

DRAFT RECOMMENDATION - January 2015 Version

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

Dear Ms. Bassi:

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

Location and Land Status. Fourmile Creek originates on the western flank of Mount Oliphant in the Elkhead Mountains, approximately 24 miles northeast of Craig. This instream flow recommendation focuses on a reach beginning at the headwaters and extending to the headgate of the Norma Ryan Ditch, a distance of approximately 3.25 miles. The BLM manages approximately 0.3 miles of this, the U.S. Forest Service manages approximately 1.4 mile, and 1.5 miles are in private ownership.

Biological Summary. Fourmile Creek is a cold-water, very high gradient stream in a densely forested environment. The stream is confined by bedrock in most locations. The stream generally has medium to large-sized substrate, consisting of cobbles and small boulders. The stream consists mostly of series of pools broken by short drops and waterfalls. As such, the creek has abundant pool habitat for overwintering fish, but runs and riffle habitat is very limited, which limits reproduction. Abundant beaver ponds also assist in maintaining pool habitat for the fish population.

Fisheries surveys have revealed a self-sustaining population of native cutthroat trout. Genetic testing has revealed that the population is a genetically pure population of Yampa River lineage. Colorado Parks and Wildlife has designated the fish in this creek as a core conservation population. Intensive macro-invertebrate surveys have not been conducted, but spot samples have revealed various species of mayfly, caddisfly, and stonefly.

The riparian community is generally comprised of spruce and alder at higher elevation and willow and aspen at lower elevation.. The riparian community is in excellent condition, and provides abundant shading and cover for fish habitat.

R2Cross Analysis. The BLM collected the following R2Cross data from Fourmile 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)
06/16/2015 #1	4.78 cfs	20.6 feet	2.42 cfs	3.76 cfs

07/08/2015 #1	1.19 cfs	20.2 feet	2.48 cfs	Out of range
		Averages:	2.45 cfs	3.76 cfs

BLM's analysis of this data, coordinated with Colorado Parks and Wildlife, indicates that the following flows are needed to protect the fishery and natural environment to a reasonable degree.

3.75 cubic feet per second is recommended during the warm weather period from May 1 to September 30. This recommendation is driven by the average velocity criteria. This portion of the creek is at high altitude and the fish growth and recruitment season is short. It is important to protect a flow rate that makes most of this habitat available to the fish population while they are completing critical life history functions during the warm weather months.

1.25 cubic feet per second is recommended during the cold weather period from October 1 to April 30. This recommendation is driven by limited water availability. This flow rate should prevent pools from freezing, allowing the fish population to successfully overwinter. Even though the base flow in this creek is small, it is extremely consistent, allowing the fishery to persist.

Water Availability. The nearest stream flow gage with a long-term record is USGS Gage 09255000 for Slater Creek near Slater, CO. This gage measures a large watershed immediately to the east of Fourmile Creek. Data from this gage may be usable if a basin apportionment is used and if adjustments are made for diversions that occur upstream from the gage. In addition, BLM recommends consulting StreamStats. BLM also recommends consultation of diversion records associated with the Norma Ryan Ditch. While this ditch does not always divert throughout the irrigation season, it can provide spot checks of the minimum amount of water available in the creek.

The BLM is not aware of any water rights within the proposed stream reach.

Relationship to Land Management Plans. The BLM's management plan calls for improvement and recovery of current and historic fisheries as a means of increasing native fish populations. In addition, the BLM plan calls for making instream flow recommendations to the Colorado Water Conservation Board to meet minimum instream flow requirements to maintain native 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 further sources of degradation. 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 2016. We thank 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,

Brian St. George
Deputy State Director
Resources and Fire

Cc: Eric Scherff, Little Snake Field Office
Tim Wilson, Little Snake Field Office
Wendy Reynolds, Little Snake Field Office

[illegible]

COLORADO WATER CONSERVATION BOARD
INSTREAM FLOW / NATURAL LAKE LEVEL PROGRAM
STREAM CROSS-SECTION AND FLOW ANALYSIS

LOCATION INFORMATION

STREAM NAME: Fourmile Creek
XS LOCATION: At BLM-USFS boundary
XS NUMBER: 1

DATE: 16-Jun-15
OBSERVERS: R. Smith, E. Scherff

1/4 SEC: NE
SECTION: 13
TWP: 10N
RANGE: 90W
PM: Sixth

COUNTY: Moffat
WATERSHED: Little Snake
DIVISION: 6
DOW CODE: 21173

USGS MAP: 0
USFS MAP: 0

SUPPLEMENTAL DATA

*** NOTE ***

Leave TAPE WT and TENSION
at defaults for data collected
with a survey level and rod

TAPE WT: 0.0106
TENSION: 99999

CHANNEL PROFILE DATA

SLOPE: 0.027

INPUT DATA CHECKED BY:DATE.....

ASSIGNED TO:DATE.....

STREAM NAME: Fourmile Creek
 XS LOCATION: At BLM-USFS boundary
 XS NUMBER: 1

DATA POINTS= 38

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE		DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
1	LS	0.00	2.96			0.00		0.00	0.00	0.0%
	G	0.90	4.30			0.00		0.00	0.00	0.0%
		2.40	4.85			0.00		0.00	0.00	0.0%
W		3.00	4.90	0.00	0.00	0.00		0.00	0.00	0.0%
		3.50	5.25	0.35	0.01	0.61	0.35	0.18	0.00	0.0%
		4.00	5.15	0.25	0.00	0.51	0.25	0.13	0.00	0.0%
		4.50	5.15	0.25	0.14	0.50	0.25	0.13	0.02	0.4%
		5.00	5.15	0.25	0.14	0.50	0.25	0.13	0.02	0.4%
		5.50	5.25	0.35	1.39	0.51	0.35	0.18	0.24	5.1%
		6.00	5.20	0.30	1.45	0.50	0.30	0.15	0.22	4.6%
		6.50	5.20	0.30	1.47	0.50	0.30	0.15	0.22	4.6%
		7.00	5.25	0.35	1.65	0.50	0.35	0.18	0.29	6.0%
		7.50	5.30	0.40	2.01	0.50	0.40	0.20	0.40	8.4%
		8.00	5.30	0.40	1.94	0.50	0.40	0.20	0.39	8.1%
		8.50	5.30	0.40	2.26	0.50	0.40	0.20	0.45	9.5%
		9.00	5.30	0.40	0.48	0.50	0.40	0.20	0.10	2.0%
		9.50	5.20	0.30	0.08	0.51	0.30	0.15	0.01	0.3%
		10.00	5.20	0.30	0.40	0.50	0.30	0.15	0.06	1.3%
		10.50	5.20	0.30	0.74	0.50	0.30	0.15	0.11	2.3%
		11.00	5.10	0.20	0.34	0.51	0.20	0.10	0.03	0.7%
		11.50	5.20	0.30	0.07	0.51	0.30	0.15	0.01	0.2%
		12.00	5.10	0.20	1.23	0.51	0.20	0.10	0.12	2.6%
		12.50	5.10	0.20	1.60	0.50	0.20	0.10	0.16	3.4%
		13.00	5.20	0.30	1.10	0.51	0.30	0.15	0.17	3.5%
		13.50	5.30	0.40	1.60	0.51	0.40	0.20	0.32	6.7%
		14.00	5.30	0.40	1.12	0.50	0.40	0.20	0.22	4.7%
		14.50	5.20	0.30	0.69	0.51	0.30	0.15	0.10	2.2%
		15.00	5.20	0.30	1.80	0.50	0.30	0.15	0.27	5.7%
		15.50	5.05	0.15	1.32	0.52	0.15	0.08	0.10	2.1%
		16.00	5.25	0.35	1.76	0.54	0.35	0.18	0.31	6.4%
		16.50	5.30	0.40	1.25	0.50	0.40	0.20	0.25	5.2%
		17.00	5.20	0.30	1.34	0.51	0.30	0.14	0.18	3.8%
W		17.40	4.90	0.00	0.00	0.50		0.00	0.00	0.0%
		17.80	4.80			0.00		0.00	0.00	0.0%
		18.70	4.60			0.00		0.00	0.00	0.0%
		20.40	4.55			0.00		0.00	0.00	0.0%
1	G	21.50	4.30			0.00		0.00	0.00	0.0%
	RS	25.30	3.50			0.00		0.00	0.00	0.0%

TOTALS -----

14.78 0.4 4.34 4.78 100.0%
 (Max.)

