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BIKIS Water Consultants LLC

MEMORANDUM

To: Huerfano County
C/o Chris Cummins, Esq

From: Dave Mehan and Eric Bikis
Bikis Water Consultants, LLC

Date: September 30, 2009

Re: Water Availability Assessment for Huerfano River and Cucharas Creek Instream Flow Filings

Bikis Water Consultants, LLC (BWC) completed an assessment of water availability for the instream flow (ISF) filings proposed for the upper reaches of the Huerfano River and Cucharas Creek by the Colorado Water Conservation Board (CWCB) and Colorado Division of Wildlife (CDOW). The bases of the proposed filings, including water availability assessments, are provided in the "Executive Summaries and Staff Analyses and Recommendations" available on the CWCB website. The locations of the proposed filings and relevant hydrologic information are shown on Figures 1 and 2.

ANALYSIS BY CWCB

A water availability assessment was completed by the CWCB for the Upper and Lower Huerfano River segments, and the mainstem of Cucharas Creek (referred to as the Cucharas River downstream). A similar assessment was completed for each segment which entailed calculation of the geometric mean of daily discharges using gaged streamflow pro-rated based on watershed area, and adjusted (reduced) for historic water rights diversions. Ninety-five percent confidence limits were placed on the geometric mean flows. The stream gage on the Huerfano River at Manzanares (U.S. Geological Survey (USGS) No. 07111000) was used for the Huerfano River segments; the stream gage at Boyd Ranch (USGS No. 07114000) was used for Cucharas Creek (Figures 1 and 2). Both of these gages have reasonable periods of record and are located relatively close to the downstream ends of the ISF segments.

It is not clear whether the pro-rated flows actually had historic diversions subtracted. Graphs were prepared which show the geometric mean daily discharge and ninety-five percent confidence limits with the proposed ISF flow amounts. These graphs (copies in Attachment 1) indicate that the geometric mean daily flow is well above the proposed ISF amounts for the upper Huerfano River segments, and close to the flows for the Cucharas Creek segment.

No specific water availability assessments are posted on the CWCB website for the four tributaries of the Cucharas River.

ANALYSIS BY BWC

BWC is concerned with the use of geometric mean daily flows to determine water availability. As described in the USGS's Techniques of Water-Resources Investigations Series by D. R. Helsel and R. M. Hirsch, which is cited as the basis for use of this method in the CWCB documents, the geometric mean is less affected by extreme values or outliers and is a more stable measure of the central tendency of a data set. It is also typically less than the arithmetic mean. However, we question the validity of the use of geometric means to assess water availability for the purpose of setting an ISF. Geometric means may be more appropriate for data that is extremely variable, i.e., data which has a range of several orders of magnitude, or numbers that are multiplied together (e.g., determining the average rate of return on an investment).

Use of the geometric mean reduces the variability in the flow data, but this variability is essential for a realistic assessment of water availability. Water supply planning is typically based on more extreme drought events. The frequency of droughts determines the economic viability of the enterprise for which the water is being used (e.g., irrigation for crop production, municipal water supply, industrial water uses, etc.).

Daily flows for the Huerfano River at Manzanares (period of record 1923-present), and Cucharas River at Boyd Ranch (period of record 1943-present) were pro-rated based on watershed area by BWC. Watershed areas for the gages and ISF segments are shown on Figures 1 and 2 and are as follows:

Manzanares Gage:	75.52 mi^2
Upper Huerfano ISF Segment:	13.52 mi^2
Lower Huerfano ISF Segment:	38.72 mi^2
Cucharas at Boyd Ranch Gage:	53.14 mi^2
Cucharas ISF Segment:	9.47 mi^2

The areas used by the CWCB in their analysis varied slightly but not enough to significantly affect the results. Based on the areas shown above, mean daily flows at the gages were adjusted by the following ratios for the proposed ISF segments:

Upper Huerfano River:	0.18
Lower Huerfano River:	0.51
Cucharas River:	0.18

Adjusted flows were not reduced by any water rights diversions. Records from the Colorado Division of Water Resources (CDWR) show that there are four ditches and several relatively small springs upstream of the Manzanares stream gage (Figure 1). The four ditches and their status are as follows:

- Central Branch Ditch: Decreed for 1.0 cfs from the Central Branch; the only recent diversions (since 1942) are reported in 1999.

- Alti Ditch: Decreed for 1.0 cfs from the Huerfano River; sporadic diversions recorded 17 years from 1942 - 2008. Most recent diversions in 2005.

- Santi Ditch: Decreed for 0.5 cfs from the South Fork of the Huerfano River; sporadic diversions recorded 14 years from 1942 - 2008. Most recent diversions in 1999.

- Pathfinder Ditch: Decreed for 0.5 cfs from the Huerfano River. Relatively continuous diversion records from 1943 - 1965. No recent diversions and ditch noted as "Not Usable" in 2008.

Based on this information, it does not appear that there are significant diversions from the Huerfano River upstream of the Manzanares gage. Likewise, records from the CDWR do not indicate any direct diversions from the Cucharas River in the reach proposed for the ISF. Therefore, no diversions or historic consumptive use were subtracted from the adjusted river flows.

Figures 3 to 5 show the adjusted mean daily flows compared to the proposed ISF amounts for the upper Huerfano, lower Huerfano and Cucharas Creek for a ten-year period from 1997-2007. This period was chosen as it represents recent data; the results are similar for the entire periods of record. Figures 3 to 5 contrast to the graphs by the CWCB in Attachment 1.

Figure 3 shows the actual flow in the upper Huerfano River is less than the proposed ISF every year for a relatively long period. The flow is less than the proposed ISF during drought years in the lower Huerfano River segment (Figure 4). The figure in Attachment 1 for this reach shows the flow to always be greater than the proposed ISF. Lastly, the flow is less than the proposed ISF each year for the Cucharas Creek segment (Figure 5). It should be noted that the flows in Figures 3 to 5 actually occur while the flows in the figures in attachment 1 are statistical constructs and may never actually occur.

The average percent of time that the flow is less than the proposed ISFs for the period of record for each stream gage is shown in Figures 6 to 8. Table 1 show the average and maximum number of days that the proposed ISFs are not met. As Figure 6 shows, flow in the upper Huerfano is less than the proposed ISF 78 percent of the time during the winter and 35 percent of the time during the summer. The proposed ISF is not met at all during drought years in this segment (Table 1). More water is available to meet the proposed ISF for the Lower Huerfano River (Figure 7); however, the ISF is not met for a significant number of days during a dry year (162 days, see Table 1). The proposed ISF for the Cucharas Creek is not met much of the time (Figure 8), and it is not met at all during drought years (Table 1).

SUMMARY

The analysis completed by BWC which used actual streamflow data found that water is not available to meet the proposed ISFs, especially for the Upper Huerfano River and Cucharas Creek. In contrast, the water availability assessment completed by the CWCB found water to be available to meet the flows, but this assessment used geometric means which BWC believes are not appropriate for water availability studies. Geometric means mask the variability in flows, yet this variability is crucial for water supply assessments.

The lack of available water means that the proposed ISFs could affect existing and future water rights in the basins. In particular, new rights for storage or direct diversion in the upper portions of

the basin could be affected. The results of this analysis would be even more critical if existing diversions are subtracted from the adjusted flows.

Attachments: Table 1. Number of Days Flow in River is Less Than the Proposed ISF Values
Figure 1. Huerfano River Proposed CWCB Instream Flow Filings
Figure 2. Cucharas River Proposed CWCB Instream Flow Filings
Figures 3-5. Proposed ISF vs. Discharge Graphs
Figures 6-8. Average Percentage of Days Below ISF Graphs
Attachment 1. CWCB Graphs

cc:

P:\Project Files\128-09 Huerfano County\Water Avail study\Blue Dot\WaterAvailStudy 9-30-09.doc

Tables

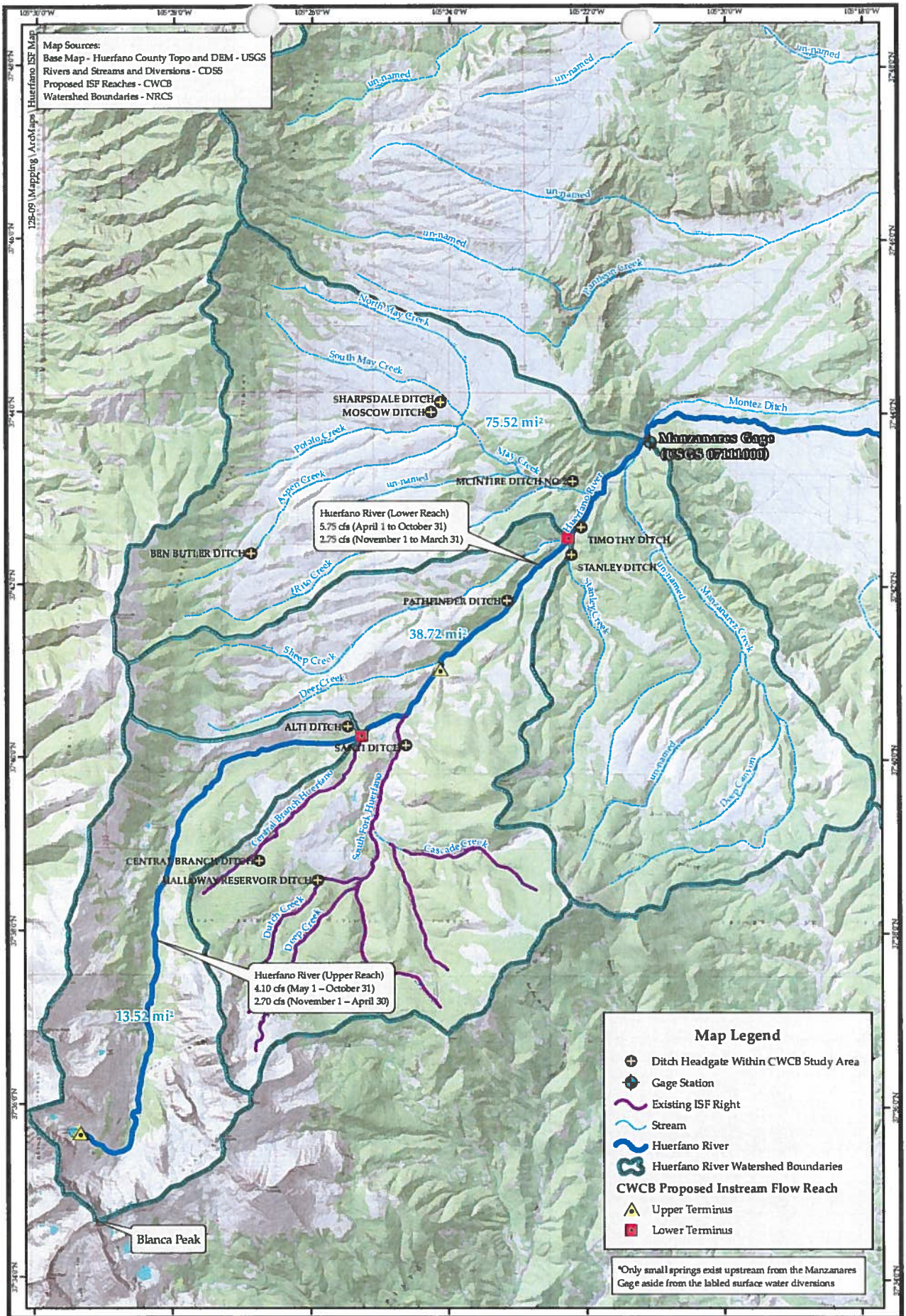
Table 1. Number of Days Flow in River is Less Than the Proposed ISF Values
Huerfano River and Cucharas Creeks

River Segment	Average Number of Days Below ISF	Maximum Number of Days Below ISF
Huerfano River Upper Segment	204	365
Huerfano River Lower Segment	15	162
Cucharas Creek	117	365

Source:
USGS Streamflow Data for Huerfano River at Mazanares Gage, and Cucharas River and Boyd Ranch Gage. Period of Record 1923-present and 1934-present, respectively.

Notes:
ISF = in-stream flow

Figures



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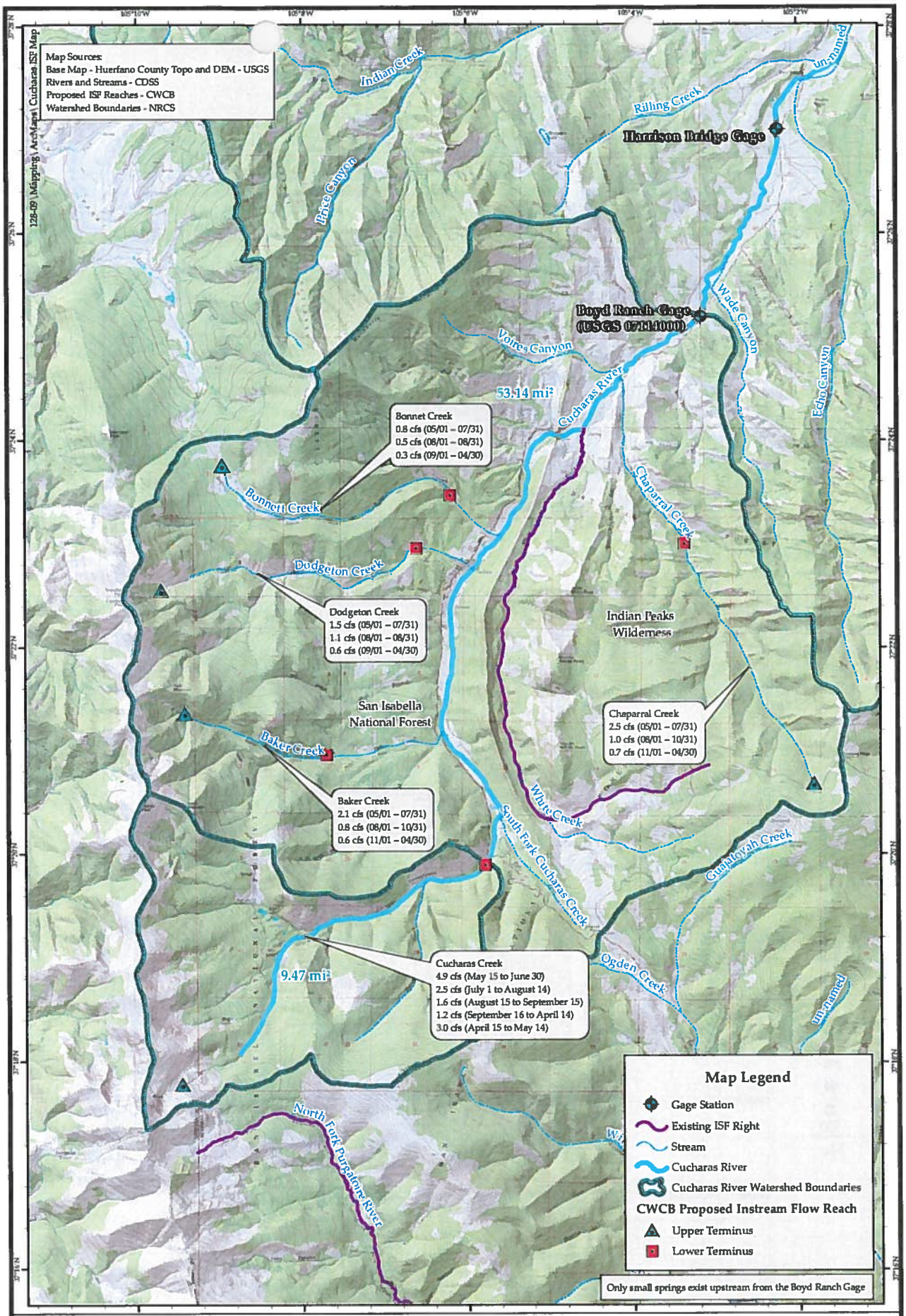
0 3,000 6,000 12,000 Feet

