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 North Lobe Creek, located in Water Division 4.

Location and Land Status. North Lobe Creek originates in an area known as "The Glade" on Pinon Mesa approximately 15 miles northeast of the community of Gateway. This recommendation addresses the portion of North Lobe Creek that starts at the headwaters and extends downstream to the headgate of the Highline Ditch, a distance of approximately 7.81 miles. The BLM manages approximately 1.51 miles of this reach, the U.S. Forest Service manages 0.57 miles, and 5.73 miles are in private ownership.

Biological Summary. North Lobe Creek is a cold water, high gradient stream. It begins in a broad, open valley on Pinon Mesa, descends through a narrow, steep, and forested canyon on the north side of Unaweep Canyon, then merges with West Creek on the floor of Unaweep Canyon. Channel size varies substantially in the lower portion of the creek as it traverses the alluvium on the north side of Unaweep Canyon. Substrate size is generally smaller in diameter in the upper portions of the stream and larger in the portion of the stream within Unaweep Canyon, where substrate size ranges from 4-inch cobbles to 3-foot boulders. Bank stability appears to be excellent.

The lower portion of the creek is generally a step pool environment, with numerous small pools and extensive vegetative cover. Limited riffle habitat and low flows are the primary limiting factors likely affecting the resident fish populations. Water quality is excellent for supporting cold water species.

Fish surveys have documented self-supporting populations of Rainbow Trout and Brown Trout. Spot surveys have revealed populations of stonefly, caddisfly, and mayfly. The creek supports a healthy riparian community comprised of narrow leaf cottonwood, alder, willow, dogwood, and hawthorn.

R2Cross Analysis. The BLM collected the following R2Cross data from North Lobe 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)
5/25/2022 #1	4.57 cfs	15.97 feet	0.43 cfs	6.34 cfs
5/25/2022 #2	4.08 cfs	9.87 feet	0.275 cfs	7.64 cfs
Averages			0.35 cfs	6.99 cfs

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

> 7.00 cubic feet per second is recommended during the snowmelt runoff period from April 1 through June 30. This recommendation is driven by the average velocity criteria. This flow rate will ensure that the limited pool and riffle habitat can be fully utilized during this high growth period.
>
> 1.0 cubic feet per second is recommended during summer, from July 1 through September 30. This recommendation is limited water availability. This flow rate should maintain full and sufficiently cool pools during the summer when stream temperatures can still be high and provide sufficient water for passage between pools.
>
> 0.35 cubic feet per second is recommended during the cold weather period from October 1 through March 31. This flow rate meets two of three instream flow criteria. This flow rate should prevent pools from completely icing during winter, allowing the fish population to successfully 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 can be partially confirmed by consulting diversion records for downstream ditches, including the Highline Ditch and Loba Ditches 1 through 5.

BLM is not aware of any water rights that authorize diversion of water upstream from the Highline Ditch. However, the creek may supply water to small diversion and storage structures that are presently undecreed.

Relationship to Land Management Plans. 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.

Data sheets, R2Cross output, fishery survey information, and photographs of the cross section were included with BLM's draft recommendation in February 2023a. 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: Kevin Hyatt, Grand Junction Field Office
Greg Wolfgang, Grand Junction Field Office
Greg Larson, Colorado River Valley District Office

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: North Lake Creek | CROSS-SECTION NO: 1

CROSS-SECTION LOCATION: At BLM-private boundary 0.5 miles upstream from confluence w/ West Creek

DATE: 5-25-22 | OBSERVERS: R. Smith, N

LEGAL DESCRIPTION: ¼ SECTION: NE | SECTION: 10 | TOWNSHIP: 15 N/S | RANGE: 102 E/W | PM: 6th

COUNTY: Mesa | WATERSHED: West Creek | WATER DIVISION: 4 | DOW WATER CODE:

MAP(S): USGS: GPS: Zone 12 693088 E 4293383 N | USFS:

SUPPLEMENTAL DATA

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

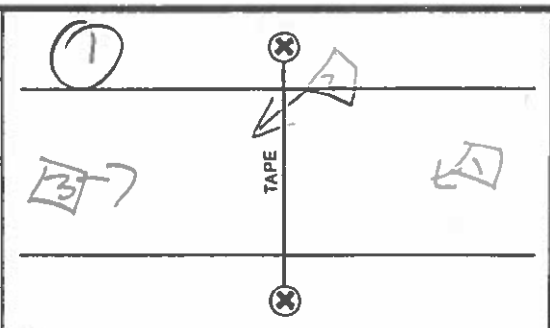
METER NUMBER: | DATE RATED: | CALIB/SPIN: _____ sec | TAPE WEIGHT: surveyed _____ lbs/foot | TAPE TENSION: surveyed _____ lbs

CHANNEL BED MATERIAL SIZE RANGE: 4" cobbles to 3' 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	7.88/7.87
② WS Upstream	14.0	7.68
③ WS Downstream	2.6	8.30
SLOPE	0.62/16.6 = 0.037	

SKETCH



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:

Caddis, snail

COMMENTS

Temp: 5.6°C pH: 8.36

Salinity: 0 ppt Riparian: alder, narrow leaf cottonwood, Hawthorn, willow, equisetum, dogwood.

Conductivity: 53

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: North Lobe Creek	CROSS SECTION NO: 1	DATE: 5-25-22	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME: 10:30 am