Manning's n = 0.0978
 Hydraulic Radius= 0.29330465

STREAM NAME: Fourmile Creek
 XS LOCATION: At BLM-USFS boundary
 XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	4.34	4.34	0.0%
4.65	4.34	8.26	90.4%
4.67	4.34	7.92	82.8%
4.69	4.34	7.60	75.2%
4.71	4.34	7.27	67.7%
4.73	4.34	6.95	60.3%
4.75	4.34	6.63	52.9%
4.77	4.34	6.31	45.6%
4.79	4.34	6.00	38.4%
4.81	4.34	5.69	31.2%
4.83	4.34	5.38	24.1%
4.85	4.34	5.08	17.1%
4.86	4.34	4.92	13.6%
4.87	4.34	4.77	10.1%
4.88	4.34	4.63	6.7%
4.89	4.34	4.48	3.3%
4.90	4.34	4.34	0.0%
4.91	4.34	4.19	-3.3%
4.92	4.34	4.05	-6.6%
4.93	4.34	3.90	-9.9%
4.94	4.34	3.76	-13.2%
4.95	4.34	3.62	-16.5%
4.97	4.34	3.33	-23.1%
4.99	4.34	3.05	-29.6%
5.01	4.34	2.77	-36.2%
5.03	4.34	2.49	-42.6%
5.05	4.34	2.21	-49.1%
5.07	4.34	1.93	-55.5%
5.09	4.34	1.65	-61.9%
5.11	4.34	1.39	-68.0%
5.13	4.34	1.14	-73.7%
5.15	4.34	0.90	-79.2%

WATERLINE AT ZERO

AREA ERROR = 4.900

STREAM NAME: Fourmile Creek
 XS LOCATION: At BLM-USFS boundary
 XS NUMBER: 1

Constant Manning's n

GL = lowest Grassline elevation corrected for sag

STAGING TABLE

WL = Waterline corrected for variations in field measured water surface elevations and sag

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	4.30	20.60	0.72	1.00	14.92	21.14	100.0%	0.71	29.51	1.98
	4.30	20.60	0.72	1.00	14.92	21.14	100.0%	0.71	29.51	1.98
	4.35	20.24	0.69	0.95	13.90	20.77	98.2%	0.67	26.53	1.91
	4.40	19.89	0.65	0.90	12.89	20.40	96.5%	0.63	23.70	1.84
	4.45	19.53	0.61	0.85	11.91	20.03	94.7%	0.59	21.01	1.76
	4.50	19.17	0.57	0.80	10.94	19.66	93.0%	0.56	18.47	1.69
	4.55	18.82	0.53	0.75	9.99	19.29	91.2%	0.52	16.08	1.61
	4.60	16.98	0.54	0.70	9.10	17.44	82.5%	0.52	14.70	1.62
	4.65	16.62	0.50	0.65	8.26	17.07	80.7%	0.48	12.69	1.54
	4.70	16.26	0.46	0.60	7.43	16.69	78.9%	0.45	10.82	1.46
	4.75	15.90	0.42	0.55	6.63	16.32	77.2%	0.41	9.08	1.37
	4.80	15.54	0.38	0.50	5.84	15.94	75.4%	0.37	7.47	1.28
	4.85	15.20	0.33	0.45	5.07	15.59	73.7%	0.33	5.99	1.18
WL	4.90	14.40	0.30	0.40	4.33	14.78	69.9%	0.29	4.78	1.10
	4.95	14.26	0.25	0.35	3.62	14.61	69.1%	0.25	3.56	0.98
	5.00	14.12	0.21	0.30	2.91	14.44	68.3%	0.20	2.49	0.86
	5.05	13.99	0.16	0.25	2.21	14.27	67.5%	0.15	1.59	0.72
	5.10	13.06	0.12	0.20	1.52	13.29	62.9%	0.11	0.89	0.59
	5.15	10.63	0.08	0.15	0.90	10.79	51.0%	0.08	0.43	0.48
	5.20	6.70	0.06	0.10	0.42	6.78	32.1%	0.06	0.16	0.39
	5.25	4.00	0.04	0.05	0.15	4.02	19.0%	0.04	0.04	0.28
	5.30	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Fourmile Creek
XS LOCATION: At BLM-USFS boundary
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	4.78 cfs
CALCULATED FLOW (Qc)=	4.78 cfs
(Qm-Qc)/Qm * 100 =	0.0 %
MEASURED WATERLINE (WLm)=	4.90 ft
CALCULATED WATERLINE (WLc)=	4.90 ft
(WLm-WLc)/WLm * 100 =	0.0 %
MAX MEASURED DEPTH (Dm)=	0.40 ft
MAX CALCULATED DEPTH (Dc)=	0.40 ft
(Dm-Dc)/Dm * 100	0.0 %
MEAN VELOCITY=	1.10 ft/sec
MANNING'S N=	0.098
SLOPE=	0.027 ft/ft
.4 * Qm =	1.9 cfs
2.5 * Qm=	11.9 cfs

RECOMMENDED INSTREAM FLOW:
=====

FLOW (CFS)	PERIOD
=====	=====
_____	_____
_____	_____
_____	_____
_____	_____

RATIONALE FOR RECOMMENDATION:
=====

[illegible]

RECOMMENDATION BY: AGENCY DATE:

CWCB REVIEW BY: DATE:

STREAM NAME: Fourmile Creek
 XS LOCATION: At BLM-USFS boundary
 XS NUMBER: 1

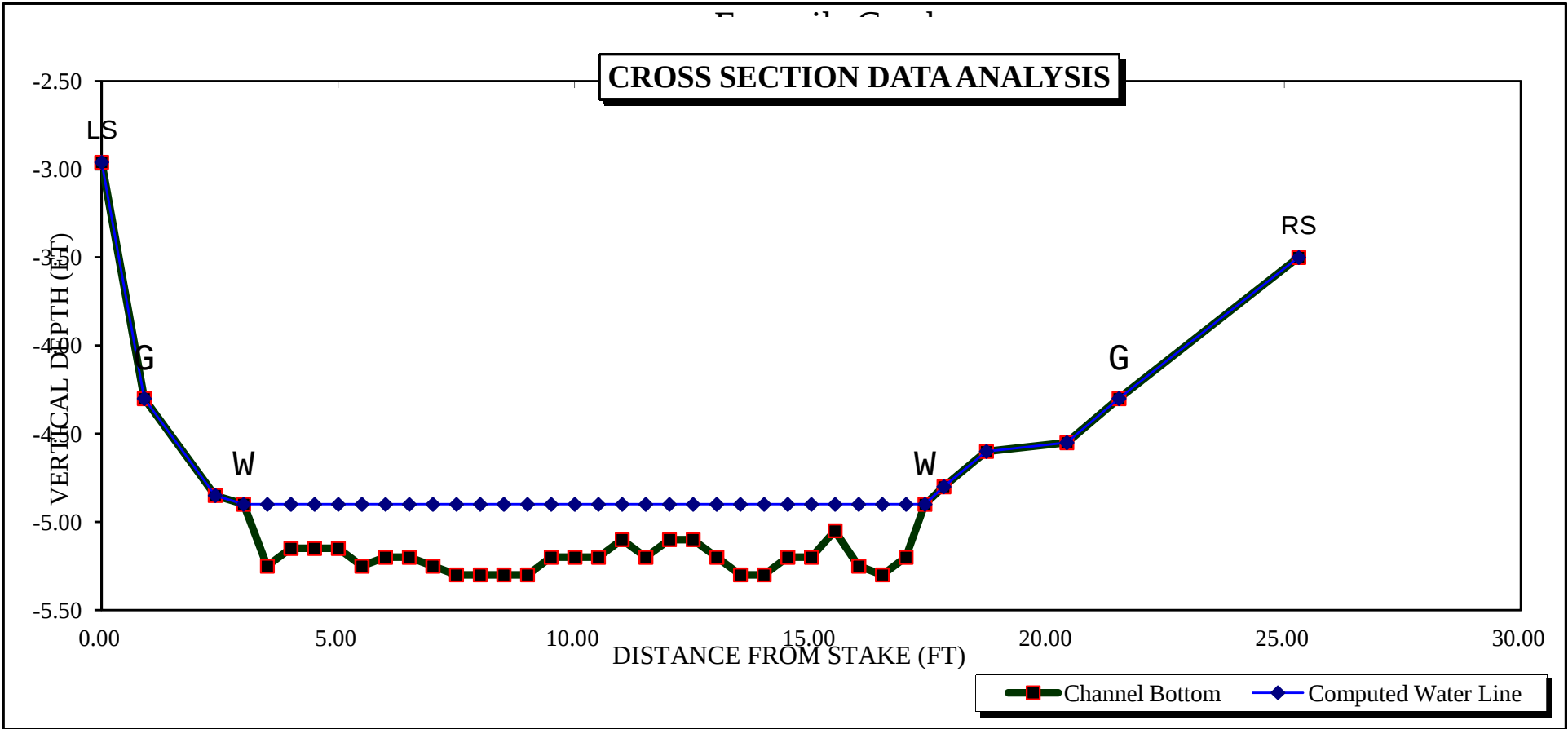
Jarrett Variable Manning's n Correction Applied