1 inch = 6,000 feet

Designed by: MJK
Detail by: DBM
Date: 09/30/2009
Scale: 1:72,000

Huerfano River Proposed CWCB Instream Flow Filings

Figure 1



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0 2,500 5,000 10,000 Feet

1 inch = 5,000 feet

Designed by: MJK
Detail by: DBM
Date: 09/30/2009
Scale: 1:60,000

Cucharas River Proposed CWCB Instream Flow Filings

Figure 2

Figure 3. Proposed ISF vs. Discharge, Upper Huerfano River 1997-2007
Huerfano County

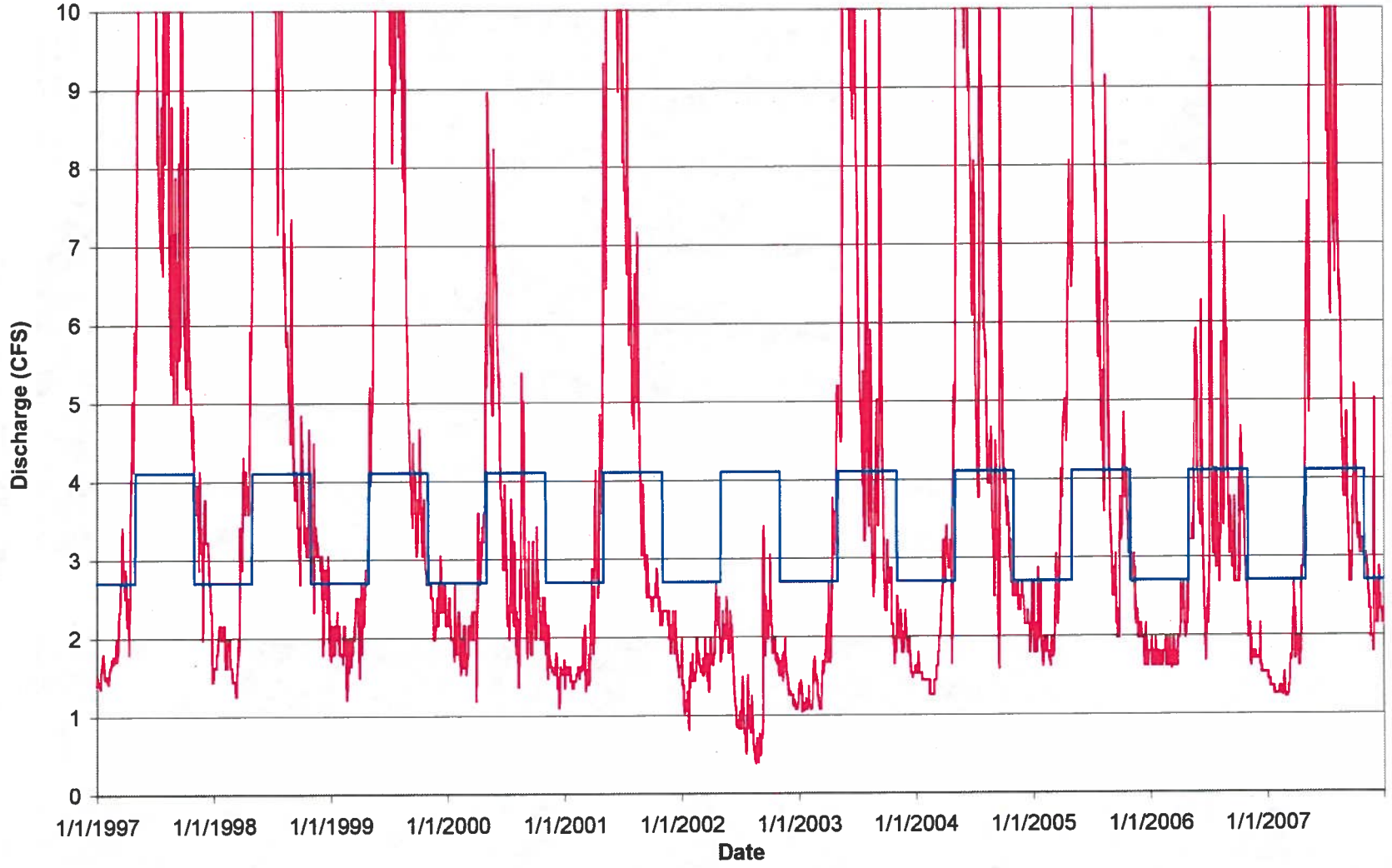


Figure 4. Proposed ISF vs. Discharge, Lower Huerfano River 1997-2007
Huerfano County

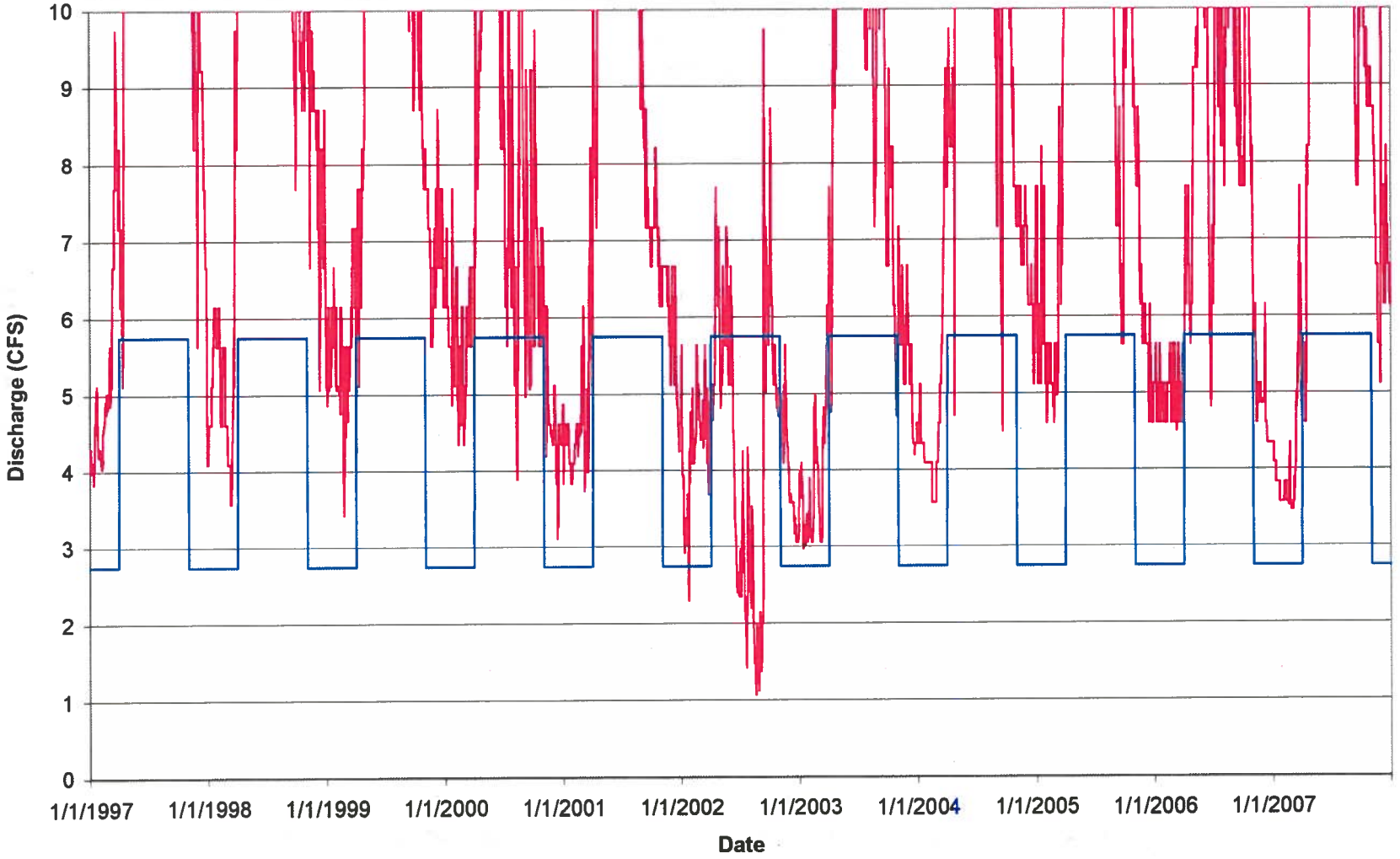


Figure 5. Proposed ISF vs. Discharge, Cucharas River, 1997-2007
Huerfano County

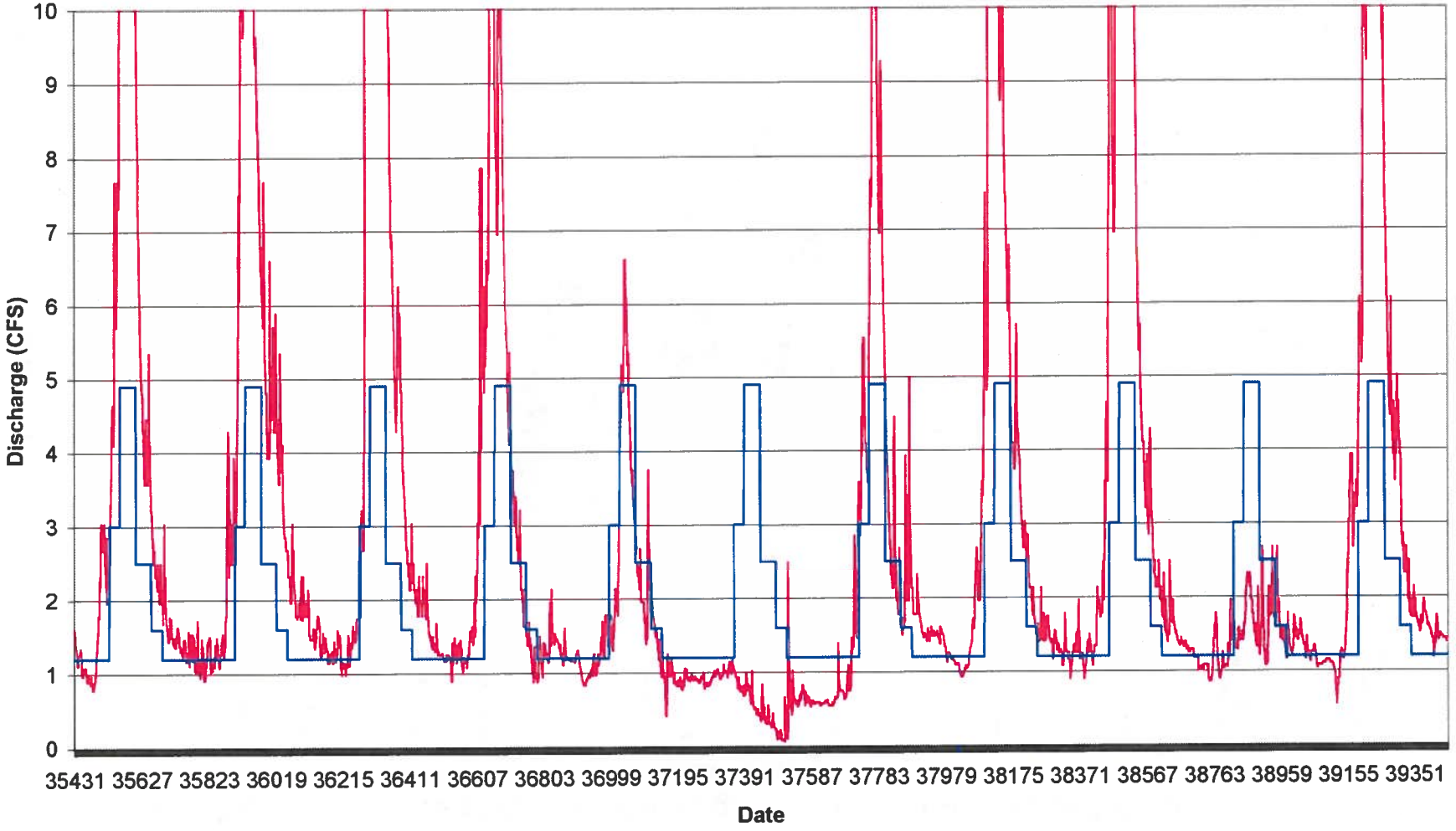
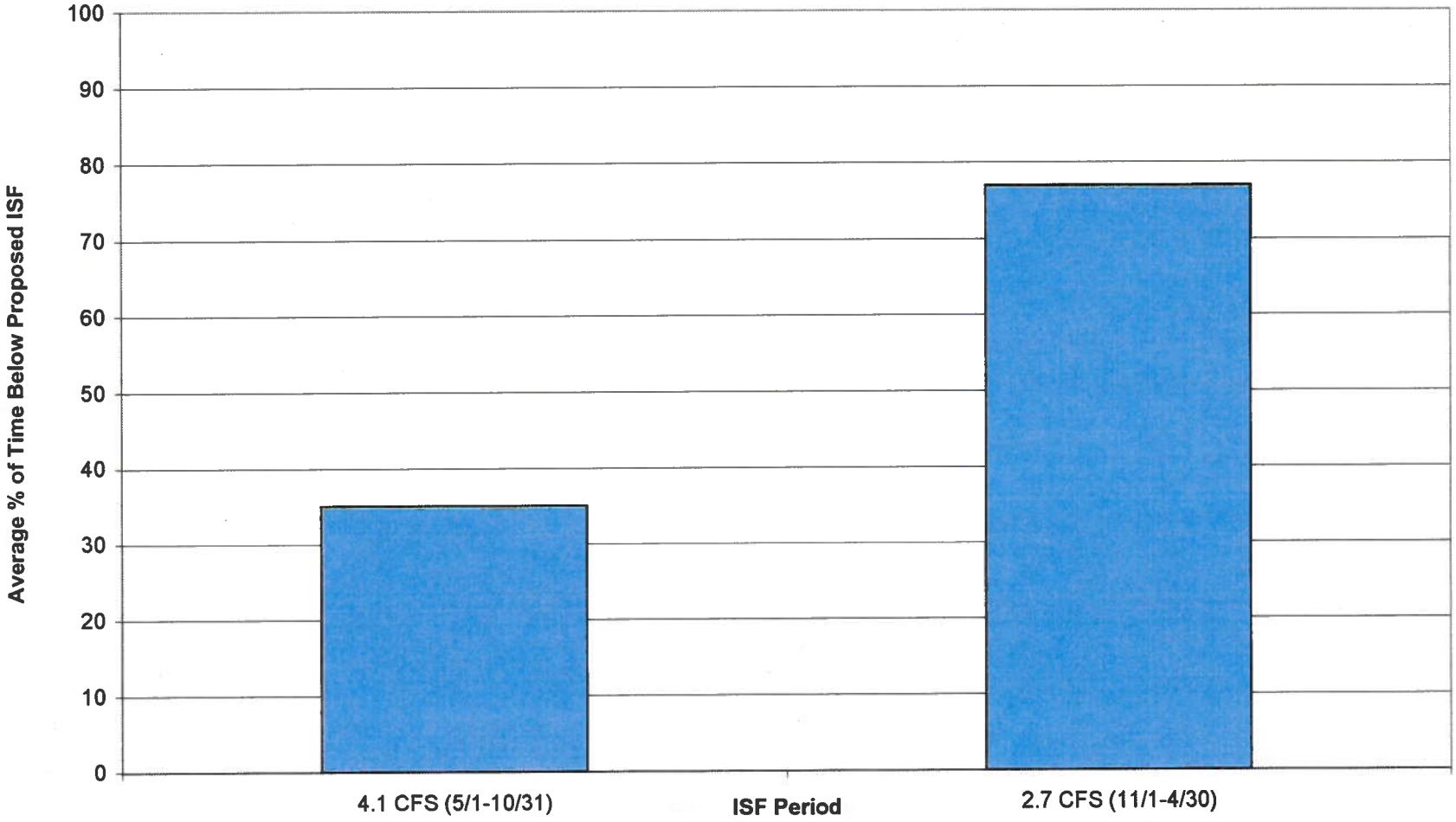
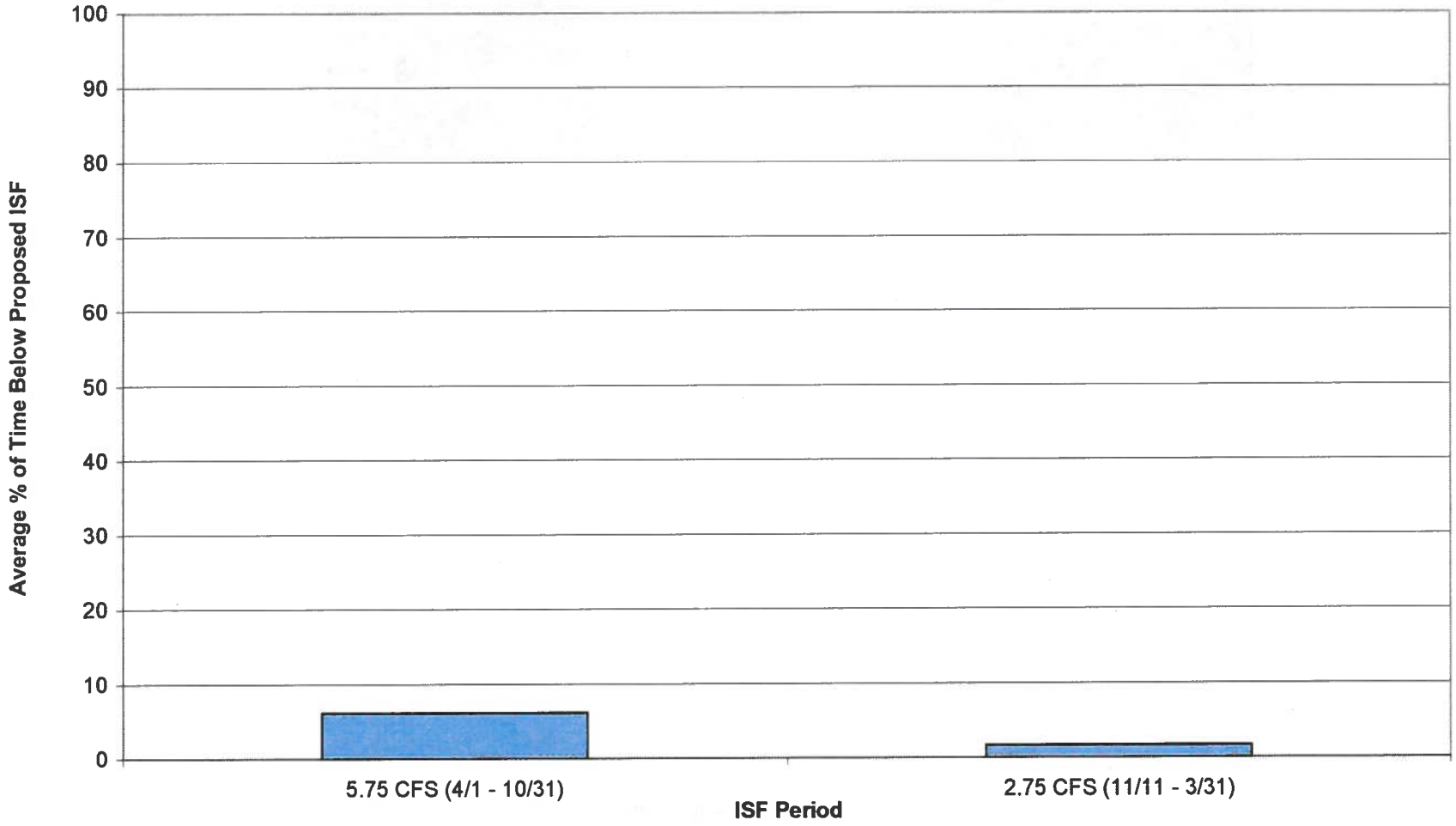


