DRAFT INSTREAM FLOW RECOMMENDATION – SUBJECT TO CHANGE

Mr. Rob Viehl
Colorado Water Conservation Board
1313 Sherman Street, Room 721
Denver, Colorado 80203

Dear Mr. Viehl:

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

Location and Land Status. Pagoda Creek originates on the north flank of Pagoda Peak, approximately 25 miles southeast of the community of Hayden. This recommendation addresses the entire length of Pagoda Creek from the headwaters to the confluence with South Fork of the Williams Fork, a distance of approximately 10.3 miles. The BLM manages approximately 1.5 miles of this reach, the U.S. Forest Service manages 7.5 miles, and 1.3 miles are in private ownership.

Biological Summary. Pagoda Creek is a cold water, high gradient stream. It begins in a forested canyon, descends through open meadows with numerous natural ponds and beaver ponds, then descends through a narrow canyon until its confluence with the South Fork of the Williams Fork River. Substrate in the higher gradient portions of the creek is very large, ranging from 3-inch cobbles to 4-foot boulders, and it appears that the creek carries a substantial sediment load, primarily due to natural slumping within the watershed. Bank stability appears to be excellent, but there are isolated locations where livestock use is evident.

The creek appears to have good pools and riffles for natural reproduction of native species, but population sizes appear to be limited by low flows in late summer. Other than occasionally high stream temperatures, water quality appears to be good for supporting native cold-water fish species.

Pagoda Creek supports a conservation population of blue lineage Colorado River cutthroat trout. Fish surveys have also documented self-supporting populations of speckled dace, mottled sculpin, and mountain suckers. A stream of this size that supports exclusively native fish species is unusual and warrants flow protection. Spot surveys have revealed populations of caddisfly and mayfly. The creek also supports a healthy riparian community comprised of narrow leaf cottonwood, willow, spruce, alder, and mountain maple.

R2Cross Analysis. The BLM collected the following R2Cross data from Pagoda Creek:

Headwaters to confluence with Slide Creek

Cross Section Date	Discharge Rate	Top Width	Winter Flow Recommendation (meets 2 of 3 hydraulic criteria)	Summer Flow Recommendation (meets 3 of 3 hydraulic criteria)
5/26/2022 #1	26.94 cfs	36.45 feet	6.55 cfs	13.97 cfs
5/26/2022 #2	29.35 cfs	35.11 feet	5.85 cfs	15.72 cfs
		Averages:	6.20 cfs	14.85 cfs

Confluence with Slide Creek to confluence with South Fork of the Williams Fork

Cross Section Date	Discharge Rate	Top Width	Winter Flow Recommendation (meets 2 of 3 hydraulic criteria)	Summer Flow Recommendation (Meets 3 of 3 hydraulic criteria)
7/21/2022 #1	1.67 cfs	29.70 feet	2.44 cfs	10.13 cfs
7/21/2022 #2	1.67 cfs	24.14 feet	1.73 cfs	12.78 cfs
		Averages:	2.09 cfs	11.46 cfs

BLM's analysis of these data indicates that the following flows are needed to protect the natural environment to a reasonable degree.

Headwaters to confluence with Slide Creek

14.85 cubic feet per second is recommended during the snowmelt runoff period from April 1 through July 15. This recommendation is driven by the average depth criteria. This flow rate will ensure that pool and riffle habitat can be fully utilized during this high growth period.

6.2 cubic feet per second is recommended during the late summer, from July 16 through September 30. This flow rate meets two of the three instream flow criteria and should provide sufficient habitat when fish populations are active, gaining weight to survive the long winter period.

1.9 cfs is recommend for the remainder of the year, from October 1 through March 3. This recommendation is limited by water availability. This flow rate comes very close to meeting both the wetted perimeter and average depth criteria. This flow rate should maintain full and sufficiently cool pools during the summer when stream temperatures can still be high, and it should provide sufficient water for passage between pools. During the winter, this flow rate should prevent icing of pools, allowing the fish population to overwinter.

Confluence with Slide Creek to confluence with South Fork of the Williams Fork

11.4 cubic feet per second is recommended during the snowmelt runoff period from April 1 through July 15. This recommendation is driven by the average

velocity criteria. This flow rate will ensure that pool and riffle habitat can be fully utilized during this high growth period.

6.2 cubic feet per second is recommended during the late summer, from July 16 through September 30. This flow rate exceeds two of the three instream flow criteria and should provide sufficient physical habitat and sufficiently cool stream temperatures when fish populations are active, gaining weight to survive the long winter period.

2.0 cfs is recommend for the remainder of the year, from October 1 through March 31. This recommendation is limited by water availability. This flow rate comes close to meeting both the wetted perimeter and average depth criteria and should prevent icing of pools, allowing the fish population to overwinter.

Water Availability. BLM recommends using a variety of data sources to confirm water availability, because BLM is not aware of any historical gage data on this creek. Use of the CSUFlow18 regression model can provide an estimate of natural hydrology. Water availability during the irrigation season for the headwaters to Slide Creek reach can be partially confirmed by consulting diversion records for the Pagoda Ditch. The general pattern of streamflow in this watershed can be confirmed by consulting historical data from the South Fork of Williams Fork gage near Pagoda, CO (USGS Gage 09249200, CDWR Gage SOFPAGCO).

The only water right within the recommended reach is the Pagoda Ditch, which is decreed for 2.0 cfs with a 1908 priority date. Diversion records from the last 25 years show that this ditch diverts primarily during June and July.

Relationship to Land Management Plans. BLM CO is a signatory to the Range-wide Conservation Agreement and Strategy for Colorado River Cutthroat Trout. In addition, BLM's management plan calls for actions to maintain and enhance habitat that supports fish species. Specifically, the BLM plan calls for making instream flow recommendations to the Colorado Water Conservation Board to meet minimum instream flow requirements to maintain fisheries. Finally, the plan calls for maintaining and improving the function of riparian areas to achieve advanced ecological stage for the riparian community, and it also calls for protecting riparian and wetland systems from activities that could degrade those habitats. Establishing an instream flow water right would assist in meeting these objectives, in part by maintaining lateral connectivity at the higher flow rates during the snowmelt runoff period.

Data sheets, R2Cross output, fishery survey information, and photographs of the cross section were included with BLM's draft recommendation in February 2023. BLM thanks both Colorado Parks and Wildlife and the Colorado Water Conservation Board for their cooperation in this effort.

If you have any questions regarding our instream flow recommendation, please contact Roy Smith at 303-239-3940.

Sincerely,

Deputy State Director
Resources

Cc: Eric Scherff, Little Snake Field Office
Acting Field Manager, Little Snake Field Office
Elijah Waters, Northwest Colorado District Office

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Pagoda Creek						CROSS-SECTION NO.: 1
CROSS-SECTION LOCATION: Approx. 800 feet downstream from Pagoda Ditch						
DATE: 5-26-22	OBSERVERS: R. Smith, E. Scherff					
LEGAL DESCRIPTION	¼ SECTION:	SECTION:	TOWNSHIP: 30 N/S	RANGE: 89 E/W	PM: 6 th	
COUNTY: Rio Blanco	WATERSHED: Yampa R	WATER DIVISION: 6	DOW WATER CODE:			
MAP(S): USGS:	13N UTMs E 295314 N 4451027					
USFS:						

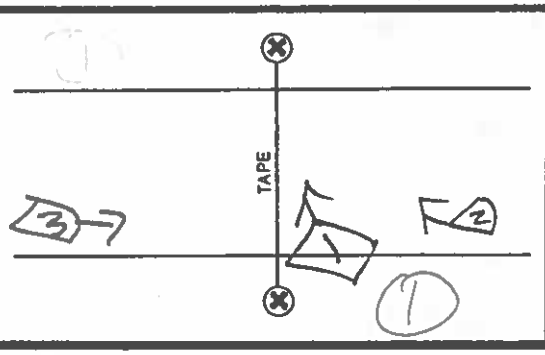
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES / NO	METER TYPE: M-M			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: surveyed ____ lbs/foot	TAPE TENSION: surveyed ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: 2" cobble to 2-foot boulder	PHOTOGRAPHS TAKEN: YES/NO	NUMBER OF PHOTOGRAPHS: 3		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	surveyed
⊗ Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB	0.0	7.4 / 7.4
② WS Upstream	15.9	6.94
③ WS Downstream	33.4	39.08
SLOPE	2.14/49.3	= 0.043

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

RIPARIAN: Alder, willow, spruce, SEDGE, EQUISETUM

WATER QUALITY: 7.3°C SAL = 0.0 PPT COND = 48 pH = 8.2

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Pagoda Ditch	CROSS-SECTION NO: 1	DATE: 5-26-22	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: ____ ft	TIME: 11:04

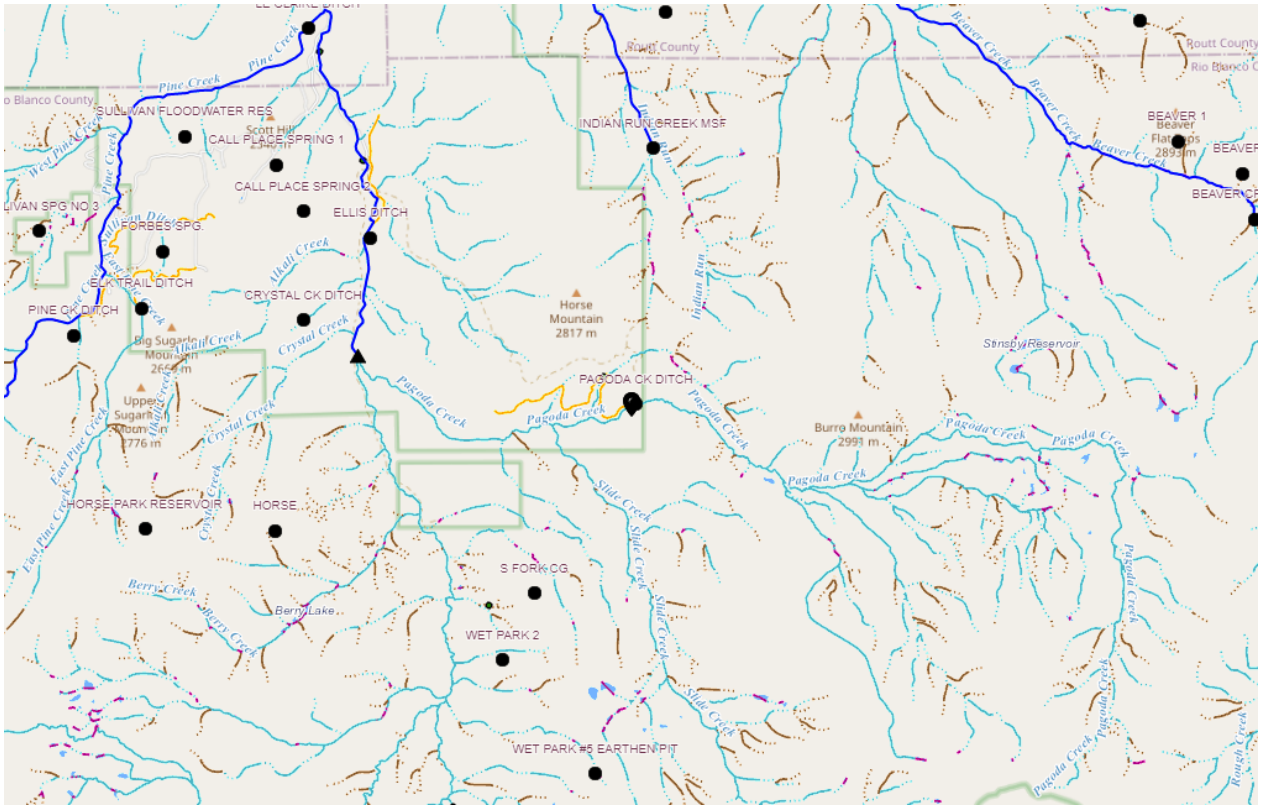
Features: Stake (S), Grassline (G), Waterline (W), Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
RS	0.0		5.20								
G	2.2		6.32								
W	2.8		7.40								
	4.0		7.6	0.20				0.62			
	5.0		7.8	0.45				2.42			
	6.0		8.0	0.60				4.40			
	7.0		7.9	0.50				1.75			
	8.0		7.9	0.50				3.10			
	9.0		8.1	0.70				3.89			
	10.0		8.1	0.70				1.94			
	11.0		7.9	0.50				2.32			
	12.0		7.8	0.40				1.64			
	13.0		7.6	0.20				0.54			
	14.0		7.65	0.25				2.17			
	15.0		7.55	0.15				1.79			
	16.0		7.85	0.45				0.83			
	17.0		8.0	0.60				3.64			
	18.0		7.9	0.50				1.21			
	19.0		7.85	0.45				0.00			
	20.0		7.85	0.45				0.00			
	21.0		7.9	0.50				0.00			
	22.0		7.95	0.55				0.44			
	23.0		8.3	0.90				3.65			
	24.0		8.05	0.65				3.47			
	25.0		8.4	1.00				2.39			
	26.0		8.1	0.70				1.36			
	27.0		7.95	0.55				0.53			
	28.0		7.75	0.35				0.70			
	29.0		7.85	0.45				1.84			
	30.0		7.60	0.20				0.92			
	31.0		7.45	0.05				0.00			
W	31.9		7.40								
	37.2		6.98								
	38.2		6.50								
G	38.8		6.26								
LS	39.3		6.12								
TOTALS:											

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

R2Cross RESULTS

Stream Name: Pagoda Creek
Stream Locations: Approx. 800' downstream from Pagoda Ditch headgate
Fieldwork Date: 05/26/2022
Cross-section: 1
Observers: R. Smith, T. Fresques
Coordinate System: UTM Zone 13
X (easting): 295314
Y (northing): 4451027
Date Processed: 05/29/2023
Slope: 0.043
Discharge: R2Cross data file: 26.94 (cfs)
Computation method: Ferguson VPE
R2Cross data filename: Pagoda Creek 5-26-22 #1.xlsx
R2Cross version: 2.0.2

LOCATION



ANALYSIS RESULTS

Habitat Criteria Results

Bankfull top width (ft) = 36.45

	Habitat Criteria	Discharge (cfs) Meeting Criteria
Mean Depth (ft)	0.4	13.97
Percent Wetted Perimeter (%)	50.0	1.38
Mean Velocity (ft/s)	1.0	6.55