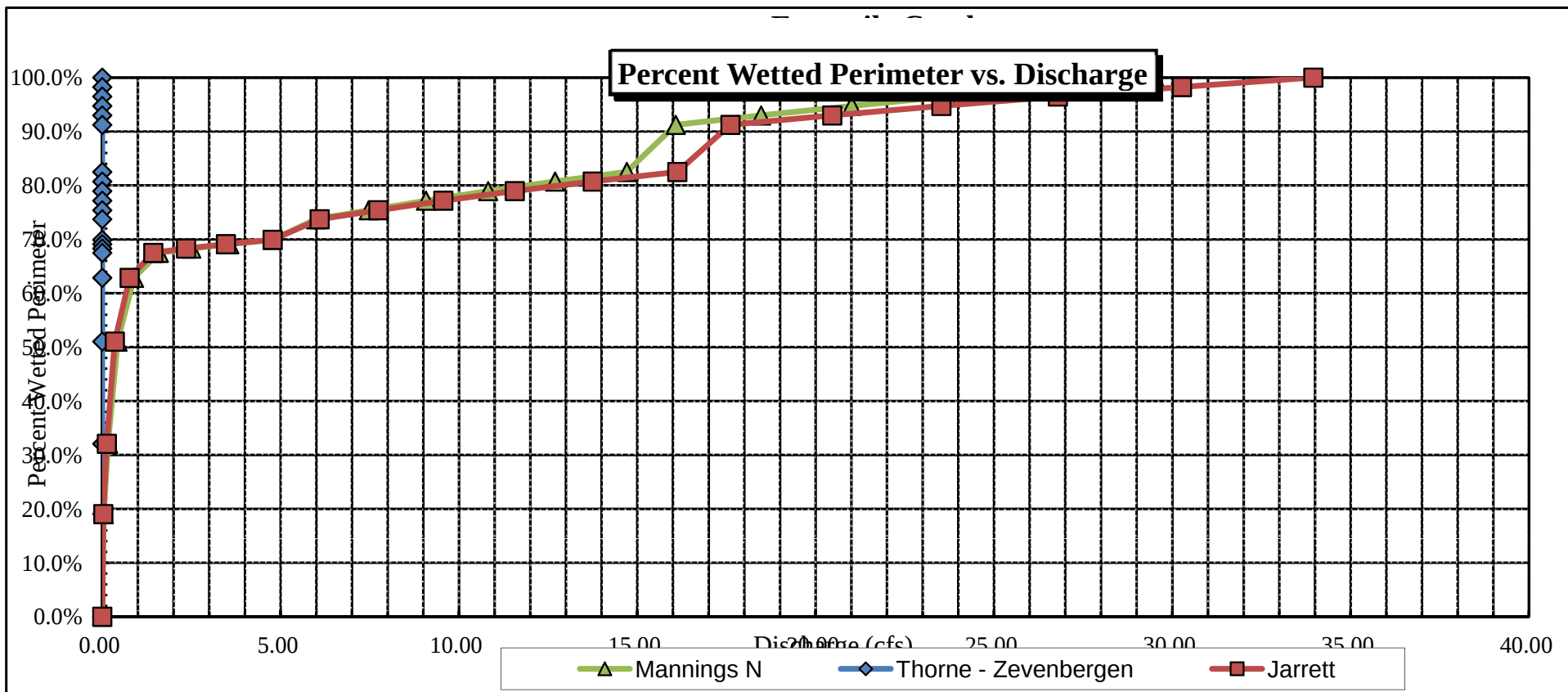
GL = lowest Grassline elevation corrected for sag

STAGING TABLE

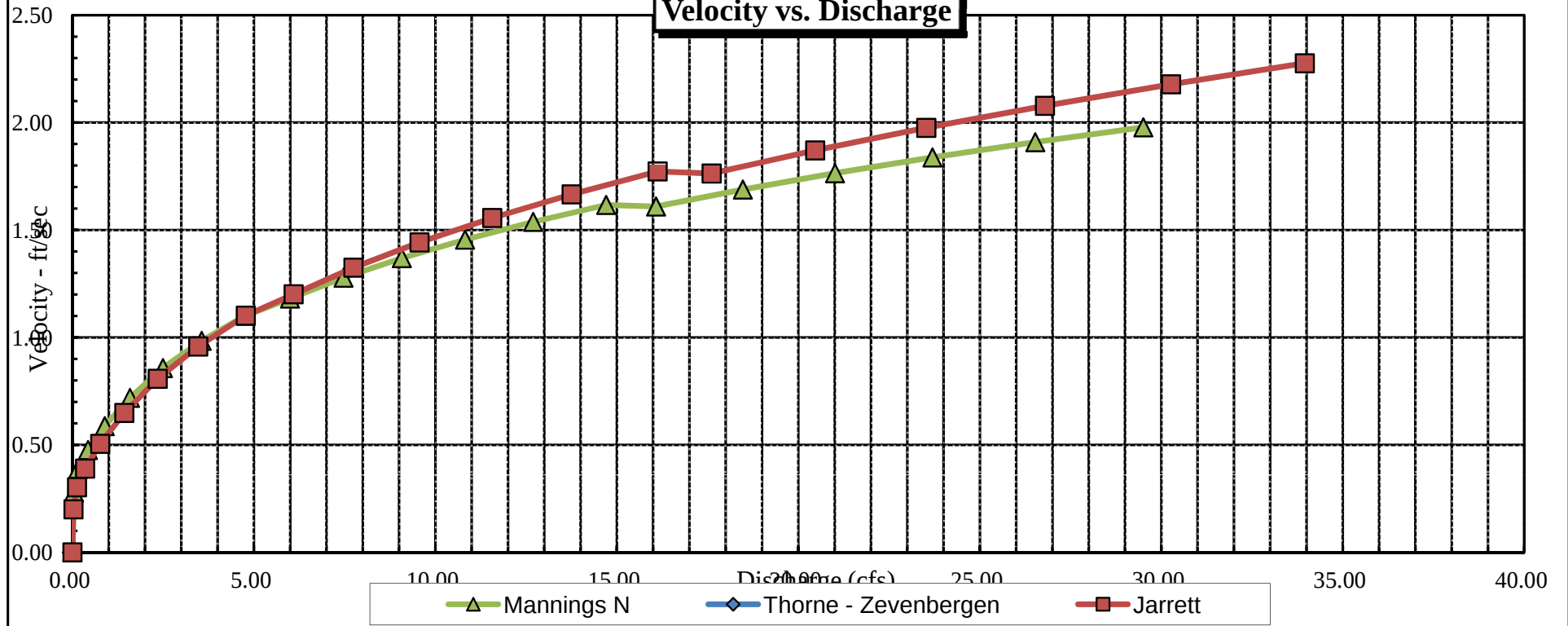
WL = Waterline corrected for variations in field measured water surface elevations and sag

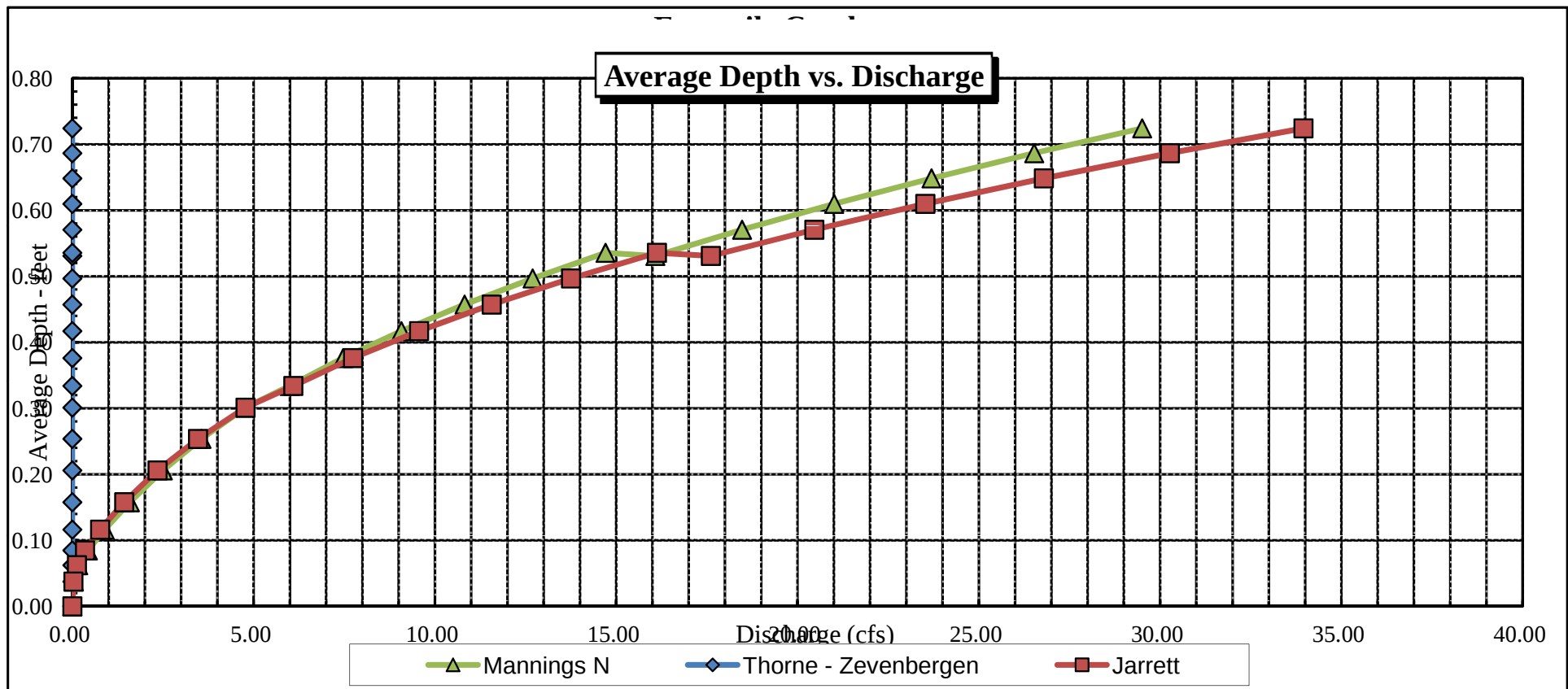
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	4.30	20.60	0.72	1.00	14.92	21.14	100.0%	0.71	33.95	2.28
	4.30	20.60	0.72	1.00	14.92	21.14	100.0%	0.71	33.95	2.28
	4.35	20.24	0.69	0.95	13.90	20.77	98.2%	0.67	30.27	2.18
	4.40	19.89	0.65	0.90	12.89	20.40	96.5%	0.63	26.79	2.08
	4.45	19.53	0.61	0.85	11.91	20.03	94.7%	0.59	23.52	1.98
	4.50	19.17	0.57	0.80	10.94	19.66	93.0%	0.56	20.46	1.87
	4.55	18.82	0.53	0.75	9.99	19.29	91.2%	0.52	17.61	1.76
	4.60	16.98	0.54	0.70	9.10	17.44	82.5%	0.52	16.12	1.77
	4.65	16.62	0.50	0.65	8.26	17.07	80.7%	0.48	13.75	1.67
	4.70	16.26	0.46	0.60	7.43	16.69	78.9%	0.45	11.57	1.56
	4.75	15.90	0.42	0.55	6.63	16.32	77.2%	0.41	9.56	1.44
	4.80	15.54	0.38	0.50	5.84	15.94	75.4%	0.37	7.74	1.32
	4.85	15.20	0.33	0.45	5.07	15.59	73.7%	0.33	6.09	1.20
WL	4.90	14.40	0.30	0.40	4.33	14.78	69.9%	0.29	4.78	1.10
	4.95	14.26	0.25	0.35	3.62	14.61	69.1%	0.25	3.47	0.96
	5.00	14.12	0.21	0.30	2.91	14.44	68.3%	0.20	2.35	0.81
	5.05	13.99	0.16	0.25	2.21	14.27	67.5%	0.15	1.43	0.65
	5.10	13.06	0.12	0.20	1.52	13.29	62.9%	0.11	0.77	0.51
	5.15	10.63	0.08	0.15	0.90	10.79	51.0%	0.08	0.35	0.39
	5.20	6.70	0.06	0.10	0.42	6.78	32.1%	0.06	0.13	0.30
	5.25	4.00	0.04	0.05	0.15	4.02	19.0%	0.04	0.03	0.20
	5.30	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!



