COLORADO
Parks and Wildlife
Department of Natural Resources

Aquatic Wildlife Section
6060 Broadway
Denver, CO 80216

January 12, 2026

Rob Viehl, Section Chief
Stream and Lake Protection Section
Colorado Water Conservation Board
1313 Sherman Street, 7th Floor
Denver, CO 80203

Re: Instream Flow Recommendations for Streams in Water Division 6, Garfield County; Big Fish Creek, to be presented at the January 2026 CWCB Meeting

Dear Mr. Viehl:

The information contained within and referred to in this letter forms the scientific and biological basis for an instream flow (ISF) recommendation on Big Fish Creek in Water Division 6. Field investigations to formulate this ISF recommendation were completed by Colorado Parks and Wildlife (CPW) staff in 2018. Big Fish Creek is a high-elevation stream that supports a recreational trout fishery. This ISF candidate was first presented to interested parties at the ISF Workshop in 2017. CPW and CWCB staff conducted outreach to the Garfield County Commissioners on numerous occasions, but most recently in 2025. It is CPW staff's opinion that the information contained in this letter is sufficient for the CWCB's staff to recommend an ISF appropriation to the Board on Big Fish Creek as it specifically addresses the findings required in Rule 5(i) of the Instream Flow Program Rules.

CPW participates in the ISF Program and develops ISF recommendations for the Board's consideration in an effort to address CPW's legislative directives "… 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" [§33-1-101 (1) C.R.S.], and "… that the natural, scenic, scientific, and outdoor recreation areas … 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 acquisition, development, and management of … lands, waters, and facilities." [§33-10-101 (1) C.R.S.].

Laura Clellan, Acting Director, Colorado Parks and Wildlife
Parks and Wildlife Commission: Richard Reading, Chair · James 'Jay' Tutchton, Vice-Chair · Eden Vardy, Secretary · Jessica Beaulieu Frances Silva Blaney · John Emerick · Tai Jacober · Dallas May · Jack Murphy · Gabriel Otero

In addition to these broad statutory guidelines, CPW's strategic planning document (CPW Strategic Plan, 2015) explains the agency's current goals to, "[c]onserve wildlife and habitat to ensure healthy sustainable populations and ecosystems" in order to, "protect and enhance water resources for fish and wildlife populations," by pursuing, "partnerships and agreements to enhance instream flows, protect reservoir levels, and influence water management activities," and to, "[a]dvocate for water quality and quantities to conserve aquatic resources." In addition to the CPW Strategic Plan, the agency's fish and wildlife conservation activities are also informed by the State Wildlife Action Plan (2015, Revised 2025). The aforementioned documents direct CPW to advocate for the preservation of the state's fish and wildlife resources and natural environment, and therefore link CPW's mission to the goals and priorities of CWCB's Instream Flow and Natural Lake Level Program.

Recommended Segments & Land Status

CPW is proposing an ISF recommendation on Big Fish Creek from its headwaters (13T 303973 4427361) to the confluence with the North Fork White River (13T 305703 4433402). The reach is approximately 4.3 miles in length. Approximately 97% of the proposed reach is on White River National Forest on public lands managed as the Flat Tops Wilderness. Near the confluence of the North Fork White River, approximately 0.15 miles of the proposed reach is on private lands owned by Rio Blanco Ranch.

Natural Environment and Biological Summary

Big Fish Creek is a tributary of the North Fork of the White River located east of the town of Buford. Its headwaters originate at nearly 11,000 feet in elevation in the Flat Tops Wilderness. Hydrology is influenced by snowmelt runoff with stable baseflows following spring runoff. Average annual precipitation is approximately 40 inches. The watershed is approximately 13.3 square miles of densely forested land cover containing stands of aspen, lodgepole pine, spruce, and conifer. Big Fish Creek supports a healthy riparian area with very good overhead shading.

Big Fish Creek is a first to third order stream that is moderately high gradient. The channel through the observed reach is mainly single thread. Substrate size predominantly ranges from fine gravel to medium-sized cobble. There are some large cobble and boulder substrate features, which support deep pools, and pockets which lend to cover habitat used by fish. There is considerable large wood in the channel, which supports complexity, additional shading, and nutrient cycling in the channel. The reach has a mixture of riffles, runs, glides, and pools. Fish sampling conducted by CPW in 2008 and 2017 indicates a fishery consisting of brook trout, rainbow trout, rainbow cutthroat trout hybrid, and native mottled sculpin. Biologist notes indicate that most fish captured were large (greater than 12 inches) and density was high. Notes also indicate habitat is excellent.

R2Cross Background

Initial biological instream flow rates were developed using the R2Cross methodology (CWCB, 2024[1]). R2Cross uses field data that has been collected in a riffle habitat type. Riffles are often the limiting habitat features in streams during low flow events, so maintaining specific hydraulic conditions across riffle habitat types will also maintain aquatic habitat in pools and runs for most life stages of fish and macroinvertebrates (Nehring, 1979[2]). The R2Cross model uses field data, including a survey of cross-sectional channel geometry, a longitudinal slope of the water surface, and a flow measurement as input to a single transect hydraulic model. R2Cross uses Ferguson's Variable-Power Equation (Ferguson, 2007[3]) to model a stage-discharge relationship and compute corresponding hydraulic parameters of average depth, average velocity, and percent wetted perimeter over modeled stages. Maintaining these three hydraulic parameters at specified levels should ensure conditions that allow movement of fish longitudinally across riffles and adequate depths, velocities, and oxygenation for production of macroinvertebrates and development of trout eggs. Baseflow recommendations are typically developed based on the flows that meet two of three hydraulic criteria and summer flow recommendations are based on hydraulic criteria that meet three of three hydraulic criteria (as described in Nehring 1979 and CWCB 2024).

In 2018, CPW collected two cross-section data sets on Big Fish Creek. The results of the R2Cross analysis are summarized below.