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	6.32	36.45	1.38	2.08	50.29	37.71	100.0	1.33	0.05	7.58	381.04
	6.35	36.36	1.35	2.05	49.26	37.61	99.71	1.31	0.05	7.43	366.11
	6.4	36.21	1.31	2.0	47.45	37.41	99.2	1.27	0.05	7.17	340.35
	6.45	36.06	1.27	1.95	45.64	37.22	98.7	1.23	0.05	6.91	315.43
	6.5	35.91	1.22	1.9	43.84	37.03	98.19	1.18	0.05	6.65	291.37
	6.55	35.77	1.18	1.85	42.05	36.86	97.73	1.14	0.05	6.37	268.01
	6.6	35.64	1.13	1.8	40.26	36.68	97.27	1.1	0.05	6.1	245.54
	6.65	35.51	1.08	1.75	38.49	36.51	96.81	1.05	0.05	5.82	223.97
	6.7	35.38	1.04	1.7	36.71	36.34	96.35	1.01	0.06	5.54	203.33
	6.75	35.24	0.99	1.65	34.95	36.17	95.89	0.97	0.06	5.25	183.61
	6.8	35.11	0.95	1.6	33.19	35.99	95.44	0.92	0.06	4.97	164.85
	6.85	34.98	0.9	1.55	31.44	35.82	94.98	0.88	0.06	4.68	147.05
	6.9	34.85	0.85	1.5	29.69	35.65	94.52	0.83	0.06	4.39	130.24
	6.95	34.72	0.81	1.45	27.95	35.48	94.06	0.79	0.06	4.09	114.42
	7.0	34.39	0.76	1.4	26.22	35.11	93.1	0.75	0.07	3.83	100.31
	7.05	33.73	0.73	1.35	24.52	34.42	91.27	0.71	0.07	3.6	88.3
	7.1	33.08	0.69	1.3	22.85	33.73	89.44	0.68	0.07	3.38	77.12
	7.15	32.42	0.65	1.25	21.21	33.04	87.61	0.64	0.07	3.15	66.76
	7.2	31.76	0.62	1.2	19.61	32.35	85.78	0.61	0.08	2.92	57.21
	7.25	31.1	0.58	1.15	18.03	31.66	83.95	0.57	0.08	2.69	48.46
	7.3	30.44	0.54	1.1	16.5	30.97	82.12	0.53	0.08	2.46	40.51
	7.35	29.78	0.5	1.05	14.99	30.28	80.29	0.5	0.09	2.22	33.33
Waterline	7.4	29.12	0.46	1.0	13.52	29.59	78.46	0.46	0.09	1.99	26.92
	7.45	27.94	0.43	0.95	12.09	28.41	75.32	0.43	0.1	1.81	21.83
	7.5	27.29	0.39	0.9	10.71	27.74	73.56	0.39	0.1	1.58	16.87

	7.55	26.66	0.35	0.85	9.36	27.1	71.86	0.35	0.11	1.35	12.6
	7.6	25.38	0.32	0.8	8.06	25.81	68.43	0.31	0.12	1.17	9.4
	7.65	23.05	0.3	0.75	6.85	23.45	62.18	0.29	0.13	1.06	7.25
	7.7	22.13	0.26	0.7	5.72	22.51	59.69	0.25	0.14	0.87	4.96
	7.75	21.26	0.22	0.65	4.64	21.62	57.33	0.21	0.16	0.68	3.14
	7.8	19.67	0.18	0.6	3.61	20.0	53.03	0.18	0.19	0.53	1.9
	7.85	17.81	0.15	0.55	2.67	18.11	48.03	0.15	0.22	0.39	1.04
	7.9	13.53	0.14	0.5	1.91	13.81	36.62	0.14	0.23	0.36	0.68
	7.95	9.2	0.15	0.45	1.37	9.45	25.05	0.14	0.22	0.38	0.52
	8.0	6.61	0.15	0.4	0.97	6.83	18.1	0.14	0.23	0.37	0.36
	8.05	5.58	0.12	0.35	0.67	5.77	15.31	0.12	0.27	0.27	0.18
	8.1	4.27	0.1	0.3	0.42	4.43	11.74	0.1	0.31	0.2	0.09
	8.15	2.6	0.11	0.25	0.28	2.72	7.22	0.1	0.3	0.22	0.06
	8.2	1.95	0.08	0.2	0.16	2.04	5.41	0.08	0.37	0.15	0.02
	8.25	1.29	0.06	0.15	0.08	1.36	3.6	0.06	0.47	0.1	0.01
	8.3	0.64	0.05	0.1	0.03	0.67	1.79	0.05	0.56	0.07	0.0
	8.35	0.32	0.03	0.05	0.01	0.34	0.89	0.02	0.97	0.03	0.0
	8.38	0.09	0.01	0.02	0.0	0.1	0.26	0.01	2.72	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) =	26.94	(cfs)
Calculated Flow (Qc) =	26.93	(cfs)
(Qm-Qc)/Qm * 100 =	0.05%	
Measured Waterline (WLm) =	7.4	(ft)
Calculated Waterline (WLc) =	7.4	(ft)
(WLm-WLc)/WLm * 100 =	0.02%	
Max Measured Depth (Dm) =	1	(ft)
Max Calculated Depth (Dc) =	1	(ft)
(Dm-Dc)/Dm * 100 =	-0.17%	
Mean Velocity =	1.99	(ft/s)
Manning's n =	0.092	
0.4 * Qm =	10.78	(cfs)
2.5 * Qm =	67.35	(cfs)

FIELD DATA

Feature	Station (ft)	Rod Height (ft)	Water depth (ft)	Velocity (ft/s)
	0	5.2		
Bankfull	2.2	6.32		
Waterline	2.8	7.4	0	0
	4	7.6	0.2	0.62
	5	7.8	0.45	2.42
	6	8	0.6	4.4
	7	7.9	0.5	1.75
	8	7.9	0.5	3.1
	9	8.1	0.7	3.89
	10	8.1	0.7	1.94
	11	7.9	0.5	2.32
	12	7.8	0.4	1.64
	13	7.6	0.2	0.54
	14	7.65	0.25	2.17
	15	7.55	0.15	1.79
	16	7.85	0.45	0.83
	17	8	0.6	3.64
	18	7.9	0.5	1.21
	19	7.85	0.45	0
	20	7.85	0.45	0
	21	7.9	0.5	0
	22	7.95	0.55	0.44
	23	8.3	0.9	3.65
	24	8.05	0.65	3.47
	25	8.4	1	2.39
	26	8.1	0.7	1.36
	27	7.95	0.55	0.53
	28	7.75	0.35	0.7
	29	7.85	0.45	1.84
	30	7.6	0.2	0.92

	31	7.45	0.05	0
Waterline	31.9	7.4	0	0
	37.2	6.98		
	38.2	6.5		
Bankfull	38.8	6.26		
	39.3	6.12		

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
1.22	0.2	0.22	0.14	0.51
1.02	0.45	0.45	1.09	4.04
1.02	0.6	0.6	2.64	9.8
1	0.5	0.5	0.88	3.25
1	0.5	0.5	1.55	5.75
1.02	0.7	0.7	2.72	10.11
1	0.7	0.7	1.36	5.04
1.02	0.5	0.5	1.16	4.31
1	0.4	0.4	0.66	2.44
1.02	0.2	0.2	0.11	0.4
1	0.25	0.25	0.54	2.01
1	0.15	0.15	0.27	1
1.04	0.45	0.45	0.37	1.39
1.01	0.6	0.6	2.18	8.11
1	0.5	0.5	0.6	2.25
1	0.45	0.45	0	0
1	0.45	0.45	0	0
1	0.5	0.5	0	0
1	0.55	0.55	0.24	0.9
1.06	0.9	0.9	3.29	12.19
1.03	0.65	0.65	2.26	8.37
1.06	1	1	2.39	8.87
1.04	0.7	0.7	0.95	3.53
1.01	0.55	0.55	0.29	1.08
1.02	0.35	0.35	0.24	0.91
1	0.45	0.45	0.83	3.07
1.03	0.2	0.2	0.18	0.68

1.01	0.05	0.05	0	0
0.9	0	0	0	0
0	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.

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Pagoda Creek						CROSS-SECTION NO.: 2
CROSS-SECTION LOCATION: Approx. 1100 feet downstream from Pagoda Ditch.						
DATE: 5-26-22	OBSERVERS: R. Smith, E. Schorff					
LEGAL DESCRIPTION	¼ SECTION: SE	SECTION: 32	TOWNSHIP: 3 N/S	RANGE: 89 E/W	PM: 6th	
COUNTY: Rio Blanco	WATERSHED: Williams Fork R.	WATER DIVISION: 6	DOW WATER CODE:			
MAP(S): USGS:	13N E: 295179					
USFS:	N: 4450950					

SUPPLEMENTAL DATA

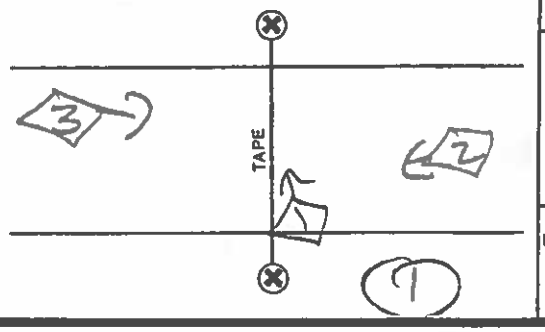
ELEVATION: 2471 meters

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES/NO	METER TYPE: M-M			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: surveyed ____ lbs/foot	TAPE TENSION: surveyed ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: 2" cobble to 2-foot boulders	PHOTOGRAPHS TAKEN: YES/NO	NUMBER OF PHOTOGRAPHS: 3		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	surveyed
⊗ Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB	0.0	6.4 / 6.4
② WS Upstream	27.4	5.50
③ WS Downstream	13.0	7.78
SLOPE	1.78 / 40.4 = 0.044	

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:

Caddisfly, mayfly.

COMMENTS

Cottonwood, alder, sp ales in ws.

DISCHARGE/CROSS SECTION NOTES

STREAM NAME:	CROSS-SECTION NO:	DATE:	SHEET ___ OF ___
Parioda Creek	2	5-26-22	

BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE)	LEFT / RIGHT	Gage Reading: _____ ft	TIME: 1:00 pm

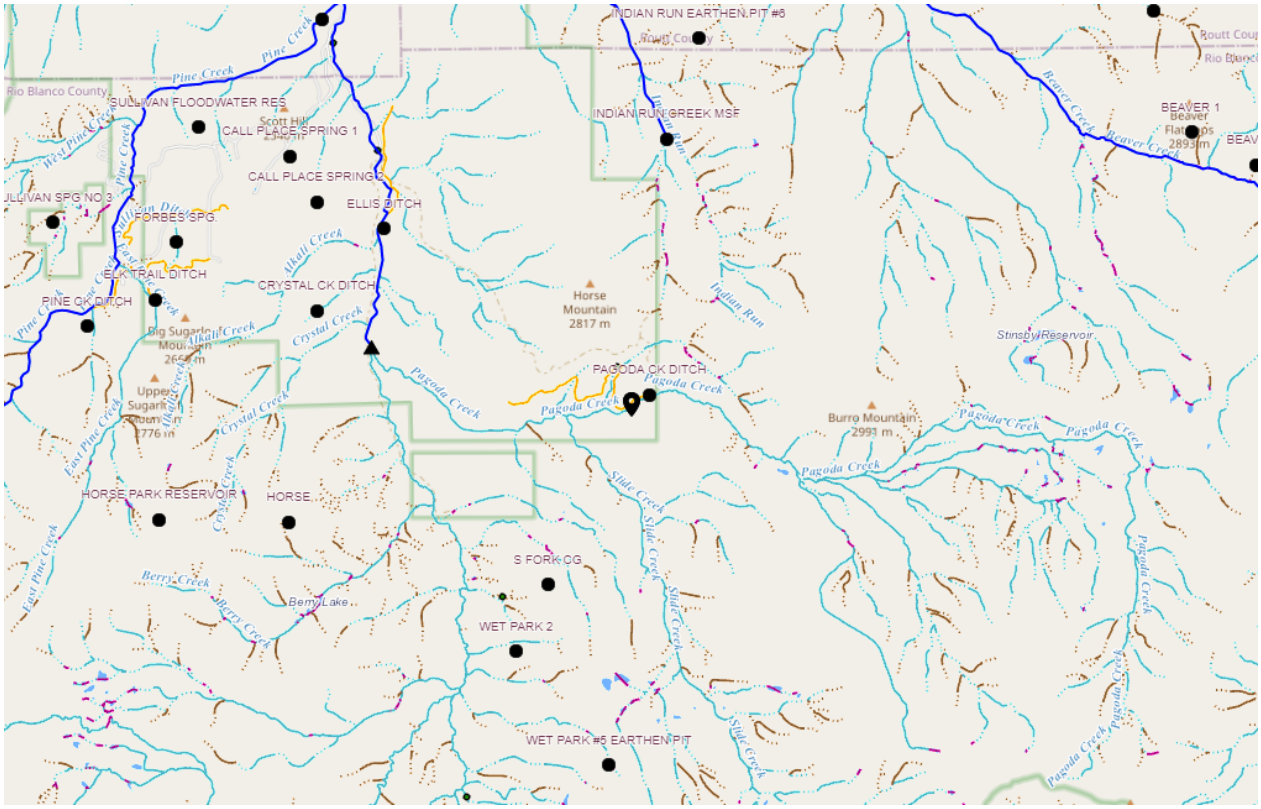
Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
RS	0.0		3.98								
G	7.1		5.45								
	8.0		5.76								
W	8.2		6.40								
	9.0		6.5	0.10				0.93			
	10.0		6.7	0.30				2.44			
	11.0		6.75	0.35				1.98			
	12.0		6.9	0.50				2.79			
	13.0		6.95	0.55				0.63			
	14.0		7.10	0.70				0.13			
	15.0		7.55	1.15				1.81			
	16.0		7.1	0.70				4.63			
	17.0		7.2	0.80				3.29			
	18.0		6.8	0.40				1.66			
	19.0		7.1	0.70				3.69			
	20.0		6.6	0.20				1.11			
	21.0		6.7	0.30				0.49			
	22.0		6.75	0.35				0.83			
	23.0		6.75	0.35				1.69			
	24.0		6.70	0.30				1.14			
	25.0		6.65	0.25				1.40			
	26.0		6.65	0.25				0.74			
	27.0		6.60	0.20				0.49			
	28.0		6.55	0.15				1.19			
	29.0		6.70	0.30				3.90			
	30.0		6.65	0.25				4.41			
	31.0		6.75	0.35				2.83			
	32.0		7.4	1.0				2.65			
	33.0		6.7	0.3				0.50			
	34.0		7.4	1.0				1.76			
	35.0		7.4	1.0				0.99			
	36.0		7.0	0.6				3.04			
	37.0		6.9	0.5				2.40			
	38.0		6.8	0.4				1.16			
	39.0		6.7	0.3				0.26			
	40.5		6.45	0.05				0.00			
W	41.4		6.40								
G	42.3		5.48								
LS	44.2		5.02								
TOTALS:											

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

R2Cross RESULTS

Stream Name: Pagoda Creek
Stream Locations: Approx. 1100' downstream from Pagoda Ditch headgate
Fieldwork Date: 05/26/2022
Cross-section: 2
Observers: R. Smith, T. Fresques
Coordinate System: UTM Zone 13
X (easting): 295179
Y (northing): 4450950
Date Processed: 05/29/2023
Slope: 0.044
Discharge: R2Cross data file: 29.35 (cfs)
Computation method: Ferguson VPE
R2Cross data filename: Pagoda Creek 5-26-22 #2.xlsx
R2Cross version: 2.0.2

LOCATION



ANALYSIS RESULTS

Habitat Criteria Results

Bankfull top width (ft) = 35.11

	Habitat Criteria	Discharge (cfs) Meeting Criteria
Mean Depth (ft)	0.4	15.72
Percent Wetted Perimeter (%)	50.0	5.85
Mean Velocity (ft/s)	1.0	4.15