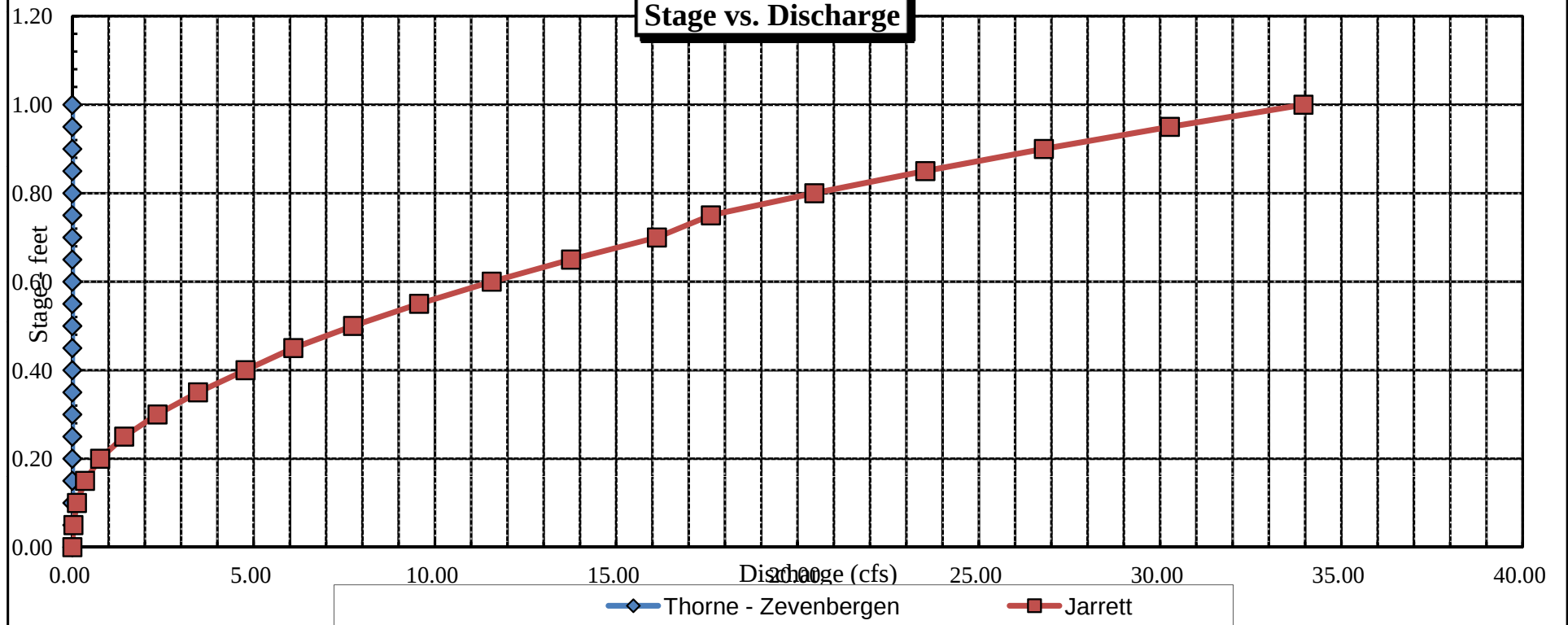


Velocity vs. Discharge





Stage vs. Discharge





COLORADO WATER
CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS



LOCATION INFORMATION

STREAM NAME: <u>Fourmile Creek</u>		CROSS-SECTION NO.: <u>1</u>
CROSS-SECTION LOCATION: <u>At BLM-USFS boundary</u>		
DATE: <u>7-8-15</u>	OBSERVERS: <u>R. Smith, E. Schorff</u>	
LEGAL DESCRIPTION	1/4 SECTION: <u>NE</u>	SECTION: <u>13</u>
COUNTY: <u>Moffat</u>	WATERSHED: <u>Little Snake</u>	TOWNSHIP: <u>10 N/S</u>
RANGE: <u>90 E/W</u>		PM: <u>Sixth</u>
WATER DIVISION: <u>6</u>		DOW WATER CODE: <u>21173</u>
MAP(S):	USGS: <u>295038</u>	USFS: <u>4521742</u>

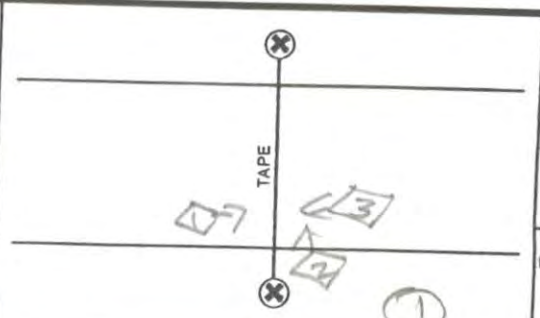
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: ☒ YES ☐ NO	METER TYPE: <u>M-M</u>
METER NUMBER:	DATE RATED:
CALIB/SPIN: _____ sec	TAPE WEIGHT: <u>surveyed</u> lbs/foot
CHANNEL BED MATERIAL SIZE RANGE: <u>2" cobble to 1-foot boulders</u>	TAPE TENSION: <u>surveyed</u> lbs
PHOTOGRAPHS TAKEN: ☒ YES ☐ NO	NUMBER OF PHOTOGRAPHS: <u>3</u>

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
(X) Tape @ Stake LB	0.0	<u>surveyed</u>
(X) Tape @ Stake RB	0.0	<u>surveyed</u>
(1) WS @ Tape LB/RB	0.0	<u>5.05/5.05</u>
(2) WS Upstream	<u>7.6</u>	<u>5.22</u>
(3) WS Downstream	<u>14.4</u>	<u>5.85</u>
SLOPE	<u>0.63 / 22.0 = 0.029</u>	

SKETCH



LEGEND:
Stake (X)
Station (1)
Photo (1)
Direction of Flow (arrow)

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: Fourmile Creek					CROSS-SECTION NO.: 1		DATE: 7-8-15		SHEET ___ OF ___			
BEGINNING OF MEASUREMENT			EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE)		LEFT / RIGHT		Gage Reading: _____ ft		TIME: 2:35 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)		Area (ft ²)	Discharge (cfs)
									At Point	Mean in Vertical		
	L.S	0.0		2.86								
	G	2.0		3.74								
		3.1		4.97								
		5.5		4.97								
	W	6.0		5.05	φ					φ		
		6.5		5.15	.1					.27		
		7		5.25	.25					.19		
		7.5		5.10	.05					.59		
		8		5.25	.2					.51		
		8.5		5.20	.15					.49		
		9		5.30	.25					.88		
		9.5		5.25	.25					1.03		
		10		5.30	.25					.89		
		10.5		5.25	.2					.53		
		11		5.05	φ					φ		
		11.5		5.30	.25					1.02		
		12		5.2	.15					.23		
		12.5		5.2	.15					.61		
		13		5.2	.15					.58		
		13.5		5.2	.15					.37		
		14		5.25	.2					.71		
		14.5		5.05	φ					φ		
		15		5.2	.15					.92		
		15.5		5.2	.15					.83		
		16		5.2	.15					.94		
		16.5		5.15	.10					.90		
		16.75		5.25	.3					1.03		
		17		5.25	.2					.81		
	W	17.2		5.05	φ					φ		
		18.9		4.34								
		20.7		3.98								
	RS+G	22.5		3.69								
TOTALS:												
End of Measurement		Time:		Gage Reading: _____ ft		CALCULATIONS PERFORMED BY:				CALCULATIONS CHECKED BY:		