	Bankfull Top Width	Date Surveyed	Flow measured	Flow Meeting Two Criteria	Flow Meeting Three Criteria
1	25.86'	7/1/2018	35.7 cfs	3.46 cfs	10.02 cfs
2	21.54'	7/1/2018	35.7 cfs	1.16 cfs	6.95 cfs
		Recommended Biological Flow Rates		**2.3 cfs**	**8.5 cfs**

Based on these cross-sections, the biological flow recommendation is 2.3 cfs during the baseflow period. This rate will support sufficient average depth and wetted perimeter necessary to overwinter fish. The biological flow recommendation during the high flow period is 8.5 cfs. This flow rate supports sufficient average velocity of at least 1.0 feet per second (fps), as well as sufficient depth and wetted perimeter.

Water Availability

In order to make a preliminary determination whether water is available for the R2Cross-based flow recommendations and to determine the appropriate seasonal transition dates, CPW examined basic hydrologic data and water rights information for the North Fork White

[1]Colorado Water Conservation Board, 2024, R2Cross field manual. https://dnrweblink.state.co.us/cwcbsearch/0/edoc/224685/R2Cross%20Field%20Manual%202024.pdf

[2]Nehring, B.R., 1979, Evaluation of Instream Flow Methods and Determination of Water Quantity Needs for Streams in the State of Colorado, Colorado Division of Wildlife.

[3] Ferguson, R.I., 2007. Flow resistance equations for gravel- and boulder-bed streams. Water Resources Research 43. https://doi.org/10.1029/2006WR005422

River basin. Median hydrology was analyzed by CWCB staff using prorated gage data from the historic gage on the North Fork White River ("North Fork White River above Ripple Creek near Trappers Lake," USGS 09302420). This gage operated between 1965 to 1973. The only active water rights in the proposed reach that CPW is aware of are the Big Fish Creek Ditch and Big Fish Ditch 1. Diversions were accounted for in water availability analysis by subtracting diversion records out of the gage data.

Final Flow Recommendations

CPW's analysis indicates that the following flows are needed to protect the natural environment to a reasonable degree. Based on median hydrology analyzed by CWCB staff, there is sufficient water available to meet the biological flow recommendations. Therefore, CPW's flow recommendation are the following:

- Summer Flow Recommendation (April 1 through September 30): **8.5 cfs**
    - This flow rate supports adequate depth, velocity, and wetted perimeter, which will support habitat availability in riffles, pools, glides, and runs. Ample habitat availability is beneficial to fish during the summer when they are active feeding and moving longitudinally throughout the channel.

- Baseflow Recommendation (October 1 through March 31): **2.3 cfs**
    - This flow rate supports adequate wetted perimeter and depth in the channel to provide sufficient habitat availability in areas of holding habitat necessary to overwinter fish.

The purpose of this letter is to formally transmit this ISF recommendation to CWCB for their Board's consideration. Based on CPW's opinion, there is a flow-dependent natural environment in Big Fish Creek that can be preserved to a reasonable degree with an ISF water right in the recommended rates. Please refer to attachments which include; R2Cross field forms, R2Cross output, fish survey information, and photographs at each cross section location.

CPW personnel will be available at the January 2026 CWCB meeting to answer any questions that the Board might have regarding these flow recommendations. We appreciate your consideration.

Sincerely,

Katie Birch Digitally signed by Katie Birch Date: 2026.01.12 14:48:28 -07'00'

Katie Birch, CPW Instream Flow Program Coordinator

Big Fish Creek Fish Survey

Water **19201** **Big Fish Creek** Date **9/4/2008**

Station **WR0239** **400 M ABV N Fk White River**

Drainage **White River** UtmX **305714** UtmY **4433038** Elevation **2659 m**

Length **31 m** Width **2.56 m** Area **0.01 Ha**

Surveyors **GLASGOW, GROVE, LACY, FONG, ANDERSON, ET AL.**

Gear **EF** Effort **2.00** Metric **PASS** Protocol **TWO-PASS REMOVAL**

Total catch **103**

Species	Count	Length (mm)	Weight (gm)	Status	Mark	Tag ID	Habitat
BRK	1	235		1			A
BRK	1	240		1			A
BRK	1	220		1			A
BRK	1	154		1			A
BRK	1	185		1			A
BRK	1	185		1			A
BRK	1	122		1			A
BRK	1	122		1			A
BRK	1	131		1			A
BRK	1	172		1			A
BRK	1	130		1			A
MTS	1	133		1			A
MTS	1	72		1			A
MTS	1	120		1			A
MTS	1	125		1			A
MTS	1	120		1			A
MTS	1	100		1			A

Big Fish Creek Fish Survey

Water **19201** **Big Fish Creek** Date **9/4/2008**

Station **WR0239** **400 M ABV N Fk White River**

Species	Count	Length (mm)	Weight (gm)	Status	Mark	Tag ID	Habitat
MTS	1	126		1			A
MTS	1	135		1			A
MTS	1	115		1			A
MTS	1	133		1			A
MTS	1	122		1			A
MTS	1	108		1			A
MTS	1	140		1			A
MTS	1	90		1			A
MTS	1	122		1			A
MTS	1	84		1			A
MTS	1	112		1			A
MTS	1	100		1			A
MTS	1	106		1			A
MTS	1	77		1			A
MTS	1	81		1			A
MTS	1	100		1			A
MTS	1	82		1			A
MTS	1	79		1			A
MTS	1	47		1			A
MTS	1	47		1			A
MTS	1	96		1			A
MTS	1	77		1			A
MTS	1	50		1			A

Big Fish Creek Fish Survey

Water **19201** **Big Fish Creek** Date **9/4/2008**

Station **WR0239** **400 M ABV N Fk White River**

Species	Count	Length (mm)	Weight (gm)	Status	Mark	Tag ID	Habitat
MTS	1	55		1			A
MTS	1	52		1			A
MTS	1	70		1			A
MTS	1	80		1			A
MTS	1	55		1			A
MTS	1	57		1			A
MTS	1	52		1			A
MTS	1	60		1			A
MTS	1	60		1			A
MTS	1	55		1			A
MTS	1	52		1			A
MTS	1	51		1			A
MTS	1	48		1			A
MTS	1	50		1			A
MTS	1	51		1			A
MTS	1	48		1			A
MTS	1	51		1			A
RBT	1	294		1			A
RBT	1	330		1			A
RBT	1	280		1			A
RBT	1	330		1			A
RBT	1	285		1			A
RBT	1	110		1			A