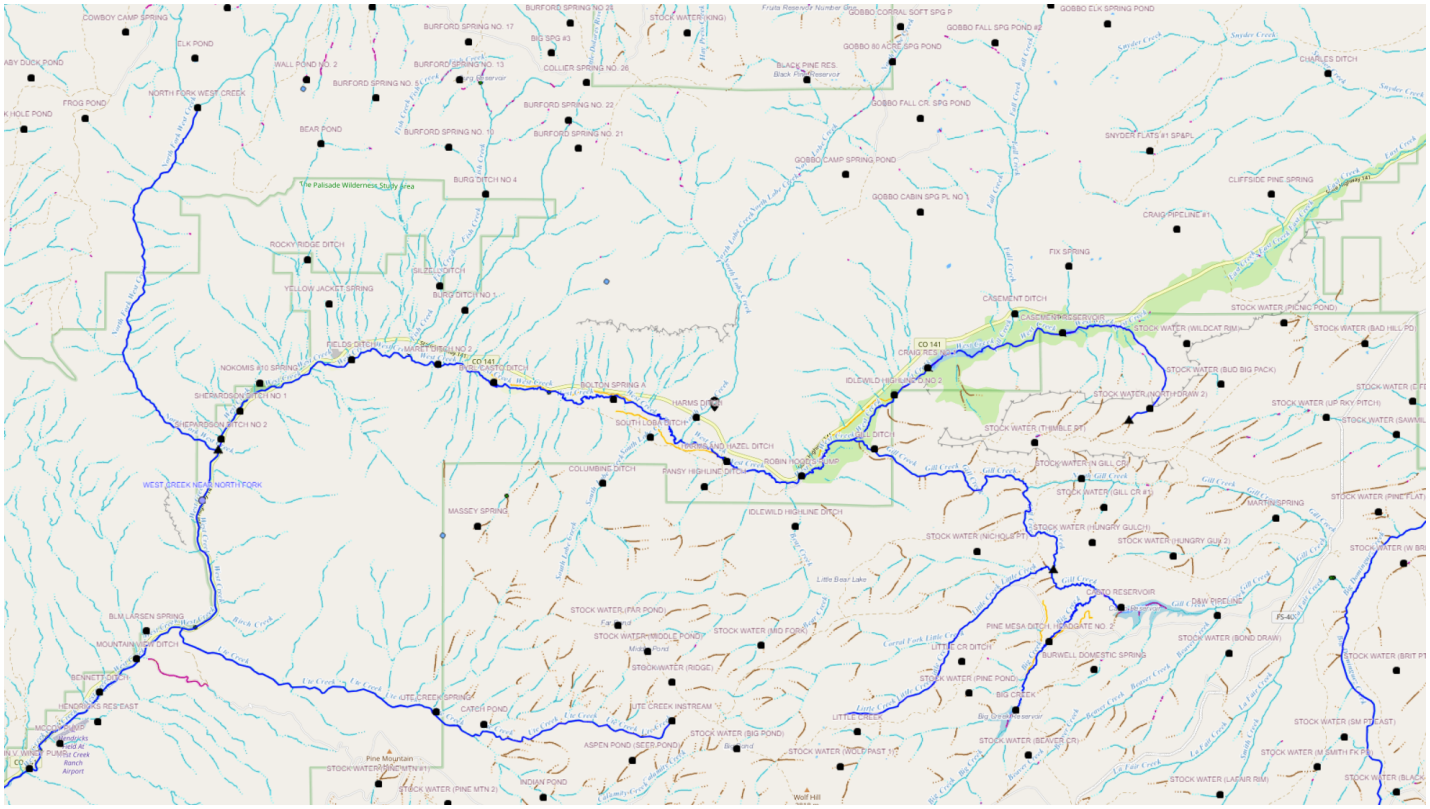
Features (Stake (S), Grassline (G), Waterline (W), Rock (R))	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
RS	1.7		6.91	~~7.27~~							
2.5	3.5		7.64								
	5.0		7.63								
W	5.4		7.87								
	6.5		8.27	0.40				0.22			
	7.5		8.47	0.60				0.23			
	8.5		8.57	0.70				0.16			
	9.5		8.37	0.50				0.71			
	10.0		8.42	0.55				0.77			
	10.5		8.22	0.35				1.47			
	11.0		8.27	0.35				1.56			
	11.5		8.27	0.40				1.55			
	12.0		8.37	0.50				1.03			
	12.5		8.47	0.55				1.09			
	13.0		8.82	0.95				1.32			
	13.5		8.67	0.80				1.44			
	14.0		8.67	0.75				1.08			
	14.5		8.57	0.65				1.25			
	15.0		8.22	0.35				0.57			
	15.5		8.27	0.40				1.20			
	16.0		7.92	0.05				0			
W	16.3		7.88								
	17.3		7.57								
	17.9		7.51								
G	18.5		7.28								
LS	23.0		5.98								
TOTALS:											

