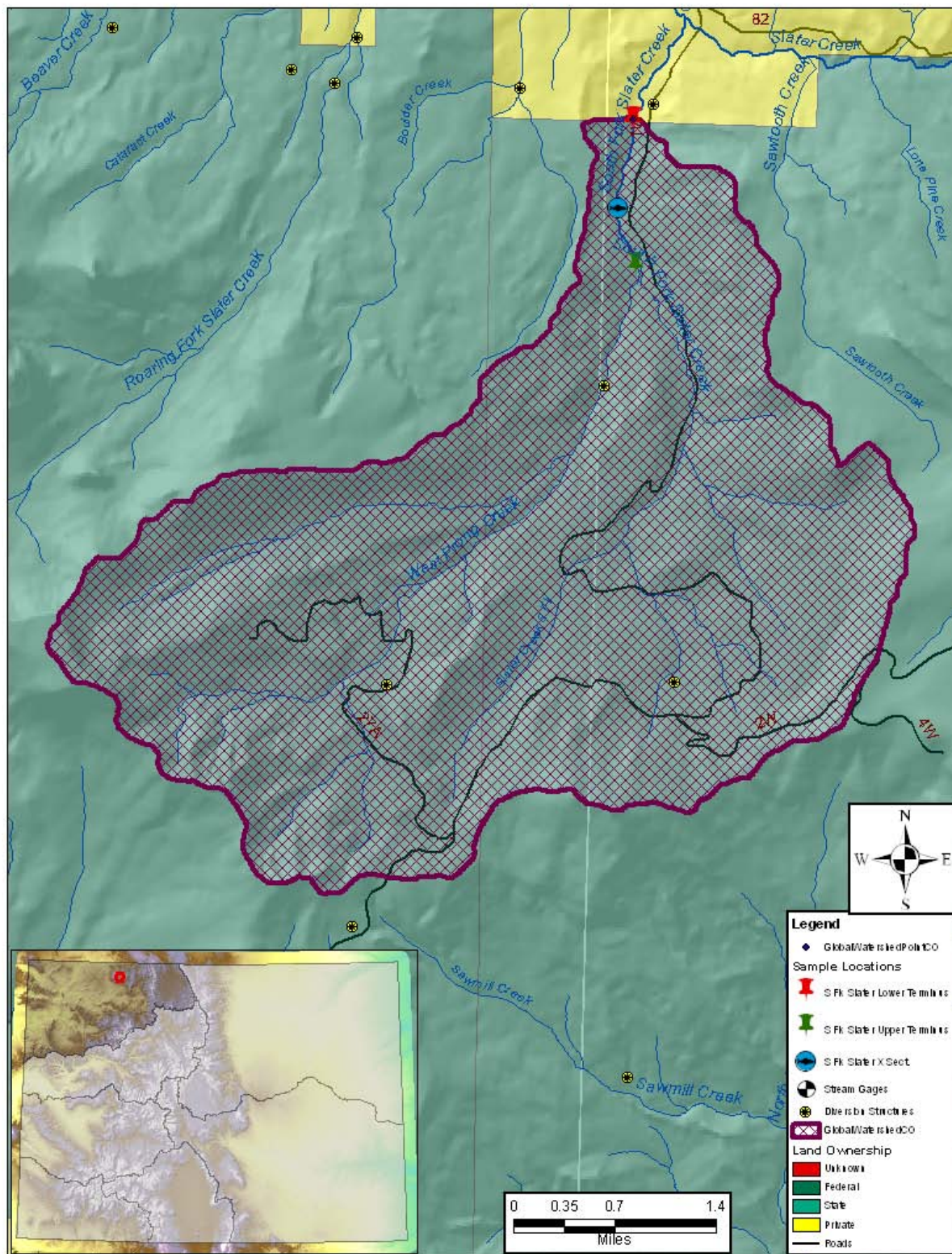


Figure 1. Map of South Fork Slater Creek watershed. Positions of upper and lower termini of the proposed instream flow reach are noted as is the location of the R2CROSS cross section. Additionally, locations known diversion structures are plotted. The watershed's location within Division 6 is indicated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