DRAFT RECOMMENDATION–January 2016 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 increase of an existing instream flow water right on a portion of the Piney River, located in Water Division 4.

Location and Land Status. Slater Creek originates on the west side of Diamond Mountain in the Elkhead Mountains, approximately 25 miles northeast of Hayden. The subject of this recommendation is a reach that begins at confluence with Beaver Creek and extends to the headgate of the Slater Fork Ditch, a distance of approximately 9.25 stream miles. The BLM manages approximately 0.65 miles of this reach and 8.6 miles are in private ownership. .

Existing Instream Flow Water Rights. The Colorado Water Conservation Board appropriated an instream flow water right on the upper portion of the Slater Creek, from the headwaters to the US Forest Service boundary, in 1977. This recommendation focuses on a portion of Slater Creek which currently has no instream flow protection.

Biological Summary. Slater Creek is a cold-water, moderate to high gradient stream. It flows through a canyon with a valley floor approximately one-fourth mile to one half mile in width. The stream cuts through alluvial deposits in the valley and is confined by bedrock in some locations. The stream generally has large substrate, consisting of mostly of small cobbles and boulders of up to two feet in diameter. The stream has a good mix of swift runs, riffles, and pools in meander bends.

Fisheries surveys have revealed a self-sustaining native fish population comprised of bluehead sucker, speckled dace, and mottled sculpin. The fish population also includes fathead minnow and creek chub, which are nonnative species. 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 narrowleaf cottonwood, alder, willows, sedges, and rushes. The riparian community is in generally in good condition. Given the wide channel, the riparian community provides some, but not extensive, shading and cover for fish.

R2Cross Analysis. The BLM collected the following R2Cross data from Slater 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)
07/08/2015 #1	50.47 cfs	58.2 feet	Out of range	34.06 cfs
07/08/2015 #2	50.93 cfs	76.1 feet	28.97 cfs	77.75 cfs
06/16/2015 #1	123.16 cfs	79.1 feet	51.34 cfs	57.50 cfs
		Averages:	40.16 cfs	56.44 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.

> 56.0 cubic feet per second is recommended during the snow melt runoff period from April 16 to June 30. This recommendation is driven by the average depth criteria. Slater Creek experiences significant icing during the winter months. 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. It is also important to make as much physical habitat as possible available to fish who enter Slater Creek from the Little Snake River. Finally, this flowrate should help recharge alluvial aquifers along Slater Creek that are important for sustaining the riparian community during annual low flow periods.
>
> 40.0 cubic feet per second is recommended from July 1 through September 30. This is the highest water temperature period of the year, so it is important to protect sufficient flow rates to keep water temperatures stable and within the tolerance range for native species. This recommendation meets two of the three instream flow criteria, and is driven by the velocity and wetted perimeter criteria.
>
> 17.0 cubic feet per second is recommended during the period from October 1 to April 15. This recommendation is driven by limited water availability. This flow rate should prevent pools from freezing, allowing the fish population to successfully overwinter.

Water Availability. The BLM recommends relying upon USGS Gage 09255000 for Slater Fork near Slater, CO. This gage is located just downstream from the proposed lower terminus for the instream flow water right, and this gage has a long period of record. Adjustments will need to be made to this gage for diversions that occur in upstream locations.

The BLM is aware of the following water rights located within the proposed instream flow reach:

Mary Hoffman 1 Ditch – 2.33 cfs (1892 priority)

Mary Hoffman 2 Ditch – 1.67 cfs (1892 priority)
Rochelle 1 Ditch – 3.0 cfs (1961 priority)
Rochelle 2 Ditch – 2.0 cfs (1961 priority)

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

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Slater Creek | CROSS-SECTION NO.: 1