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

R2Cross RESULTS

Stream Name: North Lobe Creek
Stream Locations: At BLM-private boundary 0.5 miles upst from conf w/ West Creek
Fieldwork Date: 05/25/2022
Cross-section: 1
Observers: R. Smith
Coordinate System: UTM Zone 12
X (easting): 693088
Y (northing): 4293383
Date Processed: 07/26/2023
Slope: 0.037
Discharge: R2Cross data file: 4.57 (cfs)
Computation method: Ferguson VPE
R2Cross data filename: North Lobe Creek 5-25-22 #1.xlsx
R2Cross version: 2.0.2

LOCATION



ANALYSIS RESULTS

Habitat Criteria Results

Bankfull top width (ft) = 15.97

	Habitat Criteria	Discharge (cfs) Meeting Criteria
Mean Depth (ft)	0.2	0.32
Percent Wetted Perimeter (%)	50.0	0.43
Mean Velocity (ft/s)	1.0	6.34

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	7.28	15.97	0.84	1.54	13.41	16.74	100.0	0.8	0.14	1.81	24.3
	7.32	15.76	0.81	1.5	12.78	16.51	98.64	0.77	0.14	1.72	22.02
	7.37	15.49	0.77	1.45	11.99	16.23	96.94	0.74	0.14	1.61	19.36
	7.42	15.23	0.74	1.4	11.23	15.95	95.25	0.7	0.15	1.51	16.9
	7.47	14.96	0.7	1.35	10.47	15.66	93.55	0.67	0.16	1.4	14.63
	7.52	14.62	0.67	1.3	9.73	15.3	91.42	0.64	0.16	1.3	12.64
	7.57	13.99	0.64	1.25	9.02	14.66	87.56	0.62	0.17	1.24	11.16
	7.62	13.69	0.61	1.2	8.32	14.35	85.69	0.58	0.17	1.14	9.47
	7.67	11.91	0.65	1.15	7.7	12.54	74.92	0.61	0.17	1.23	9.51
	7.72	11.67	0.61	1.1	7.11	12.28	73.33	0.58	0.18	1.13	8.07
	7.77	11.42	0.57	1.05	6.53	12.01	71.74	0.54	0.18	1.04	6.76
	7.82	11.18	0.53	1.0	5.97	11.74	70.15	0.51	0.19	0.94	5.59
Waterline	7.87	10.93	0.5	0.95	5.41	11.48	68.56	0.47	0.21	0.84	4.55
	7.92	10.46	0.47	0.9	4.88	10.99	65.68	0.44	0.22	0.77	3.75
	7.97	10.25	0.43	0.85	4.36	10.76	64.28	0.41	0.23	0.67	2.93
	8.02	10.04	0.38	0.8	3.85	10.53	62.89	0.37	0.25	0.58	2.23
	8.07	9.84	0.34	0.75	3.36	10.29	61.49	0.33	0.28	0.49	1.64
	8.12	9.63	0.3	0.7	2.87	10.06	60.1	0.29	0.31	0.4	1.15
	8.17	9.42	0.25	0.65	2.39	9.83	58.7	0.24	0.35	0.32	0.76
	8.22	8.7	0.22	0.6	1.93	9.09	54.29	0.21	0.4	0.26	0.5
	8.27	7.29	0.21	0.55	1.53	7.62	45.53	0.2	0.41	0.24	0.36
	8.32	6.58	0.18	0.5	1.18	6.88	41.1	0.17	0.47	0.19	0.22
	8.37	5.87	0.15	0.45	0.87	6.13	36.65	0.14	0.55	0.14	0.12
	8.42	4.16	0.15	0.4	0.62	4.39	26.23	0.14	0.55	0.14	0.09
	8.47	3.52	0.12	0.35	0.43	3.7	22.12	0.12	0.65	0.1	0.04

	8.52	2.62	0.1	0.3	0.27	2.77	16.54	0.1	0.74	0.08	0.02
	8.57	1.56	0.11	0.25	0.17	1.68	10.03	0.1	0.73	0.09	0.01
	8.62	1.25	0.08	0.2	0.1	1.34	8.02	0.07	0.94	0.05	0.01
	8.67	0.69	0.07	0.15	0.05	0.76	4.55	0.07	1.02	0.05	0.0
	8.72	0.46	0.05	0.1	0.02	0.51	3.03	0.05	1.43	0.03	0.0
	8.77	0.23	0.02	0.05	0.01	0.25	1.51	0.02	2.55	0.01	0.0
	8.8	0.07	0.01	0.02	0.0	0.08	0.46	0.01	6.94	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) =	4.57	(cfs)
Calculated Flow (Qc) =	4.56	(cfs)
(Qm-Qc)/Qm * 100 =	0.20%	
Measured Waterline (WLm) =	7.88	(ft)
Calculated Waterline (WLc) =	7.87	(ft)
(WLm-WLc)/WLm * 100 =	0.06%	
Max Measured Depth (Dm) =	0.95	(ft)
Max Calculated Depth (Dc) =	0.95	(ft)
(Dm-Dc)/Dm * 100 =	0.02%	
Mean Velocity =	0.84	(ft/s)
Manning's n =	0.206	
0.4 * Qm =	1.83	(cfs)
2.5 * Qm =	11.43	(cfs)

FIELD DATA

Feature	Station (ft)	Rod Height (ft)	Water depth (ft)	Velocity (ft/s)
	1.7	6.91		
Bankfull	2.5	7.27		
	3.5	7.64		
	5	7.63		
Waterline	5.4	7.87	0	0
	6.5	8.27	0.4	0.22
	7.5	8.47	0.6	0.23
	8.5	8.57	0.7	0.16
	9.5	8.37	0.5	0.71
	10	8.42	0.55	0.77
	10.5	8.22	0.35	1.47
	11	8.22	0.35	1.56
	11.5	8.27	0.4	1.55
	12	8.37	0.5	1.03
	12.5	8.42	0.55	1.09
	13	8.82	0.95	1.32
	13.5	8.67	0.8	1.44
	14	8.62	0.75	1.08
	14.5	8.52	0.65	1.25
	15	8.22	0.35	0.57
	15.5	8.27	0.4	1.2
	16	7.92	0.05	0
Waterline	16.3	7.88	0	0
	17.3	7.57		
	17.9	7.51		
Bankfull	18.5	7.28		
	23	5.98		