Figure 6. Average Percentage of Days Below Proposed ISF
Upper Huerfano River



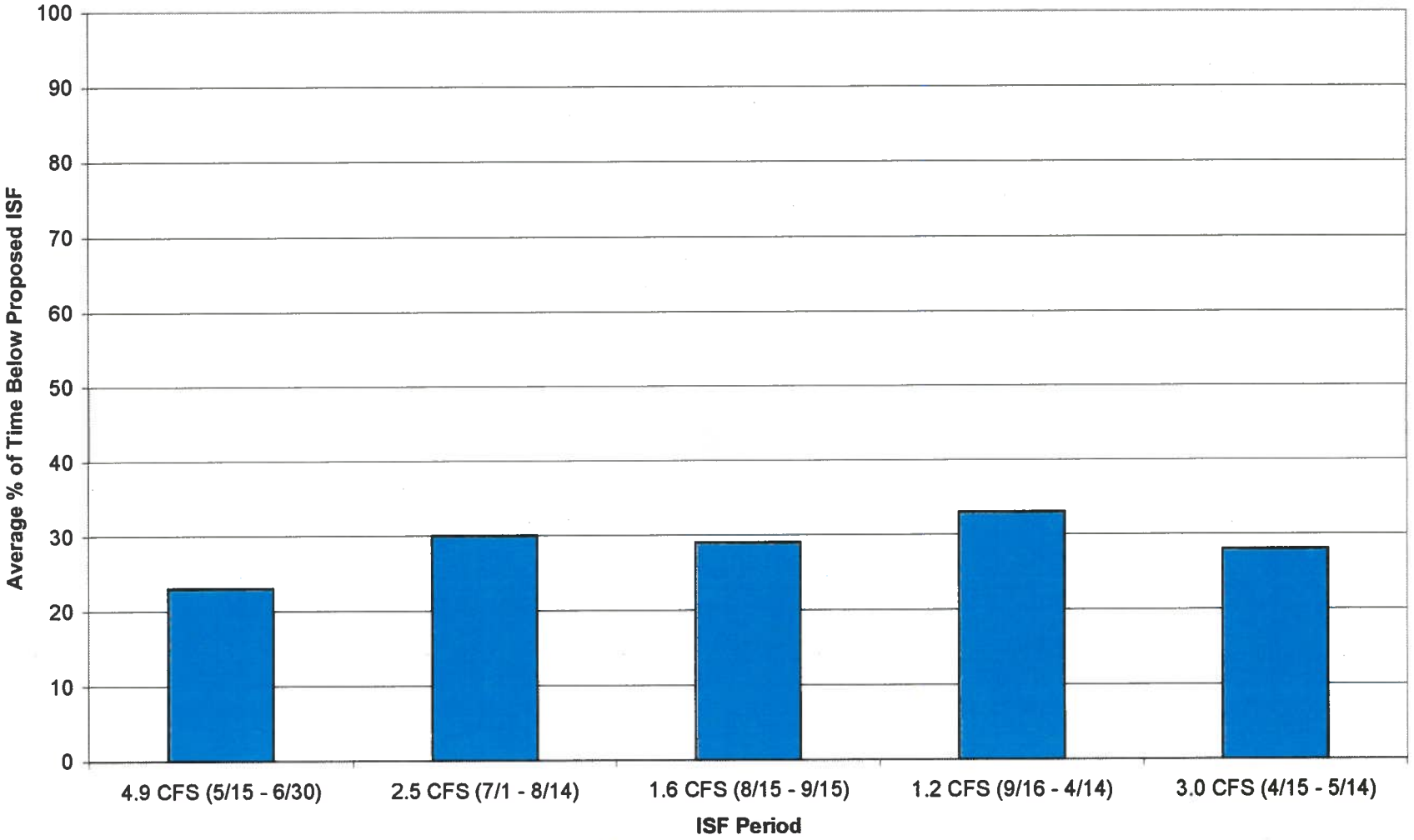
Source: Huerfano River Manzanares Gage (USGS 07111000), 1923 - Present

Figure 7. Average Percentage of Days Below Proposed ISF
Lower Huerfano River



Source: Huerfano River Manzanares Gage (USGS 07111000), 1923 - Present

Figure 8. Average Percentage of Days Below Proposed ISF
Cucharas River



Source: Cucharas River Boyd Ranch Gage (USGS 01114000), 1934 - Present

Attachment 1:

Fig. 1. Geometric Mean Daily Discharge Upper Huerfano R. abv LT (proportioned on Huerfano R at Manzaneres-adj for irr) & ISFs

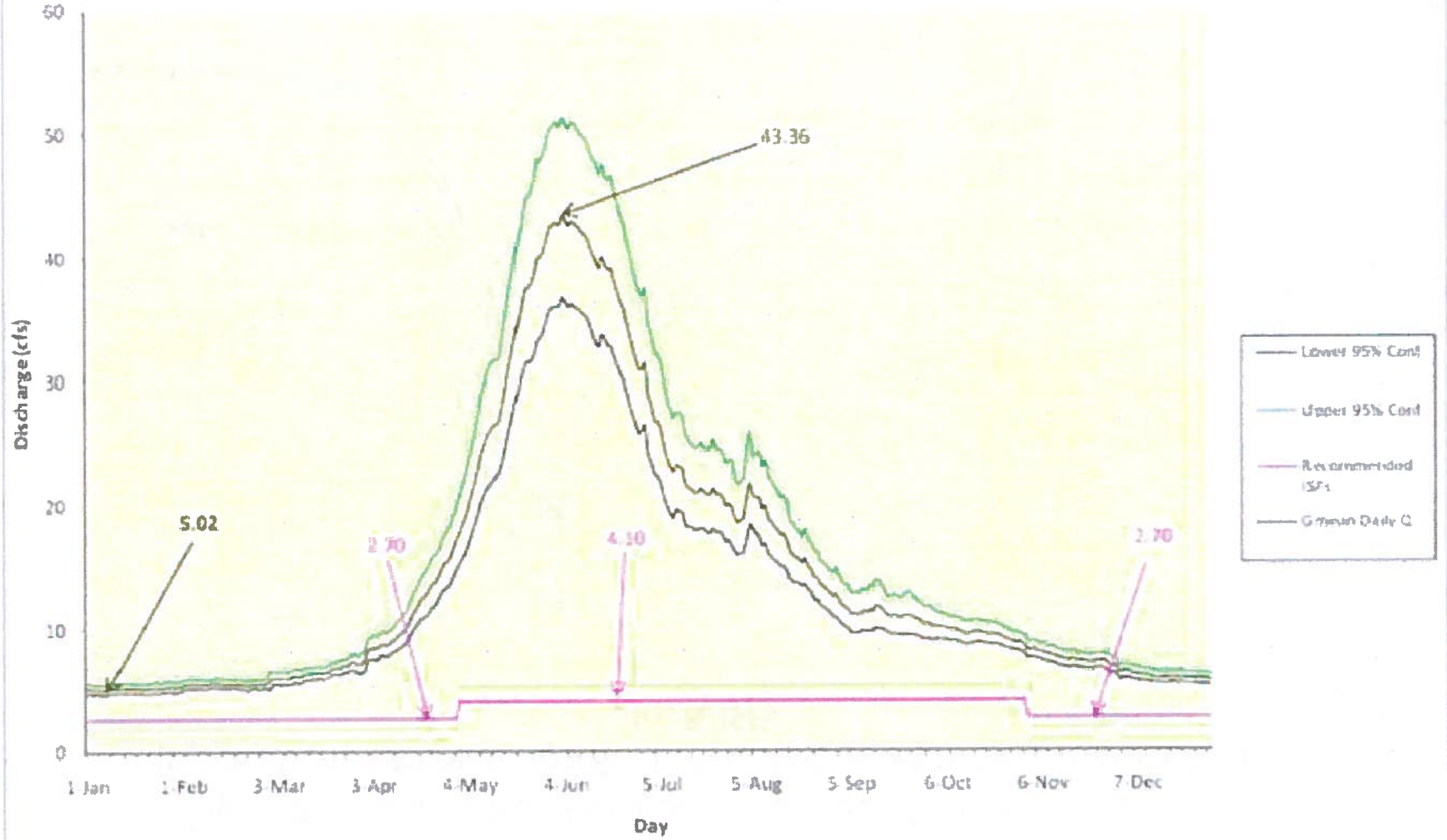


Fig. 1. Geometric Mean Daily Discharge Lower Huerfano R. abv LT (proportioned on Huerfano R. at Manzaneres-adj for irr), Adjusted for Irr, & ISFs