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	5.48	35.11	1.31	2.07	45.92	37.28	100.0	1.23	0.05	7.42	340.87
	5.5	35.04	1.29	2.05	45.22	37.19	99.76	1.22	0.05	7.32	330.99
	5.55	34.84	1.25	2.0	43.47	36.97	99.16	1.18	0.05	7.06	306.87
	5.6	34.65	1.2	1.95	41.73	36.75	98.56	1.14	0.05	6.8	283.57
	5.65	34.45	1.16	1.9	40.0	36.52	97.96	1.1	0.05	6.53	261.12
	5.7	34.26	1.12	1.85	38.29	36.3	97.36	1.05	0.05	6.26	239.53
	5.75	34.06	1.07	1.8	36.58	36.08	96.76	1.01	0.05	5.98	218.8
	5.8	33.97	1.03	1.75	34.88	35.93	96.38	0.97	0.05	5.69	198.4
	5.85	33.91	0.98	1.7	33.18	35.81	96.05	0.93	0.05	5.39	178.79
	5.9	33.85	0.93	1.65	31.49	35.69	95.72	0.88	0.06	5.09	160.11
	5.95	33.78	0.88	1.6	29.8	35.57	95.4	0.84	0.06	4.78	142.4
	6.0	33.72	0.83	1.55	28.11	35.44	95.07	0.79	0.06	4.47	125.67
	6.05	33.65	0.79	1.5	26.42	35.32	94.74	0.75	0.06	4.16	109.94
	6.1	33.59	0.74	1.45	24.74	35.2	94.41	0.7	0.06	3.85	95.24
	6.15	33.52	0.69	1.4	23.07	35.08	94.08	0.66	0.07	3.54	81.57
	6.2	33.46	0.64	1.35	21.39	34.95	93.76	0.61	0.07	3.22	68.96
	6.25	33.39	0.59	1.3	19.72	34.83	93.43	0.57	0.07	2.91	57.42
	6.3	33.33	0.54	1.25	18.05	34.71	93.1	0.52	0.08	2.6	46.97
	6.35	33.26	0.49	1.2	16.39	34.59	92.77	0.47	0.08	2.3	37.61
Waterline	6.4	33.2	0.44	1.15	14.73	34.46	92.44	0.43	0.09	1.99	29.35
	6.45	31.9	0.41	1.1	13.1	33.16	88.94	0.39	0.09	1.79	23.42
	6.5	31.2	0.37	1.05	11.52	32.45	87.05	0.35	0.1	1.54	17.74
	6.55	30.65	0.33	1.0	9.97	31.89	85.55	0.31	0.11	1.29	12.84
	6.6	28.77	0.3	0.95	8.49	30.0	80.46	0.28	0.12	1.12	9.48
	6.65	25.28	0.28	0.9	7.11	26.49	71.04	0.27	0.13	1.04	7.37

6.7	21.3	0.28	0.85	5.95	22.47	60.27	0.26	0.13	1.01	6.03
6.75	16.06	0.31	0.8	4.99	17.17	46.07	0.29	0.12	1.16	5.78
6.8	14.9	0.28	0.75	4.21	15.96	42.8	0.26	0.13	1.01	4.26
6.85	13.46	0.26	0.7	3.51	14.43	38.71	0.24	0.14	0.9	3.14
6.9	12.01	0.24	0.65	2.87	12.9	34.61	0.22	0.15	0.79	2.26
6.95	9.9	0.23	0.6	2.32	10.71	28.74	0.22	0.15	0.76	1.76
7.0	8.46	0.22	0.55	1.86	9.19	24.65	0.2	0.16	0.69	1.28
7.05	7.39	0.2	0.5	1.47	8.03	21.54	0.18	0.17	0.59	0.87
7.1	6.32	0.18	0.45	1.12	6.87	18.43	0.16	0.19	0.5	0.56
7.15	5.13	0.16	0.4	0.84	5.59	14.99	0.15	0.2	0.44	0.37
7.2	3.93	0.16	0.35	0.61	4.31	11.56	0.14	0.21	0.41	0.25
7.25	3.37	0.13	0.3	0.43	3.66	9.83	0.12	0.24	0.31	0.13
7.3	2.8	0.1	0.25	0.27	3.02	8.1	0.09	0.3	0.21	0.06
7.35	2.23	0.07	0.2	0.15	2.38	6.37	0.06	0.41	0.12	0.02
7.4	0.67	0.08	0.15	0.05	0.73	1.96	0.07	0.38	0.14	0.01
7.45	0.44	0.05	0.1	0.02	0.49	1.31	0.05	0.53	0.08	0.0
7.5	0.22	0.03	0.05	0.01	0.24	0.65	0.02	0.94	0.03	0.0
7.54	0.07	0.01	0.01	0.0	0.07	0.2	0.01	2.57	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) =	29.35	(cfs)
Calculated Flow (Qc) =	29.35	(cfs)
(Qm-Qc)/Qm * 100 =	-0.00%	
Measured Waterline (WLm) =	6.4	(ft)
Calculated Waterline (WLc) =	6.4	(ft)
(WLm-WLc)/WLm * 100 =	0.00%	
Max Measured Depth (Dm) =	1.15	(ft)
Max Calculated Depth (Dc) =	1.15	(ft)
(Dm-Dc)/Dm * 100 =	-0.00%	
Mean Velocity =	1.99	(ft/s)
Manning's n =	0.089	
0.4 * Qm =	11.74	(cfs)
2.5 * Qm =	73.36	(cfs)

FIELD DATA

Feature	Station (ft)	Rod Height (ft)	Water depth (ft)	Velocity (ft/s)
	0	3.98		
Bankfull	7.1	5.45		
	8	5.76		
Waterline	8.2	6.4	0	0
	9	6.5	0.1	0.93
	10	6.7	0.3	2.44
	11	6.75	0.35	1.98
	12	6.9	0.5	2.79
	13	6.95	0.55	0.63
	14	7.1	0.7	0.13
	15	7.55	1.15	1.81
	16	7.1	0.7	4.63
	17	7.2	0.8	3.29
	18	6.8	0.4	1.66
	19	7.1	0.7	3.69
	20	6.6	0.2	1.11
	21	6.7	0.3	0.49
	22	6.75	0.35	0.83
	23	6.75	0.35	1.69
	24	6.7	0.3	1.14
	25	6.65	0.25	1.4
	26	6.65	0.25	0.74
	27	6.6	0.2	0.49
	28	6.55	0.15	1.19
	29	6.7	0.3	3.9
	30	6.65	0.25	4.41
	31	6.75	0.35	2.83
	32	7.4	1	2.65
	33	6.7	0.3	0.5
	34	7.4	1	1.76

	35	7.4	1	0.99
	36	7	0.6	3.04
	37	6.9	0.5	2.4
	38	6.8	0.4	1.16
	39	6.7	0.3	0.26
	40.5	6.45	0.05	0
Waterline	41.4	6.4	0	
Bankfull	42.3	5.48		
	44.2	5.02		

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
0.81	0.1	0.09	0.08	0.29
1.02	0.3	0.3	0.73	2.49
1	0.35	0.35	0.69	2.36
1.01	0.5	0.5	1.4	4.75
1	0.55	0.55	0.35	1.18
1.01	0.7	0.7	0.09	0.31
1.1	1.15	1.15	2.08	7.09
1.1	0.7	0.7	3.24	11.04
1	0.8	0.8	2.63	8.97
1.08	0.4	0.4	0.66	2.26
1.04	0.7	0.7	2.58	8.8
1.12	0.2	0.2	0.22	0.76
1	0.3	0.3	0.15	0.5
1	0.35	0.35	0.29	0.99
1	0.35	0.35	0.59	2.02
1	0.3	0.3	0.34	1.17
1	0.25	0.25	0.35	1.19
1	0.25	0.25	0.18	0.63
1	0.2	0.2	0.1	0.33
1	0.15	0.15	0.18	0.61
1.01	0.3	0.3	1.17	3.99
1	0.25	0.25	1.1	3.76
1	0.35	0.35	0.99	3.38
1.19	1	1	2.65	9.03
1.22	0.3	0.3	0.15	0.51
1.22	1	1	1.76	6

1	1	1	0.99	3.37
1.08	0.6	0.6	1.82	6.22
1	0.5	0.5	1.2	4.09
1	0.4	0.4	0.46	1.58
1	0.3	0.38	0.1	0.33
1.52	0.05	0.06	0	0
0.9	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.

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Pagoda Creek					CROSS-SECTION NO.: 1	
CROSS-SECTION LOCATION: 1/3 mile upstream from confluence with South Fork						
DATE: 7-21-22	OBSERVERS: R. Smith, E. Scherff, C. Brady					
LEGAL DESCRIPTION	¼ SECTION: SW	SECTION: 31	TOWNSHIP: 3 (N/S)	RANGE: 89 (E/W)	PM: 6th	
COUNTY: Rio Blanco	WATERSHED: Williams Fork	WATER DIVISION: 6	DOW WATER CODE:			
MAP(S): USGS:	Lat 40.18599 Long: 107.43605					
USFS:						

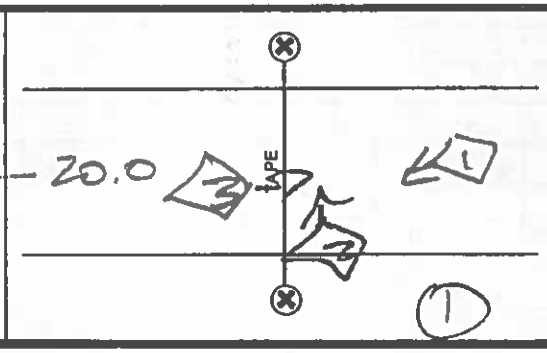
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES / NO	METER TYPE: M-M			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: surveyed ____ lbs/foot	TAPE TENSION: surveyed ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: 3" cobbles to 4-foot boulders	PHOTOGRAPHS TAKEN: YES/NO	NUMBER OF PHOTOGRAPHS: 3		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	surveyed
⊗ Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB	0.0 33.6	7.5 / 7.5
② WS Upstream	26.2	6.85
③ WS Downstream	14.6	8.15
SLOPE	1.3 / 40.8 = 0.032	

SKETCH



LEGEND: Stake ⊗ Station ① Photo ◇ Direction of Flow

AQUATIC SAMPLING SUMMARY

STREAM ELECTROFISHED: YES/NO	DISTANCE ELECTROFISHED: ____ ft	FISH CAUGHT: YES/NO	WATER CHEMISTRY SAMPLED: YES/NO
(NO)			(YES)

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: Micrasema sp. (Trichoptera), Ephemeroptera

Very low abundance

COMMENTS

Temp: 16.4°C
Sp Cond: 277
Salinity: 0.2 parts/1000
pH: 8.64

Pinaceae = S, Narrowleaf Cottonwood, Equisetum (Horse Tail), Snake Grass, Common Juniper, Timothy, Lupine, Woods Rose, Geranium, Alder, Blue Spruce, Yarrow, Peavine, mountain maple, starry solomon seal

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Pagoda Creek | CROSS-SECTION NO.: 1 | DATE: 7-21-22 | SHEET ___ OF ___

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT | Gage Reading: _____ ft | TIME: 11 am

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
RS	0.0		4.66								
	3.4		5.64								
RBF	15.3		5.82								
	17.8		6.42								
	19.5		6.59								
RW	20.0		7.50	ϕ				ϕ			
	21.0		7.65	0.15				0.53			
	21.3		7.7	0.20				0.61			
	21.6		7.7	0.20				0.41			
	21.9		7.85	0.35				0.13			
	22.2		7.7	0.20				0.18			
	22.5		7.85	0.35				0.22			
	22.8		7.8	0.30				0.23			
	23.1		7.8	0.30				0.10			
	23.4		8.2	0.70				0.18			
	23.7		8.2	0.70				0.13			
	24.0		8.1	0.60				0.65			
	24.2		8.1	0.60				1.07			
	24.4		8.2	0.70				0.88			
	24.6		8.2	0.70				0.72			
	24.8		8.2	0.70				0.76			
	25.0		8.05	0.55				1.08			
	25.2		8.1	0.60				0.97			
	25.4		7.9	0.40				0.92			
	25.6		7.9	0.40				0.84			
	25.8		7.9	0.40				0.75			
	26.0		7.85	0.35				0.69			
	26.2		8.05	0.55				0.51			
	26.4		8.10	0.60				0.37			
	26.6		8.10	0.60				0.26			
	26.8		8.0	0.50				0.22			
	27.0		8.05	0.55				0.28			
	27.5		8.1	0.60				0.52			
		See	rock	sheet							
	32.5		7.7	0.20				0.07			
	33.0		7.7	0.20				0.04			
LW	33.6		7.50	ϕ				ϕ			
	37.9		7.33								
	39.6		6.28								
	43.3		6.43								
RBF	45.0		5.82								
TOTALS: LS	49.5	5.3									

Note: U.S. discharge from cross-section #1 for best accuracy.

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

COLORADO WATER CONSERVATION BOARD

Rock Sheet
XS1
Pagoda

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Pagoda Creek (Rock sheet)					CROSS-SECTION NO.:
CROSS-SECTION LOCATION:					
DATE: 7/21/22	OBSERVERS:				
LEGAL DESCRIPTION	¼ SECTION:	SECTION:	TOWNSHIP: N/S	RANGE: E/W	PM:
COUNTY:	WATERSHED:		WATER DIVISION:		DOW WATER CODE:
MAP(S):	USGS:				
	USFS:				

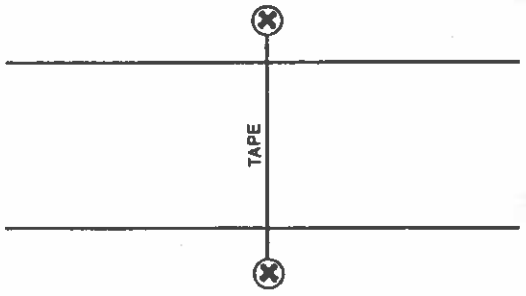
SUPPLEMENTAL DATA

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

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	
⊗ Tape @ Stake RB	0.0	
① WS @ Tape LB/RB	0.0	
② WS Upstream		
③ WS Downstream		
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

CFD 1-85

Rock sheet for Kagoda XS 1 - 7/21/22

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:

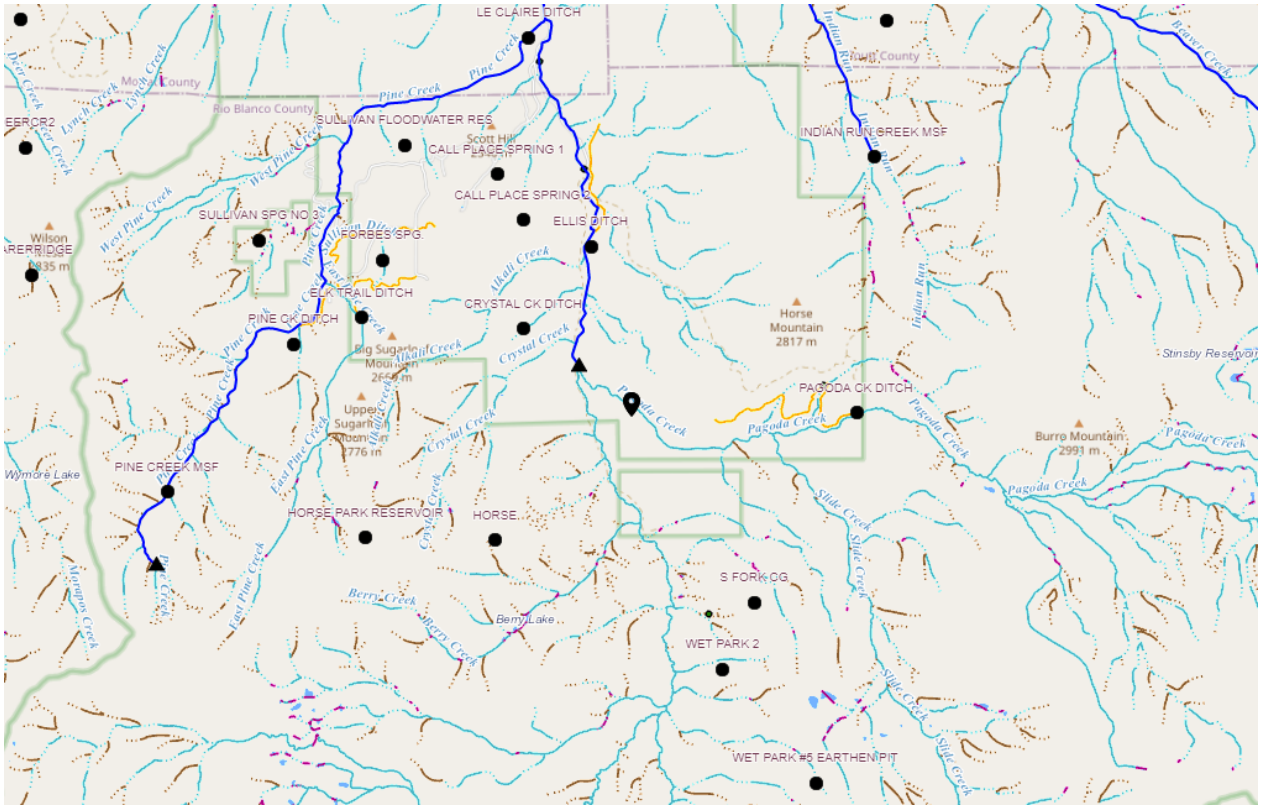
Features: Stake (S), Grassline (G), Waterline (W), Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
(3.)	28.0		7.5		7.5 is surface of water						
	28.5		7.1								
	29.0		6.95								
	29.5		6.95								
	30.0		6.90								
	30.5		7.5								
	31.0		7.4								
	31.5		7.5								
	32.0	—	7.5								
TOTALS:											