CROSS-SECTION LOCATION: 200 ft. downstream from Mary E Hoffman Ditch headgate

DATE: 6-16-15 | OBSERVERS: R. Smith, E. Scherff

LEGAL DESCRIPTION	¼ SECTION:	SECTION:	TOWNSHIP:	RANGE:	PM:
	NE	4	11 (N/S)	89 (E/W)	6th

COUNTY:	WATERSHED:	WATER DIVISION:	DOW WATER CODE:
Moffat	Little Snake	6	21953

MAP(S): USGS: Zone 13 299499 4534973

USFS:

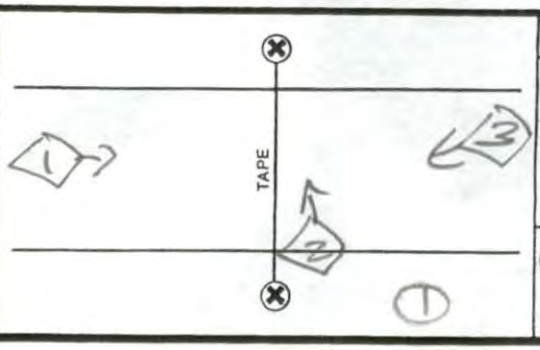
SUPPLEMENTAL DATA

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: ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: sand to 8" cobble		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	5.0/5.0
(2) WS Upstream	45.0	5.06
(3) WS Downstream	62.5	5.33
SLOPE	0.27/107.5 =	

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:

mayfly, caddisfly, beetles, worms

COMMENTS

TDS =

Ph =

Cond =

Salinity =

Riparian = cottonwood - alder sedges

FORM #ISF FD 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Slater Creek | CROSS-SECTION NO.: 1 | DATE: 6-16-15 | SHEET ___ OF ___

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT | Gage Reading: _____ ft | TIME: 1:10 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)
LS	0.0		1.57								
	3.2		2.37								
G	3.6		2.68								
W	5.4		5.00								
	7		5.85	0.85				.67			
	9		6.65	1.65				.99			
	11		6.8	1.80				1.16			
	13		6.6	1.60				1.05			
	15		6.3	1.30				1.26			
	17		6.15	1.15				1.24			
	19		6.0	1.00				1.35			
	21		6.20	1.20				1.52			
	23		6.5	1.50				2.18			
	25		6.75	1.75				2.14			
	27		6.8	1.80				1.90			
	29		6.9	1.90				2.16			
	31		6.8	1.80				2.41			
	33		6.6	1.60				2.90			
	35		6.4	1.40				2.75			
	37		6.3	1.30				2.30			
	39		6.0	1.00				2.54			
	41		5.95	.95				2.01			
	43		6.05	1.05				2.73			
	45		6.0	1.00				2.50			
	47		6.0	1.00				2.42			
	49		5.9	.90				1.82			
	51		5.85	.85				2.16			
	53		5.70	.70				2.35			
	55		5.50	.50				1.32			
	57		5.35	.35				1.50			
	59		5.30	.30				1.51			
	61		5.25	.25				0.47			
W	62.0		5.00								
	75.0		4.05								
G	82.8		2.66								
RS	85.0		2.30								
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:	Slater Creek
XS LOCATION:	200 ft ds from Mary Hoffman Ditch hdgt
XS NUMBER:	1
DATE:	16-Jun-15
OBSERVERS:	R. Smith, E. Scherff
1/4 SEC:	NE
SECTION:	4
TWP:	11N
RANGE:	89W
PM:	Sixth
COUNTY:	Moffat
WATERSHED:	Little Snake
DIVISION:	6
DOW CODE:	21953
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

		*** NOTE ***
		Leave TAPE WT and TENSION
		at defaults for data collected
TAPE WT:	0.0106	with a survey level and rod
TENSION:	99999	

CHANNEL PROFILE DATA

SLOPE:	0.0025

INPUT DATA CHECKED BY: .....DATE.....

ASSIGNED TO: ….....……..…….....DATE.....