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
1.17	0.4	0.42	0.09	2.02
1.02	0.6	0.6	0.14	3.02
1	0.7	0.7	0.11	2.45
1.02	0.5	0.38	0.27	5.82
0.5	0.55	0.28	0.21	4.63
0.54	0.35	0.17	0.26	5.63
0.5	0.35	0.17	0.27	5.97
0.5	0.4	0.2	0.31	6.78
0.51	0.5	0.25	0.26	5.63
0.5	0.55	0.28	0.3	6.56
0.64	0.95	0.47	0.63	13.71
0.52	0.8	0.4	0.58	12.6
0.5	0.75	0.38	0.41	8.86
0.51	0.65	0.33	0.41	8.89
0.58	0.35	0.17	0.1	2.18
0.5	0.4	0.2	0.24	5.25
0.61	0.05	0.02	0	0
0.3	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: North Lobe Creek						CROSS-SECTION NO.: 2
CROSS-SECTION LOCATION: At BLM-private boundary 0.5 miles upstream from confluence w/ West Creek						
DATE: 5-25-22	OBSERVERS: R. Smith					
LEGAL DESCRIPTION	¼ SECTION: NE	SECTION: 10	TOWNSHIP: 15 N/S	RANGE: 102E/W	PM: 6th	
COUNTY: Mesa	WATERSHED: West Creek	WATER DIVISION: 4	DOW WATER CODE:			
MAP(S): USGS:	GPS Zone 12 693032					
USFS:	4293308					

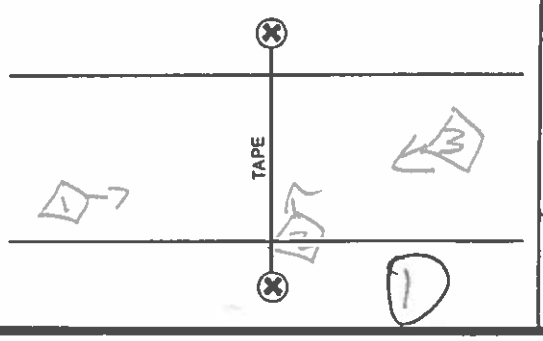
SUPPLEMENTAL DATA

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: ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: 4" cobbles to 3-foot boulders	PHOTOGRAPHS TAKEN: YES/NO	NUMBER OF PHOTOGRAPHS:		

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	7.61/7.60
② WS Upstream	11.4	7.37
③ WS Downstream	25.6	7.63
SLOPE	0.26/14.0 = 0.0186	

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: North Lake Creek | CROSS SECTION NO: 2 | DATE: 5-25-22 | SHEET ___ OF ___

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT | Gage Reading: ____ ft | TIME: 11:45 am