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

R2Cross RESULTS

Stream Name: Pagoda Creek
Stream Locations: 1/3 mile upstream from confluence with South Fork of Williams Fork
Fieldwork Date: 07/21/2022
Cross-section: 1
Observers: R. Smith, E. Scherff, C. Brady
Coordinate System: Lat/Long
X (easting): -107.43605
Y (northing): 40.18599
Date Processed: 05/29/2023
Slope: 0.032
Discharge: R2Cross data file: 1.67 (cfs)
Computation method: Ferguson VPE
R2Cross data filename: Pagoda Creek 7-21-22 #1.xlsx
R2Cross version: 2.0.2

LOCATION



ANALYSIS RESULTS

Habitat Criteria Results

Bankfull top width (ft) = 29.7

	Habitat Criteria	Discharge (cfs) Meeting Criteria
Mean Depth (ft)	0.3	0.85
Percent Wetted Perimeter (%)	50.0	2.44
Mean Velocity (ft/s)	1.0	10.13

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	5.82	29.7	1.31	2.38	38.78	32.18	100.0	1.21	0.1	3.12	121.04
	5.85	29.49	1.28	2.35	37.89	31.96	99.32	1.19	0.1	3.05	115.67
	5.9	29.14	1.25	2.3	36.42	31.6	98.2	1.15	0.1	2.94	107.03
	5.95	28.8	1.21	2.25	34.97	31.24	97.07	1.12	0.1	2.82	98.77
	6.0	28.45	1.18	2.2	33.54	30.87	95.95	1.09	0.1	2.71	90.89
	6.05	28.1	1.14	2.15	32.13	30.51	94.82	1.05	0.11	2.6	83.39
	6.1	27.75	1.11	2.1	30.73	30.15	93.69	1.02	0.11	2.48	76.26
	6.15	27.41	1.07	2.05	29.35	29.79	92.57	0.99	0.11	2.37	69.5
	6.2	27.06	1.03	2.0	27.99	29.42	91.44	0.95	0.11	2.25	63.1
	6.25	26.71	1.0	1.95	26.65	29.06	90.32	0.92	0.12	2.14	57.05
	6.3	25.84	0.98	1.9	25.33	28.17	87.54	0.9	0.12	2.08	52.75
	6.35	24.17	1.0	1.85	24.08	26.48	82.28	0.91	0.12	2.12	50.95
	6.4	22.51	1.02	1.8	22.91	24.78	77.02	0.92	0.12	2.17	49.6
	6.45	21.22	1.03	1.75	21.82	23.47	72.95	0.93	0.12	2.18	47.63
	6.5	20.64	1.01	1.7	20.78	22.88	71.09	0.91	0.12	2.11	43.88
	6.55	20.06	0.98	1.65	19.76	22.28	69.23	0.89	0.12	2.04	40.36
	6.6	19.58	0.96	1.6	18.77	21.77	67.65	0.86	0.12	1.96	36.85
	6.65	19.47	0.91	1.55	17.79	21.62	67.18	0.82	0.13	1.84	32.71
	6.7	19.36	0.87	1.5	16.82	21.46	66.71	0.78	0.13	1.71	28.85
	6.75	19.25	0.82	1.45	15.86	21.31	66.23	0.74	0.14	1.59	25.25
	6.8	19.14	0.78	1.4	14.9	21.16	65.76	0.7	0.14	1.47	21.92
	6.85	19.03	0.73	1.35	13.94	21.01	65.29	0.66	0.15	1.35	18.85
	6.9	18.93	0.69	1.3	12.99	20.86	64.81	0.62	0.16	1.23	16.03
	6.95	17.78	0.68	1.25	12.06	19.64	61.02	0.61	0.16	1.21	14.59
	7.0	17.46	0.64	1.2	11.18	19.24	59.81	0.58	0.17	1.12	12.47

	7.05	17.14	0.6	1.15	10.32	18.85	58.59	0.55	0.17	1.02	10.55
	7.1	16.83	0.56	1.1	9.47	18.46	57.38	0.51	0.18	0.93	8.8
	7.15	16.61	0.52	1.05	8.63	18.16	56.45	0.48	0.19	0.83	7.18
	7.2	16.4	0.48	1.0	7.81	17.87	55.53	0.44	0.21	0.74	5.74
	7.25	16.19	0.43	0.95	6.99	17.57	54.6	0.4	0.22	0.64	4.48
	7.3	15.98	0.39	0.9	6.19	17.27	53.68	0.36	0.24	0.55	3.4
	7.35	15.29	0.35	0.85	5.4	16.51	51.3	0.33	0.26	0.48	2.59
	7.4	13.89	0.34	0.8	4.67	15.04	46.74	0.31	0.27	0.44	2.07
	7.45	12.0	0.34	0.75	4.02	13.06	40.59	0.31	0.28	0.44	1.77
Waterline	7.5	9.6	0.36	0.7	3.47	10.58	32.89	0.33	0.26	0.48	1.67
	7.55	8.95	0.34	0.65	3.01	9.89	30.73	0.3	0.28	0.43	1.29
	7.6	8.3	0.31	0.6	2.57	9.19	28.57	0.28	0.3	0.38	0.98
	7.65	7.65	0.28	0.55	2.18	8.5	26.41	0.26	0.32	0.33	0.73
	7.7	6.23	0.29	0.5	1.81	7.04	21.87	0.26	0.32	0.34	0.61
	7.75	5.89	0.26	0.45	1.51	6.64	20.63	0.23	0.35	0.28	0.42
	7.8	5.25	0.23	0.4	1.22	5.94	18.45	0.21	0.38	0.24	0.29
	7.85	4.57	0.21	0.35	0.97	5.17	16.06	0.19	0.41	0.21	0.21
	7.9	3.84	0.2	0.3	0.75	4.36	13.56	0.17	0.44	0.19	0.14
	7.95	3.66	0.15	0.25	0.57	4.1	12.73	0.14	0.53	0.13	0.08
	8.0	3.48	0.11	0.2	0.39	3.83	11.89	0.1	0.69	0.08	0.03
	8.05	3.0	0.08	0.15	0.23	3.24	10.07	0.07	0.94	0.05	0.01
	8.1	1.41	0.07	0.1	0.11	1.53	4.76	0.07	0.95	0.05	0.0
	8.15	1.05	0.04	0.05	0.04	1.12	3.47	0.04	1.52	0.02	0.0
	8.19	0.81	0.01	0.02	0.01	0.82	2.56	0.01	3.66	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) =	1.67	(cfs)
Calculated Flow (Qc) =	1.67	(cfs)
(Qm-Qc)/Qm * 100 =	0.00%	
Measured Waterline (WLm) =	7.5	(ft)
Calculated Waterline (WLc) =	7.5	(ft)
(WLm-WLc)/WLm * 100 =	-0.00%	
Max Measured Depth (Dm) =	0.7	(ft)
Max Calculated Depth (Dc) =	0.7	(ft)
(Dm-Dc)/Dm * 100 =	0.00%	
Mean Velocity =	0.48	(ft/s)
Manning's n =	0.262	
0.4 * Qm =	0.67	(cfs)
2.5 * Qm =	4.18	(cfs)

FIELD DATA

Feature	Station (ft)	Rod Height (ft)	Water depth (ft)	Velocity (ft/s)
	0	4.66		
	3.4	5.64		
Bankfull	15.3	5.82		
	17.8	6.42		
	19.5	6.59		
Waterline	20	7.5	0	0
	21	7.65	0.15	0.53
	21.3	7.7	0.2	0.61
	21.6	7.7	0.2	0.41
	21.9	7.85	0.35	0.13
	22.2	7.7	0.2	0.18
	22.5	7.85	0.35	0.22
	22.8	7.8	0.3	0.23
	23.1	7.8	0.3	0.1
	23.4	8.2	0.7	0.18
	23.7	8.2	0.7	0.13
	24	8.1	0.6	0.65
	24.2	8.1	0.6	1.07
	24.4	8.2	0.7	0.88
	24.6	8.2	0.7	0.72
	24.8	8.2	0.7	0.76
	25	8.05	0.55	1.08
	25.2	8.1	0.6	0.97
	25.4	7.9	0.4	0.92
	25.6	7.9	0.4	0.84
	25.8	7.9	0.4	0.75
	26	7.85	0.35	0.69
	26.2	8.05	0.55	0.51
	26.4	8.1	0.6	0.37
	26.6	8.1	0.6	0.26

	26.8	8	0.5	0.22
	27	8.05	0.55	0.28
	27.5	8.1	0.6	0.52
	28	7.5	0	0
	28.5	7.1	0	0
	29	6.95	0	0
	29.5	6.95	0	0
	30	6.9	0	0
	30.5	7.5	0	0
	31	7.4	0	0
	31.5	7.5	0	0
	32	7.5	0	0
	32.5	7.7	0.2	0.07
	33	7.7	0.2	0.04
Waterline	33.6	7.5	0	
	37.9	7.33		
	39.6	6.28		
	43.3	6.43		
Bankfull	45	5.82		
	49.5	5.31		

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
1.01	0.15	0.1	0.05	3.09
0.3	0.2	0.06	0.04	2.19
0.3	0.2	0.06	0.02	1.47
0.34	0.35	0.1	0.01	0.82
0.34	0.2	0.06	0.01	0.65
0.34	0.35	0.1	0.02	1.38
0.3	0.3	0.09	0.02	1.24
0.3	0.3	0.09	0.01	0.54
0.5	0.7	0.21	0.04	2.26
0.3	0.7	0.21	0.03	1.63
0.32	0.6	0.15	0.1	5.83
0.2	0.6	0.12	0.13	7.68
0.22	0.7	0.14	0.12	7.37
0.2	0.7	0.14	0.1	6.03
0.2	0.7	0.14	0.11	6.37
0.25	0.55	0.11	0.12	7.11
0.21	0.6	0.12	0.12	6.97
0.28	0.4	0.08	0.07	4.41
0.2	0.4	0.08	0.07	4.02
0.2	0.4	0.08	0.06	3.59
0.21	0.35	0.07	0.05	2.89
0.28	0.55	0.11	0.06	3.36
0.21	0.6	0.12	0.04	2.66
0.2	0.6	0.12	0.03	1.87

0.22	0.5	0.1	0.02	1.32
0.21	0.55	0.19	0.05	3.23
0.5	0.6	0.3	0.16	9.34
0.78	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	0	0	0
0	0	0	0	0
0	0	0	0	0
0.54	0.2	0.1	0.01	0.42
0.5	0.2	0.11	0	0.26
0.63	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

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.

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Pagoda Creek - top of riffle						CROSS-SECTION NO: 2	
CROSS-SECTION LOCATION: 1/3 mile upstream from confluence with South Fk.							
DATE: 7-21-22	OBSERVERS: R. Smith, E. Scherff, C. Brady						
LEGAL DESCRIPTION	¼ SECTION: SW	SECTION: 31	TOWNSHIP: 3 (N)/S	RANGE: 89 E/(W)	PM: 6th		
COUNTY: Rio Blanco	WATERSHED: Williams Fork	WATER DIVISION: 6	DOW WATER CODE:				
MAP(S): USGS:	UTM 13 292623 4451228						
USFS:							

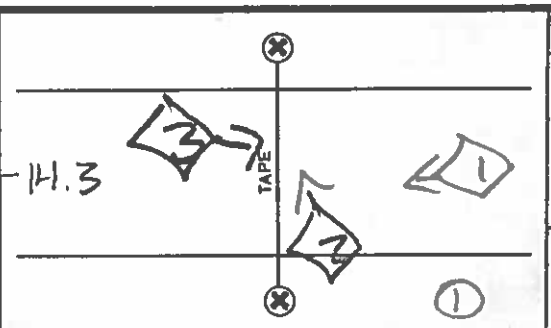
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES / NO	METER TYPE: M-M			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: surveyed ____ lbs/foot	TAPE TENSION: surveyed ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: 3-inch cobble to 4-foot boulder	PHOTOGRAPHS TAKEN: (YES)/NO	NUMBER OF PHOTOGRAPHS: 3		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
(X) Tape @ Stake LB	0.0	surveyed
(X) Tape @ Stake RB	0.0	surveyed
(1) WS @ Tape LB/RB	0.0 26.9	8.45 / 8.45
(2) WS Upstream	1.0	8.45
(3) WS Downstream	23.0	9.34
SLOPE	0.89 / 24.0 = 0.037	

SKETCH



LEGEND:
Stake (X)
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

Didymo algae present.
Naturally high sediment load.