Big Fish Creek Fish Survey

Water **19201** **Big Fish Creek** Date **9/4/2008**

Station **WR0239** **400 M ABV N Fk White River**

Species	Count	Length (mm)	Weight (gm)	Status	Mark	Tag ID	Habitat
RBT	1	60		1			A
RBT	1	65		1			A
RBT	1	102		1			A
RBT	1	62		1			A
RBT	1	50		1			A
RBT	1	66		1			A
RBT	1	62		1			A
RBT	1	68		1			A
RBT	1	55		1			A
BRK	1	190		2			A
BRK	1	153		2			A
BRK	1	130		2			A
BRK	1	73		2			A
BRK	1	74		2			A
MTS	1	50		2			A
MTS	1	77		2			A
MTS	1	196		2			A
MTS	1	117		2			A
MTS	1	70		2			A
MTS	1	75		2			A
MTS	1	50		2			A
MTS	1	74		2			A
MTS	1	80		2			A

Big Fish Creek Fish Survey

Water **19201** **Big Fish Creek** Date **9/4/2008**

Station **WR0239** **400 M ABV N Fk White River**

Species	Count	Length (mm)	Weight (gm)	Status	Mark	Tag ID	Habitat
MTS	1	108		2			A
MTS	1	55		2			A
MTS	1	100		2			A
MTS	1	70		2			A
MTS	1	103		2			A
MTS	1	50		2			A
MTS	1	51		2			A
MTS	1	77		2			A
MTS	1	72		2			A
MTS	1	55		2			A
MTS	1	47		2			A
MTS	1	50		2			A
MTS	1	82		2			A
MTS	1	45		2			A
MTS	1	46		2			A
RBT	1	189		2			A
RBT	1	190		2			A

Notes: 2 shockers, 4 netters Metric Staion Length and Width

Big Fish Creek Fish Survey

Water **19201** **Big Fish Creek** Date **9/28/2017**

Station **WR0239** **400 M ABV N Fk White River**

Drainage **White River** UtmX **305714** UtmY **4433038** Elevation **2659 m**

Length **152 m** Width **5.49 m** Area **0.08 Ha**

Surveyors **Ramey, Piper**

Gear **BPEF** Effort Metric Protocol **PRESENCE/ABSENCE**

Total catch **120**

Species	Count	Length (mm)	Weight (gm)	Status	Mark	Tag ID	Habitat
BRK	75						
RXN	45						

Notes: We shocked Big Fish to test a backpack shocker, get a fish community sample, and assess the instream habitat in Big Fish. Most fish were large (> 12 inches), and density was high. Habitat was excellent. Virtually all of the non-BRK appeared to be RXN.

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Big Fish					CROSS-SECTION NO.: 1-Lower-18
CROSS-SECTION LOCATION: @ Fence Boundary for RBR					
DATE: 7/11/18	OBSERVERS: K. Birch, K. Humphreys (Meeker Crew), J Skinner				
LEGAL DESCRIPTION	¼ SECTION:	SECTION:	TOWNSHIP: N/S	RANGE: E/W	PM:
COUNTY:	WATERSHED:	WATER DIVISION:	DOW WATER CODE:		
MAP(S): USGS:					
USFS:					

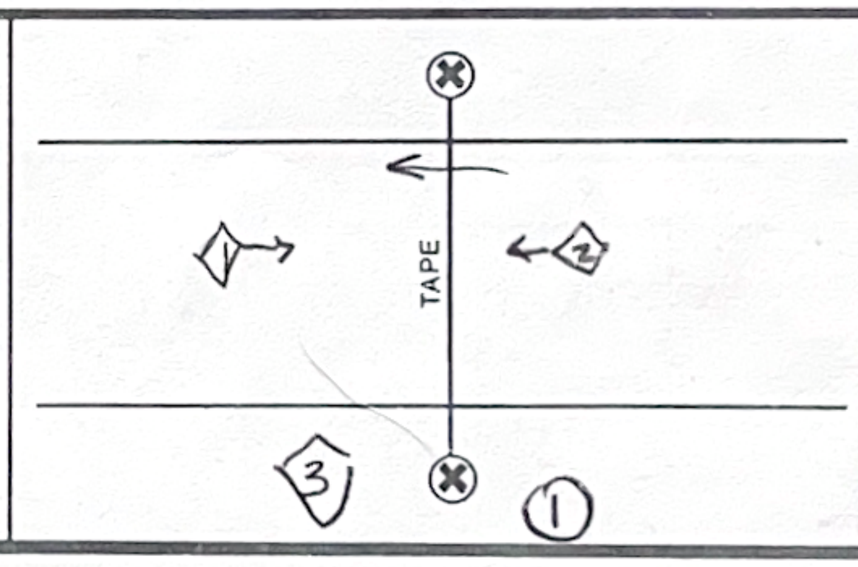
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: (YES) NO	METER TYPE: Marsh Mc B			
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	8.00 / 7.95
② WS Upstream	9'	7.32
③ WS Downstream	31 - 9 = 22	8.54
SLOPE	/31	

SKETCH



LEGEND:

Stake ⊗

Station ①

Photo ◇1

Direction of Flow ← →

AQUATIC SAMPLING SUMMARY

STREAM ELECTROFISHED: YES/NO	DISTANCE ELECTROFISHED: _____ft	FISH CAUGHT: YES/NO	WATER CHEMISTRY SAMPLED: YES/NO

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

SPECIES (FILL IN)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	>15	TOTAL

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

COMMENTS

DISCHARGE/CROSS SECTION NOTES

STREAM NAME:	CROSS-SECTION NO.:	DATE:	SHEET ___ OF ___

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

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Rod (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec)		Area (ft^2)	Discharge (cfs)
								At Point	Mean in Vertical		
S	0		6.05								
	1.8		7.1								
GL	2.6		7.35	0							
WSE/→	2.7		9.05	1.05				V from w/s XS			
Add Q	3.7		9.1	1.1							
2.7'	4.7		9.0	1.0							
	5.7		8.9	0.95							
	6.7		8.55	0.6							
	7.7		8.60	0.55							
	8.7		8.45	0.45							
	9.7		8.5	0.5							
	10.7		8.45	0.5							
	11.7		8.4	0.4							
	12.7		8.6	0.5							
	13.7		8.6	0.7							
	14.7		8.45	0.55							
	15.7		8.45	0.5							
	16.7		8.4	0.6							
	17.7		8.45	0.5							
	18.7		8.45	0.6							
	19.7		8.50	0.55							
	20.7		8.55	0.7							
	21.7		8.65	0.85							
	22.7		8.80	1.0							
	23.7		8.80	0.9							
	24.7		8.75	0.95							
	25.7		8.5	0.75							
	26.7		8.45	0.65							
	27.5		8.45	0.6							
WL	27.5		7.95	Ø							
GL	29.5		6.7								
	30.8		6.1								
S	32.4		5.7								
TOTALS:											