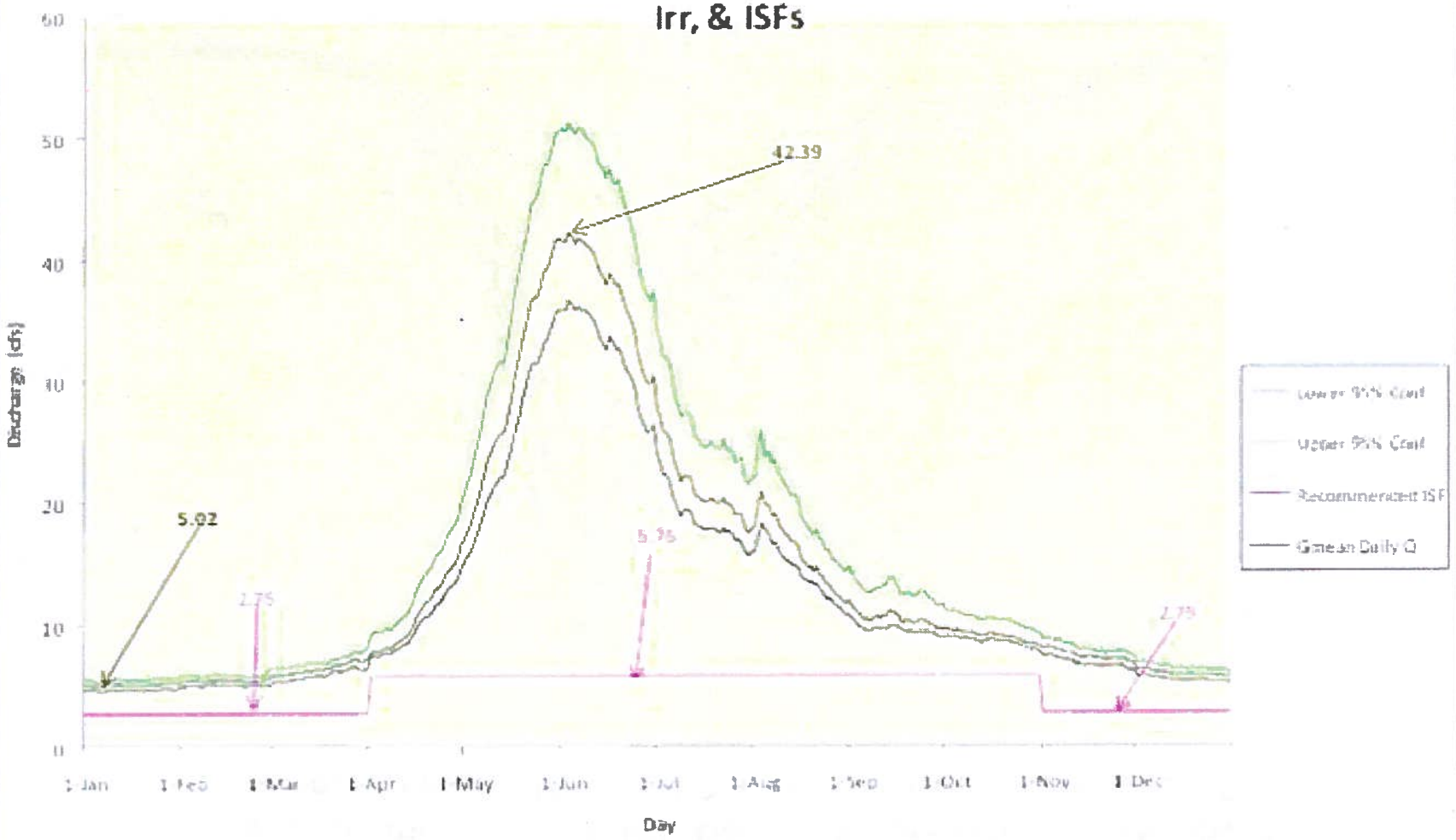
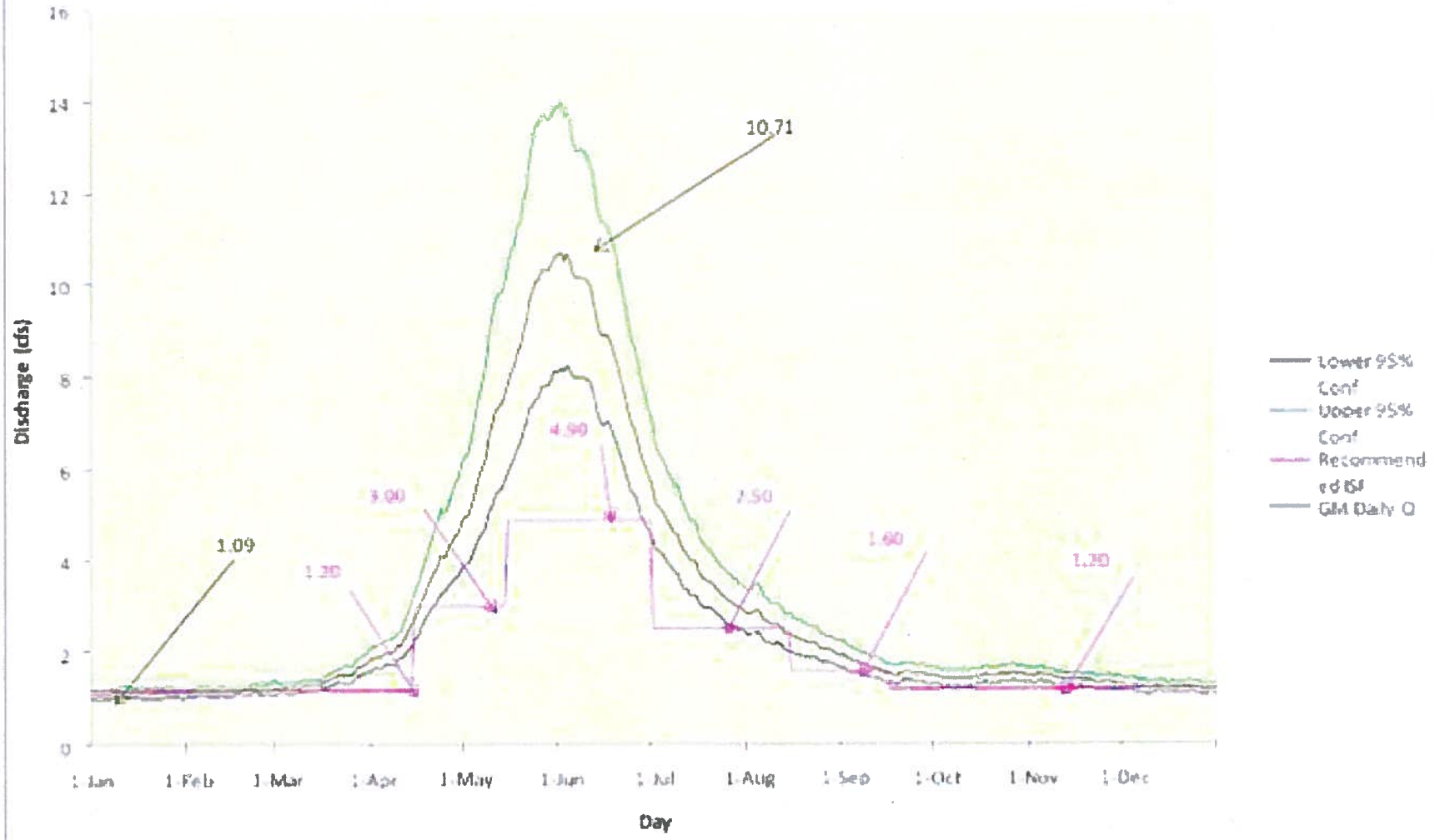


Fig. 1. Geometric Mean Q Cucharas Cr abv LT (prop on Cucharas R at Boyd Ranch near La Veta, adjusted for irr) & ISFs



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MEMORANDUM

To: Chris Cummins, Esq.

From: Dave Mehan
Bikis Water Consultants, LLC

Date: September 30, 2009

Re: R2Cross Modeling for Cucharas and Huerfano Rivers

INTRODUCTION/PURPOSE

This memorandum presents the results of field work and modeling to assess the reasonableness of the instream flows (ISFs) being proposed by the Colorado Water Conservation Board (CWCB) for the Cucharas and Huerfano Rivers.

BACKGROUND

The proposed ISFs and their bases are discussed in the "Executive Summaries and Staff Analysis and Recommendations", available at: www.cwcb.state.co.us/StreamAndLake/NewAppropriations/ISFAppropriationNotices. The flow levels proposed for these water bodies are as follows:

Cucharas River:

- May 15 to June 30: 4.9 cubic feet per second (cfs)
- July 1 to August 14: 2.5 cfs
- August 15 to September 15: 1.6 cfs,
- September 16 to April 14: 1.2 cfs
- April 15 to May 14: 3.0 cfs

Upper Huerfano River:

- May 1 to October 31: 4.1 cfs
- November 1 to April 30: 2.70 cfs

Lower Huerfano River:

- April 1 to October 31: 5.75 cfs

- November 1 to March 31: 2.75 cfs

These proposed flows are based on R2Cross model runs and a water availability assessment by the CWCB, as described in the Executive Summaries at the website cited above.

R2Cross is a hydraulic model based on Manning's equation that is used to determine the amount of water needed to protect the natural environment. Use of the model is described in "Development of Instream Flow Recommendations Using R2Cross" (CWCB January 1996). Based on this manual, three specified parameters must be met: average depth, average velocity, and percent wetted perimeter. All three parameters must be met for an initial summer ISF recommendation; two of three parameters must be met for the initial wintertime ISF recommendation.

The values of these parameters depend on stream width. For the three stream reaches of interest that all have a top width of less than 20 feet, the values of these parameters are as follows:

- Average depth: 0.2 feet
- Average velocity: 1.0 feet per second (fps)
- Percent (bank-full) wetted perimeter: 50 percent

Fieldwork necessary for R2Cross includes completion of a cross-section and flow measurements at a riffle. The model is able to predict the values of the three parameters at flows that are 40 to 240 percent of the measured flow.

The recommended flows from R2Cross are adjusted to reflect water availability and water rights information.

METHODS

Fieldwork was conducted at both rivers on August 19, 2009, at which time baseflow conditions existed. A representative riffle was identified in each stream reach, the locations of which are shown on Figures 1a. and 1b. Field work consisted of the following at each site:

- Surveying of the channel cross-section and slope with a rod, tape and survey level.
- Measurement of flow at the section using a pigmy current meter.
- Qualitative macroinvertebrate assessment.
- Documentation of conditions with photographs.

Field data were input into R2Cross and the model run for each site. The results of the model runs were compared to the specified values of the hydraulic parameters and the results found by the CWCB.

RESULTS

Figures 2 through 4 show the surveyed cross-sections at the three sites. Tables 1 to 3 show the flow measurement calculations; the stream gaging field sheets are included in Attachment 1. Photographs of the sites are included in Attachment 2.

The measured flows at the sites on August 19, 2009, are as follows:

- Cucharas River: 6.43 cfs
- Upper Huerfano River: 7.25 cfs
- Lower Huerfano River: 14.61 cfs

The flow on this day at the U.S. Geologic Survey (USGS) stream gage at Boyd Ranch on Cucharas River was around 8.0 cfs; however, this gage is located a distance downstream with several intervening tributaries. The flow in the Huerfano River at Manzanares, which is downstream of the lower site, was around 10 cfs. The lower flow at the gage was due to irrigation diversions between the lower site and the stream gage.

The results of the R2Cross modeling are included in Attachment 3. The modeling by Bikis Water Consultants, LLC (BWC) found the following flows are needed to meet the model parameters:

- Cucharas River:
  - Summertime initial flow recommendation (all three parameters met): 2.4 cfs
  - Wintertime initial flow recommendation (two parameters met): 1.7 cfs
- Upper Huerfano River:
  - Summertime flow: 2.4 cfs
  - Wintertime flow: 2.2 cfs
- Lower Huerfano River:
  - Summertime flow: 4.5 cfs
  - Wintertime flow: 3.6 cfs

It should be noted that the above flows are slightly outside of the recommended range of accuracy of the R2Cross model (40 percent of the measured flow). However, the modeling results are still indicative of the amount of water required to meet the parameters, and results are often projected outside of the accepted range. For example, the winter flow recommendation by the State for the Lower Huerfano River was outside the accepted range of their modeling.

DISCUSSION

The summertime flow recommendation for Cucharas River by the CWCB is 4.9 cfs. CWCB reduced this to 3.0 and 2.5 cfs due to water availability limitations. The wintertime flow recommendation from the CWCB modeling was 1.3 to 2.0 cfs. The average of this (1.6 cfs) was reduced by CWCB to 1.2 cfs due to water availability limitations.

The water availability study by BWC found that the flow in the Cucharas River routinely goes below 1.0 cfs each winter (see Figure 5 of the BWC study). Therefore, it is recommended that any ISF that is adopted for this reach more accurately reflect water availability and be less than 1.0 cfs for the winter. Likewise, the water availability assessment found that the flow is less than 2.5 cfs towards the end of the summer in most years so that any flow adopted for July 1 to August 14 should be less than 2.5 cfs.

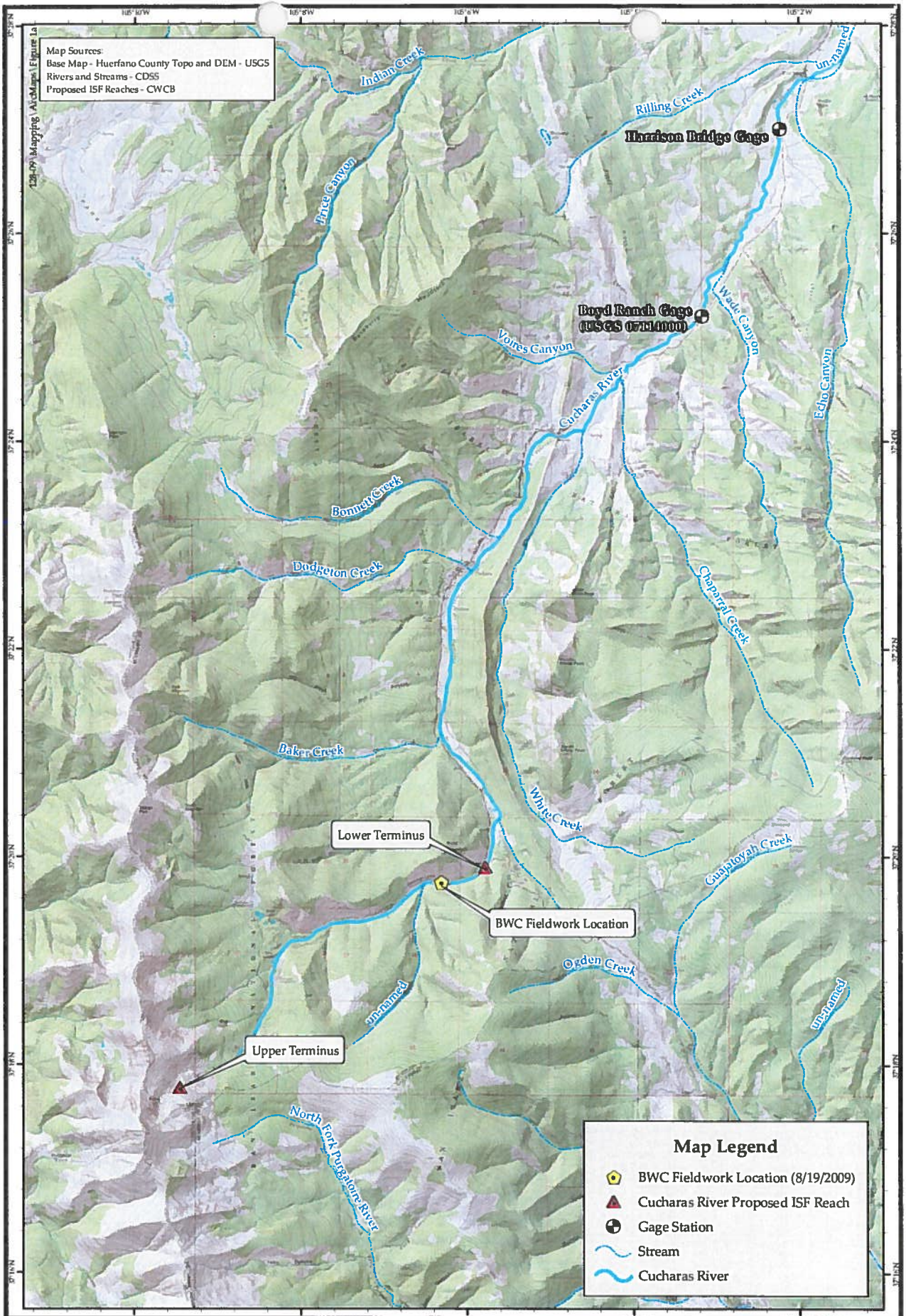
The summer and winter flow recommendations by the CWCB for the upper Huerfano River are 4.1 and 2.7 cfs, respectively. The water availability assessment by BWC showed that the flow in the river is less than these values each year, with flow being significantly below 2.7 cfs in the winter each year (See Figure 3 of BWC's study). The summer flow of 2.4 cfs determined by BWC's R2Cross modeling is more appropriate and supported by water availability. Any winter ISF adopted should be 2.2 cfs or less, consistent with BWC's model results and water availability.

The winter flow proposed by the CWCB for the Lower Huerfano (2.75 cfs) is lower than the flow derived by BWC. Flow data indicate that this flow is available most years (Figure 4 of BWC study). Therefore, 2.75 cfs appears reasonable if a winter ISF is adopted. The proposed summer ISF of 5.75 cfs is met most years, though the flow in the river is less than this amount at the beginning and end of the summer (Figure 4 of BWC study). The flow of 4.5 cfs derived by BWC is met more often. It is recommended that 4.5 cfs be used as the summer ISF to be more consistent with water availability.