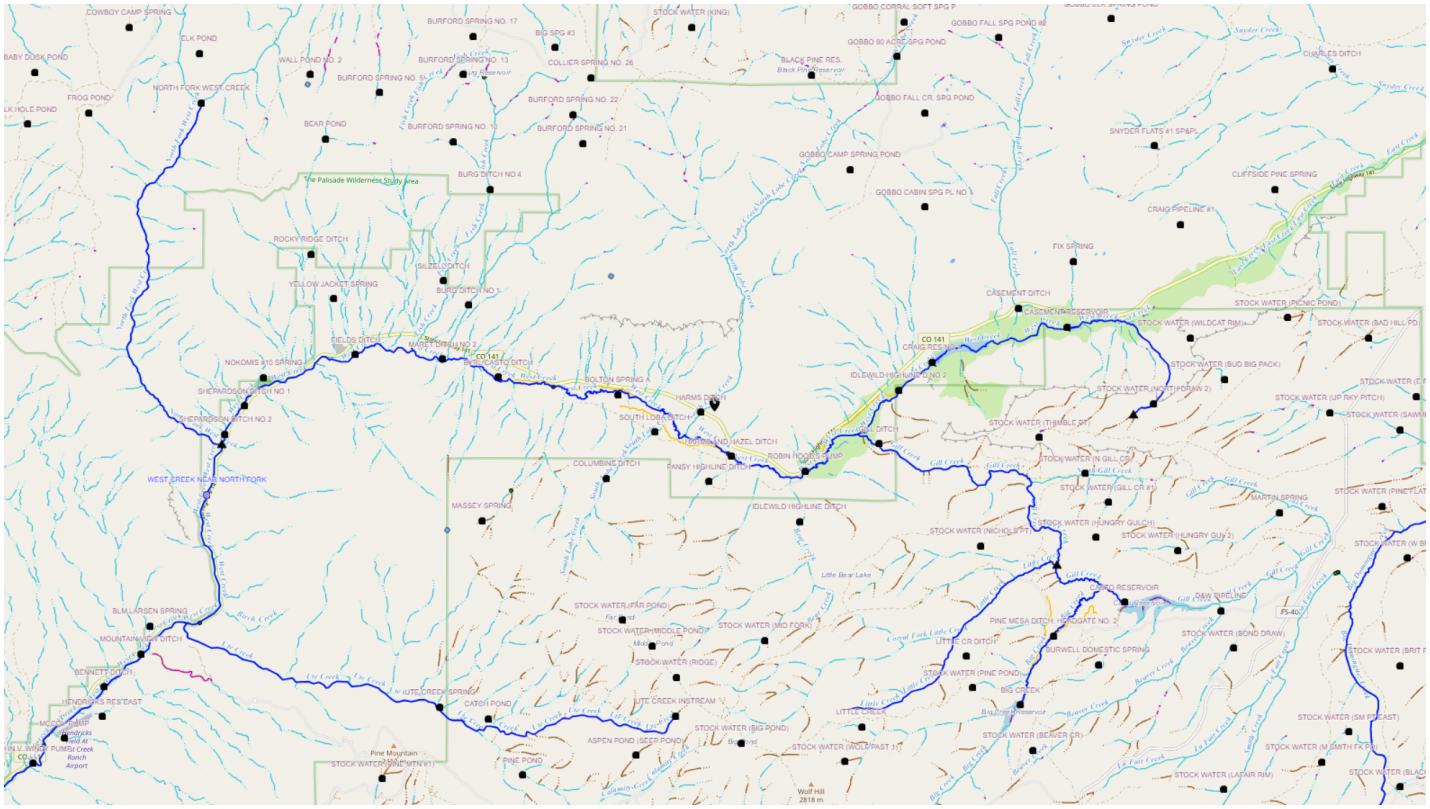
Features (Stake (S), Grassline (G), Waterline (W), Rock (R))	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
RS	0.0		6.86								
	1.8		6.89								
G	2.1		7.05								
W	2.6		7.60								
	3.0		8.05	0.45				0.02			
	4.0		8.1	0.50				0.11			
	5.0		8.2	0.60				0.10			
	6.0		8.4	0.80				0.71			
	6.3		8.5	0.90				0.56			
	6.6		8.55	0.95				0.60			
	6.9		8.60	1.00				0.36			
	7.2		8.60	1.00				0.42			
	7.5		8.60	1.00				0.22			
	7.8		8.50	0.90				0.39			
	8.2		8.55	0.95				1.02			
	8.5		8.20	0.60				1.06			
	8.8		7.95	0.35				1.11			
	9.1		7.90	0.30				1.32			
	9.4		7.85	0.25				1.65			
	9.7		7.95	0.35				1.82			
	10.0		8.05	0.45				1.98			
	10.3		8.15	0.55				2.07			
	10.6		8.3	0.70				1.83			
	10.9		8.45	0.85				1.36			
	11.2		8.55	0.95				1.24			
	11.5		8.1	0.50				0.71			
W	11.6	7.100 →									
G	12.	7.01 →									
	12.5	6.81 →									
	13.0	6.70 →									
LS	20.5	5.95 →									
TOTALS:											