STREAM NAME: Slater Creek
XS LOCATION: 200 ft ds from Mary Hoffman Ditch hdgt
XS NUMBER: 1

DATA POINTS= 36

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
	LS	0.00	1.57			0.00		0.00	0.00	0.0%
		3.20	2.37			0.00		0.00	0.00	0.0%
1	G	3.60	2.68			0.00		0.00	0.00	0.0%
	W	5.40	5.00	0.00	0.00	0.00		0.00	0.00	0.0%
		7.00	5.85	0.85	0.67	1.81	0.85	1.53	1.03	0.8%
		9.00	6.65	1.65	0.99	2.15	1.65	3.30	3.27	2.7%
		11.00	6.80	1.80	1.16	2.01	1.80	3.60	4.18	3.4%
		13.00	6.60	1.60	1.05	2.01	1.60	3.20	3.36	2.7%
		15.00	6.30	1.30	1.26	2.02	1.30	2.60	3.28	2.7%
		17.00	6.15	1.15	1.24	2.01	1.15	2.30	2.85	2.3%
		19.00	6.00	1.00	1.35	2.01	1.00	2.00	2.70	2.2%
		21.00	6.20	1.20	1.52	2.01	1.20	2.40	3.65	3.0%
		23.00	6.50	1.50	2.18	2.02	1.50	3.00	6.54	5.3%
		25.00	6.75	1.75	2.14	2.02	1.75	3.50	7.49	6.1%
		27.00	6.80	1.80	1.90	2.00	1.80	3.60	6.84	5.6%
		29.00	6.90	1.90	2.16	2.00	1.90	3.80	8.21	6.7%
		31.00	6.80	1.80	2.41	2.00	1.80	3.60	8.68	7.0%
		33.00	6.60	1.60	2.90	2.01	1.60	3.20	9.28	7.5%
		35.00	6.40	1.40	2.75	2.01	1.40	2.80	7.70	6.3%
		37.00	6.30	1.30	2.30	2.00	1.30	2.60	5.98	4.9%
		39.00	6.00	1.00	2.54	2.02	1.00	2.00	5.08	4.1%
		41.00	5.95	0.95	2.01	2.00	0.95	1.90	3.82	3.1%
		43.00	6.05	1.05	2.73	2.00	1.05	2.10	5.73	4.7%
		45.00	6.00	1.00	2.50	2.00	1.00	2.00	5.00	4.1%
		47.00	6.00	1.00	2.42	2.00	1.00	2.00	4.84	3.9%
		49.00	5.90	0.90	1.82	2.00	0.90	1.80	3.28	2.7%
		51.00	5.85	0.85	2.16	2.00	0.85	1.70	3.67	3.0%
		53.00	5.70	0.70	2.35	2.01	0.70	1.40	3.29	2.7%
		55.00	5.50	0.50	1.32	2.01	0.50	1.00	1.32	1.1%
		57.00	5.35	0.35	1.50	2.01	0.35	0.70	1.05	0.9%
		59.00	5.30	0.30	1.51	2.00	0.30	0.60	0.91	0.7%
		61.00	5.25	0.25	0.42	2.00	0.25	0.38	0.16	0.1%
	W	62.00	5.00	0.00	0.00	1.03		0.00	0.00	0.0%
		75.00	4.05			0.00		0.00	0.00	0.0%
1	G	82.80	2.66			0.00		0.00	0.00	0.0%
	RS	85.00	2.30			0.00		0.00	0.00	0.0%
	TOTALS ----------					57.17	1.9 (Max.)	64.61	123.16	100.0%