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Pagoda Creek | CROSS-SECTION NO: 2 | DATE: 7-21-22 | SHEET __ OF __

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) | LEFT / RIGHT | Gage Reading: _____ ft | TIME: 12:30 pm

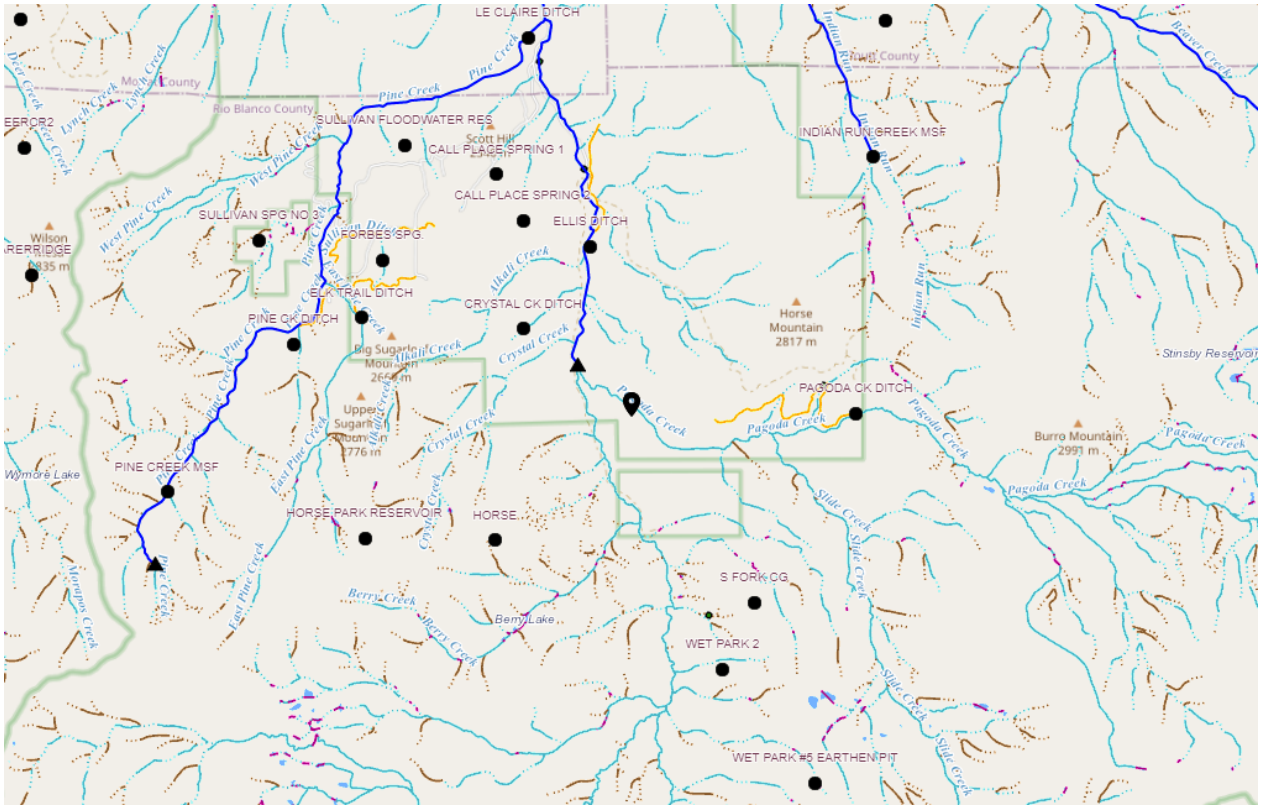
Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Obser-vation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
RS	2.8		6.75								
BF	5.4		7.08								
	8.8		7.84								
	9.1		7.70								
	11.2		7.50								
	11.7		7.11								
	14.4		7.94								
RW	14.5		8.45	0				0			
	15		8.75	.3				0			
	15.5		8.5	.05				0			
	16		8.65	.2				0			
	16.5		8.75	.3				0			
	17.0		8.85	.4				0.2			
	17.5		8.85	.4				0.2			
	18.0		8.85	.4				0.23			
	18.5		8.9	.45				0.29			
	19.0		8.95	.5				0.33			
	19.5		9.05	.6				0.30			
	20.0		9.15	.7				0.35			
	20.5		9.15	.7				0.53			
	20.8		9.15	.7				0.55			
	21.1		9.2	.75				0.46			
	21.4		9.05	.6				0.54			
	21.7		9.05	.6				0.47			
	22.0		9	.55				0.43			
	22.3		8.8	.35				0.29			
LS	22.6		8.75	.30				0.24			
	22.9		8.75	.30				0.24			
	23.2		8.9	.45				0.36			
	23.5		9.05	.60				0.12			
	23.8		9.05	.60				0.15			
	24.4		9	.55				0.21			
	24.9		8.85	.40				0.13			
	26.0		8.75	.30				0			
	26.5		8.60	.15				0			
RW	26.9		8.45	0				0			
	28.7		7.33								
	29.2		7.22								
BF	30.0		6.89								
LS	31.5		8.60								
TOTALS:											

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

R2Cross RESULTS

Stream Name: Pagoda Creek
Stream Locations: 1/3 mile upstream from confluence with South Fork of Williams Fork
Fieldwork Date: 07/21/2022
Cross-section: 2
Observers: R. Smith, E. Scherff, C. Brady
Coordinate System: UTM Zone 13
X (easting): 292623
Y (northing): 4451228
Date Processed: 05/29/2023
Slope: 0.037
Discharge: Entered Value: 1.67 (cfs)
Computation method: Ferguson VPE
R2Cross data filename: Pagoda Creek 7-21-22 #2.xlsx
R2Cross version: 2.0.2

LOCATION



ANALYSIS RESULTS

Habitat Criteria Results

Bankfull top width (ft) = 24.14

	Habitat Criteria	Discharge (cfs) Meeting Criteria
Mean Depth (ft)	0.2	0.36
Percent Wetted Perimeter (%)	50.0	1.73
Mean Velocity (ft/s)	1.0	12.78

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	7.08	24.14	1.15	2.12	27.77	25.77	100.0	1.08	0.22	1.38	38.33
	7.1	24.0	1.14	2.1	27.29	25.62	99.44	1.07	0.22	1.36	37.02
	7.15	23.48	1.11	2.05	26.1	25.06	97.26	1.04	0.22	1.31	34.27
	7.2	22.9	1.09	2.0	24.95	24.45	94.89	1.02	0.23	1.27	31.76
	7.25	22.27	1.07	1.95	23.82	23.78	92.28	1.0	0.23	1.24	29.52
	7.3	21.59	1.05	1.9	22.72	23.06	89.51	0.99	0.23	1.21	27.48
	7.35	20.97	1.03	1.85	21.66	22.41	86.95	0.97	0.24	1.18	25.47
	7.4	20.44	1.01	1.8	20.62	21.83	84.72	0.94	0.24	1.14	23.45
	7.45	19.91	0.99	1.75	19.61	21.26	82.49	0.92	0.25	1.1	21.54
	7.5	19.38	0.96	1.7	18.63	20.68	80.26	0.9	0.25	1.06	19.76
	7.55	18.39	0.96	1.65	17.69	19.66	76.29	0.9	0.25	1.06	18.72
	7.6	17.4	0.97	1.6	16.79	18.64	72.33	0.9	0.25	1.06	17.81
	7.65	16.4	0.97	1.55	15.95	17.62	68.36	0.91	0.25	1.07	17.03
	7.7	15.41	0.98	1.5	15.15	16.59	64.4	0.91	0.25	1.08	16.39
	7.75	14.84	0.97	1.45	14.39	15.98	62.03	0.9	0.25	1.06	15.26
	7.8	14.26	0.96	1.4	13.67	15.37	59.65	0.89	0.25	1.04	14.22
	7.85	13.76	0.94	1.35	12.97	14.83	57.54	0.87	0.26	1.02	13.16
	7.9	13.51	0.91	1.3	12.29	14.56	56.51	0.84	0.27	0.96	11.83
	7.95	13.3	0.87	1.25	11.62	14.32	55.58	0.81	0.27	0.91	10.55
	8.0	13.21	0.83	1.2	10.95	14.18	55.01	0.77	0.28	0.85	9.26
	8.05	13.12	0.78	1.15	10.29	14.03	54.45	0.73	0.3	0.78	8.06
	8.1	13.03	0.74	1.1	9.64	13.88	53.88	0.69	0.31	0.72	6.96
	8.15	12.94	0.69	1.05	8.99	13.74	53.32	0.65	0.33	0.66	5.95
	8.2	12.85	0.65	1.0	8.35	13.59	52.75	0.61	0.34	0.6	5.02
	8.25	12.76	0.6	0.95	7.71	13.45	52.19	0.57	0.36	0.54	4.18

	8.3	12.67	0.56	0.9	7.07	13.3	51.62	0.53	0.39	0.49	3.43
	8.35	12.58	0.51	0.85	6.44	13.16	51.06	0.49	0.41	0.43	2.76
	8.4	12.49	0.47	0.8	5.81	13.01	50.49	0.45	0.45	0.37	2.18
Waterline	8.45	12.4	0.42	0.75	5.19	12.87	49.93	0.4	0.48	0.32	1.67
	8.5	12.18	0.38	0.7	4.58	12.63	49.0	0.36	0.53	0.27	1.25
	8.55	11.7	0.34	0.65	3.98	12.1	46.96	0.33	0.57	0.24	0.94
	8.6	11.22	0.3	0.6	3.41	11.58	44.92	0.29	0.63	0.2	0.68
	8.65	10.7	0.27	0.55	2.86	11.02	42.76	0.26	0.7	0.17	0.48
	8.7	10.1	0.23	0.5	2.34	10.38	40.28	0.23	0.79	0.13	0.31
	8.75	9.2	0.2	0.45	1.85	9.44	36.64	0.2	0.88	0.11	0.2
	8.8	8.0	0.18	0.4	1.42	8.22	31.9	0.17	0.98	0.09	0.13
	8.85	6.03	0.17	0.35	1.04	6.21	24.1	0.17	1.0	0.09	0.09
	8.9	5.18	0.15	0.3	0.76	5.33	20.69	0.14	1.15	0.07	0.05
	8.95	4.34	0.12	0.25	0.52	4.45	17.28	0.12	1.35	0.05	0.03
	9.0	3.75	0.09	0.2	0.32	3.82	14.83	0.08	1.78	0.03	0.01
	9.05	1.9	0.09	0.15	0.17	1.95	7.57	0.08	1.77	0.03	0.01
	9.1	1.55	0.05	0.1	0.08	1.58	6.14	0.05	2.76	0.01	0.0
	9.15	0.4	0.03	0.05	0.01	0.42	1.61	0.02	5.06	0.0	0.0
	9.19	0.12	0.01	0.02	0.0	0.12	0.48	0.01	13.81	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) =	1.67	(cfs)
Calculated Flow (Qc) =	1.67	(cfs)
(Qm-Qc)/Qm * 100 =	-0.00%	
Measured Waterline (WLm) =	8.45	(ft)
Calculated Waterline (WLc) =	8.45	(ft)
(WLm-WLc)/WLm * 100 =	0.00%	
Max Measured Depth (Dm) =	0.75	(ft)
Max Calculated Depth (Dc) =	0.75	(ft)
(Dm-Dc)/Dm * 100 =	-0.00%	
Mean Velocity =	0.32	(ft/s)
Manning's n =	0.485	
0.4 * Qm =	0.67	(cfs)
2.5 * Qm =	4.17	(cfs)

FIELD DATA

Feature	Station (ft)	Rod Height (ft)	Water depth (ft)	Velocity (ft/s)
	2.8	6.75		
Bankfull	5.4	7.08		
	8.8	7.84		
	9.1	7.7		
	11.2	7.5		
	11.7	7.11		
	14.4	7.94		
Waterline	14.5	8.45	0	0
	15	8.75	0.3	0
	15.5	8.5	0.05	0
	16	8.65	0.2	0
	16.5	8.75	0.3	0
	17	8.85	0.4	0.2
	17.5	8.85	0.4	0.2
	18	8.85	0.4	0.23
	18.5	8.9	0.45	0.29
	19	8.95	0.5	0.33
	19.5	9.05	0.6	0.3
	20	9.15	0.7	0.35
	20.5	9.15	0.7	0.53
	20.8	9.15	0.7	0.55
	21.1	9.2	0.75	0.46
	21.4	9.05	0.6	0.54
	21.7	9.05	0.6	0.47
	22	9	0.55	0.43
	22.3	8.8	0.35	0.29
	22.6	8.75	0.3	0.24
	22.9	8.75	0.3	0.24
	23.2	8.9	0.45	0.36
	23.5	9.05	0.6	0.12

	23.8	9.05	0.6	0.15
	24.4	9	0.55	0.21
	24.9	8.85	0.4	0.13
	26	8.75	0.3	0
	26.5	8.6	0.15	0
Waterline	26.9	8.45	0	0
	28.7	7.33		
	29.2	7.22		
Bankfull	30	6.89		
	31.5	5.6		

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	0	0	0	0
0	0	0	0	0
0.58	0.3	0.15	0.05	2.89
0.56	0.05	0.03	0.01	0.48
0.52	0.2	0.1	0.03	1.93
0.51	0.3	0.15	0.05	2.89
0.51	0.4	0.2	0.06	3.85
0.5	0.4	0.2	0.06	3.85
0.5	0.4	0.2	0.06	3.85
0.5	0.45	0.23	0.07	4.33
0.5	0.5	0.25	0.08	4.82
0.51	0.6	0.3	0.1	5.78
0.51	0.7	0.35	0.11	6.74
0.5	0.7	0.28	0.09	5.39
0.3	0.7	0.21	0.07	4.05
0.3	0.75	0.22	0.07	4.33
0.34	0.6	0.18	0.06	3.47
0.3	0.6	0.18	0.06	3.47
0.3	0.55	0.17	0.05	3.18
0.36	0.35	0.1	0.03	2.02
0.3	0.3	0.09	0.03	1.73
0.3	0.3	0.09	0.03	1.73
0.34	0.45	0.14	0.04	2.6
0.34	0.6	0.18	0.06	3.47

0.3	0.6	0.27	0.09	5.2
0.6	0.55	0.3	0.1	5.83
0.52	0.4	0.32	0.1	6.17
1.1	0.3	0.24	0.08	4.62
0.52	0.15	0.07	0.02	1.3
0.43	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

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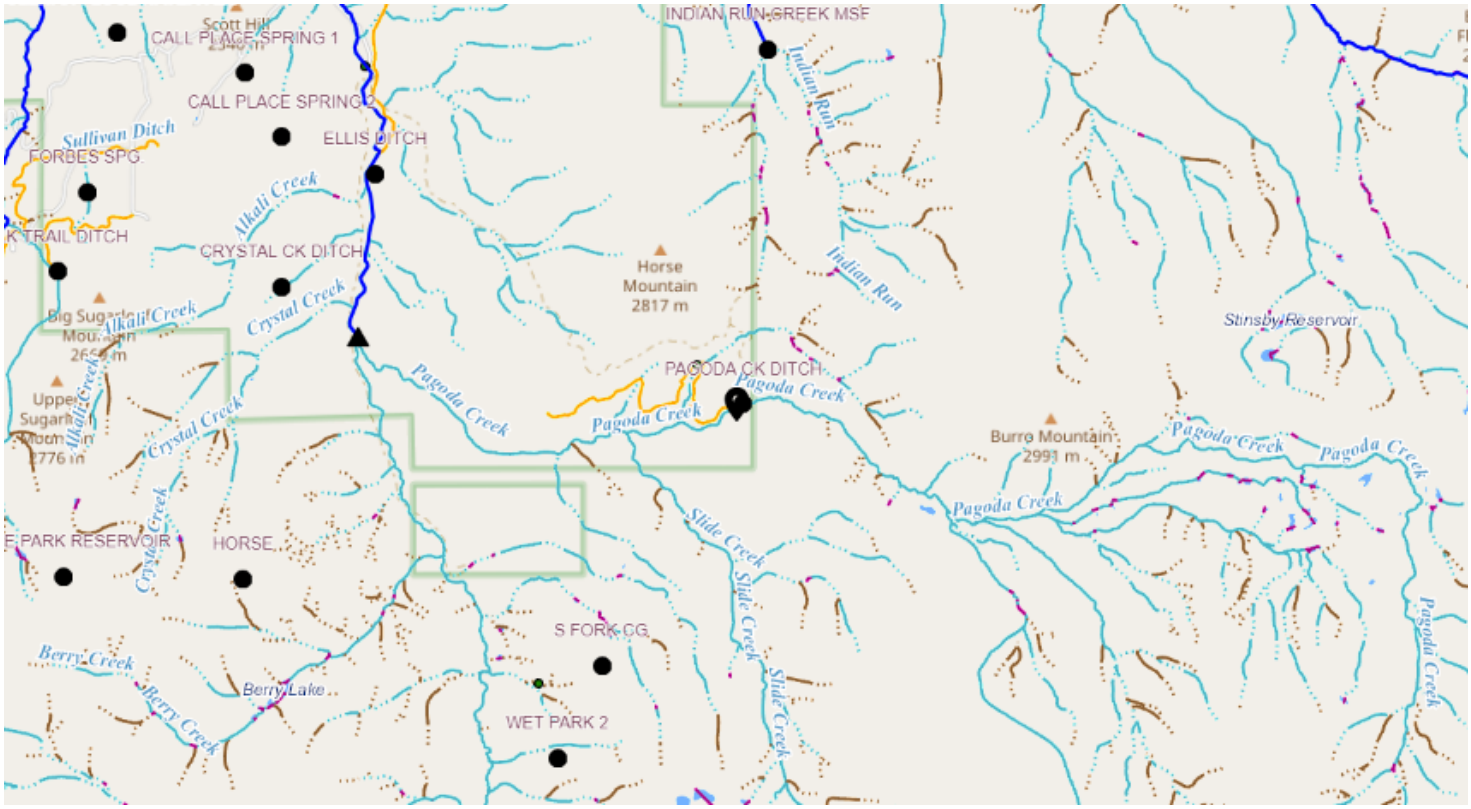
R2Cross RESULTS