End of Measurement	Time:	Gage Reading: _____ 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: BIG FISH CREEK – Upper (2018)	CROSS-SECTION NO.: 2
CROSS-SECTION LOCATION: Near RBR Boundary	
DATE: 11 July	OBSERVERS: JWS, KB, Meeker Temps

LEGAL DESCRIPTION	¼ SECTION:	SECTION:	TOWNSHIP: N/S	RANGE: E/W	PM:
COUNTY:	WATERSHED:	WATER DIVISION:	DOW WATER CODE:		
MAP(S): USGS:					
USFS:					

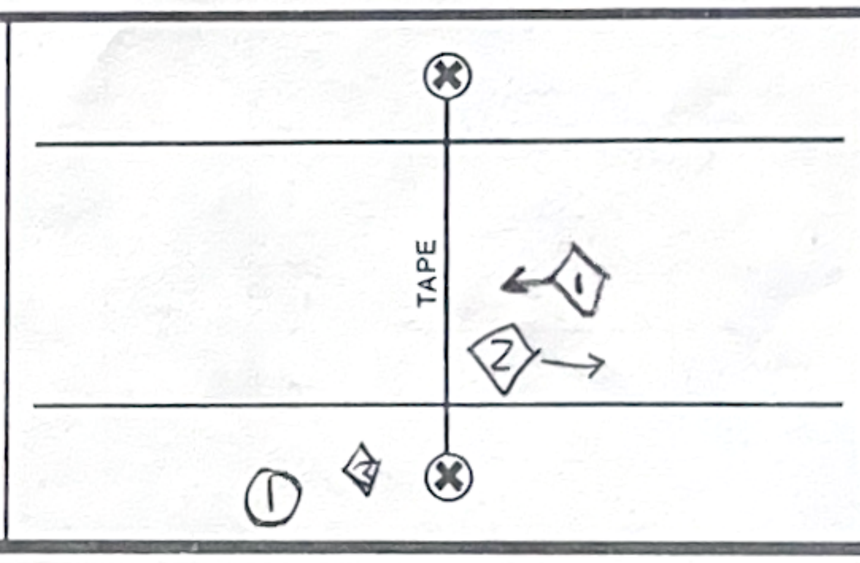
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: (YES) / NO	METER TYPE: March McB			
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-KB		

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	7.32 / 7.60
② WS Upstream	14.0	7.03
③ WS Downstream	13.5	7.72
SLOPE		

SKETCH



LEGEND:

Stake ⊗

Station ①

Photo ①

Direction of Flow

AQUATIC SAMPLING SUMMARY

STREAM ELECTROFISHED: YES/NO	DISTANCE ELECTROFISHED: _____ft	FISH CAUGHT: YES/NO	WATER CHEMISTRY SAMPLED: YES/NO

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

SPECIES (FILL IN)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	>15	TOTAL

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

COMMENTS

DISCHARGE/CROSS SECTION NOTES

STREAM NAME:	CROSS-SECTION NO.:	DATE:	SHEET ___ OF ___

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

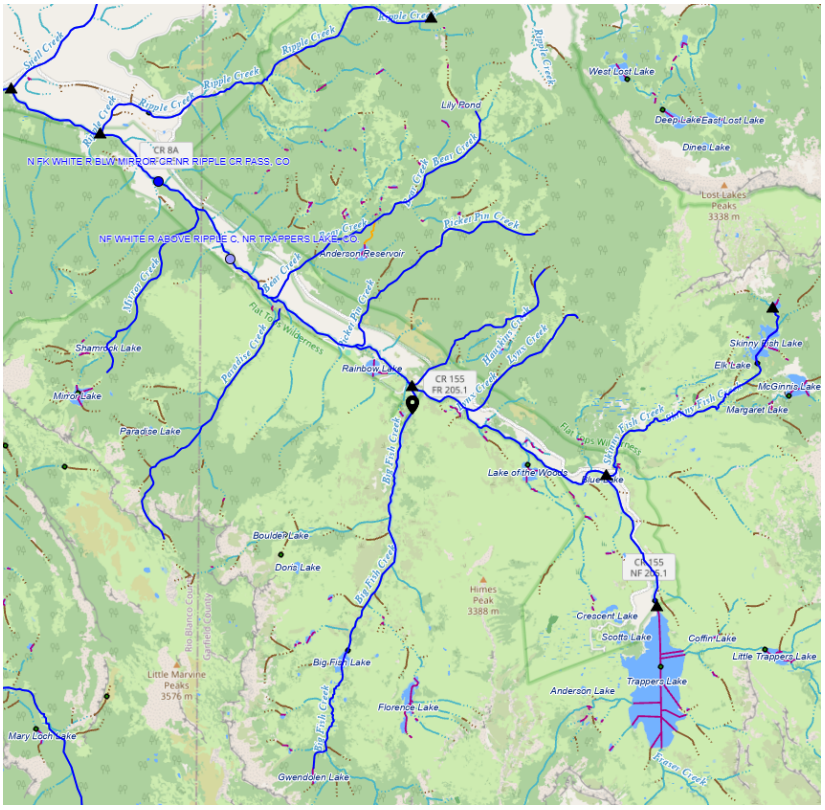
Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft²)	Discharge (cfs)
S	0		5.25								
	3		5.80								
	5		6.15								
GL	6		6.45								
	6.3		6.70								
W	6.5		7.32	0							
	7		7.90	0.5				0			
	8		8.20	.9				0.75			
	9		8.65	1.3				3.40			
	10		8.50	1.3				3.89			
	11		8.40	1.2				3.62			
	12		8.40	.95				3.80			
	13		8.40	1.0				2.97			
	14		8.50	1.1				3.42			
	15		8.35	.85				.88			
	16		8.10	.6				2.32			
	17		8.10	.4				1.84			
	18		7.95	.45				1.68			
	19		8.05	.35				2.21			
	20		8.05	.5				1.97			
	21		8.10	.6				2.39			
	22		8.25	.65				1.82			
	23		8.30	.7				2.41			
	24		8.30	.7				1.67			
	25		8.25	.4				0			
W	26		7.60	0							
	27.6		6.50								
S	28		6.4						Q =	35.7	cfs
TOTALS:											