Manning's n = 0.0423
Hydraulic Radius= 1.12998152

STREAM NAME: Slater Creek
XS LOCATION: 200 ft ds from Mary Hoffman Ditch hdgt
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	64.61	64.61	0.0%
4.75	64.61	79.21	22.6%
4.77	64.61	78.01	20.7%
4.79	64.61	76.81	18.9%
4.81	64.61	75.62	17.1%
4.83	64.61	74.44	15.2%
4.85	64.61	73.26	13.4%
4.87	64.61	72.09	11.6%
4.89	64.61	70.92	9.8%
4.91	64.61	69.76	8.0%
4.93	64.61	68.60	6.2%
4.95	64.61	67.45	4.4%
4.96	64.61	66.88	3.5%
4.97	64.61	66.31	2.6%
4.98	64.61	65.74	1.8%
4.99	64.61	65.17	0.9%
5.00	64.61	64.61	0.0%
5.01	64.61	64.04	-0.9%
5.02	64.61	63.48	-1.7%
5.03	64.61	62.91	-2.6%
5.04	64.61	62.35	-3.5%
5.05	64.61	61.78	-4.4%
5.07	64.61	60.66	-6.1%
5.09	64.61	59.54	-7.8%
5.11	64.61	58.42	-9.6%
5.13	64.61	57.30	-11.3%
5.15	64.61	56.18	-13.0%
5.17	64.61	55.07	-14.8%
5.19	64.61	53.96	-16.5%
5.21	64.61	52.85	-18.2%
5.23	64.61	51.74	-19.9%
5.25	64.61	50.64	-21.6%