Attachments: Figures 1a. and 1b. Locations of Field Work by BWC
Figures 2. to 4. Cross-sections
Attachment 1. Streamflow Gaging Forms
Attachment 2. Photographs
Attachment 3. BWC R2Cross Model Results

P:\Project Files\128-09 Huerfano County\R2Cross model memo 8-09\Memo-R2Cross Model report 9-30-09.doc

Figures



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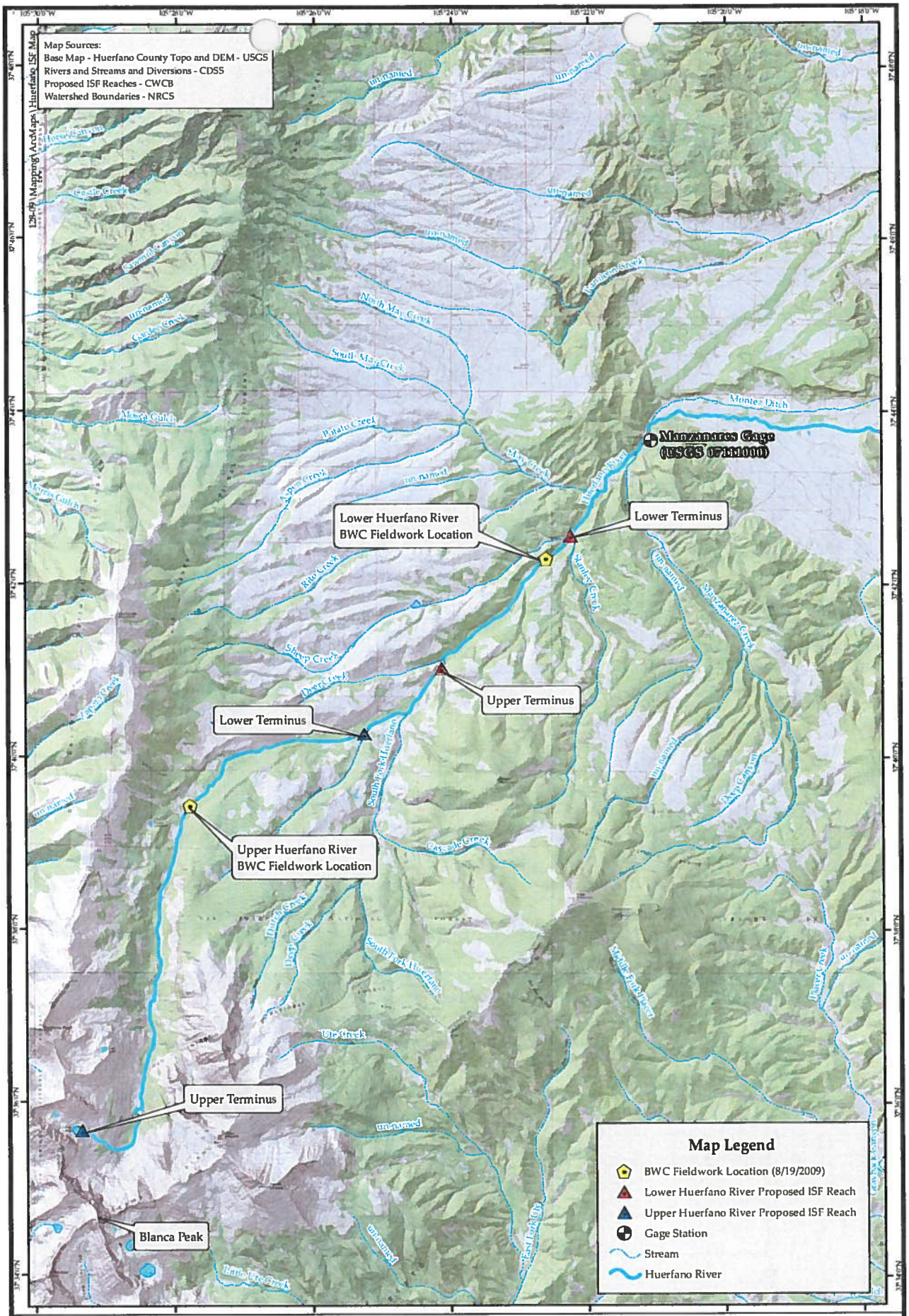
0 2,500 5,000 10,000 Feet

1 inch = 5,000 feet

Designed by: MJK
Detail by: DBM
Date: 08/28/2009
Scale: 1:60,000

Cucharas River Fieldwork Location Map

Figure 1A



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0 3,000 6,000 12,000 Feet

1 inch = 6,000 feet

Designed by: MJK
Detail by: DBM
Date: 08/28/2009
Scale: 1:72,000

Huerfano River Fieldwork Location Map

Figure 1B

Figure 2. Upper Cucharas River Cross-section

Huerfano County

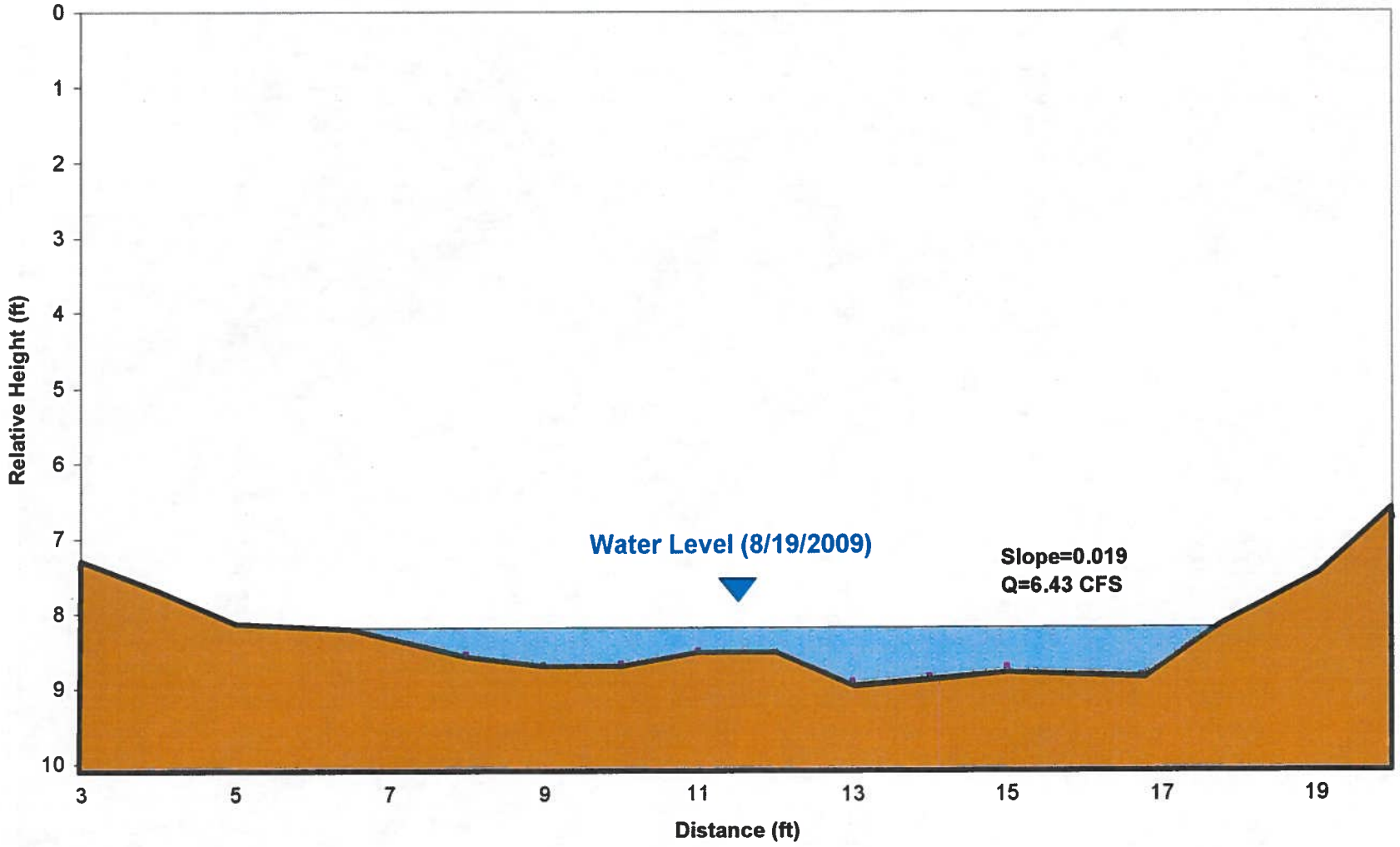


Figure 3. Upper Huerfano River Cross-section

Huerfano County

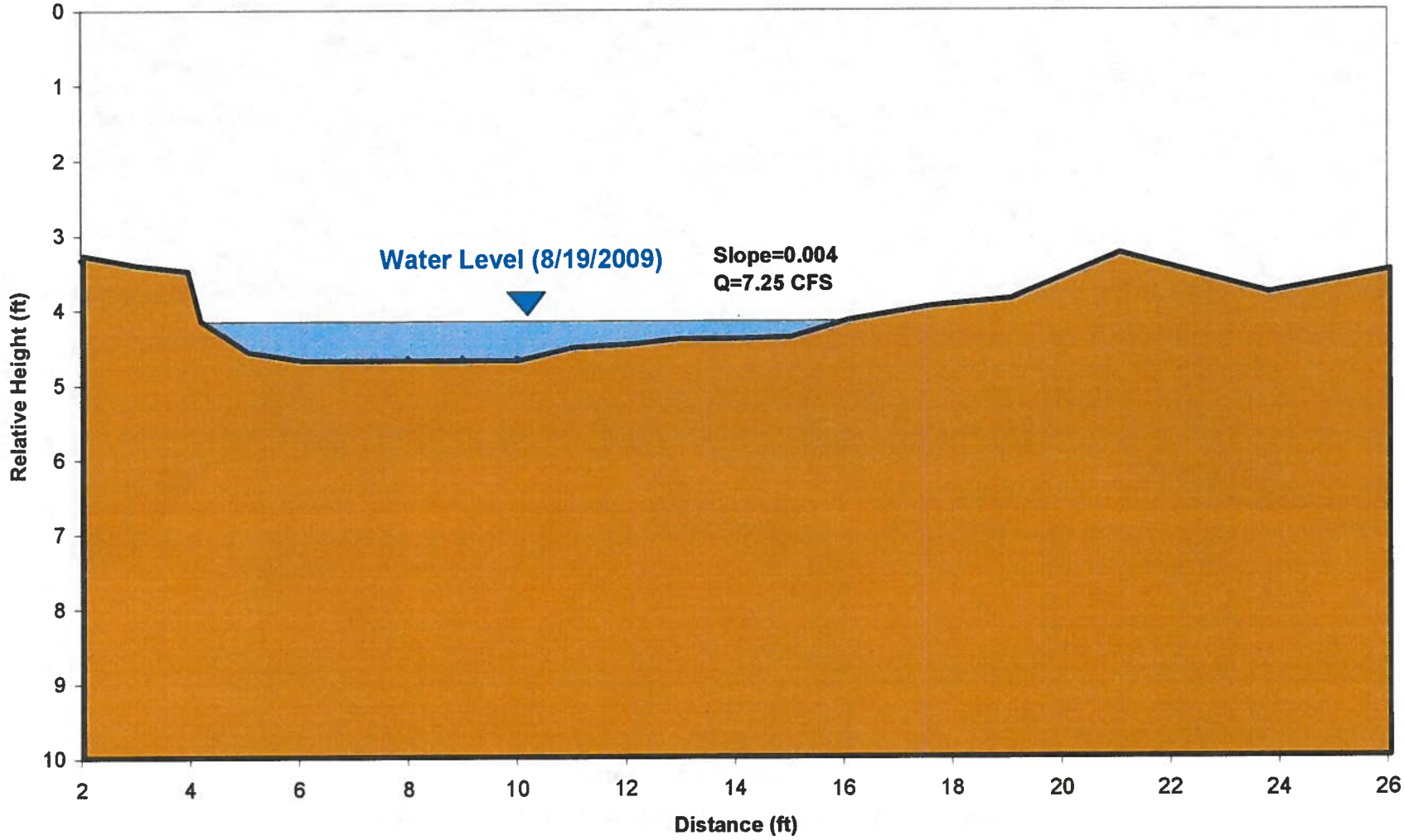
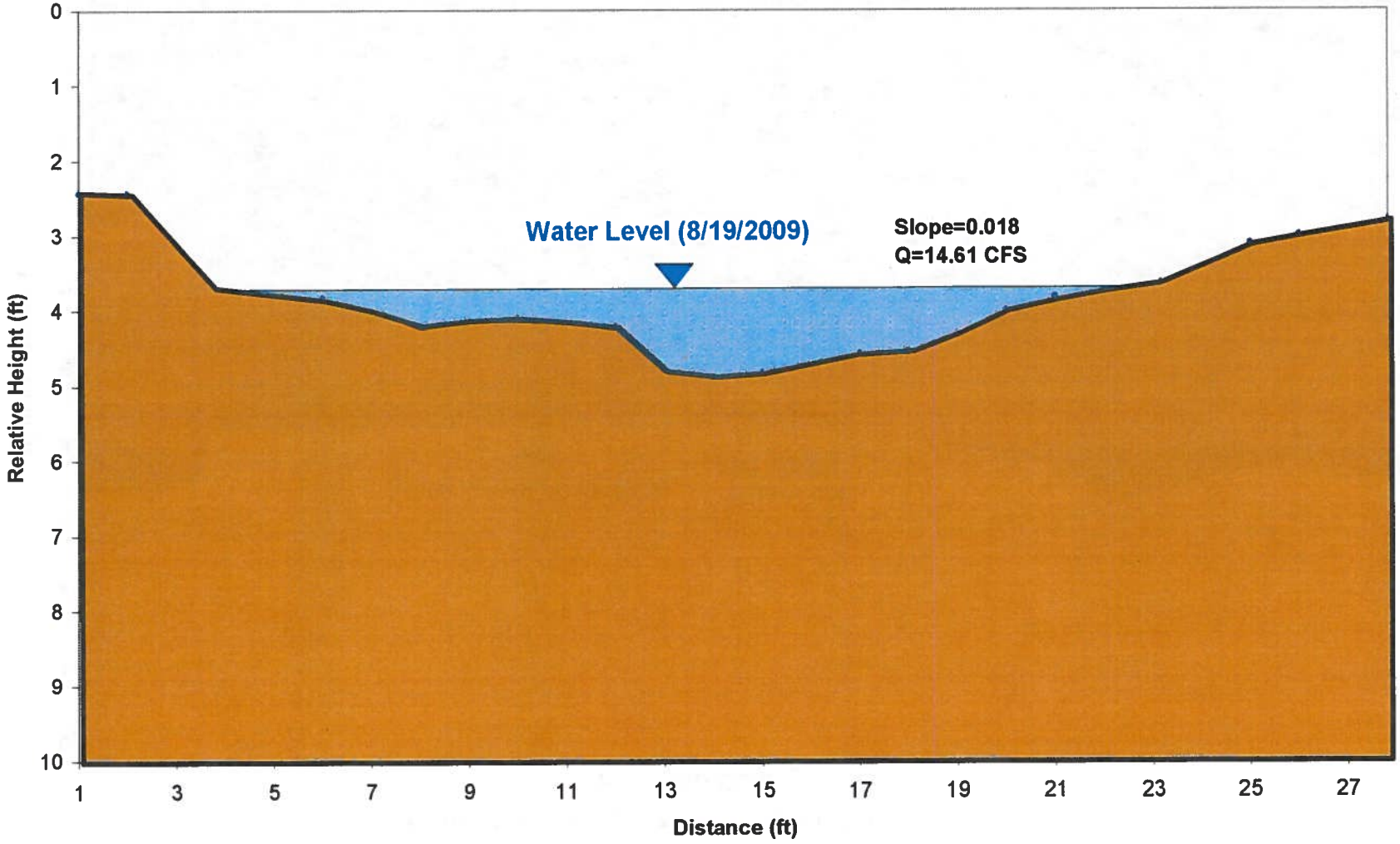