COLORADO WATER CONSERVATION BOARD
INSTREAM FLOW / NATURAL LAKE LEVEL PROGRAM
STREAM CROSS-SECTION AND FLOW ANALYSIS

LOCATION INFORMATION

STREAM NAME: Fourmile Creek
XS LOCATION: At BLM-USFS boundary
XS NUMBER: 1

DATE: 8-Jul-15
OBSERVERS: R. Smith, E. Scherff

1/4 SEC: NE
SECTION: 13
TWP: 10N
RANGE: 90W
PM: Sixth

COUNTY: Moffat
WATERSHED: Little Snake
DIVISION: 6
DOW CODE: 21173

USGS MAP: 0
USFS MAP: 0

SUPPLEMENTAL DATA

*** NOTE ***

Leave TAPE WT and TENSION
at defaults for data collected
with a survey level and rod

TAPE WT: 0.0106
TENSION: 99999

CHANNEL PROFILE DATA

SLOPE: 0.029

INPUT DATA CHECKED BY:DATE.....

ASSIGNED TO:DATE.....

STREAM NAME: Fourmile Creek
 XS LOCATION: At BLM-USFS boundary
 XS NUMBER: 1

DATA POINTS= 32

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL
LS	0.00	2.86		
1 G	2.00	3.74		
	3.10	4.97		
	5.50	4.97		
W	6.00	5.05	0.00	0.00
	6.50	5.15	0.10	0.27
	7.00	5.25	0.20	0.19
	7.50	5.10	0.05	0.59
	8.00	5.25	0.20	0.51
	8.50	5.20	0.15	0.49
	9.00	5.30	0.25	0.88
	9.50	5.25	0.20	1.03
	10.00	5.30	0.25	0.89
	10.50	5.25	0.20	0.53
	11.00	5.05	0.00	0.00
	11.50	5.30	0.25	1.02
	12.00	5.20	0.15	0.23
	12.50	5.20	0.15	0.61
	13.00	5.20	0.15	0.58
	13.50	5.20	0.15	0.37
	14.00	5.25	0.20	0.71
	14.50	5.05	0.00	0.00
	15.00	5.20	0.15	0.92
	15.50	5.20	0.15	0.83
	16.00	5.20	0.15	0.94
	16.50	5.15	0.10	0.90
	16.75	5.35	0.30	1.03
	17.00	5.25	0.20	0.81
W	17.20	5.05	0.00	0.00
	18.90	4.34		
	20.70	3.98		
1 RS & G	22.50	3.69		

WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.51	0.10	0.05	0.01	1.1%
0.51	0.20	0.10	0.02	1.6%
0.52	0.05	0.03	0.01	1.2%
0.52	0.20	0.10	0.05	4.3%
0.50	0.15	0.08	0.04	3.1%
0.51	0.25	0.13	0.11	9.2%
0.50	0.20	0.10	0.10	8.6%
0.50	0.25	0.13	0.11	9.3%
0.50	0.20	0.10	0.05	4.4%
0.54		0.00	0.00	0.0%
0.56	0.25	0.13	0.13	10.7%
0.51	0.15	0.08	0.02	1.4%
0.50	0.15	0.08	0.05	3.8%
0.50	0.15	0.08	0.04	3.6%
0.50	0.15	0.08	0.03	2.3%
0.50	0.20	0.10	0.07	5.9%
0.54		0.00	0.00	0.0%
0.52	0.15	0.08	0.07	5.8%
0.50	0.15	0.08	0.06	5.2%
0.50	0.15	0.08	0.07	5.9%
0.50	0.10	0.04	0.03	2.8%
0.32	0.30	0.08	0.08	6.5%
0.27	0.20	0.04	0.04	3.1%
0.28		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%

TOTALS -----

11.63 0.3 1.71 1.19 100.0%
 (Max.)

Manning's n = 0.1007
 Hydraulic Radius= 0.14683216

STREAM NAME: Fourmile Creek
 XS LOCATION: At BLM-USFS boundary
 XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	1.71	1.71	0.0%
4.80	1.71	5.11	199.2%
4.82	1.71	4.81	181.8%
4.84	1.71	4.52	164.5%
4.86	1.71	4.22	147.3%
4.88	1.71	3.93	130.2%
4.90	1.71	3.64	113.2%
4.92	1.71	3.35	96.2%
4.94	1.71	3.06	79.3%
4.96	1.71	2.77	62.5%
4.98	1.71	2.51	47.2%
5.00	1.71	2.28	33.4%
5.01	1.71	2.16	26.6%
5.02	1.71	2.05	19.9%
5.03	1.71	1.93	13.2%
5.04	1.71	1.82	6.6%
5.05	1.71	1.71	0.0%
5.06	1.71	1.60	-6.5%
5.07	1.71	1.49	-12.9%
5.08	1.71	1.38	-19.2%
5.09	1.71	1.27	-25.5%
5.10	1.71	1.17	-31.6%
5.12	1.71	0.96	-43.5%
5.14	1.71	0.77	-54.8%
5.16	1.71	0.59	-65.6%
5.18	1.71	0.42	-75.6%
5.20	1.71	0.26	-84.9%
5.22	1.71	0.17	-90.1%
5.24	1.71	0.10	-94.2%
5.26	1.71	0.05	-97.1%
5.28	1.71	0.02	-99.0%
5.30	1.71	0.00	-99.7%

WATERLINE AT ZERO

AREA ERROR = 5.050

STREAM NAME: Fourmile Creek
 XS LOCATION: At BLM-USFS boundary
 XS NUMBER: 1

Constant Manning's n

GL = lowest Grassline elevation corrected for sag

STAGING TABLE

WL = Waterline corrected for variations in field measured water surface elevations and sag

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	3.74	20.19	1.15	1.61	23.20	21.37	100.0%	1.09	61.59	2.65
	4.05	18.07	0.96	1.30	17.28	19.09	89.3%	0.91	40.64	2.35
	4.10	17.78	0.92	1.25	16.38	18.77	87.8%	0.87	37.61	2.30
	4.15	17.48	0.89	1.20	15.50	18.45	86.3%	0.84	34.70	2.24
	4.20	17.19	0.85	1.15	14.64	18.12	84.8%	0.81	31.90	2.18
	4.25	16.89	0.82	1.10	13.78	17.80	83.3%	0.77	29.21	2.12
	4.30	16.60	0.78	1.05	12.95	17.48	81.8%	0.74	26.63	2.06
	4.35	16.33	0.74	1.00	12.12	17.18	80.4%	0.71	24.15	1.99
	4.40	16.17	0.70	0.95	11.31	16.99	79.5%	0.67	21.68	1.92
	4.45	16.00	0.66	0.90	10.51	16.79	78.6%	0.63	19.32	1.84
	4.50	15.84	0.61	0.85	9.71	16.59	77.6%	0.59	17.08	1.76
	4.55	15.67	0.57	0.80	8.92	16.40	76.7%	0.54	14.95	1.68
	4.60	15.51	0.53	0.75	8.14	16.20	75.8%	0.50	12.94	1.59
	4.65	15.34	0.48	0.70	7.37	16.00	74.9%	0.46	11.05	1.50
	4.70	15.18	0.44	0.65	6.61	15.81	74.0%	0.42	9.29	1.41
	4.75	15.02	0.39	0.60	5.85	15.61	73.0%	0.38	7.65	1.31
	4.80	14.85	0.34	0.55	5.11	15.41	72.1%	0.33	6.15	1.20
	4.85	14.69	0.30	0.50	4.37	15.22	71.2%	0.29	4.78	1.09
	4.90	14.52	0.25	0.45	3.64	15.02	70.3%	0.24	3.56	0.98
	4.95	14.36	0.20	0.40	2.92	14.82	69.3%	0.20	2.48	0.85
	5.00	11.63	0.20	0.35	2.28	12.08	56.5%	0.19	1.88	0.83
WL	5.05	11.20	0.15	0.30	1.71	11.63	54.4%	0.15	1.19	0.70
	5.10	10.38	0.11	0.25	1.17	10.75	50.3%	0.11	0.67	0.57
	5.15	9.23	0.07	0.20	0.68	9.52	44.5%	0.07	0.29	0.43
	5.20	5.02	0.05	0.15	0.26	5.21	24.4%	0.05	0.09	0.34
	5.25	2.48	0.03	0.10	0.07	2.56	12.0%	0.03	0.02	0.23
	5.30	0.19	0.02	0.05	0.00	0.21	1.0%	0.02	0.00	0.20

STREAM NAME: Fourmile Creek
XS LOCATION: At BLM-USFS boundary
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	1.19 cfs
CALCULATED FLOW (Qc)=	1.19 cfs
(Qm-Qc)/Qm * 100 =	0.0 %
MEASURED WATERLINE (WLm)=	5.05 ft
CALCULATED WATERLINE (WLc)=	5.05 ft
(WLm-WLc)/WLm * 100 =	0.0 %
MAX MEASURED DEPTH (Dm)=	0.30 ft
MAX CALCULATED DEPTH (Dc)=	0.30 ft
(Dm-Dc)/Dm * 100	0.0 %
MEAN VELOCITY=	0.70 ft/sec
MANNING'S N=	0.101
SLOPE=	0.029 ft/ft
.4 * Qm =	0.5 cfs
2.5 * Qm=	3.0 cfs

RECOMMENDED INSTREAM FLOW:
=====

FLOW (CFS)	PERIOD
=====	=====

RATIONALE FOR RECOMMENDATION:
=====

[illegible]

RECOMMENDATION BY: AGENCY..... DATE:.....