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

R2Cross RESULTS

Stream Name: Big Fish
Stream Locations: At Fence Boundary for RBR
Fieldwork Date: 07/01/2018
Cross-section: 1
Observers: Birch Skinner
Coordinate System: UTM Zone 13
X (easting): 305725
Y (northing): 4433108
Date Processed: 09/05/2025
Slope: 0.0394
Discharge: R2Cross data file: 35.7 (cfs)
Computation method: Ferguson VPE
R2Cross data filename: R2Cross_BigFish_1_07-11-2018.xlsx
R2Cross version: 2.0.4

LOCATION



ANALYSIS RESULTS

Habitat Criteria Results

Bankfull top width (ft) = 25.86

	Habitat Criteria	Discharge (cfs) Meeting Criteria
Mean Depth (ft)	0.259	3.46
Percent Wetted Perimeter (%)	50.0	1.21
Mean Velocity (ft/s)	1.0	10.02

STAGING TABLE

Feature	Distance to Water (ft)	Top Width (ft)	Mean Depth (ft)	Maximum Depth (ft)	Area (sq ft)	Wetted Perimeter (ft)	Percent Wetted Perimeter	Hydraulic Radius (ft)	Manning's n	Mean Velocity (ft/s)	Discharge (cfs)
Bankfull	7.35	25.86	1.22	1.75	31.45	28.31	100.0	1.11	0.07	4.36	137.11
	7.37	25.83	1.2	1.73	30.99	28.26	99.82	1.1	0.07	4.29	132.9
	7.42	25.74	1.15	1.68	29.7	28.12	99.31	1.06	0.07	4.09	121.39
	7.47	25.65	1.11	1.63	28.42	27.97	98.79	1.02	0.08	3.89	110.41
	7.52	25.57	1.06	1.58	27.14	27.83	98.28	0.98	0.08	3.68	99.95
	7.57	25.48	1.01	1.53	25.86	27.68	97.77	0.93	0.08	3.48	90.02
	7.62	25.39	0.97	1.48	24.59	27.54	97.26	0.89	0.08	3.28	80.61
	7.67	25.3	0.92	1.43	23.32	27.39	96.75	0.85	0.09	3.08	71.74
	7.72	25.21	0.87	1.38	22.06	27.25	96.23	0.81	0.09	2.87	63.4
	7.77	25.13	0.83	1.33	20.8	27.1	95.72	0.77	0.09	2.67	55.6
	7.82	25.04	0.78	1.28	19.55	26.96	95.21	0.73	0.1	2.47	48.34
	7.87	24.95	0.73	1.23	18.3	26.81	94.7	0.68	0.1	2.27	41.62
Waterline	7.92	24.86	0.69	1.18	17.05	26.67	94.19	0.64	0.11	2.08	35.43
	7.97	24.8	0.64	1.13	15.81	26.54	93.73	0.6	0.11	1.88	29.76
	8.02	24.8	0.59	1.08	14.57	26.44	93.38	0.55	0.12	1.69	24.57
	8.07	24.8	0.54	1.03	13.33	26.34	93.02	0.51	0.13	1.49	19.92
	8.12	24.8	0.49	0.98	12.09	26.24	92.67	0.46	0.13	1.31	15.79
	8.17	24.8	0.44	0.93	10.85	26.14	92.32	0.42	0.15	1.12	12.2
	8.22	24.8	0.39	0.88	9.61	26.04	91.96	0.37	0.16	0.95	9.11
	8.27	24.8	0.34	0.83	8.37	25.94	91.61	0.32	0.18	0.78	6.52
	8.32	24.8	0.29	0.78	7.13	25.84	91.26	0.28	0.2	0.62	4.42
	8.37	24.8	0.24	0.73	5.89	25.74	90.9	0.23	0.23	0.47	2.77
	8.42	23.64	0.2	0.68	4.66	24.48	86.45	0.19	0.27	0.36	1.67
	8.47	17.0	0.21	0.63	3.61	17.74	62.66	0.2	0.26	0.4	1.43
	8.52	13.08	0.22	0.58	2.88	13.75	48.57	0.21	0.25	0.41	1.18

	8.57	10.73	0.21	0.53	2.28	11.33	40.03	0.2	0.26	0.39	0.88
	8.62	7.66	0.24	0.48	1.82	8.18	28.89	0.22	0.24	0.45	0.82
	8.67	6.87	0.21	0.43	1.46	7.33	25.88	0.2	0.26	0.38	0.56
	8.72	6.2	0.18	0.38	1.13	6.58	23.25	0.17	0.3	0.31	0.35
	8.77	5.24	0.16	0.33	0.84	5.56	19.62	0.15	0.33	0.26	0.22
	8.82	3.23	0.2	0.28	0.63	3.49	12.33	0.18	0.28	0.33	0.21
	8.87	3.09	0.15	0.23	0.47	3.29	11.62	0.14	0.34	0.24	0.11
	8.92	2.82	0.11	0.18	0.32	2.96	10.47	0.11	0.43	0.16	0.05
	8.97	2.32	0.08	0.13	0.19	2.41	8.52	0.08	0.55	0.1	0.02
	9.02	1.82	0.05	0.08	0.09	1.86	6.57	0.05	0.84	0.05	0.0
	9.07	0.97	0.02	0.03	0.02	0.97	3.42	0.02	2.12	0.01	0.0
	9.09	0.45	0.01	0.02	0.0	0.45	1.59	0.01	4.01	0.0	0.0