Figure 4. Lower Huerfano River Cross-section

Huerfano County



Attachment 1:

Form 9-275F (Apr. 2001)

U.S. DEPARTMENT OF THE INTERIOR
U.S. Geological Survey
WATER RESOURCES DIVISION
DISCHARGE MEASUREMENT AND GAGE INSPECTION NOTES

Meas No 1
Comp by RK
Checked by OM

Sta No LOWER HUCKLAND 6/19/09
Sta Name
Date 6/19 ,2009 Party BWC
Width ___ Area ___ Vel ___ G H ___ Disch ___
Method WADING No secs ___ G H change ___ in ___ hrs
Method coef. ___ Horiz angle coef ___ Susp ___ Tags checked ___
Meter Type PIGMY Meter No. ___ Meter ___ ft. above bottom of wt
Rating used ___ Spin test before meas ___ , after ___
Meas. plots ___ % diff. from rating no. ___ Indicated shift ___

GAGE READINGS

Time					Inside	Outside
	Start					
	Finish					
Weighted MGH						
GH correction						
Correct MGH						

Samples collected: water quality, sediment, biological, other ___
Measurements documented on separate sheets: water quality, aux./base gage, other ___
Rain gage serviced/calibrated ___
Weather: CLEAR, WARM
Air Temp 70 °F at ___
Water Temp ___ °C at ___
Check bar/chain found ___
Changed to ___ at ___
Correct ___

Wading, cable, ice, boat; upstr, downstr, side bridge, ___ ft, mi upstr, downstr of gage
Measurement rated excellent (2%), good (5%), fair (8%), poor (> 8%): based on following conditions: Flow BANK FULL
Cross section: UNIFORM

Gage operating ___ Record Removed ___
Battery voltage ___ Intake/Orifice cleaned/purged ___
Bubble-gage pressure, psi: Tank ___, Line ___, Bubble-rate ___ /min
Extreme-GH indicators: max ___, min ___
CSG checked ___ HWM height on stick ___ Ref elev ___ HWM elev ___
HWM inside/outside: ___
Control ___
Remarks: ___
GH of zero flow = GH ___ - depth at control ___ = ___ ft rated ___
Sheet No 1 of 1 sheets

Front

River at -

ANGLE COEFFICIENT	DIST FROM INITIAL POINT	WIDTH	DEPTH	OBSERVATION DEPTH	REVOLUTIONS	TIME IN SECONDS	VELOCITY AT POINT	VELOCITY MEAN IN VERTICAL	ADJUSTED FOR HOR. ANGLE OR	AREA	DISCHARGE
2.17	232		0		0	0					
	21'		.1"		24	40					
	20'		.35		4	40					
	19'		.165		10	40					
	18'		.205		18	40					
	17'		.9		85	40					
	16'		.8		90	40					
	15'		.9		85	40					
	13'6"		1.2		24	40					
	12'		.5		45	40					
	11'		.7		95	40					
	10'		.06		90	40					
	9'		.06		100	40					
	8'		.5		87	40					
0	7'2"		.4		81	40					
0.27	6'4"		.15		64	40					
5.5	5'5"		.1		11	40					
3.52	3'11"		0		0	0					

SEE CALCULATIONS IN FALLS IN REPORT

WATER'S EDGE N SIDE

WATER'S EDGE S SIDE

Inside Top

Form 9-275F
(Apr. 2001)

U.S. DEPARTMENT OF THE INTERIOR
U.S. Geological Survey
WATER RESOURCES DIVISION

DISCHARGE MEASUREMENT AND GAGE INSPECTION NOTES

Meas No 1
Comp by RK
Checked by DM

Sta No. UPPER HUERFANO 8-19-09
Sta Name
Date 8/19/2009 Party RWC
Width ____ Area ____ Vel ____ G H ____ Disch ____
Method WADING No. secs ____ G H change ____ in ____ hrs
Method coef ____ Horiz. angle coef ____ Susp ____ Tags checked ____
Meter Type PIGMY Meter No. ____ Meter ____ ft above bottom of wt
Rating used ____ Spin test before meas ____ after ____
Meas. plots ____ % diff from rating no. ____ Indicated shift ____

GAGE READINGS

Time					Inside	Outside
	Start					
	Finish					
Weighted MGH						
GH correction						
Correct MGH						

Samples collected: water quality, sediment biological, other ____

Measurements documented on separate sheets water quality, aux./base gage, other ____

Rain gage serviced/calibrated ____

Weather Clear, warm
Air Temp ____ °C at ____
Water Temp ____ °C at ____
Check bar/chain found ____
Changed to ____ at ____
Correct ____

Wading, cable, ice, boat upstr, downstr, side bridge, ____ ft, mi upstr, downstr of gage
Measurement rated excellent (2%), good (5%), fair (8%), poor (> 8%); based on following conditions: Flow baseflow
Cross section: UNTOUM

Gage operating ____ Record Removed ____
Battery voltage ____ Intake/Orifice cleaned/purged ____
Bubble-gage pressure, psi Tank ____, Line ____, Bubble rate ____ /min
Extreme-GH indicators max ____, min ____
CSG checked ____ HWM height on stick ____ Ref elev ____ HWM elev ____
HWM inside/outside: ____
Control ____
Remarks ____
GH of zero flow = GH ____ - depth at control ____ = ____ ft rated ____
Sheet No 1 of 1 sheets

Front

River at -

ANGLE COEFFICIENT	DIST FROM INITIAL POINT	WIDTH	DEPTH	OBSERVATION DEPTH	REVOLUTIONS	TIME IN SECONDS	VELOCITY AT POINT	VELOCITY MEAN IN VERTICAL	ADJUSTED FOR ICE, ANGLE OR	AREA	DISCHARGE
0	4'		0		0	0					
4.42	4'5"		.3		25	40					
	5'		.1		34	40					
	5'6"		.6		43	40					
	6'6"		.75		67	40					
	7'6"		.65		78	40					
	8'6"		.3		39	40					
	9'6"		.3		20	40					
	10'6"		.5		68	40					
	11'6"		.3		94	40					
	12'6"		.25		69	40					
	13'6"		.5		87	40					
	14'6"		.4		55	40					
	15'6"		.25		15	40					
0	16'		.2		44	40					
16.92	16'1"		0		0	0					

SEE calculations in Table in Report.

WATERS EDGE W. SIDE

WATERS EDGE E. SIDE

Inside Top

J Smy 6 cfs

CDC 45 DAVE 5.5

Form 9-275F (Apr. 2001)

U.S. DEPARTMENT OF THE INTERIOR
U.S. Geological Survey
WATER RESOURCES DIVISION
DISCHARGE MEASUREMENT AND GAGE INSPECTION NOTES

Meas. No 1
Comp by RK
Checked by OM

Sta No. Upper cuchoras ck
Sta Name
Date 8/19/20 Party RWC
Width ____ Area ____ Vel ____ G H ____ Disch ____
Method WADING No secs ____ G H change ____ in ____ hrs
Method coef ____ Horiz angle coef ____ Susp ____ Tags checked ____
Meter Type PIGMY Meter No ____ Meter ____ ft above bottom of wt
Rating used ____ Spin test before meas ____ , after ____
Meas plots ____ % diff from rating no. ____ Indicated shift ____

GAGE READINGS

Time					Inside	Outside
	Start					
	End					
Weighted MGH						
GH correction						
Correct MGH						

Samples collected water quality sediment biological, other ____

Measurements documented on separate sheets water quality, aux./base gage, other ____

Rain gage serviced/calibrated ____

Weather ____
Air Temp ____ °C at ____
Water Temp ____ °C at ____
Check bar/cham found ____
Changed to ____ at ____
Correct ____

Wading, cable, ice, boat, upstr., downstr. side bridge, ____ ft, mi upstr., downstr. of gage
Measurement rated excellent (2%), good (5%), fair (8%) poor (> 8%), based on following
conditions: Flow BASEFLOW
Cross section: UNIFORM

Gage operating ____ Record Removed ____
Battery voltage ____ Intake/Orifice cleaned/purged ____
Bubble-gage pressure, psi: Tank ____ , Line ____ , Bubble rate ____ /min
Extreme-GH indicators: max ____ , min ____
CSG checked ____ HWM height on stick ____ Ref elev ____ HWM elev ____
HWM inside/outside: ____
Control ____
Remarks ____
GH of zero flow = GH ____ - depth at control ____ = ____ ft rated ____
Sheet No 1 of 1 sheets

Front

River at ·

ANGLE COEFFICIENT	DIST. FROM INITIAL POINT	WIDTH	DEPTH	OBSERVATION DEPTH	REVOLUTIONS	TIME IN SECONDS	VELOCITY AT POINT	VELOCITY MEAN IN VERTICAL	ADJUSTED FOR HOR. ANGLE OR	AREA	DISCHARGE
20.17	20'2"		0		0	0					
19.67	19'8"		.3		22	40					
	18'6"		.4		26	40					
	17'4"		.55		25	40					
	16'2"		.6		57	40					
	15'		.7		86	40					
	14'		.45		114	40					
	13'		.3		106	40					
	12'		.4		63	40					
	11'		.4		41	40					
	10'		.25		30	40					
	9'3"		.1		15	40					
	8'		0								
0											

WATERS EDGE EAST BANK

WATERS EDGE WEST BANK

SEE CALCULATIONS IN TABLE IN REPORT.

Inside Top

Appendix B7. Form 9-275-F, Discharge Measurement Notes

Attachment 2:

Huerfano County

Photo 1. Upper Cucharas River site.

Photo 2. Upper Cucharas River site looking downstream

Photo 3. Lower Huerfano River site.

Huerfano County

Photo 4. Lower Huerfano River site looking downstream.

Photo 6. Upper Huerfano River site looking downsteram.

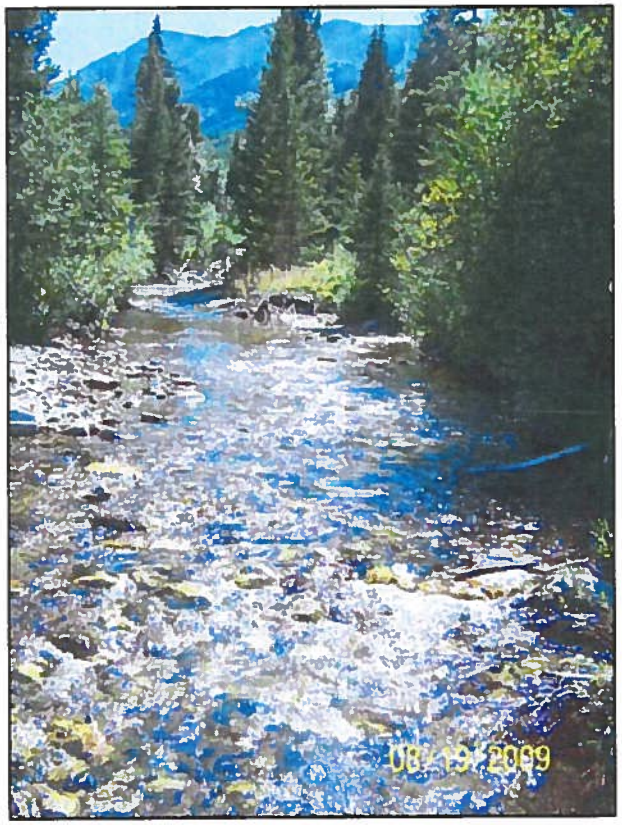


Photo 5. Upper Huerfano River site.

Attachment 3:

STREAM NAME: Cucharas River
XS LOCATION: 0
XS NUMBER: 0

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)
7.56	17.92	1.12	1.70	20.10	18.60	100.0%	1.08	55.29	2.75
7.56	17.92	1.12	1.70	20.10	18.60	100.0%	1.08	55.29	2.75
7.61	17.72	1.08	1.65	19.21	18.37	98.8%	1.05	51.69	2.69
7.66	17.52	1.05	1.60	18.33	18.15	97.6%	1.01	48.20	2.63
7.71	17.32	1.01	1.55	17.46	17.92	96.3%	0.97	44.82	2.57
7.76	17.12	0.97	1.50	16.60	17.70	95.1%	0.94	41.54	2.50
7.81	16.94	0.93	1.45	15.75	17.49	94.0%	0.90	38.35	2.44
7.86	16.75	0.89	1.40	14.90	17.27	92.9%	0.86	35.28	2.37
7.91	16.57	0.85	1.35	14.07	17.06	91.7%	0.82	32.32	2.30
7.96	16.38	0.81	1.30	13.25	16.85	90.6%	0.79	29.47	2.23
8.01	16.20	0.77	1.25	12.43	16.64	89.4%	0.75	26.74	2.15
8.06	16.01	0.73	1.20	11.63	16.43	88.3%	0.71	24.12	2.07
8.11	15.83	0.68	1.15	10.83	16.21	87.2%	0.67	21.62	2.00
8.16	15.46	0.65	1.10	10.04	15.81	85.0%	0.64	19.39	1.93
8.21	14.32	0.65	1.05	9.30	14.66	78.8%	0.63	17.93	1.93
8.26	13.87	0.62	1.00	8.60	14.19	76.3%	0.61	16.09	1.87
8.31	13.59	0.58	0.95	7.91	13.88	74.6%	0.57	14.21	1.80
8.36	13.30	0.54	0.90	7.24	13.57	73.0%	0.53	12.44	1.72
8.41	13.02	0.51	0.85	6.58	13.27	71.3%	0.50	10.77	1.64
8.46	12.74	0.47	0.80	5.94	12.96	69.7%	0.46	9.22	1.55
8.51	12.45	0.43	0.75	5.31	12.66	68.0%	0.42	7.77	1.46
8.56	12.17	0.39	0.70	4.69	12.35	66.4%	0.38	6.43	1.37
8.61	11.46	0.36	0.65	4.10	11.62	62.5%	0.35	5.35	1.30
8.66	10.75	0.33	0.60	3.55	10.90	58.6%	0.33	4.38	1.24
8.71	10.42	0.29	0.55	3.02	10.55	56.7%	0.29	3.42	1.13
8.76	10.09	0.25	0.50	2.50	10.20	54.8%	0.25	2.57	1.02
8.81	9.75	0.21	0.45	2.01	9.84	52.9%	0.20	1.82	0.91
8.86	9.34	0.16	0.40	1.53	9.41	50.6%	0.16	1.19	0.78
8.91	7.58	0.15	0.35	1.11	7.65	41.1%	0.14	0.80	0.72
8.96	4.83	0.16	0.30	0.77	4.88	26.2%	0.16	0.59	0.76
9.01	4.11	0.13	0.25	0.55	4.15	22.3%	0.13	0.37	0.68
9.06	3.52	0.10	0.20	0.36	3.55	19.1%	0.10	0.20	0.57
9.11	2.93	0.07	0.15	0.20	2.95	15.9%	0.07	0.08	0.43
9.16	1.65	0.05	0.10	0.08	1.67	9.0%	0.05	0.03	0.35
9.21	0.83	0.03	0.05	0.02	0.83	4.5%	0.02	0.00	0.22
9.26	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

< .20

< 50%

3 met

2 met

2.43 d.s.

1.69 d.s.

1.17 m.p.