CWCB REVIEW BY: DATE:

STREAM NAME: Fourmile Creek
 XS LOCATION: At BLM-USFS boundary
 XS NUMBER: 1

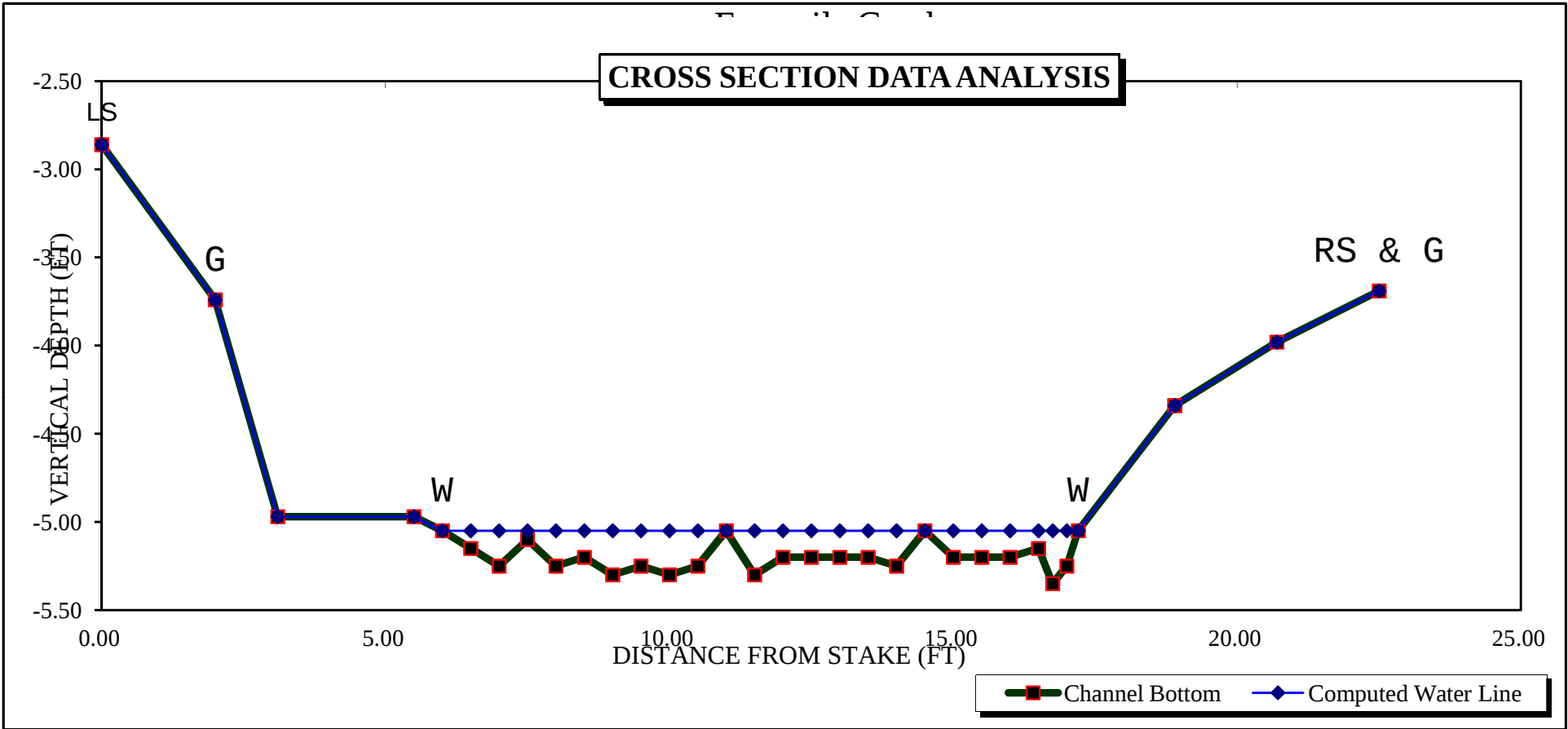
Jarrett Variable Manning's n Correction Applied

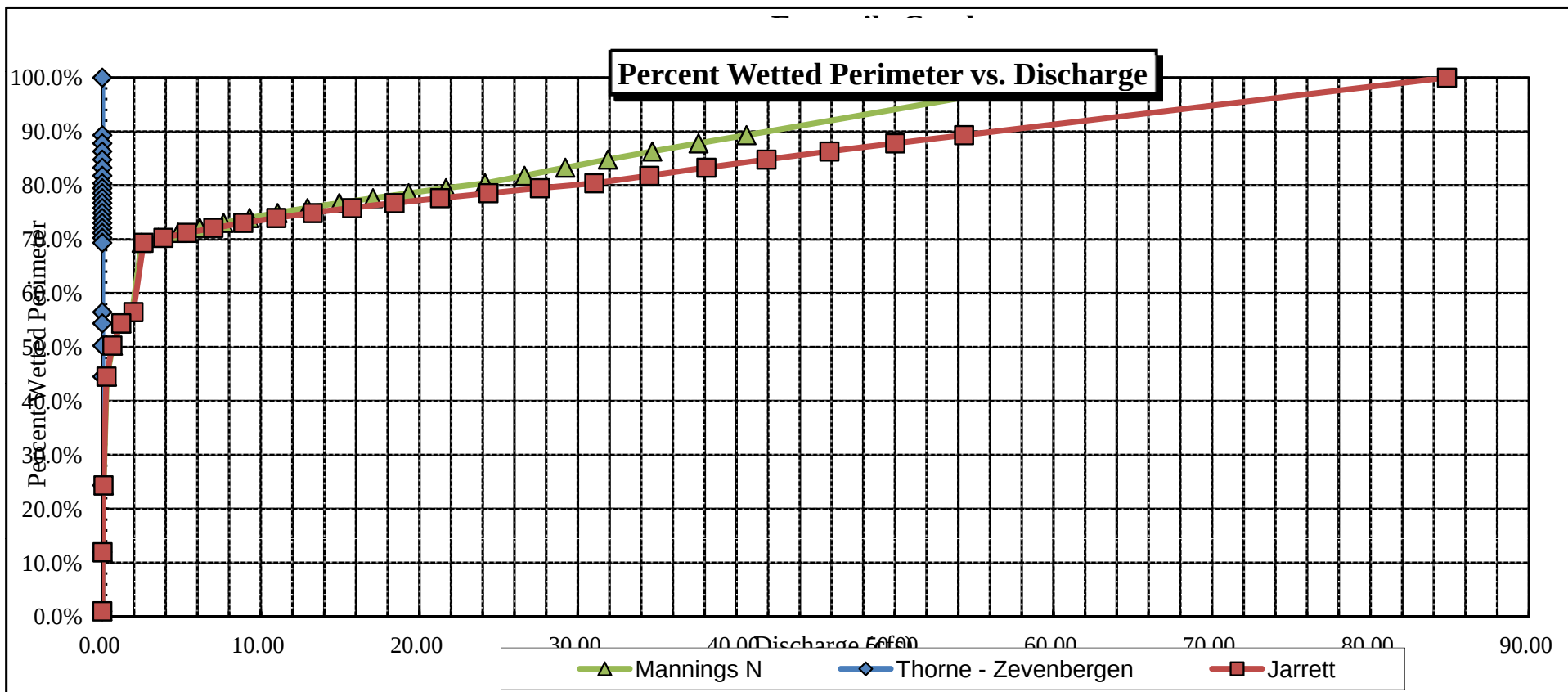
GL = lowest Grassline elevation corrected for sag