Stream Name: Pagoda Creek
Stream Locations: below Pagoda Ditch headgate
Fieldwork Date: 07/18/2023
Cross-section: 1
Observers: R. Smith, E. Scherff
Coordinate System: UTM Zone 13
X (easting): 295314
Y (northing): 4451027
Date Processed: 07/24/2023
Slope: 0.0388
Discharge: Entered Value: 3.84 (cfs)
Computation method: Ferguson VPE
R2Cross data filename: Pagoda Creek 7-18-23 #1.xlsx
R2Cross version: 2.0.2

LOCATION



ANALYSIS RESULTS

Habitat Criteria Results

Bankfull top width (ft) = 21.76

	Habitat Criteria	Discharge (cfs) Meeting Criteria
Mean Depth (ft)	0.2	0.58
Percent Wetted Perimeter (%)	50.0	0.67
Mean Velocity (ft/s)	1.0	9.14

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	2.54	21.76	1.28	2.36	27.97	25.15	100.0	1.11	0.09	3.38	94.41
	2.55	21.68	1.28	2.35	27.73	25.05	99.61	1.11	0.09	3.36	93.07
	2.6	21.29	1.25	2.3	26.66	24.6	97.8	1.08	0.09	3.26	86.94
	2.65	20.89	1.23	2.25	25.61	24.14	95.99	1.06	0.1	3.17	81.08
	2.7	20.49	1.2	2.2	24.57	23.69	94.18	1.04	0.1	3.07	75.49
	2.75	20.1	1.17	2.15	23.56	23.23	92.37	1.01	0.1	2.98	70.15
	2.8	19.7	1.14	2.1	22.56	22.78	90.56	0.99	0.1	2.88	65.07
	2.85	19.31	1.12	2.05	21.59	22.32	88.75	0.97	0.1	2.79	60.24
	2.9	18.91	1.09	2.0	20.63	21.87	86.94	0.94	0.1	2.7	55.65
	2.95	18.52	1.06	1.95	19.69	21.41	85.12	0.92	0.11	2.6	51.29
	3.0	18.16	1.03	1.9	18.78	20.98	83.43	0.89	0.11	2.51	47.07
	3.05	18.06	0.99	1.85	17.87	20.84	82.86	0.86	0.11	2.36	42.22
	3.1	17.96	0.94	1.8	16.97	20.7	82.29	0.82	0.12	2.22	37.66
	3.15	17.86	0.9	1.75	16.08	20.55	81.72	0.78	0.12	2.08	33.38
	3.2	17.77	0.85	1.7	15.19	20.41	81.15	0.74	0.12	1.93	29.38
	3.25	17.67	0.81	1.65	14.3	20.27	80.58	0.71	0.13	1.79	25.66
	3.3	17.57	0.76	1.6	13.42	20.12	80.01	0.67	0.13	1.66	22.21
	3.35	17.47	0.72	1.55	12.54	19.98	79.44	0.63	0.14	1.52	19.04
	3.4	17.37	0.67	1.5	11.67	19.84	78.87	0.59	0.15	1.38	16.15
	3.45	17.28	0.63	1.45	10.81	19.69	78.3	0.55	0.16	1.25	13.51
	3.5	17.18	0.58	1.4	9.94	19.55	77.73	0.51	0.17	1.12	11.14
	3.55	17.08	0.53	1.35	9.09	19.41	77.16	0.47	0.18	0.99	9.03
	3.6	16.98	0.48	1.3	8.24	19.26	76.59	0.43	0.19	0.87	7.16
	3.65	16.89	0.44	1.25	7.39	19.12	76.02	0.39	0.21	0.75	5.54
	3.7	16.49	0.4	1.2	6.55	18.68	74.29	0.35	0.22	0.65	4.26

Waterline	3.75	15.77	0.36	1.15	5.74	17.94	71.31	0.32	0.24	0.57	3.26
	3.8	13.53	0.37	1.1	5.05	15.67	62.3	0.32	0.24	0.57	2.89
	3.85	13.02	0.34	1.05	4.38	15.1	60.04	0.29	0.26	0.49	2.15
	3.9	12.65	0.3	1.0	3.74	14.68	58.36	0.25	0.29	0.41	1.52
	3.95	11.97	0.26	0.95	3.12	13.95	55.45	0.22	0.32	0.33	1.04
	4.0	10.83	0.24	0.9	2.55	12.73	50.63	0.2	0.35	0.28	0.72
	4.05	10.07	0.2	0.85	2.03	11.91	47.36	0.17	0.4	0.22	0.45
	4.1	7.08	0.23	0.8	1.6	8.79	34.97	0.18	0.38	0.24	0.39
	4.15	5.93	0.21	0.75	1.27	7.5	29.82	0.17	0.41	0.22	0.28
	4.2	4.97	0.2	0.7	1.0	6.4	25.45	0.16	0.44	0.19	0.19
	4.25	4.02	0.19	0.65	0.77	5.31	21.1	0.15	0.46	0.18	0.14
	4.3	2.81	0.21	0.6	0.6	3.94	15.66	0.15	0.44	0.19	0.11
	4.35	2.38	0.2	0.55	0.47	3.39	13.47	0.14	0.48	0.16	0.08
	4.4	1.83	0.2	0.5	0.37	2.72	10.82	0.13	0.49	0.16	0.06
	4.45	1.43	0.2	0.45	0.29	2.22	8.81	0.13	0.51	0.15	0.04
	4.5	1.25	0.18	0.4	0.22	1.94	7.73	0.11	0.57	0.12	0.03
	4.55	1.07	0.15	0.35	0.16	1.67	6.64	0.1	0.65	0.1	0.02
	4.6	0.89	0.13	0.3	0.11	1.39	5.54	0.08	0.75	0.07	0.01
	4.65	0.71	0.1	0.25	0.07	1.12	4.45	0.06	0.9	0.05	0.0
	4.7	0.53	0.08	0.2	0.04	0.84	3.36	0.05	1.14	0.03	0.0
	4.75	0.35	0.06	0.15	0.02	0.57	2.26	0.03	1.54	0.02	0.0
	4.8	0.17	0.04	0.1	0.01	0.29	1.17	0.02	2.21	0.01	0.0
	4.85	0.06	0.02	0.05	0.0	0.12	0.46	0.01	3.47	0.0	0.0
	4.88	0.02	0.01	0.01	0.0	0.04	0.14	0.0	9.35	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) =	3.84	(cfs)
Calculated Flow (Qc) =	3.57	(cfs)
(Qm-Qc)/Qm * 100 =	7.11%	
Measured Waterline (WLm) =	3.75	(ft)
Calculated Waterline (WLc) =	3.75	(ft)
(WLm-WLc)/WLm * 100 =	-0.02%	
Max Measured Depth (Dm) =	1.15	(ft)
Max Calculated Depth (Dc) =	1.15	(ft)
(Dm-Dc)/Dm * 100 =	0.06%	
Mean Velocity =	0.62	(ft/s)
Manning's n =	0.22	
0.4 * Qm =	1.54	(cfs)
2.5 * Qm =	9.6	(cfs)

FIELD DATA

Feature	Station (ft)	Rod Height (ft)	Water depth (ft)	Velocity (ft/s)
	0	2		
Bankfull	1	2.54		
	2	2.49		
	3	2.96		
	4	3.67		
Waterline	4.9	3.75	0	
	5.5	3.85	0.1	
	6	4.02	0.27	
	6.5	3.96	0.21	
	7	3.94	0.19	
	7.5	4.06	0.31	
	8	4.06	0.31	
	8.5	4.9	1.15	
	9	4.1	0.35	
	9.5	4.08	0.33	
	10	4.15	0.4	
	10.5	3.8	0.05	
	11	4.08	0.33	
	11.5	4.1	0.35	
	12	4.05	0.3	
	12.5	4.2	0.45	
	13	4.03	0.28	
	13.5	4.3	0.55	
	14	4.05	0.3	
	14.5	4.3	0.55	
	15	4.25	0.5	
	15.5	4.17	0.42	
	16	4.5	0.75	
	16.5	4.82	1.07	
	17	4.22	0.47	

	17.5	4.35	0.6
	18	4.43	0.68
Waterline	18.8	3.75	0
	20.8	3.76	
	21.6	2.29	
	23	3	
Bankfull	24.5	2.54	
	27.5	0.48	

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
0.61	0.1	0.06	0.04	0.96
0.53	0.27	0.14	0.09	2.35
0.5	0.21	0.1	0.07	1.83
0.5	0.19	0.1	0.06	1.65
0.51	0.31	0.15	0.1	2.7
0.5	0.31	0.15	0.1	2.7
0.98	1.15	0.57	0.38	10.01
0.94	0.35	0.17	0.12	3.05
0.5	0.33	0.17	0.11	2.87
0.5	0.4	0.2	0.13	3.48
0.61	0.05	0.03	0.02	0.44
0.57	0.33	0.17	0.11	2.87
0.5	0.35	0.17	0.12	3.05
0.5	0.3	0.15	0.1	2.61
0.52	0.45	0.23	0.15	3.92
0.53	0.28	0.14	0.09	2.44
0.57	0.55	0.28	0.18	4.79
0.56	0.3	0.15	0.1	2.61
0.56	0.55	0.28	0.18	4.79
0.5	0.5	0.25	0.17	4.35
0.51	0.42	0.21	0.14	3.66
0.6	0.75	0.38	0.25	6.53
0.59	1.07	0.54	0.36	9.32
0.78	0.47	0.23	0.16	4.09

0.52	0.6	0.3	0.2	5.22
0.51	0.68	0.44	0.3	7.7
1.05	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

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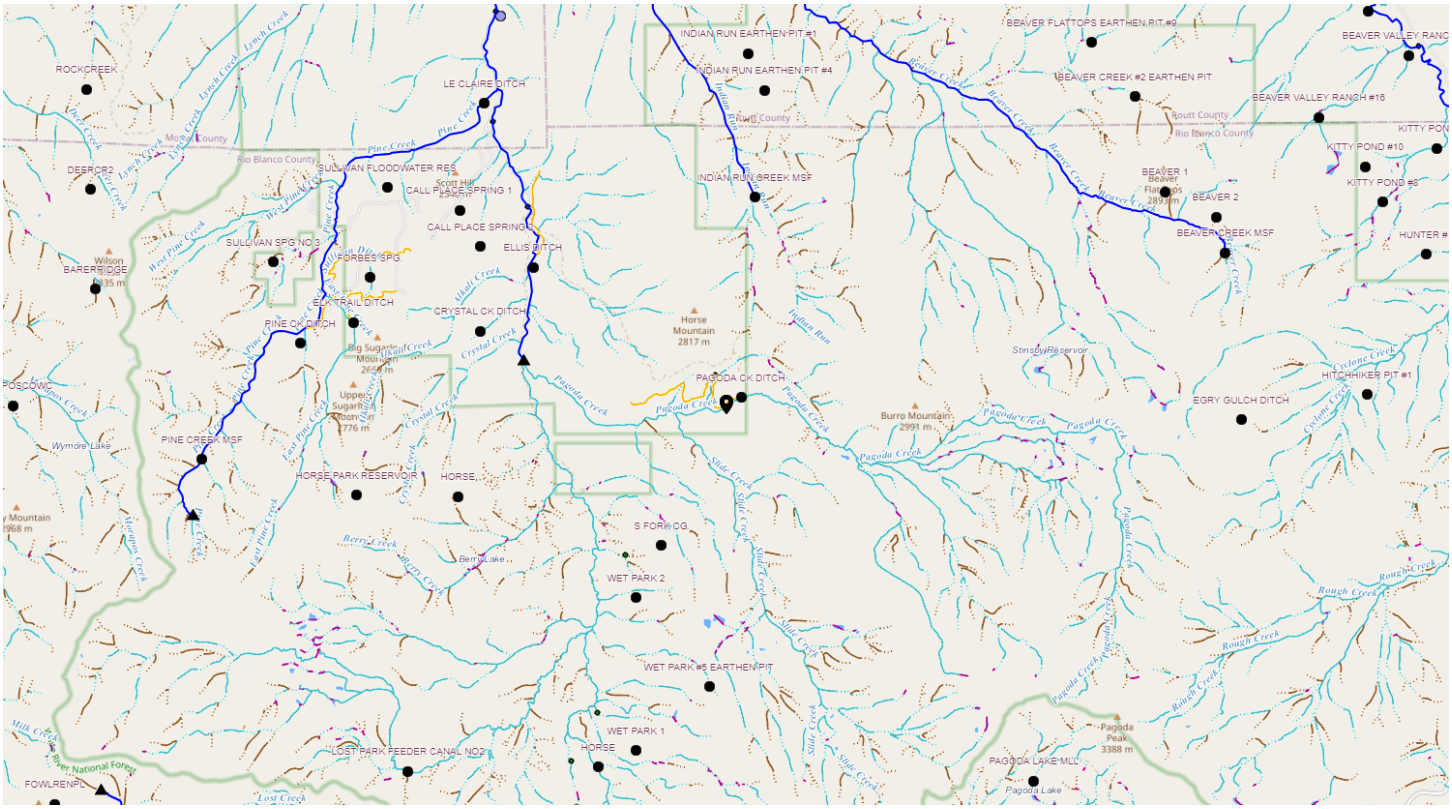
R2Cross RESULTS

Stream Name: Pagoda Creek
Stream Locations: downstream from Pagoda Ditch headgate
Fieldwork Date: 07/18/2023
Cross-section: 2
Observers: R. Smith, E. Scherff
Coordinate System: Lat/Long
X (easting): -107.406064
Y (northing): 40.184021
Date Processed: 07/25/2023
Slope: 0.037
Discharge: Entered Value: 3.84 (cfs)
Computation method: Ferguson VPE
R2Cross data filename: BlankR2CrossDataFile.xlsx
R2Cross version: 2.0.2

LOCATION



ANALYSIS RESULTS

Habitat Criteria Results

Bankfull top width (ft) = 18.74

	Habitat Criteria	Discharge (cfs) Meeting Criteria
Mean Depth (ft)	0.2	0.33
Percent Wetted Perimeter (%)	50.0	2.58
Mean Velocity (ft/s)	1.0	9.24