< 1.0

STREAM NAME: Upper Huerfano River
XS LOCATION: 0
XS NUMBER: 0

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)
3.52	20.11	0.69	1.31	13.93	21.23	100.0%	0.66	30.18	2.17
3.53	19.94	0.69	1.30	13.73	21.05	99.2%	0.65	29.62	2.16
3.58	19.12	0.67	1.25	12.75	20.17	95.0%	0.63	26.95	2.11
3.63	18.30	0.65	1.20	11.81	19.29	90.9%	0.61	24.46	2.07
3.68	17.47	0.62	1.15	10.92	18.41	86.7%	0.59	22.13	2.03
3.73	16.65	0.60	1.10	10.07	17.52	82.5%	0.57	19.97	1.98
3.78	15.83	0.58	1.05	9.25	16.64	78.4%	0.56	17.96	1.94
3.83	15.27	0.56	1.00	8.48	16.02	75.6%	0.53	15.93	1.88
3.88	15.09	0.51	0.95	7.72	15.80	74.4%	0.49	13.75	1.78
3.93	14.60	0.48	0.90	6.98	15.26	71.8%	0.46	11.89	1.70
3.98	13.88	0.45	0.85	6.26	14.49	68.3%	0.43	10.28	1.64
4.03	13.34	0.42	0.80	5.59	13.91	65.5%	0.40	8.73	1.56
4.08	12.92	0.38	0.75	4.93	13.44	63.3%	0.37	7.25	1.47
4.13	12.62	0.34	0.70	4.29	13.12	61.8%	0.33	5.85	1.36
4.18	12.32	0.30	0.65	3.67	12.80	60.3%	0.29	4.57	1.25
4.23	11.82	0.26	0.60	3.06	12.26	57.7%	0.25	3.49	1.14
4.28	11.33	0.22	0.55	2.48	11.71	55.2%	0.21	2.54	1.02
4.33	10.57	0.18	0.50	1.94	10.90	51.3%	0.18	1.76	0.91
4.38	7.77	0.19	0.45	1.45	8.04	37.9%	0.18	1.33	0.92
4.43	6.54	0.17	0.40	1.10	6.77	31.9%	0.16	0.94	0.85
4.48	5.31	0.15	0.35	0.80	5.49	25.9%	0.15	0.64	0.79
4.53	3.92	0.15	0.30	0.57	4.05	19.1%	0.14	0.44	0.78
4.58	2.53	0.16	0.25	0.41	2.61	12.3%	0.16	0.34	0.83
4.63	2.34	0.12	0.20	0.29	2.39	11.3%	0.12	0.20	0.70
4.68	2.14	0.08	0.15	0.17	2.17	10.2%	0.08	0.09	0.53
4.73	1.61	0.05	0.10	0.08	1.62	7.6%	0.05	0.03	0.39
4.78	0.80	0.02	0.05	0.02	0.81	3.8%	0.02	0.00	0.24

STREAM NAME: Lower Huerfano River
XS LOCATION: 0
XS NUMBER: 0

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)
2.81	25.25	1.15	2.08	28.94	25.99	100.0%	1.11	71.25	2.46
2.84	24.94	1.13	2.05	28.24	25.66	98.8%	1.10	68.96	2.44
2.89	24.38	1.11	2.00	27.01	25.09	96.5%	1.08	64.99	2.41
2.94	23.82	1.08	1.95	25.80	24.51	94.3%	1.05	61.16	2.37
2.99	23.26	1.06	1.90	24.63	23.94	92.1%	1.03	57.49	2.33
3.04	22.76	1.03	1.85	23.47	23.41	90.1%	1.00	53.87	2.29
3.09	22.26	1.00	1.80	22.35	22.90	88.1%	0.98	50.37	2.25
3.14	21.86	0.97	1.75	21.25	22.47	86.5%	0.95	46.89	2.21
3.19	21.61	0.93	1.70	20.16	22.20	85.4%	0.91	43.31	2.15
3.24	21.35	0.89	1.65	19.09	21.93	84.4%	0.87	39.86	2.09
3.29	21.10	0.85	1.60	18.03	21.65	83.3%	0.83	36.54	2.03
3.34	20.85	0.81	1.55	16.98	21.38	82.3%	0.79	33.35	1.96
3.39	20.60	0.77	1.50	15.94	21.10	81.2%	0.76	30.29	1.90
3.44	20.34	0.73	1.45	14.92	20.83	80.2%	0.72	27.35	1.83
3.49	20.09	0.69	1.40	13.91	20.56	79.1%	0.68	24.55	1.77
3.54	19.84	0.65	1.35	12.91	20.28	78.1%	0.64	21.88	1.69
3.59	19.59	0.61	1.30	11.92	20.01	77.0%	0.60	19.34	1.62
3.64	19.34	0.57	1.25	10.95	19.73	75.9%	0.55	16.94	1.55
3.69	18.56	0.54	1.20	10.00	18.94	72.9%	0.53	14.97	1.50
3.74	17.11	0.53	1.15	9.11	17.49	67.3%	0.52	13.51	1.48
3.79	15.64	0.53	1.10	8.29	16.01	61.6%	0.52	12.25	1.48
3.84	14.51	0.52	1.05	7.54	14.88	57.3%	0.51	10.97	1.46
3.89	14.12	0.48	1.00	6.82	14.47	55.7%	0.47	9.47	1.39
3.94	13.75	0.45	0.95	6.13	14.09	54.2%	0.43	8.05	1.31
3.99	13.38	0.41	0.90	5.45	13.71	52.7%	0.40	6.74	1.24
4.04	13.01	0.37	0.85	4.79	13.33	51.3% < 50%	0.36	5.54 (4.52) wp	1.16
4.09	12.68	0.33	0.80	4.15	12.98	49.9%	0.32	3 met 4.44	1.07 < 1.0
4.14	12.10	0.29	0.75	3.53	12.39	47.7%	0.28	3.49 (3.61 v)	0.99
4.19	11.52	0.25	0.70	2.93	11.80	45.4%	0.25	2 met 2.66	0.91
4.24	10.52	0.23	0.65	2.38	10.77	41.4%	0.22	2.00	0.84
4.29	9.49	0.20	0.60	1.88	9.72	37.4%	0.19	1.44	0.77
4.34	7.47	(0.20)	0.55	1.48	7.67	29.5%	0.19	1.14 d	0.77
4.39	5.41	0.22	0.50	1.18	5.59	21.5%	0.21	0.96	0.81
4.44	5.08	0.18	0.45	0.92	5.23	20.1%	0.18	0.66	0.72
4.49	4.77	0.14	0.40	0.68	4.91	18.9%	0.14	0.41	0.61
4.54	3.50	0.13	0.35	0.47	3.62	13.9%	0.13	0.27	0.59
4.59	2.19	0.15	0.30	0.33	2.29	8.8%	0.14	0.20	0.62
4.64	1.80	0.13	0.25	0.23	1.88	7.2%	0.12	0.13	0.56
4.69	1.44	0.10	0.20	0.15	1.51	5.8%	0.10	0.07	0.48
4.74	1.09	0.08	0.15	0.08	1.13	4.4%	0.07	0.03	0.40
4.79	0.73	0.05	0.10	0.04	0.76	2.9%	0.05	0.01	0.31
4.84	0.37	0.03	0.05	0.01	0.39	1.5%	0.02	0.00	0.20
4.89	0.01	0.00	0.00	0.00	0.01	0.1%	0.00	0.00	0.02

FELT, MONSON & CULICHIA, LLC

319 N. WEBER ST.
COLORADO SPRINGS, CO 80903

JAMES G. FELT
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September 4, 2009

Privileged and Confidential Pursuant to C.R.E. Rule 408 – Settlement Document

MEMORANDUM

TO: Linda Bassi (CWCB); Susan Schneider (AG - CWCB)

CC: John Galusha (Huerfano County)

FROM: Chris Cummins

RE: Proposed ISF on Cucharas Creek, Upper Huerfano River, and Lower Huerfano River

Dear Linda and Susan:

Our consultant, Bikis Water Consultants, LLC ("BWC"), completed their field work on August 19, 2009, and have provided us with some information to share with you in hopes of progressing towards a mutually agreeable settlement concerning the CWCB's proposed in-stream flow ("ISF") appropriations on the Cucharas Creek, the Upper Huerfano River, and the Lower Huerfano River.

I. Water Availability Assessment:

BWC completed a Preliminary Water Availability Assessment on both the Huerfano River proposed reaches, as well as on Cucharas Creek. BWC determined water availability on the basis of daily flows for the Huerfano River (as measured at the Manzanares gage) and the Cucharas Creek (as measured at the Boyd Ranch gage), pro-rated based on watershed areas, as opposed to the CWCB's "geometric mean" method, which BWC believes may not be appropriate for use in determining water availability for ISF purposes. It is BWC's opinion that there is substantially less water available than estimated by the CWCB and/or CDOW, and that frequently, if not the majority of the time, there is insufficient water available to support the proposed ISFs. Copies of graphs depicting the proposed ISF v. measured discharge in each of the proposed stream reaches

are attached hereto as Exhibits A, B, and C, and a table illustrating the number of days annually in which physically available flows would be less than the proposed ISFs is attached as Exhibit D.

II. R2Cross Assessment:

BWC has done a complete R2Cross analysis of each proposed ISF reach, and I hope to provide you a copy of that analysis in full shortly. For purposes of this preliminary negotiation, I will summarize these findings. During BWC's fieldwork on August 19, 2009, stream flows in the subject channels were determined to be 6.43 cfs for Cucharas Creek, 7.25 cfs for the Upper Huerfano River, and 14.61 cfs for the Lower Huerfano River. Maps depicting the locations of this field work are attached hereto as Exhibits E and F. BWC's modeling determined that the following flows were necessary in order to meet R2Cross model parameters:

- Cucharas River:
  - Summertime flow: 2.4 cfs
  - Wintertime flow: 1.7 cfs
- Upper Huerfano River:
  - Summertime flow: 2.4 cfs
  - Wintertime flow: 2.2 cfs
- Lower Huerfano River:
  - Summertime flow: 4.5 cfs
  - Wintertime flow: 3.6 cfs

III. Proposed Flows - Conclusions:

Based upon the above-discussed water availability study, and BWC's R2Cross analysis, BWC has developed the following proposed ISF amounts for each of the proposed reaches of stream. I have included in this table the CWCB's currently proposed ISF amounts for ease of reference:

	CWCB Proposed Amount	BWC Recommendation
Cucharas Creek:		
5/15-6/30	4.9 cfs	2.4 cfs
7/1-8/14	2.5 cfs	2.4 cfs
8/15-9/15	1.6 cfs	1.0 cfs
9/16-4/14	1.2 cfs	1.0 cfs
4/15-5/14	3.0 cfs	2.4 cfs
Upper Huerfano River:		
5/1-10/31	4.1 cfs	2.4 cfs
11/1-4/30	2.7 cfs	2.2 cfs

Lower Huerfano River:		
4/1-10/31	5.75 cfs	4.5 cfs
11/1-3/31	2.75 cfs	2.75 cfs (confirmed)

IV. Huerfano County Development Projections - Reservation of Exchange Potential:

In concert with representatives of Huerfano County and BWC, we have analyzed prospective growth projections for Huerfano County, including analysis of specific projects anticipated to develop in both the short and long term. These factors were considered with a focus on water usage, and specifically, with an eye towards the development of high-altitude storage to allow for greater flexibility of future uses. It is such high-altitude storage, and the potential to exchange water rights through the proposed ISF reaches into such storage with which Huerfano County is concerned. Specific projects considered include multiple "green" energy projects (including wind farms), and re-opening of Cucharas Ski area, along with the associated employees/visitors who will either visit or make Huerfano County their home as a result of such projects. In addition, water needs to be secured for continued and future agricultural purposes.

Cucharas River:

The bulk of the new residential/industrial projects anticipated for Huerfano County are likely to be located within the Cucharas River Basin, including recreational ski-area development and energy projects. Likewise, the County seat and largest town in Huerfano County, Walsenburg, is located in the Cucharas drainage, making it likely that increases in population associated with such projects will be in or near Walsenberg, or in the case of the ski-area, in the Cucharas/La Veta area.

Snow-making requirements at the ski-area are anticipated to be 0.11 to 0.13 cfs, with diversions of this nature being necessary during the months of November through January (BWC's Preliminary Water Availability analysis indicates physical flows available during most winters of approximately 0.45 cfs). A total of 8 acre-feet of storage is anticipated to be associated with snow-making at the ski-area. Associated residential development at the ski-area is approved for a total of 1,077 EQRs, as currently approved by Huerfano County (additional projected employee/associated residential growth in Cucharas/La Veta/Walsenberg is discussed below). Of these, around 407 EQRs are still unallocated for future growth. These units require approximately 0.000341 cfs per unit, for a total of 0.139 cfs, or approximately 100 acre feet per year. Therefore, the future water ***demand in the upper valley is estimated as 108 acre feet annually.***

Current water usage in Walsenburg is approximately 1,080 acre feet annually, while La Veta uses approximately 206 acre feet. Conservatively assuming 3% growth annually on the basis of developing energy projects, and increasing population shifts to semi-rural demographics, these numbers are expected to increase to approximately 1,450 and 277 acre feet, respectively, in 10 years, and 1,950 and 372 acre feet in 20 years. Therefore,

an additional approximately ***1,036 acre-feet annually of water is anticipated to be required for these two towns in the future***. Storage to account for this growth will be vital, and Huerfano County, the respective city governments, and the Huerfano County Water Conservancy District, are currently working to analyze potential high-altitude storage locations and water rights which could be changed to meet their needs.

As such, we have identified a potential future need for 1,144 (108+1036) acre feet of storage, which represents the County's estimated future water demand for the ski area and associated development, as well as the towns of La Veta and Walsenburg. Most of this water would be stored during spring runoff and released later in the year during baseflow conditions. The required exchange potential may range from 5-10 cfs during summer months, and 2-5 cfs during winter months on the Cucharas River. Any change of water rights and request for right of appropriative exchange to accommodate such needs would need to be senior to the proposed ISF, and our client therefor wishes to obtain CWCB's stipulation to subordinate to up to ***5 cfs in the summer*** and ***2 cfs in the winter*** of future exchange for up to ***1,144 acre feet*** in a to-be-determined storage vessel high on the Cucharas River.

Huerfano River:

As you know, the bulk of water usage in the Huerfano River drainage is currently agricultural, and while some additional residential development could occur in this area, particularly in or around Gardner, the primary concern is protecting flexibility in the use of water for irrigation purposes, with over 7,000 acres currently being irrigated in this drainage. It is difficult to calculate the amount of high-altitude storage that would be necessary to provide sufficient future flexibility for irrigation practices or residential development, given that monthly water usage could exceed 1,750 acre feet with such substantial irrigation application as currently occurs. In order to develop a reasonable figure which would allow for some irrigation flexibility as well as reasonable residential development, Huerfano County and its consultants have estimated that storage of approximately 250 acre feet would be reasonable. Our client therefore wishes to obtain CWCB's stipulation to subordinate up to ***2 cfs*** of future exchange for up to ***250 acre feet*** of storage in a to-be-determined storage vessel high on the Huerfano River.

V. Summary of Huerfano County Settlement Proposals:

Huerfano County proposes the following:

1. Cucharas Creek ISF be reduced to the following flows:

5/15-6/30	2.4 cfs
7/1-8/14	2.4 cfs
8/15-9/15	1.0 cfs
9/16-4/14	1.0 cfs
4/15-5/14	2.4 cfs

2. Upper Huerfano River ISF be reduced to the following flows:

5/1-10/31	2.4 cfs
11/1-4/30	2.2 cfs

3. Lower Huerfano River ISF summer flow be reduced as follows (BWC confirms the appropriateness of Lower Huerfano River winter flow as proposed by the CWCB):

4/1-10/31	4.5 cfs

4. CWCB, subject to terms and conditions to be negotiated by the parties, stipulates not to oppose and to subordinate its Cucharas Creek ISF, and subsequent ISF appropriations within the Cucharas River drainage, to 5 cfs summertime, and 2 cfs wintertime exchanges to be adjudicated in the future by water users in the Cucharas River drainage, and for the adjudication of a to-be-determined storage vessel high on the Cucharas River drainage for up to 1,144 acre feet of storage.