STAGING TABLE

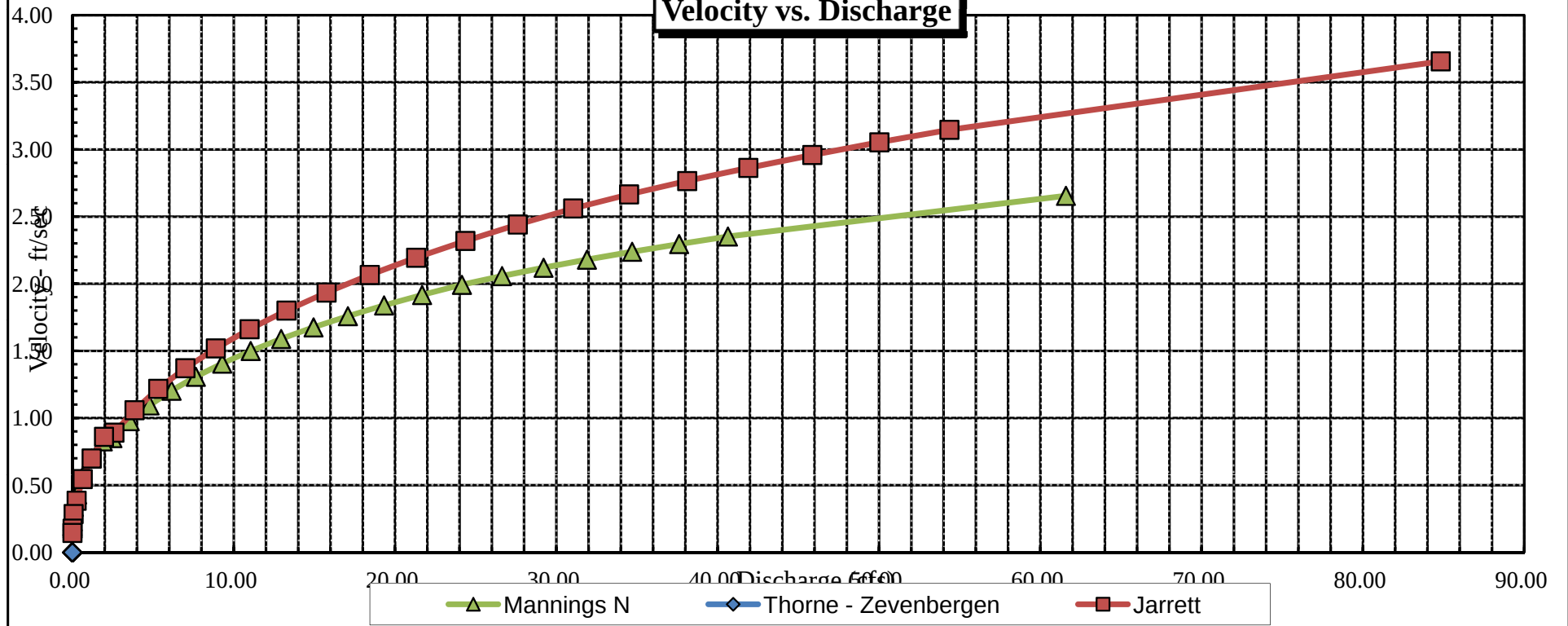
WL = Waterline corrected for variations in field measured water surface elevations and sag

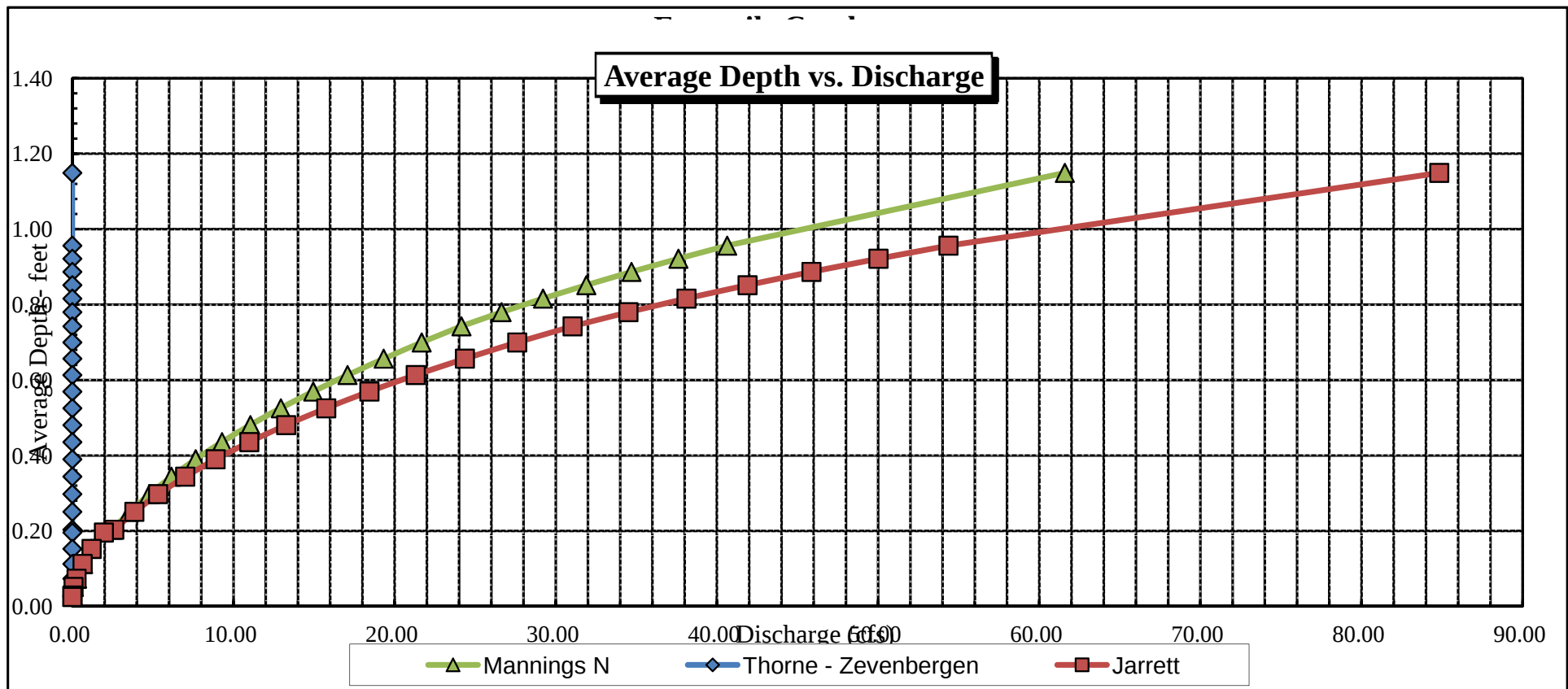
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	3.74	20.19	1.15	1.61	23.20	21.37	100.0%	1.09	84.82	3.66
	4.05	18.07	0.96	1.30	17.28	19.09	89.3%	0.91	54.36	3.15
	4.10	17.78	0.92	1.25	16.38	18.77	87.8%	0.87	50.02	3.05
	4.15	17.48	0.89	1.20	15.50	18.45	86.3%	0.84	45.87	2.96
	4.20	17.19	0.85	1.15	14.64	18.12	84.8%	0.81	41.90	2.86
	4.25	16.89	0.82	1.10	13.78	17.80	83.3%	0.77	38.11	2.76
	4.30	16.60	0.78	1.05	12.95	17.48	81.8%	0.74	34.50	2.67
	4.35	16.33	0.74	1.00	12.12	17.18	80.4%	0.71	31.04	2.56
	4.40	16.17	0.70	0.95	11.31	16.99	79.5%	0.67	27.61	2.44
	4.45	16.00	0.66	0.90	10.51	16.79	78.6%	0.63	24.36	2.32
	4.50	15.84	0.61	0.85	9.71	16.59	77.6%	0.59	21.30	2.19
	4.55	15.67	0.57	0.80	8.92	16.40	76.7%	0.54	18.43	2.07
	4.60	15.51	0.53	0.75	8.14	16.20	75.8%	0.50	15.76	1.93
	4.65	15.34	0.48	0.70	7.37	16.00	74.9%	0.46	13.27	1.80
	4.70	15.18	0.44	0.65	6.61	15.81	74.0%	0.42	10.98	1.66
	4.75	15.02	0.39	0.60	5.85	15.61	73.0%	0.38	8.89	1.52
	4.80	14.85	0.34	0.55	5.11	15.41	72.1%	0.33	7.00	1.37
	4.85	14.69	0.30	0.50	4.37	15.22	71.2%	0.29	5.32	1.22
	4.90	14.52	0.25	0.45	3.64	15.02	70.3%	0.24	3.85	1.06
	4.95	14.36	0.20	0.40	2.92	14.82	69.3%	0.20	2.60	0.89
	5.00	11.63	0.20	0.35	2.28	12.08	56.5%	0.19	1.96	0.86
WL	5.05	11.20	0.15	0.30	1.71	11.63	54.4%	0.15	1.19	0.70
	5.10	10.38	0.11	0.25	1.17	10.75	50.3%	0.11	0.64	0.55
	5.15	9.23	0.07	0.20	0.68	9.52	44.5%	0.07	0.26	0.38
	5.20	5.02	0.05	0.15	0.26	5.21	24.4%	0.05	0.07	0.29
	5.25	2.48	0.03	0.10	0.07	2.56	12.0%	0.03	0.01	0.18
	5.30	0.19	0.02	0.05	0.00	0.21	1.0%	0.02	0.00	0.14