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	5.42	18.74	0.91	1.57	17.06	19.27	100.0	0.89	0.15	1.79	30.46
	5.45	18.5	0.89	1.54	16.48	19.02	98.69	0.87	0.15	1.73	28.54
	5.5	18.11	0.86	1.49	15.57	18.62	96.59	0.84	0.15	1.65	25.61
	5.55	17.72	0.83	1.44	14.67	18.21	94.49	0.81	0.16	1.56	22.88
	5.6	17.33	0.8	1.39	13.8	17.8	92.38	0.77	0.16	1.47	20.33
	5.65	16.94	0.76	1.34	12.94	17.4	90.28	0.74	0.17	1.39	17.97
	5.7	16.55	0.73	1.29	12.1	16.99	88.17	0.71	0.17	1.3	15.78
	5.75	16.16	0.7	1.24	11.28	16.59	86.07	0.68	0.18	1.22	13.77
	5.8	15.77	0.66	1.19	10.49	16.18	83.97	0.65	0.19	1.14	11.92
	5.85	15.39	0.63	1.14	9.71	15.79	81.91	0.61	0.2	1.05	10.22
	5.9	15.01	0.6	1.09	8.95	15.39	79.85	0.58	0.21	0.97	8.68
	5.95	14.63	0.56	1.04	8.21	14.99	77.8	0.55	0.22	0.89	7.28
	6.0	14.25	0.53	0.99	7.48	14.6	75.74	0.51	0.23	0.81	6.03
	6.05	13.59	0.5	0.94	6.79	13.92	72.24	0.49	0.24	0.75	5.08
	6.1	12.76	0.48	0.89	6.13	13.08	67.87	0.47	0.24	0.71	4.32
	6.15	11.93	0.46	0.84	5.51	12.24	63.5	0.45	0.25	0.67	3.67
Waterline	6.2	9.7	0.51	0.79	4.98	10.0	51.89	0.5	0.23	0.77	3.84
	6.25	9.51	0.47	0.74	4.5	9.79	50.82	0.46	0.25	0.69	3.08
	6.3	9.33	0.43	0.69	4.03	9.59	49.75	0.42	0.27	0.6	2.42
	6.35	9.15	0.39	0.64	3.56	9.38	48.67	0.38	0.29	0.52	1.85
	6.4	8.97	0.35	0.59	3.11	9.17	47.6	0.34	0.32	0.44	1.36
	6.45	8.79	0.3	0.54	2.67	8.97	46.52	0.3	0.35	0.36	0.96
	6.5	8.6	0.26	0.49	2.23	8.75	45.4	0.26	0.4	0.29	0.64
	6.55	8.39	0.22	0.44	1.81	8.52	44.21	0.21	0.47	0.22	0.39
	6.6	8.12	0.17	0.39	1.39	8.23	42.7	0.17	0.56	0.16	0.22

	6.65	7.76	0.13	0.34	1.0	7.85	40.73	0.13	0.72	0.1	0.1
	6.7	5.6	0.12	0.29	0.66	5.67	29.39	0.12	0.77	0.09	0.06
	6.75	3.12	0.14	0.24	0.43	3.16	16.41	0.14	0.68	0.11	0.05
	6.8	2.73	0.1	0.19	0.28	2.76	14.34	0.1	0.86	0.07	0.02
	6.85	2.25	0.07	0.14	0.16	2.28	11.81	0.07	1.2	0.04	0.01
	6.9	1.59	0.04	0.09	0.06	1.6	8.32	0.04	2.0	0.02	0.0
	6.95	0.49	0.02	0.04	0.01	0.5	2.6	0.02	3.44	0.01	0.0
	6.97	0.19	0.01	0.01	0.0	0.19	1.0	0.01	7.63	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) =	3.84	(cfs)
Calculated Flow (Qc) =	3.84	(cfs)
(Qm-Qc)/Qm * 100 =	-0.03%	
Measured Waterline (WLm) =	6.2	(ft)
Calculated Waterline (WLc) =	6.2	(ft)
(WLm-WLc)/WLm * 100 =	-0.02%	
Max Measured Depth (Dm) =	0.79	(ft)
Max Calculated Depth (Dc) =	0.79	(ft)
(Dm-Dc)/Dm * 100 =	0.13%	
Mean Velocity =	0.77	(ft/s)
Manning's n =	0.233	
0.4 * Qm =	1.54	(cfs)
2.5 * Qm =	9.6	(cfs)

FIELD DATA

Feature	Station (ft)	Rod Height (ft)	Water depth (ft)	Velocity (ft/s)
	0.9	5.36		
Bankfull	6	5.41		
	8.2	5.8		
	9.4	6.02		
Waterline	12	6.2	0	
	12.5	6.48	0.28	
	13	6.7	0.5	
	13.5	6.66	0.46	
	14	6.72	0.52	
	14.5	6.74	0.54	
	15	6.75	0.55	
	15.5	6.66	0.46	
	16	6.74	0.52	
	16.5	6.72	0.52	
	17	6.84	0.64	
	17.5	6.9	0.7	
	18	6.99	0.79	
	18.5	6.92	0.72	
	19	6.92	0.72	
	19.5	6.82	0.62	
	20	6.68	0.48	
	20.5	6.68	0.48	
	21	6.58	0.38	
Waterline	21.7	6.2	0	
	22.5	6.16		
	23.2	6.16		
Bankfull	24.8	5.42		
	25.2	5.24		

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
0.57	0.28	0.14	0.11	2.81
0.55	0.5	0.25	0.19	5.02
0.5	0.46	0.23	0.18	4.62
0.5	0.52	0.26	0.2	5.22
0.5	0.54	0.27	0.21	5.42
0.5	0.55	0.28	0.21	5.52
0.51	0.46	0.23	0.18	4.62
0.51	0.52	0.26	0.2	5.22
0.5	0.52	0.26	0.2	5.22
0.51	0.64	0.32	0.25	6.43
0.5	0.7	0.35	0.27	7.03
0.51	0.79	0.4	0.3	7.93
0.5	0.72	0.36	0.28	7.23
0.5	0.72	0.36	0.28	7.23
0.51	0.62	0.31	0.24	6.23
0.52	0.48	0.24	0.19	4.82
0.5	0.48	0.24	0.19	4.82
0.51	0.38	0.23	0.18	4.58
0.8	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

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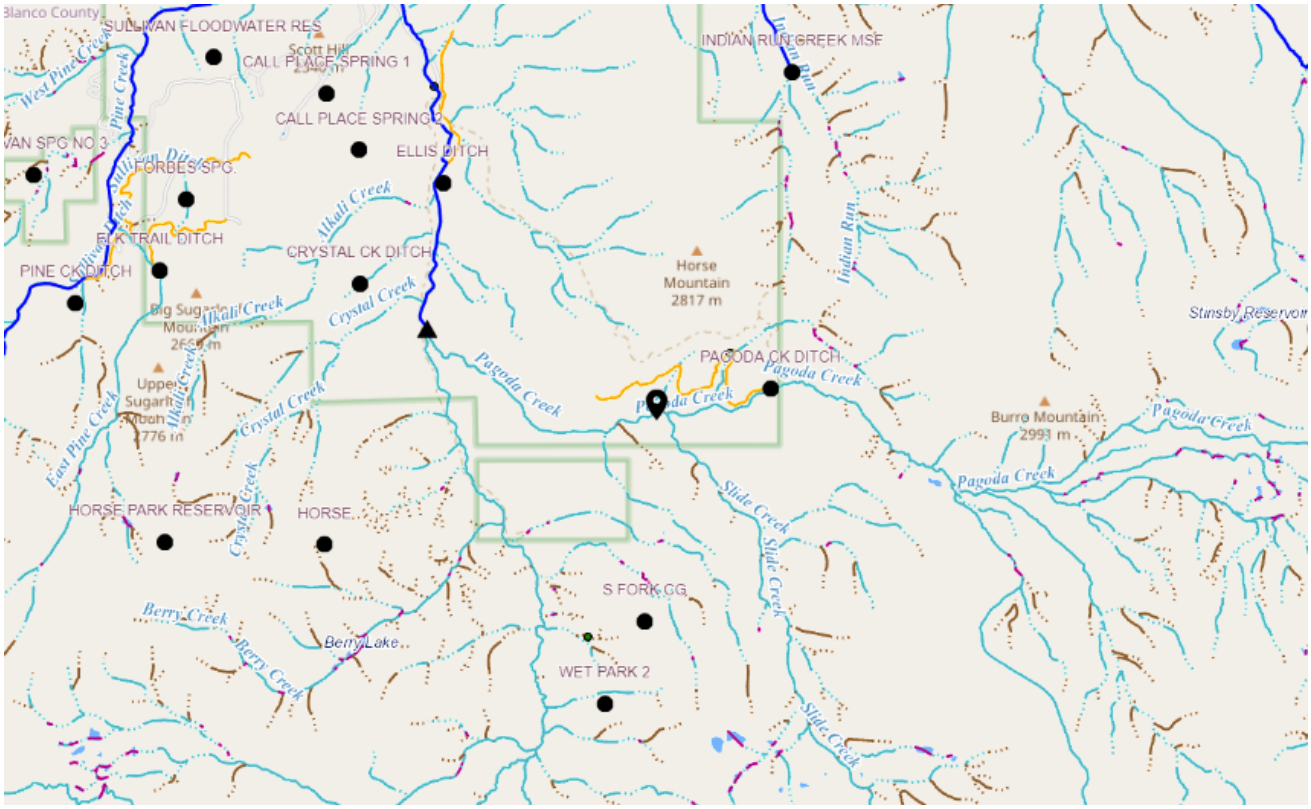
R2Cross RESULTS

Stream Name: Pagoda Creek
Stream Locations: Below confluence with Slide Creek
Fieldwork Date: 07/18/2023
Cross-section: 3
Observers: R. Smith, E. Scherff
Coordinate System: Lat/Long
X (easting): -107.416733
Y (northing): 40.183547
Date Processed: 07/25/2023
Slope: 0.022
Discharge: Entered Value: 7.3 (cfs)
Computation method: Ferguson VPE
R2Cross data filename: Pagoda Creek 7-18-23 #3.xlsx
R2Cross version: 2.0.2

LOCATION



ANALYSIS RESULTS

Habitat Criteria Results

Bankfull top width (ft) = 24.9

	Habitat Criteria	Discharge (cfs) Meeting Criteria
Mean Depth (ft)	0.2	0.58
Percent Wetted Perimeter (%)	50.0	0.17
Mean Velocity (ft/s)	1.0	21.86

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	3.43	24.9	1.53	2.18	38.15	27.02	100.0	1.41	0.14	1.97	75.29
	3.45	24.86	1.51	2.16	37.66	26.96	99.76	1.4	0.14	1.94	73.18
	3.5	24.75	1.47	2.11	36.42	26.79	99.15	1.36	0.14	1.87	68.07
	3.55	24.64	1.43	2.06	35.18	26.63	98.54	1.32	0.15	1.8	63.16
	3.6	24.54	1.38	2.01	33.95	26.47	97.94	1.28	0.15	1.72	58.45
	3.65	24.43	1.34	1.96	32.73	26.3	97.33	1.24	0.15	1.65	53.93
	3.7	24.32	1.3	1.91	31.51	26.14	96.73	1.21	0.16	1.57	49.62
	3.75	24.22	1.25	1.86	30.29	25.97	96.12	1.17	0.16	1.5	45.5
	3.8	24.11	1.21	1.81	29.09	25.81	95.51	1.13	0.17	1.43	41.57
	3.85	24.0	1.16	1.76	27.88	25.65	94.91	1.09	0.17	1.36	37.84
	3.9	23.9	1.12	1.71	26.69	25.48	94.3	1.05	0.18	1.29	34.3
	3.95	23.79	1.07	1.66	25.49	25.32	93.69	1.01	0.18	1.21	30.96
	4.0	23.68	1.03	1.61	24.31	25.15	93.07	0.97	0.19	1.14	27.81
	4.05	23.57	0.98	1.56	23.13	24.98	92.46	0.93	0.19	1.07	24.85
	4.1	23.46	0.94	1.51	21.95	24.82	91.84	0.88	0.2	1.01	22.07
	4.15	23.35	0.89	1.46	20.78	24.65	91.23	0.84	0.21	0.94	19.47
	4.2	23.24	0.84	1.41	19.62	24.49	90.61	0.8	0.22	0.87	17.06
	4.25	23.13	0.8	1.36	18.46	24.32	90.0	0.76	0.23	0.8	14.83
	4.3	23.02	0.75	1.31	17.3	24.15	89.38	0.72	0.24	0.74	12.77
	4.35	22.91	0.7	1.26	16.15	23.99	88.77	0.67	0.25	0.67	10.88
	4.4	22.14	0.68	1.21	15.03	23.17	85.74	0.65	0.26	0.64	9.58
	4.45	21.37	0.65	1.16	13.94	22.35	82.71	0.62	0.27	0.6	8.39
Waterline	4.5	20.6	0.63	1.11	12.89	21.53	79.68	0.6	0.28	0.57	7.3
	4.55	20.3	0.58	1.06	11.87	21.22	78.51	0.56	0.29	0.51	6.08
	4.6	20.0	0.54	1.01	10.86	20.9	77.35	0.52	0.31	0.46	4.99

	4.65	19.71	0.5	0.96	9.87	20.59	76.18	0.48	0.33	0.41	4.02
	4.7	19.41	0.46	0.91	8.89	20.27	75.03	0.44	0.36	0.36	3.17
	4.75	18.85	0.42	0.86	7.93	19.7	72.9	0.4	0.38	0.31	2.49
	4.8	18.12	0.39	0.81	7.0	18.92	70.01	0.37	0.41	0.28	1.94
	4.85	17.21	0.36	0.76	6.12	17.95	66.41	0.34	0.44	0.25	1.5
	4.9	16.36	0.32	0.71	5.28	17.02	62.99	0.31	0.47	0.21	1.13
	4.95	15.92	0.28	0.66	4.48	16.52	61.14	0.27	0.53	0.17	0.78
	5.0	15.59	0.24	0.61	3.69	16.13	59.7	0.23	0.61	0.14	0.5
	5.05	14.84	0.2	0.56	2.92	15.32	56.69	0.19	0.71	0.1	0.3
	5.1	13.34	0.17	0.51	2.22	13.76	50.92	0.16	0.82	0.08	0.18
	5.15	11.38	0.14	0.46	1.6	11.75	43.48	0.14	0.94	0.06	0.1
	5.2	9.17	0.12	0.41	1.08	9.48	35.09	0.11	1.08	0.05	0.05
	5.25	6.89	0.1	0.36	0.68	7.14	26.42	0.1	1.26	0.04	0.02
	5.3	4.48	0.09	0.31	0.39	4.67	17.28	0.08	1.41	0.03	0.01
	5.35	2.55	0.08	0.26	0.21	2.69	9.94	0.08	1.47	0.03	0.01
	5.4	1.29	0.09	0.21	0.12	1.39	5.15	0.09	1.35	0.03	0.0
	5.45	0.85	0.08	0.16	0.07	0.91	3.38	0.08	1.48	0.03	0.0
	5.5	0.63	0.05	0.11	0.03	0.67	2.47	0.05	2.11	0.01	0.0
	5.55	0.34	0.03	0.06	0.01	0.36	1.35	0.03	3.49	0.01	0.0
	5.59	0.09	0.01	0.01	0.0	0.09	0.34	0.01	11.08	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) =	7.3	(cfs)
Calculated Flow (Qc) =	7.3	(cfs)
(Qm-Qc)/Qm * 100 =	0.00%	
Measured Waterline (WLm) =	4.5	(ft)
Calculated Waterline (WLc) =	4.5	(ft)
(WLm-WLc)/WLm * 100 =	-0.00%	
Max Measured Depth (Dm) =	1.11	(ft)
Max Calculated Depth (Dc) =	1.11	(ft)
(Dm-Dc)/Dm * 100 =	0.00%	
Mean Velocity =	0.57	(ft/s)
Manning's n =	0.276	
0.4 * Qm =	2.92	(cfs)
2.5 * Qm =	18.25	(cfs)

FIELD DATA

Feature	Station (ft)	Rod Height (ft)	Water depth (ft)	Velocity (ft/s)
	0	2.61		
Bankfull	1.6	3.42		
Waterline	1.7	4.5	0	
	2	4.62	0.12	
	3	5.03	0.53	
	4	5.15	0.65	
	5	5.32	0.82	
	6	5.38	0.88	
	7	5.15	0.65	
	8	5.35	0.85	
	9	5.14	0.64	
	10	5.09	0.59	
	10.5	5.04	0.54	
	11	4.76	0.26	
	11.5	5.2	0.7	
	12	5.26	0.76	
	12.5	5.16	0.66	
	13	5.14	0.64	
	13.5	5.02	0.52	
	14	5.18	0.68	
	14.5	5.34	0.84	
	15	5.21	0.71	
	15.5	5.3	0.8	
	16	5.28	0.78	
	16.5	5.43	0.93	
	17	5.34	0.84	
	17.5	5.61	1.11	
	18	5.48	0.98	
	18.5	5.19	0.69	
	19	5.17	0.67	