5. CWCB, subject to terms and conditions to be negotiated by the parties, stipulates not to oppose and to subordinate its Huerfano River ISF, and subsequent ISF appropriations within the Huerfano River drainage, to 2 cfs summertime, and 2 cfs wintertime exchanges to be adjudicated in the future by water users in the Huerfano River drainage, and for the adjudication of a to-be-determined storage vessel high on the Huerfano River drainage for up to 250 acre feet of storage.

Huerfano County and its consultants have utilized this approach to identifying potential future water requirements and seeking the CWCB's stipulation thereto on the basis of prior similar discussions on the lower San Miguel River involving our firm, BWC and other clients. We have discussed this approach with you on several occasions over the past couple of months, as we awaited proper stream conditions to conduct our flow studies, and understood you to be receptive to such an approach, at least in principle. I therefore was somewhat surprised at your reaction this morning on the telephone to my summary of the contents of this proposal. It is my understanding that this conceptual approach was the product of a work session concerning the lower San Miguel River ISF, which included the participation of CWCB Board member Bruce Whitehead, in attempting to accommodate reasonable future water requirements for growth and development, when immediate application for water rights to satisfy such requirements might not be feasible.

I believe the statutes authorizing the CWCB to initiate ISF appropriations provide sufficient flexibility for such accommodations, requiring the CWCB to "*maintain a balance between the development of the state's water resources and protection of the state's fish and wildlife resources*" (C.R.S. §37-60-106(q)), and providing that the CWCB has the duty "*to foster the conservation of the water of the state of Colorado by the promotion and implementation of sound measures to enhance water use efficiency in order to serve all*

the water needs of the state, to assure the availability of adequate supplies for future uses, and to assure that necessary water services are provided at a reasonable cost" (C.R.S. §37-60-106®)). In addition, statute expressly provides that the CWCB may enter into an agreement such as proposed:

> ...the board has the power and it is its duty... (t) ***to enter into one or more agreements with*** the Colorado water resources development authority and ***any other entities to assist in the development of the water resources of the state.***

C.R.S. §37-60-106(t) (emphasis added). It is our opinion that the proposed subordinations to upstream storage may actually enhance the availability of water during late summer and wintertime, when flows released from storage could supplement otherwise low stream flows. The proposed settlement is therefore consistent with the CWCB's statutory powers and duties, in appropriating water in order to protect the natural environment to a reasonable degree, and in assisting in the development of the water resources of the State.

Thank you for your consideration. While I will be out of the office for the week following the Labor Day weekend, Jim Felt and principals for our client and consultant should be available for a conference call next week to discuss this matter. Jim and Dave Mehan at BWC have expressed a preference for Tuesday, September 8, 2009 between 11 a.m. and 3 p.m., but can likely be available later in the week should your schedules so require. Please contact Fay Whitfield at our offices to coordinate the call, which we would be happy to host. It is our client's sincere hope that a hearing on these matters might be avoided, and that the parties may reach a mutually agreeable settlement concerning these proposed in-stream flows.

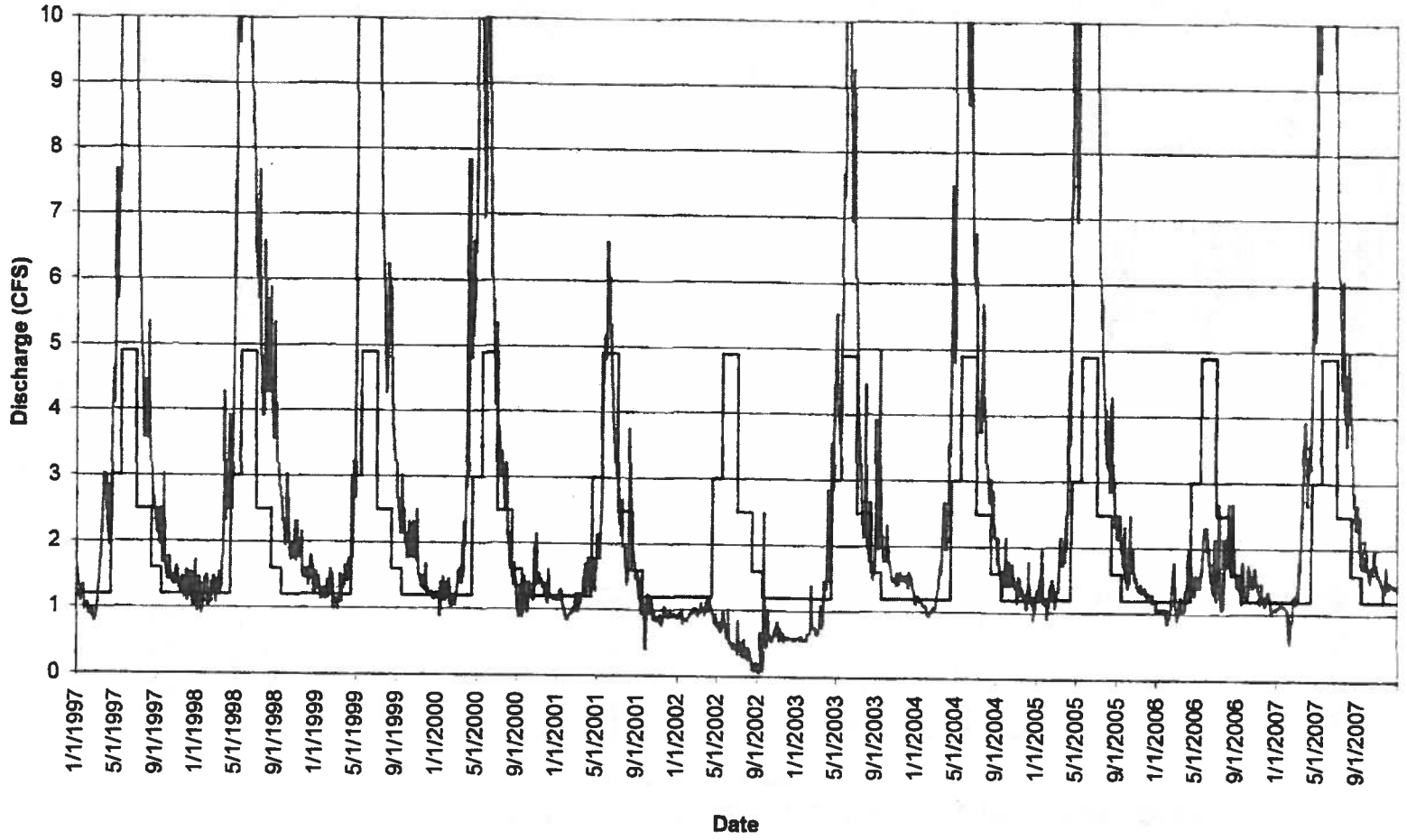
Sincerely,

FELT, MONSON & CULICHIA, LLC

Chris D. Cummins

encl.
cc: Huerfano County BoCC
and County Manager

Figure 5 Proposed ISF vs. Discharge, Cucharas River, 1997-2007
Huerfano County



Bikis Water Consultants, LLC
July 21, 2009

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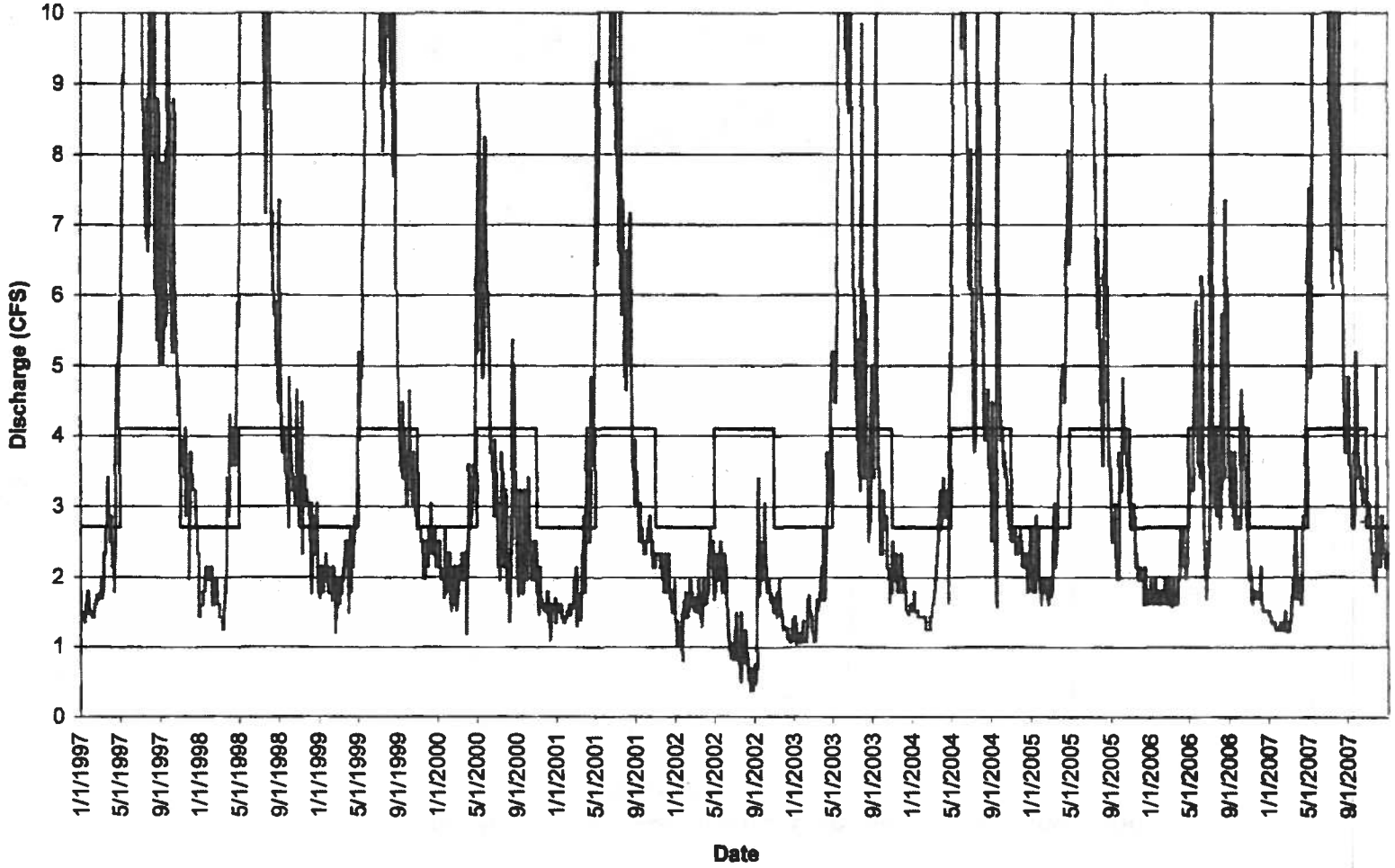
Fig3 to 8-ISF_Graphs

EXHIBIT
A

Figure 3. Proposed ISF vs. Discharge, Upper Huerfano River 1997-2007

Huerfano County



Bikis Water Consultants, LLC
07/21/2009

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Fig3 to 8-ISF

EXHIBIT
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Figure 4. Proposed ISF vs. Discharge, Lower Huerfano River 1997-2007

Huerfano County

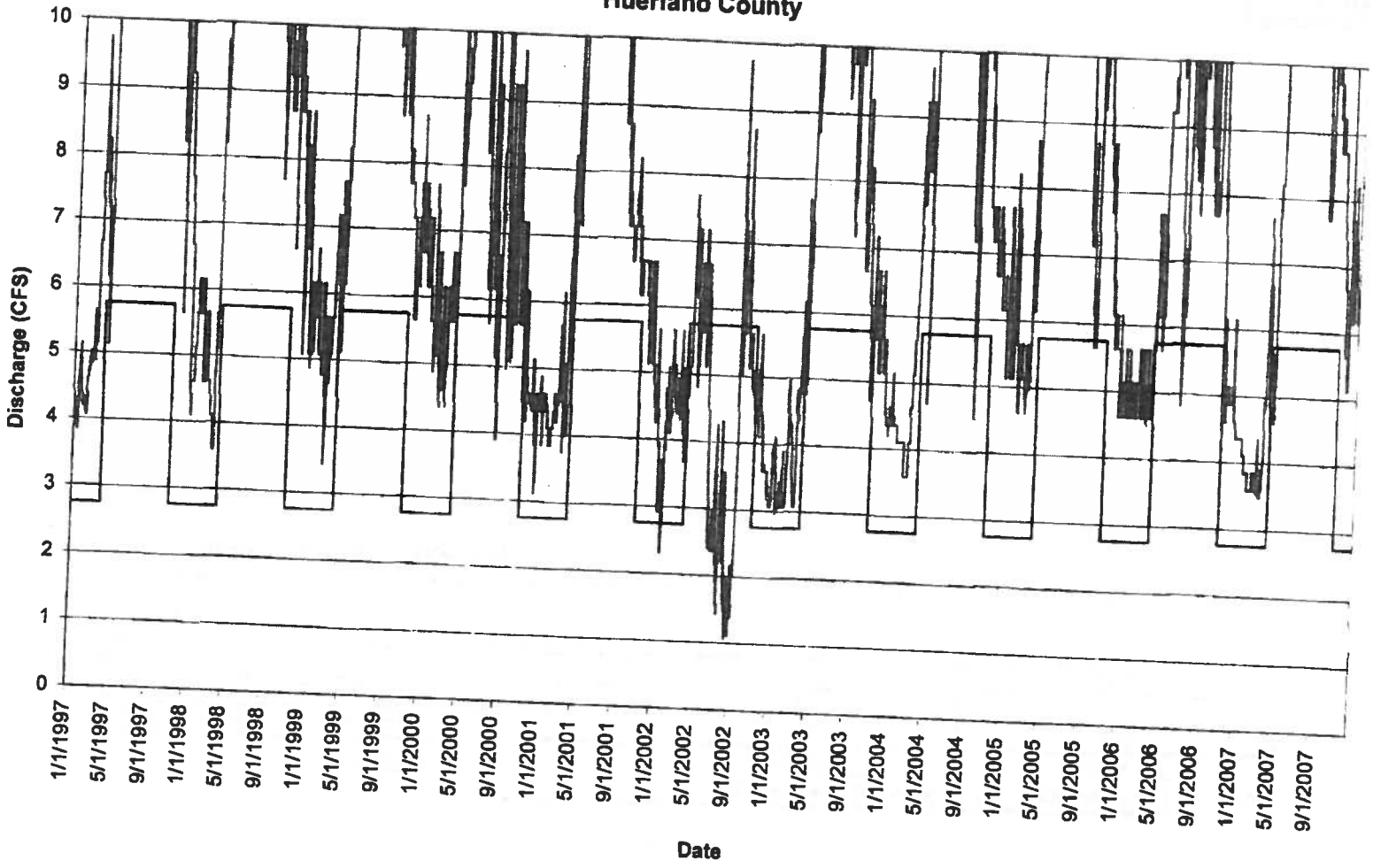

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Table 1. Number of Days Flow in River is Less Than the Proposed ISF Values

Huerfano River and Cucharas Creeks

DRAFT

River Segment	Average Number of Days Below ISF	Maximum Number of Days Below ISF
Huerfano River Upper Segment	204	365
Huerfano River Lower Segment	15	162
Cucharas Creek	117	365

Source:
USGS Streamflow Data for Huerfano River at Mazanares Gage, and Cucharas River and Boyd Ranch Gage. Period of Record 1923-present and 1934-present, respectively.

Notes:
ISF = in-stream flow