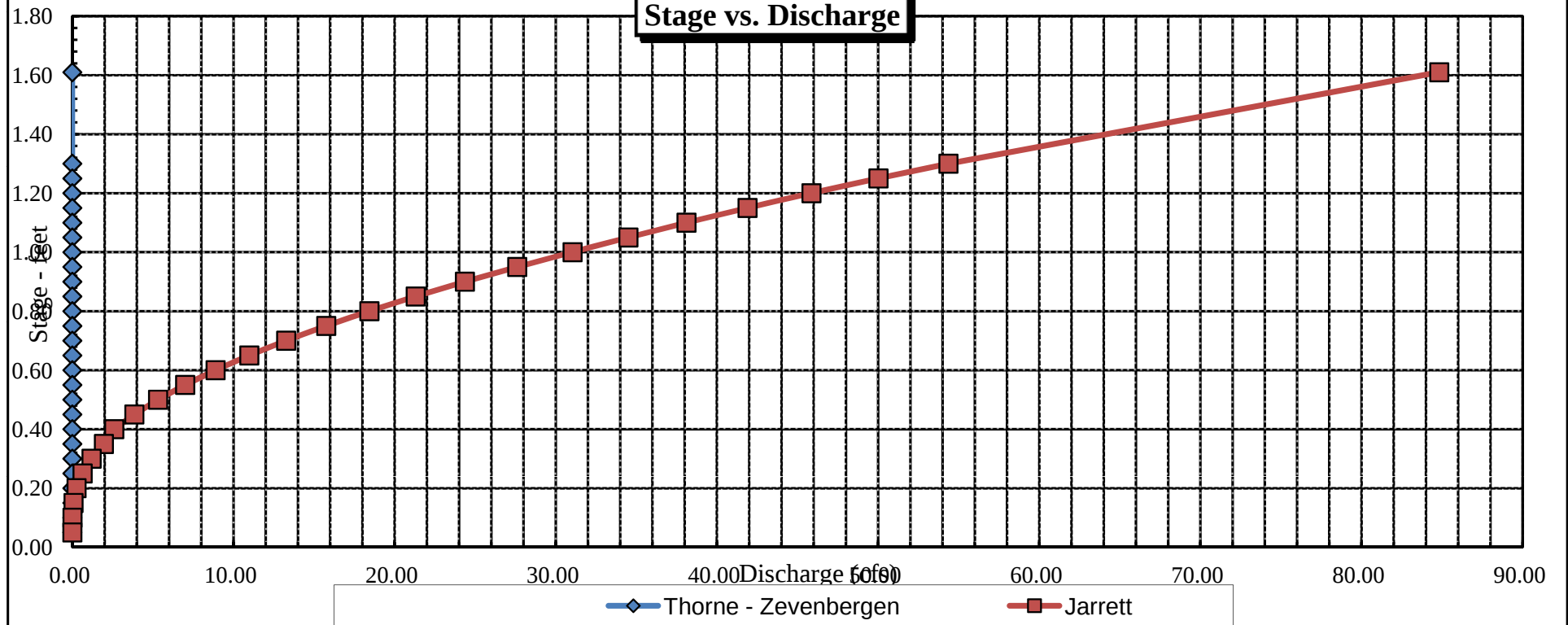


Velocity vs. Discharge





Stage vs. Discharge



Little Snake Field Office Stream Surveys

July 2008

Fourmile Creek - Water Code #21173

Fourmile Creek, north of Craig, CO and located on BLM lands managed by the Little Snake Field Office and USFS lands managed by the Routt National Forest was sampled on July 29, 2008. Fourmile Creek is tributary to the Little Snake River. Presence/absence sampling was done to collect fin clips from suspected Colorado River cutthroat trout to determine genetic purity. Sampling was conducted via backpack electro-shocker and two sites were sampled – see map below. Personnel present were Gregor Dekleva, BLM, and Rick Henderson and Chris Carroll, USFS.



Fourmile creek lower site



Colorado River cutthroat trout



Colorado River cutthroat trout

STREAM SURVEY FISH SAMPLING FORM

WATER Fourmile Creek H2O CODE 21173 DATE 7/29/08

GEAR BPE EFFORT ~250ft STATION # 1 PASS # 1

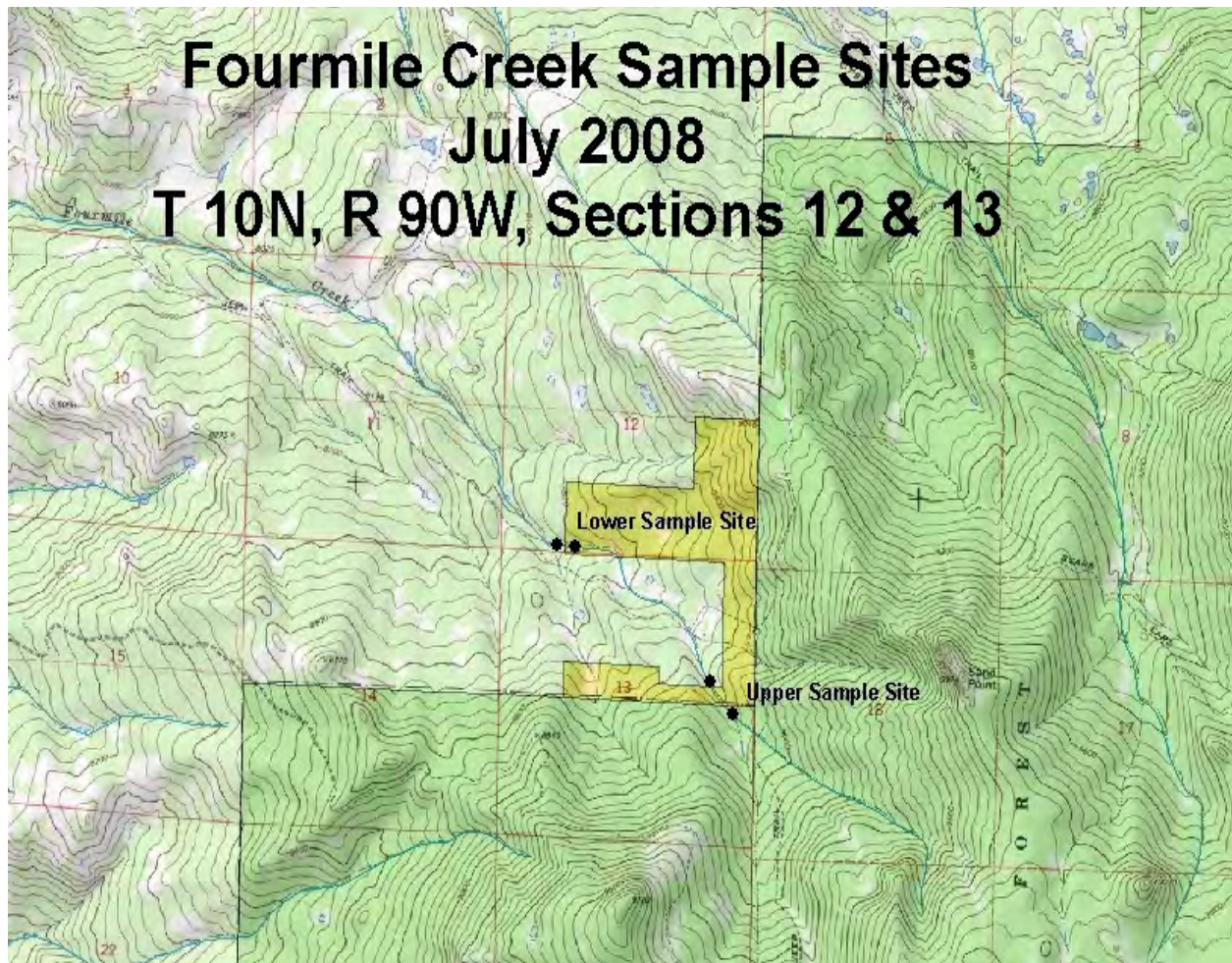
CREW Dekleva, Carroll, Womble DRAINAGE Yampa LOCATION GPS

Pass	species	length	weight		species	length	weight	Pass
1	CRN	91	5					
1	CRN	90	5					
1	CRN	92	5					
1	CRN	120	24					
1	CRN	125	26					
1	CRN	150	32					
1	CRN	190	61					
1	CRN	100	24					
1	CRN	180	58					
1	CRN	140	26					
1	CRN	120	21					
1	CRN	235	120					
1	CRN	230	110					
1	CRN	90	6					
1	CRN	90	6					
1	CRN	200	87					
1	CRN	175	54					
1	CRN	170	47					
1	CRN	160	39					

GPS Location: MAP

Notes: Stream Width 5 ft. Sample Reach ~250 ft.

Conductivity: Electroshocker settings



Discussion:

Fourmile Creek was sampled near the headwaters on BLM and USFS lands. The stream appears to be in good condition. Riparian vegetation is in excellent shape with a good diversity of plant species present including willows, sedges, aspen, and spruce. Stream cover was good and there are several beaver ponds located on private land between the two BLM sections. The stream contains a good mix of micro-habitats with adequate pools present for oversummer and overwinter survival.

Of the nineteen Colorado River cutthroat trout collected, 14 had fin clips taken – all from the lower sample area. At least three age classes of fish were observed. In the upper sample site one Colorado River cutthroat trout was seen but not netted. Fish appeared healthy and aquatic insects were abundant consisting primarily of caddis and mayflies.

Recommendations:

- Conduct additional sampling of the creek to determine upper and lower distribution limits of cutthroat
- Complete a population estimate
- Collect a minimum of fifteen more adult fish for fin clip genetic analysis