This Manning's roughness coefficient was calculated based on velocity estimates from the Ferguson VPE method

MODEL SUMMARY

Measured Flow (Qm) =	35.7	(cfs)
Calculated Flow (Qc) =	35.57	(cfs)
(Qm-Qc)/Qm * 100 =	0.36%	
Measured Waterline (WLm) =	7.97	(ft)
Calculated Waterline (WLc) =	7.92	(ft)
(WLm-WLc)/WLm * 100 =	0.72%	
Max Measured Depth (Dm) =	1.1	(ft)
Max Calculated Depth (Dc) =	1.18	(ft)
(Dm-Dc)/Dm * 100 =	-7.47%	
Mean Velocity =	2.09	(ft/s)
Manning's n =	0.105	
0.4 * Qm =	14.28	(cfs)
2.5 * Qm =	89.25	(cfs)

FIELD DATA

Feature	Station (ft)	Rod Height (ft)	Water depth (ft)	Velocity (ft/s)
	0	6.05		
	1.8	7.1		
Bankfull	2.6	7.35		
Waterline	2.7	8	0	0
	2.7	9.05	1.05	2.093841642228739
	3.7	9.1	1.1	2.093841642228739
	4.7	9	1	2.093841642228739
	5.7	8.9	0.95	2.093841642228739
	6.7	8.55	0.6	2.093841642228739
	7.7	8.6	0.55	2.093841642228739
	8.7	8.45	0.45	2.093841642228739
	9.7	8.5	0.5	2.093841642228739
	10.7	8.45	0.5	2.093841642228739
	11.7	8.4	0.4	2.093841642228739
	12.7	8.6	0.5	2.093841642228739
	13.7	8.6	0.7	2.093841642228739
	14.7	8.45	0.55	2.093841642228739
	15.7	8.45	0.5	2.093841642228739
	16.7	8.4	0.6	2.093841642228739
	17.7	8.45	0.5	2.093841642228739
	18.7	8.45	0.6	2.093841642228739
	19.7	8.5	0.55	2.093841642228739
	20.7	8.55	0.7	2.093841642228739
	21.7	8.65	0.85	2.093841642228739
	22.7	8.8	1	2.093841642228739
	23.7	8.8	0.9	2.093841642228739
	24.7	8.75	0.95	2.093841642228739
	25.7	8.5	0.75	2.093841642228739
	26.7	8.45	0.65	2.093841642228739
	27.5	8.45	0.6	2.093841642228739

Waterline	27.5	7.95	0	0
Bankfull	29.5	6.7		
	30.8	6.1		
	32.4	5.7		

COMPUTED FROM MEASURED FIELD DATA

Wetted Perimeter (ft)	Water Depth (ft)	Area (ft^2)	Discharge (cfs)	Percent Discharge
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
1.05	1.05	0.53	1.1	3.08
1	1.1	1.1	2.3	6.45
1	1	1	2.09	5.87
1	0.95	0.95	1.99	5.57
1.06	0.6	0.6	1.26	3.52
1	0.55	0.55	1.15	3.23
1.01	0.45	0.45	0.94	2.64
1	0.5	0.5	1.05	2.93
1	0.5	0.5	1.05	2.93
1	0.4	0.4	0.84	2.35
1.02	0.5	0.5	1.05	2.93
1	0.7	0.7	1.47	4.11
1.01	0.55	0.55	1.15	3.23
1	0.5	0.5	1.05	2.93
1	0.6	0.6	1.26	3.52
1	0.5	0.5	1.05	2.93
1	0.6	0.6	1.26	3.52
1	0.55	0.55	1.15	3.23
1	0.7	0.7	1.47	4.11
1	0.85	0.85	1.78	4.99
1.01	1	1	2.09	5.87
1	0.9	0.9	1.88	5.28
1	0.95	0.95	1.99	5.57
1.03	0.75	0.75	1.57	4.4
1	0.65	0.58	1.22	3.43
0.8	0.6	0.24	0.5	1.41