	19.5	4.78	0.28
	20	4.84	0.34
	20.5	4.91	0.41
	21	4.76	0.26
	21.5	4.73	0.23
Waterline	22.3	4.5	0
	24.6	4.35	
	25.5	3.92	
Bankfull	26.5	3.43	

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
0.32	0.12	0.08	0.04	0.61
1.08	0.53	0.53	0.3	4.11
1.01	0.65	0.65	0.37	5.04
1.01	0.82	0.82	0.46	6.36
1	0.88	0.88	0.5	6.83
1.03	0.65	0.65	0.37	5.04
1.02	0.85	0.85	0.48	6.59
1.02	0.64	0.64	0.36	4.96
1	0.59	0.44	0.25	3.43
0.5	0.54	0.27	0.15	2.1
0.57	0.26	0.13	0.07	1.01
0.67	0.7	0.35	0.2	2.71
0.5	0.76	0.38	0.22	2.95
0.51	0.66	0.33	0.19	2.56
0.5	0.64	0.32	0.18	2.48
0.51	0.52	0.26	0.15	2.02
0.52	0.68	0.34	0.19	2.64
0.52	0.84	0.42	0.24	3.26
0.52	0.71	0.35	0.2	2.75
0.51	0.8	0.4	0.23	3.1
0.5	0.78	0.39	0.22	3.03
0.52	0.93	0.47	0.26	3.61
0.51	0.84	0.42	0.24	3.26
0.57	1.11	0.56	0.31	4.31
0.52	0.98	0.49	0.28	3.8
0.58	0.69	0.34	0.2	2.68
0.5	0.67	0.34	0.19	2.6

0.63	0.28	0.14	0.08	1.09
0.5	0.34	0.17	0.1	1.32
0.5	0.41	0.2	0.12	1.59
0.52	0.26	0.13	0.07	1.01
0.5	0.23	0.15	0.08	1.16
0.83	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

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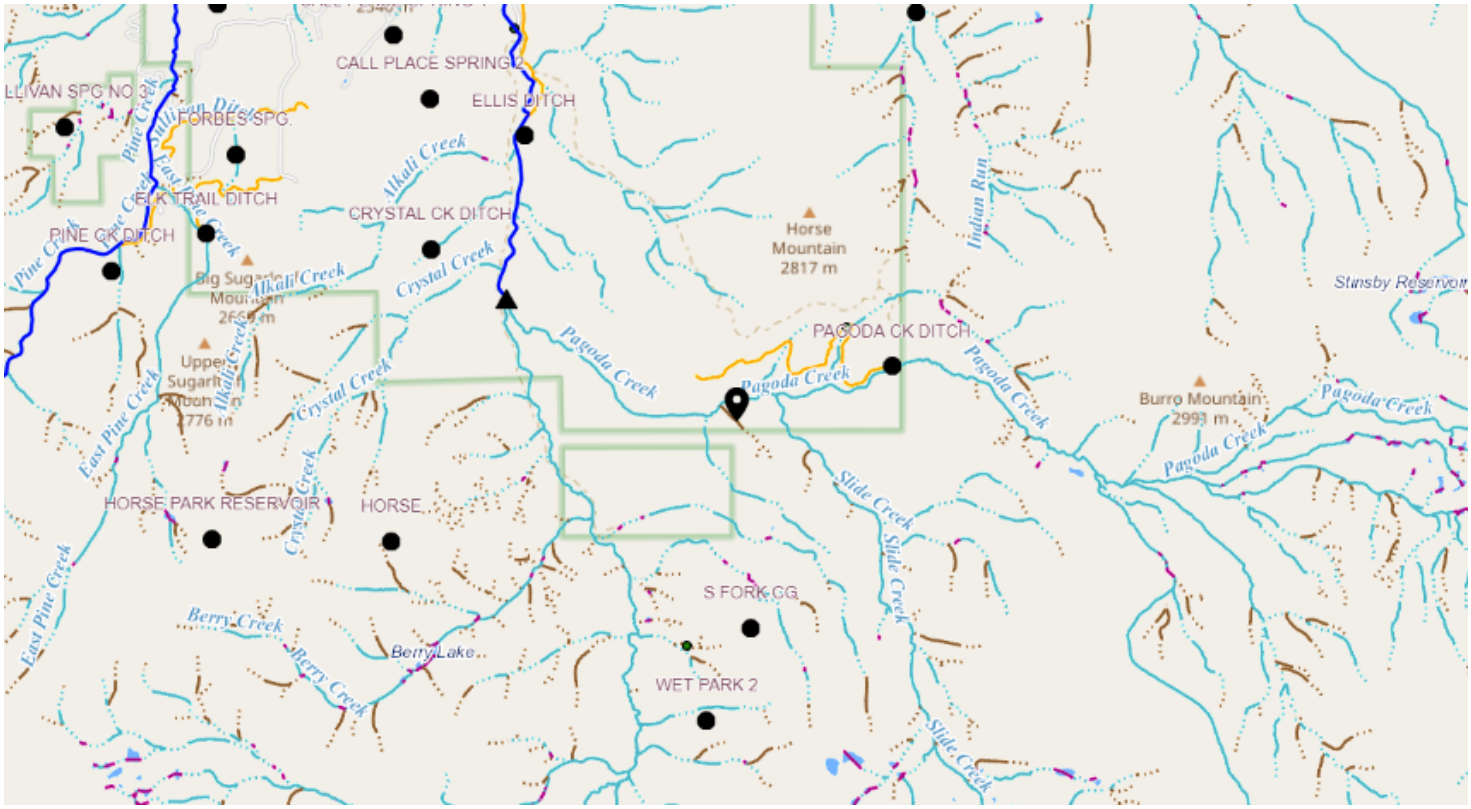
R2Cross RESULTS

Stream Name: 0.026
Stream Locations: downstream from confluence with Slide Creek
Fieldwork Date: 07/18/2023
Cross-section: 4
Observers: R. Smith, E. Scherff
Coordinate System: Lat/Long
X (easting): -107.41961
Y (northing): 40.181972
Date Processed: 07/25/2023
Slope: 0.026
Discharge: Entered Value: 7.3 (cfs)
Computation method: Ferguson VPE
R2Cross data filename: Pagoda Creek 7-18-23 #4.xlsx
R2Cross version: 2.0.2

LOCATION



ANALYSIS RESULTS

Habitat Criteria Results

Bankfull top width (ft) = 27.61

	Habitat Criteria	Discharge (cfs) Meeting Criteria
Mean Depth (ft)	0.3	1.11
Percent Wetted Perimeter (%)	50.0	2.29
Mean Velocity (ft/s)	1.0	11.25

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	4.01	27.61	1.72	2.52	47.36	30.02	100.0	1.58	0.08	4.03	190.71
	4.05	27.56	1.68	2.48	46.2	29.92	99.67	1.54	0.08	3.92	180.94
	4.1	27.5	1.63	2.43	44.82	29.8	99.27	1.5	0.08	3.78	169.65
	4.15	27.44	1.58	2.38	43.45	29.68	98.87	1.46	0.08	3.65	158.72
	4.2	27.38	1.54	2.33	42.08	29.57	98.48	1.42	0.09	3.52	148.15
	4.25	27.32	1.49	2.28	40.71	29.45	98.08	1.38	0.09	3.39	137.94
	4.3	27.24	1.44	2.23	39.35	29.32	97.65	1.34	0.09	3.26	128.16
	4.35	27.12	1.4	2.18	37.99	29.15	97.1	1.3	0.09	3.13	118.95
	4.4	26.99	1.36	2.13	36.64	28.99	96.56	1.26	0.09	3.0	110.09
	4.45	26.86	1.31	2.08	35.29	28.83	96.02	1.22	0.1	2.88	101.59
	4.5	26.74	1.27	2.03	33.95	28.66	95.47	1.18	0.1	2.75	93.46
	4.55	26.61	1.23	1.98	32.62	28.5	94.93	1.14	0.1	2.63	85.68
	4.6	26.48	1.18	1.93	31.29	28.34	94.39	1.1	0.1	2.5	78.26
	4.65	26.36	1.14	1.88	29.97	28.17	93.84	1.06	0.11	2.38	71.21
	4.7	26.23	1.09	1.83	28.65	28.01	93.3	1.02	0.11	2.25	64.51
	4.75	26.1	1.05	1.78	27.35	27.85	92.76	0.98	0.11	2.13	58.16
	4.8	25.98	1.0	1.73	26.04	27.68	92.21	0.94	0.11	2.0	52.18
	4.85	25.85	0.96	1.68	24.75	27.52	91.67	0.9	0.12	1.88	46.54
	4.9	25.72	0.91	1.63	23.46	27.36	91.12	0.86	0.12	1.76	41.26
	4.95	25.54	0.87	1.58	22.18	27.13	90.38	0.82	0.13	1.64	36.44
	5.0	23.9	0.88	1.53	20.94	25.46	84.8	0.82	0.13	1.66	34.73
	5.05	22.15	0.89	1.48	19.79	23.67	78.84	0.84	0.13	1.7	33.58
	5.1	21.21	0.88	1.43	18.71	22.71	75.63	0.82	0.13	1.66	31.11
	5.15	20.72	0.85	1.38	17.66	22.21	73.99	0.8	0.13	1.58	27.92
	5.2	20.24	0.82	1.33	16.64	21.72	72.35	0.77	0.13	1.5	24.94

	5.25	19.81	0.79	1.28	15.64	21.28	70.87	0.73	0.14	1.41	22.09
	5.3	19.39	0.76	1.23	14.66	20.84	69.42	0.7	0.14	1.33	19.44
	5.35	18.98	0.72	1.18	13.7	20.42	68.02	0.67	0.15	1.24	16.98
	5.4	18.62	0.69	1.13	12.76	20.05	66.78	0.64	0.15	1.15	14.66
	5.45	18.26	0.65	1.08	11.84	19.68	65.54	0.6	0.16	1.06	12.54
	5.5	17.9	0.61	1.03	10.93	19.3	64.3	0.57	0.17	0.97	10.61
	5.55	17.54	0.57	0.98	10.05	18.93	63.06	0.53	0.18	0.88	8.87
Waterline	5.6	17.18	0.53	0.93	9.18	18.56	61.81	0.49	0.19	0.8	7.31
	5.65	16.8	0.5	0.88	8.33	18.14	60.42	0.46	0.2	0.71	5.95
	5.7	15.96	0.47	0.83	7.5	17.26	57.49	0.43	0.21	0.66	4.95
	5.75	14.82	0.45	0.78	6.74	16.08	53.56	0.42	0.21	0.62	4.21
	5.8	14.44	0.42	0.73	6.01	15.64	52.11	0.38	0.23	0.55	3.3
	5.85	14.05	0.38	0.68	5.3	15.18	50.55	0.35	0.25	0.48	2.52
	5.9	13.65	0.34	0.63	4.6	14.71	48.99	0.31	0.27	0.41	1.87
	5.95	13.23	0.3	0.58	3.93	14.22	47.35	0.28	0.3	0.34	1.33
	6.0	12.91	0.25	0.53	3.28	13.86	46.16	0.24	0.34	0.27	0.88
	6.05	12.3	0.22	0.48	2.65	13.18	43.89	0.2	0.39	0.21	0.56
	6.1	11.58	0.18	0.43	2.05	12.36	41.17	0.17	0.46	0.16	0.32
	6.15	10.36	0.14	0.38	1.5	11.03	36.74	0.14	0.54	0.12	0.17
	6.2	8.39	0.12	0.33	1.02	8.96	29.84	0.11	0.63	0.09	0.09
	6.25	6.08	0.11	0.28	0.66	6.54	21.8	0.1	0.69	0.07	0.05
	6.3	5.02	0.08	0.23	0.38	5.38	17.92	0.07	0.92	0.04	0.02
	6.35	3.27	0.05	0.18	0.17	3.51	11.71	0.05	1.26	0.03	0.0
	6.4	1.65	0.03	0.13	0.05	1.78	5.94	0.03	2.04	0.01	0.0
	6.45	0.28	0.04	0.08	0.01	0.34	1.12	0.03	1.93	0.01	0.0
	6.5	0.09	0.01	0.03	0.0	0.11	0.36	0.01	4.18	0.0	0.0
	6.51	0.05	0.01	0.01	0.0	0.06	0.19	0.01	7.02	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) =	7.3	(cfs)
Calculated Flow (Qc) =	7.3	(cfs)
(Qm-Qc)/Qm * 100 =	-0.06%	
Measured Waterline (WLm) =	5.6	(ft)
Calculated Waterline (WLc) =	5.6	(ft)
(WLm-WLc)/WLm * 100 =	-0.04%	
Max Measured Depth (Dm) =	0.93	(ft)
Max Calculated Depth (Dc) =	0.93	(ft)
(Dm-Dc)/Dm * 100 =	0.22%	
Mean Velocity =	0.8	(ft/s)
Manning's n =	0.188	
0.4 * Qm =	2.92	(cfs)
2.5 * Qm =	18.25	(cfs)

FIELD DATA

Feature	Station (ft)	Rod Height (ft)	Water depth (ft)	Velocity (ft/s)
	0	2.96		
	1.5	3.41		
Bankfull	3	3.91		
	4	5.07		
	5	5.03		
	7	4.95		
	9	5.34		
Waterline	10	5.6	0	
	11	5.74	0.14	
	12	5.68	0.08	
	13	5.92	0.32	
	14	6.12	0.52	
	15	6.18	0.58	
	16	6.21	0.61	
	16.5	6.24	0.64	
	17	6.24	0.64	
	17.5	6.29	0.69	
	18	6.02	0.42	
	18.5	6.21	0.61	
	19	6.32	0.72	
	19.5	6.35	0.75	
	20	6.42	0.82	
	20.5	6.22	0.62	
	21	6.19	0.59	
	21.5	6	0.4	
	22	6.53	0.93	
	22.5	6.31	0.71	
	23	6.39	0.79	
	23.5	6.09	0.49	
	24	6.43	0.83	

	24.5	6.42	0.82
	25	6.39	0.79
	25.5	6.3	0.7
	26	6.46	0.86
	26.5	5.76	0.16
	27	5.96	0.26
Waterline	27.2	5.6	0
	28.5	5.21	
	29.4	5.01	
	30.6	4.29	
Bankfull	30.7	4.01	

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	0	0	0	0
0	0	0	0	0
1.01	0.14	0.14	0.11	1.52
1	0.08	0.08	0.06	0.87
1.03	0.32	0.32	0.25	3.49
1.02	0.52	0.52	0.41	5.67
1	0.58	0.58	0.46	6.32
1	0.61	0.46	0.36	4.98
0.5	0.64	0.32	0.25	3.49
0.5	0.64	0.32	0.25	3.49
0.5	0.69	0.34	0.27	3.76
0.57	0.42	0.21	0.17	2.29
0.53	0.61	0.3	0.24	3.32
0.51	0.72	0.36	0.29	3.92
0.5	0.75	0.38	0.3	4.09
0.5	0.82	0.41	0.33	4.47
0.54	0.62	0.31	0.25	3.38
0.5	0.59	0.29	0.23	3.21
0.53	0.4	0.2	0.16	2.18
0.73	0.93	0.47	0.37	5.07
0.55	0.71	0.35	0.28	3.87
0.51	0.79	0.4	0.31	4.3
0.58	0.49	0.24	0.19	2.67
0.6	0.83	0.41	0.33	4.52

0.5	0.82	0.41	0.33	4.47
0.5	0.79	0.4	0.31	4.3
0.51	0.7	0.35	0.28	3.81
0.52	0.86	0.43	0.34	4.68
0.86	0.16	0.08	0.06	0.87
0.54	0.26	0.09	0.07	0.99
0.41	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

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