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

R2Cross RESULTS

Stream Name: North Lobe Creek
Stream Locations: At BLM-private boundary 0.5 mile upst fr conf w/West Creek
Fieldwork Date: 05/25/2022
Cross-section: 2
Observers: R. Smith
Coordinate System: UTM Zone 12
X (easting): 693032
Y (northing): 4293308
Date Processed: 07/26/2023
Slope: 0.0186
Discharge: R2Cross data file: 4.08 (cfs)
Computation method: Ferguson VPE
R2Cross data filename: North Lobe Creek 5-25-22 #2.xlsx
R2Cross version: 2.0.2

LOCATION



ANALYSIS RESULTS

Habitat Criteria Results

Bankfull top width (ft) = 9.87

	Habitat Criteria	Discharge (cfs) Meeting Criteria
Mean Depth (ft)	0.2	0.11
Percent Wetted Perimeter (%)	50.0	0.28
Mean Velocity (ft/s)	1.0	7.64

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	7.05	9.87	1.11	1.55	10.93	11.73	100.0	0.93	0.13	1.5	16.35
	7.05	9.87	1.11	1.55	10.93	11.73	100.0	0.93	0.13	1.5	16.35
	7.1	9.79	1.07	1.5	10.44	11.6	98.91	0.9	0.13	1.42	14.85
	7.15	9.71	1.02	1.45	9.95	11.47	97.82	0.87	0.14	1.35	13.44
	7.2	9.63	0.98	1.4	9.47	11.34	96.73	0.83	0.14	1.28	12.1
	7.25	9.56	0.94	1.35	8.99	11.21	95.63	0.8	0.15	1.21	10.84
	7.3	9.48	0.9	1.3	8.51	11.09	94.54	0.77	0.15	1.13	9.65
	7.35	9.4	0.86	1.25	8.04	10.96	93.45	0.73	0.16	1.06	8.54
	7.4	9.32	0.81	1.2	7.57	10.83	92.36	0.7	0.16	0.99	7.5
	7.45	9.24	0.77	1.15	7.11	10.7	91.27	0.66	0.17	0.92	6.54
	7.5	9.16	0.73	1.1	6.65	10.57	90.18	0.63	0.18	0.85	5.65
	7.55	9.08	0.68	1.05	6.19	10.45	89.09	0.59	0.18	0.78	4.83
Waterline	7.6	9.0	0.64	1.0	5.74	10.32	87.99	0.56	0.19	0.71	4.08
	7.65	8.95	0.59	0.95	5.29	10.2	86.99	0.52	0.2	0.64	3.4
	7.7	8.89	0.55	0.9	4.85	10.08	85.98	0.48	0.22	0.57	2.78
	7.75	8.84	0.5	0.85	4.4	9.96	84.98	0.44	0.23	0.51	2.23
	7.8	8.78	0.45	0.8	3.96	9.85	83.97	0.4	0.25	0.44	1.75
	7.85	8.73	0.4	0.75	3.53	9.73	82.97	0.36	0.27	0.38	1.33
	7.9	8.22	0.38	0.7	3.1	9.15	78.02	0.34	0.29	0.34	1.06
	7.95	7.72	0.35	0.65	2.7	8.57	73.07	0.32	0.31	0.31	0.83
	8.0	7.45	0.31	0.6	2.32	8.21	70.05	0.28	0.33	0.26	0.61
	8.05	7.19	0.27	0.55	1.96	7.86	67.03	0.25	0.37	0.22	0.42
	8.1	5.97	0.27	0.5	1.63	6.57	56.04	0.25	0.37	0.21	0.35
	8.15	5.23	0.26	0.45	1.35	5.77	49.23	0.23	0.39	0.2	0.27
	8.2	4.53	0.24	0.4	1.11	5.02	42.81	0.22	0.41	0.18	0.2