0.5	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

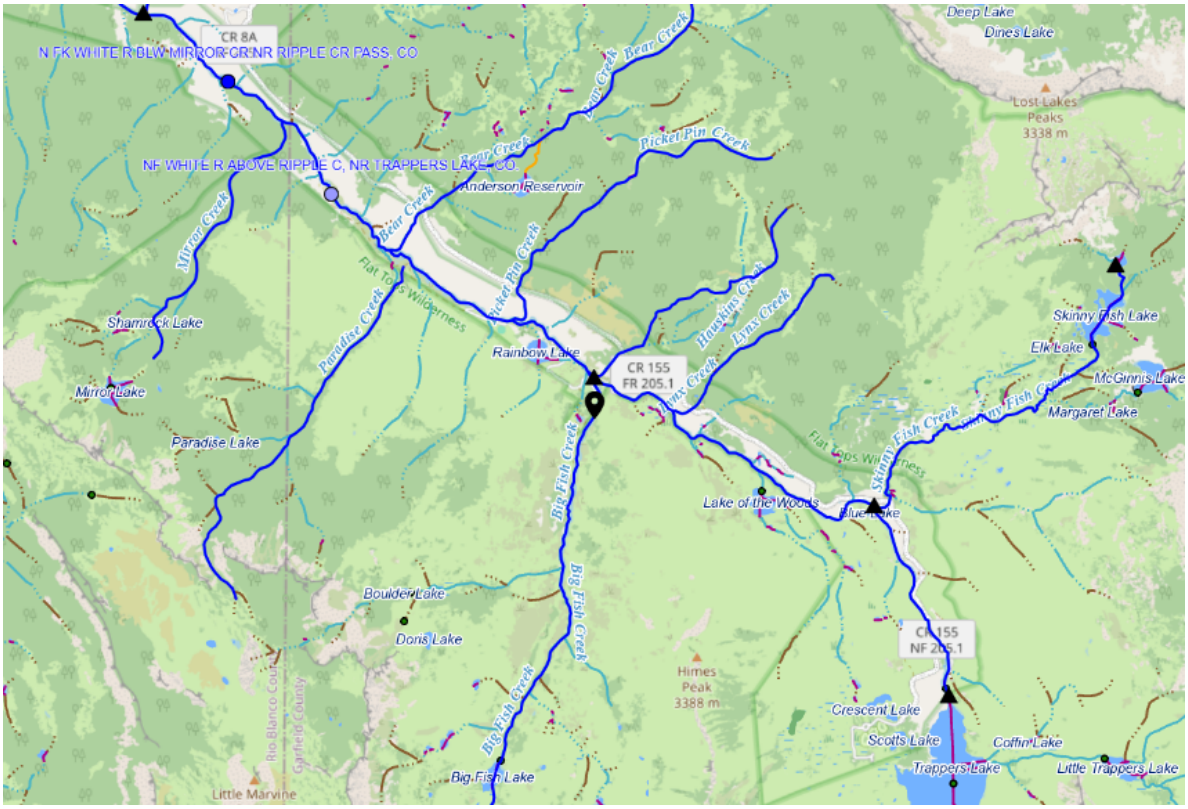
DISCLAIMER

"The Colorado Water Conservation Board makes no representations about the use of the software contained in the R2Cross platform for any purpose besides that for which it was designed. To the maximum extent permitted by applicable law, all information, modeling results, and software are provided “as is” without warranty or condition of any kind, including all implied warranties or conditions of merchantability, or fitness for a particular purpose. The user assumes all responsibility for the accuracy and suitability of this program for a specific application. In no event shall the Colorado Water Conservation Board or any state agency, official or employee be liable for any direct, indirect, punitive, incidental, special, consequential damages or any damages whatsoever including, without limitation, damages for loss of use, data, profits, or savings arising from the implementation, reliance on, or use of or inability to use the R2Cross platform.

R2Cross RESULTS

Stream Name: Big Fish
Stream Locations: At Fence Boundary for RBR
Fieldwork Date: 07/01/2018
Cross-section: 2
Observers: Birch Skinner
Coordinate System: UTM Zone 13
X (easting): 305725
Y (northing): 4433108
Date Processed: 10/07/2025
Slope: 0.0251
Discharge: R2Cross data file: 35.7 (cfs)
Computation method: Ferguson VPE
R2Cross data filename: R2Cross_BigFish_2_07-11-2018.xlsx
R2Cross version: 2.0.4

LOCATION



ANALYSIS RESULTS

Habitat Criteria Results

Bankfull top width (ft) = 21.54

	Habitat Criteria	Discharge (cfs) Meeting Criteria
Mean Depth (ft)	0.215	1.16
Percent Wetted Perimeter (%)	50.0	0.95
Mean Velocity (ft/s)	1.0	6.95

STAGING TABLE

Feature	Distance to Water (ft)	Top Width (ft)	Mean Depth (ft)	Maximum Depth (ft)	Area (sq ft)	Wetted Perimeter (ft)	Percent Wetted Perimeter	Hydraulic Radius (ft)	Manning's n	Mean Velocity (ft/s)	Discharge (cfs)
Bankfull	6.5	21.54	1.61	2.15	34.66	23.1	100.0	1.5	0.05	6.14	212.9
	6.54	21.43	1.58	2.11	33.75	22.96	99.39	1.47	0.05	6.01	202.74
	6.59	21.29	1.53	2.06	32.68	22.79	98.67	1.43	0.05	5.85	191.06
	6.64	21.16	1.49	2.01	31.62	22.63	97.95	1.4	0.05	5.68	179.7
	6.69	21.03	1.45	1.96	30.57	22.46	97.23	1.36	0.05	5.52	168.66
	6.74	20.93	1.41	1.91	29.52	22.31	96.6	1.32	0.05	5.34	157.76
	6.79	20.84	1.37	1.86	28.47	22.17	95.99	1.28	0.05	5.17	147.16
	6.84	20.76	1.32	1.81	27.43	22.03	95.38	1.25	0.05	4.99	136.88
	6.89	20.67	1.28	1.76	26.4	21.89	94.77	1.21	0.06	4.81	126.94
	6.94	20.58	1.23	1.71	25.37	21.75	94.16	1.17	0.06	4.63	117.34
	6.99	20.49	1.19	1.66	24.34	21.61	93.55	1.13	0.06	4.44	108.08
	7.04	20.4	1.14	1.61	23.32	21.47	92.95	1.09	0.06	4.25	99.17
	7.09	20.31	1.1	1.56	22.3	21.33	92.34	1.05	0.06	4.06	90.62
	7.14	20.22	1.05	1.51	21.29	21.19	91.73	1.0	0.06	3.87	82.43
	7.19	20.13	1.01	1.46	20.28	21.05	91.12	0.96	0.06	3.68	74.6
	7.24	20.05	0.96	1.41	19.27	20.91	90.51	0.92	0.06	3.48	67.15
	7.29	19.96	0.92	1.36	18.27	20.77	89.9	0.88	0.07	3.29	60.07
	7.34	19.86	0.87	1.31	17.28	20.62	89.26	0.84	0.07	3.09	53.39
	7.39	19.74	0.83	1.26	16.29	20.46	88.59	0.8	0.07	2.89	47.13
	7.44	19.62	0.78	1.21	15.3	20.31	87.93	0.75	0.07	2.7	41.26
Waterline	7.49	19.51	0.73	1.16	14.32	20.16	87.26	0.71	0.08	2.5	35.79
	7.54	19.39	0.69	1.11	13.35	20.0	86.59	0.67	0.08	2.3	30.71
	7.59	19.28	0.64	1.06	12.39	19.85	85.92	0.62	0.08	2.1	26.04
	7.64	19.16	0.6	1.01	11.42	19.69	85.24	0.58	0.09	1.91	21.77
	7.69	19.04	0.55	0.96	10.47	19.53	84.56	0.54	0.09	1.71	17.91

	7.74	18.92	0.5	0.91	9.52	19.37	83.88	0.49	0.1	1.52	14.44
	7.79	18.8	0.46	0.86	8.58	19.22	83.19	0.45	0.1	1.33	11.38
	7.84	18.68	0.41	0.81	7.64	19.06	82.51	0.4	0.11	1.14	8.71
	7.89	18.56	0.36	0.76	6.71	18.9	81.83	0.36	0.12	0.96	6.44
	7.94	18.33	0.32	0.71	5.79	18.65	80.75	0.31	0.14	0.79	4.57
	7.99	17.38	0.28	0.66	4.89	17.67	76.52	0.28	0.15	0.67	3.28
	8.04	16.31	0.25	0.61	4.05	16.57	71.73	0.24	0.16	0.56	2.26
	8.09	13.8	0.24	0.56	3.31	14.04	60.79	0.24	0.17	0.53	1.76
	8.14	11.91	0.23	0.51	2.69	12.11	52.43	0.22	0.18	0.49	1.31
	8.19	11.13	0.19	0.46	2.11	11.3	48.93	0.19	0.2	0.38	0.8
	8.24	10.4	0.15	0.41	1.58	10.54	45.62	0.15	0.24	0.27	0.43
	8.29	8.33	0.13	0.36	1.1	8.45	36.57	0.13	0.27	0.22	0.24
	8.34	6.71	0.11	0.31	0.75	6.81	29.5	0.11	0.31	0.17	0.13
	8.39	6.29	0.07	0.26	0.43	6.37	27.6	0.07	0.48	0.08	0.03
	8.44	3.0	0.07	0.21	0.22	3.06	13.26	0.07	0.44	0.09	0.02
	8.49	1.55	0.07	0.16	0.11	1.6	6.93	0.07	0.46	0.09	0.01
	8.54	0.96	0.05	0.11	0.05	0.99	4.28	0.05	0.58	0.06	0.0
	8.59	0.51	0.03	0.06	0.01	0.53	2.29	0.03	0.98	0.02	0.0
	8.63	0.13	0.01	0.02	0.0	0.14	0.6	0.01	3.01	0.0	0.0

This Manning's roughness coefficient was calculated based on velocity estimates from the Ferguson VPE method

MODEL SUMMARY

Measured Flow (Qm) =	35.7	(cfs)
Calculated Flow (Qc) =	35.74	(cfs)
(Qm-Qc)/Qm * 100 =	-0.12%	
Measured Waterline (WLm) =	7.46	(ft)
Calculated Waterline (WLc) =	7.49	(ft)
(WLm-WLc)/WLm * 100 =	-0.43%	
Max Measured Depth (Dm) =	1.3	(ft)
Max Calculated Depth (Dc) =	1.16	(ft)
(Dm-Dc)/Dm * 100 =	10.95%	
Mean Velocity =	2.5	(ft/s)
Manning's n =	0.075	
0.4 * Qm =	14.28	(cfs)
2.5 * Qm =	89.25	(cfs)

FIELD DATA

Feature	Station (ft)	Rod Height (ft)	Water depth (ft)	Velocity (ft/s)
	0	5.25		
	3	5.8		
	5	6.15		
Bankfull	6	6.45		
	6.3	6.7		
Waterline	6.5	7.32	0	0
	7	7.9	0.5	0
	8	8.2	0.9	0.75
	9	8.65	1.3	3.4
	10	8.5	1.3	3.89
	11	8.4	1.2	3.62
	12	8.4	0.95	3.8
	13	8.4	1	2.97
	14	8.5	1.1	3.42
	15	8.35	0.85	0.88
	16	8.1	0.6	2.32
	17	8.1	0.4	1.84
	18	7.95	0.45	1.68
	19	8.05	0.35	2.21
	20	8.05	0.5	1.97
	21	8.1	0.6	2.39
	22	8.25	0.65	1.82
	23	8.3	0.7	2.41
	24	8.3	0.7	1.67
	25	8.25	0.4	0
Waterline	26	7.6	0	0
Bankfull	27.6	6.5		
	28	6.4		

COMPUTED FROM MEASURED FIELD DATA

Wetted Perimeter (ft)	Water Depth (ft)	Area (ft^2)	Discharge (cfs)	Percent Discharge
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0.77	0.5	0.38	0	0
1.04	0.9	0.9	0.68	1.89
1.1	1.3	1.3	4.42	12.38
1.01	1.3	1.3	5.06	14.16
1	1.2	1.2	4.34	12.17
1	0.95	0.95	3.61	10.11
1	1	1	2.97	8.32
1	1.1	1.1	3.76	10.54
1.01	0.85	0.85	0.75	2.1
1.03	0.6	0.6	1.39	3.9
1	0.4	0.4	0.74	2.06
1.01	0.45	0.45	0.76	2.12
1	0.35	0.35	0.77	2.17
1	0.5	0.5	0.98	2.76
1	0.6	0.6	1.43	4.02
1.01	0.65	0.65	1.18	3.31
1	0.7	0.7	1.69	4.72
1	0.7	0.7	1.17	3.27
1	0.4	0.4	0	0
1.19	0	0	0	0
0	0	0	0	0
0	0	0	0	0

DISCLAIMER

"The Colorado Water Conservation Board makes no representations about the use of the software contained in the R2Cross platform for any purpose besides that for which it was designed. To the maximum extent permitted by applicable law, all information, modeling results, and software are provided “as is” without warranty or condition of any kind, including all implied warranties or conditions of merchantability, or fitness for a particular purpose. The user assumes all responsibility for the accuracy and suitability of this program for a specific application. In no event shall the Colorado Water Conservation Board or any state agency, official or employee be liable for any direct, indirect, punitive, incidental, special, consequential damages or any damages whatsoever including, without limitation, damages for loss of use, data, profits, or savings arising from the implementation, reliance on, or use of or inability to use the R2Cross platform.

Big Fish Creek, Cross-Section 1, Looking upstream

Big Fish Creek, Cross-Section 1, Looking Downstream

Big Fish Creek, Cross-Section 1, Looking across

Big Fish Creek, Cross-Section 2, Looking Upstream

Big Fish Creek, Cross-Section 2, Looking Downstream

Bear Creek Cross Section 2, Looking Across.