	8.25	4.11	0.22	0.35	0.89	4.53	38.61	0.2	0.45	0.15	0.14
	8.3	3.68	0.19	0.3	0.7	4.04	34.41	0.17	0.5	0.12	0.09
	8.35	3.25	0.16	0.25	0.52	3.54	30.21	0.15	0.57	0.1	0.05
	8.4	2.83	0.13	0.2	0.37	3.05	26.01	0.12	0.67	0.07	0.03
	8.45	2.5	0.09	0.15	0.24	2.65	22.63	0.09	0.87	0.05	0.01
	8.5	2.13	0.06	0.1	0.12	2.21	18.86	0.05	1.31	0.02	0.0
	8.55	1.05	0.04	0.05	0.04	1.06	9.06	0.04	1.73	0.01	0.0
	8.59	0.74	0.01	0.02	0.01	0.74	6.3	0.01	4.17	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) =	4.08	(cfs)
Calculated Flow (Qc) =	4.08	(cfs)
(Qm-Qc)/Qm * 100 =	0.00%	
Measured Waterline (WLm) =	7.6	(ft)
Calculated Waterline (WLc) =	7.6	(ft)
(WLm-WLc)/WLm * 100 =	-0.00%	
Max Measured Depth (Dm) =	1	(ft)
Max Calculated Depth (Dc) =	1	(ft)
(Dm-Dc)/Dm * 100 =	0.00%	
Mean Velocity =	0.71	(ft/s)
Manning's n =	0.193	
0.4 * Qm =	1.63	(cfs)
2.5 * Qm =	10.2	(cfs)

FIELD DATA

Feature	Station (ft)	Rod Height (ft)	Water depth (ft)	Velocity (ft/s)
	0	6.86		
	1.8	6.89		
Bankfull	2.1	7.05		
Waterline	2.6	7.6	0	0
	3	8.05	0.45	0.02
	4	8.1	0.5	0.11
	5	8.2	0.6	0.1
	6	8.4	0.8	0.71
	6.3	8.5	0.9	0.56
	6.6	8.55	0.95	0.6
	6.9	8.6	1	0.36
	7.2	8.6	1	0.42
	7.5	8.6	1	0.22
	7.8	8.5	0.9	0.39
	8.2	8.55	0.95	1.02
	8.5	8.2	0.6	1.06
	8.8	7.95	0.35	1.11
	9.1	7.9	0.3	1.32
	9.4	7.85	0.25	1.65
	9.7	7.95	0.35	1.82
	10	8.05	0.45	1.98
	10.3	8.15	0.55	2.07
	10.6	8.3	0.7	1.83
	10.9	8.45	0.85	1.36
	11.2	8.55	0.95	1.24
	11.5	8.1	0.5	0.71
Waterline	11.6	7.6	0	0
Bankfull	12	7.01		
	12.5	6.81		
	15	6.7		

	20.5	5.95		

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
0.6	0.45	0.32	0.01	0.15
1	0.5	0.5	0.06	1.35
1	0.6	0.6	0.06	1.47
1.02	0.8	0.52	0.37	9.05
0.32	0.9	0.27	0.15	3.71
0.3	0.95	0.28	0.17	4.19
0.3	1	0.3	0.11	2.65
0.3	1	0.3	0.13	3.09
0.3	1	0.3	0.07	1.62
0.32	0.9	0.32	0.12	3.01
0.4	0.95	0.33	0.34	8.31
0.46	0.6	0.18	0.19	4.68
0.39	0.35	0.1	0.12	2.86
0.3	0.3	0.09	0.12	2.91
0.3	0.25	0.07	0.12	3.03
0.32	0.35	0.1	0.19	4.68
0.32	0.45	0.14	0.27	6.55
0.32	0.55	0.17	0.34	8.37
0.34	0.7	0.21	0.38	9.42
0.34	0.85	0.26	0.35	8.5
0.32	0.95	0.28	0.35	8.66
0.54	0.5	0.1	0.07	1.74
0.51	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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