WATERLINE AT ZERO
AREA ERROR = 5.000

STREAM NAME: Slater Creek
XS LOCATION: 200 ft ds from Mary Hoffman Ditch hdgt
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	2.68	79.09	2.87	4.22	227.26	80.95	100.0%	2.81	794.74	3.50
	4.00	70.66	1.82	2.90	128.42	71.76	88.6%	1.79	332.66	2.59
	4.05	70.34	1.78	2.85	124.90	71.41	88.2%	1.75	318.61	2.55
	4.10	69.61	1.74	2.80	121.40	70.66	87.3%	1.72	306.02	2.52
	4.15	68.89	1.71	2.75	117.94	69.91	86.4%	1.69	293.69	2.49
	4.20	68.17	1.68	2.70	114.51	69.16	85.4%	1.66	281.63	2.46
	4.25	67.44	1.65	2.65	111.12	68.41	84.5%	1.62	269.82	2.43
	4.30	66.72	1.62	2.60	107.77	67.66	83.6%	1.59	258.27	2.40
	4.35	66.00	1.58	2.55	104.45	66.91	82.7%	1.56	246.98	2.36
	4.40	65.28	1.55	2.50	101.17	66.16	81.7%	1.53	235.95	2.33
	4.45	64.55	1.52	2.45	97.92	65.42	80.8%	1.50	225.17	2.30
	4.50	63.83	1.48	2.40	94.71	64.67	79.9%	1.46	214.65	2.27
	4.55	63.11	1.45	2.35	91.54	63.92	79.0%	1.43	204.38	2.23
	4.60	62.38	1.42	2.30	88.40	63.17	78.0%	1.40	194.36	2.20
	4.65	61.66	1.38	2.25	85.30	62.42	77.1%	1.37	184.59	2.16
	4.70	60.94	1.35	2.20	82.24	61.67	76.2%	1.33	175.07	2.13
	4.75	60.21	1.32	2.15	79.21	60.92	75.3%	1.30	165.80	2.09
	4.80	59.49	1.28	2.10	76.21	60.17	74.3%	1.27	156.78	2.06
	4.85	58.77	1.25	2.05	73.26	59.42	73.4%	1.23	148.01	2.02
	4.90	58.05	1.21	2.00	70.34	58.67	72.5%	1.20	139.48	1.98
	4.95	57.32	1.18	1.95	67.45	57.92	71.6%	1.16	131.20	1.95
WL	5.00	56.60	1.14	1.90	64.60	57.17	70.6%	1.13	123.16	1.91
	5.05	56.31	1.10	1.85	61.78	56.86	70.2%	1.09	114.74	1.86
	5.10	56.01	1.05	1.80	58.97	56.55	69.9%	1.04	106.58	1.81
	5.15	55.72	1.01	1.75	56.18	56.24	69.5%	1.00	98.66	1.76
	5.20	55.42	0.96	1.70	53.40	55.92	69.1%	0.95	91.00	1.70
	5.25	55.13	0.92	1.65	50.64	55.61	68.7%	0.91	83.60	1.65
	5.30	53.04	0.90	1.60	47.93	53.50	66.1%	0.90	78.28	1.63
	5.35	50.94	0.89	1.55	45.34	51.40	63.5%	0.88	73.27	1.62
	5.40	50.18	0.85	1.50	42.81	50.62	62.5%	0.85	67.27	1.57
	5.45	49.42	0.82	1.45	40.32	49.85	61.6%	0.81	61.50	1.53
	5.50	48.66	0.78	1.40	37.87	49.07	60.6%	0.77	55.98	1.48
	5.55	48.06	0.74	1.35	35.45	48.46	59.9%	0.73	50.57	1.43
	5.60	47.47	0.70	1.30	33.06	47.85	59.1%	0.69	45.40	1.37
	5.65	46.88	0.65	1.25	30.70	47.24	58.4%	0.65	40.47	1.32
	5.70	46.28	0.61	1.20	28.37	46.63	57.6%	0.61	35.79	1.26
	5.75	45.52	0.57	1.15	26.08	45.86	56.6%	0.57	31.45	1.21
	5.80	44.76	0.53	1.10	23.82	45.08	55.7%	0.53	27.35	1.15
	5.85	44.00	0.49	1.05	21.60	44.31	54.7%	0.49	23.51	1.09
	5.90	41.88	0.46	1.00	19.45	42.17	52.1%	0.46	20.41	1.05
	5.95	40.75	0.43	0.95	17.39	41.04	50.7%	0.42	17.24	0.99
	6.00	34.63	0.45	0.90	15.45	34.90	43.1%	0.44	15.77	1.02
	6.05	30.00	0.46	0.85	13.84	30.25	37.4%	0.46	14.43	1.04
	6.10	28.37	0.44	0.80	12.38	28.61	35.3%	0.43	12.44	1.01
	6.15	26.75	0.41	0.75	11.00	26.97	33.3%	0.41	10.63	0.97
	6.20	25.12	0.39	0.70	9.70	25.33	31.3%	0.38	8.99	0.93
	6.25	23.67	0.36	0.65	8.48	23.85	29.5%	0.36	7.48	0.88
	6.30	22.21	0.33	0.60	7.34	22.37	27.6%	0.33	6.13	0.84
	6.35	20.42	0.31	0.55	6.27	20.56	25.4%	0.30	4.99	0.80
	6.40	18.62	0.28	0.50	5.29	18.75	23.2%	0.28	4.00	0.76
	6.45	17.33	0.25	0.45	4.40	17.44	21.5%	0.25	3.08	0.70
	6.50	16.04	0.22	0.40	3.56	16.13	19.9%	0.22	2.29	0.64
	6.55	14.68	0.19	0.35	2.79	14.75	18.2%	0.19	1.62	0.58
	6.60	13.32	0.16	0.30	2.09	13.37	16.5%	0.16	1.07	0.51
	6.65	11.80	0.12	0.25	1.46	11.83	14.6%	0.12	0.64	0.44
	6.70	9.73	0.10	0.20	0.93	9.76	12.1%	0.09	0.34	0.37
	6.75	7.67	0.06	0.15	0.49	7.68	9.5%	0.06	0.14	0.28

STREAM NAME: Slater Creek
XS LOCATION: 200 ft ds from Mary Hoffman Ditch hdgt
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	123.16	cfs
CALCULATED FLOW (Qc)=	123.16	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	5.00	ft
CALCULATED WATERLINE (WLc)=	5.00	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	1.90	ft
MAX CALCULATED DEPTH (Dc)=	1.90	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	1.91	ft/sec
MANNING'S N=	0.042	
SLOPE=	0.0025	ft/ft
.4 * Qm =	49.3	cfs
2.5 * Qm=	307.9	cfs

RECOMMENDED INSTREAM FLOW:
==========

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

RATIONALE FOR RECOMMENDATION:
==========

_____
_____
_____
_____
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_____
_____
_____
_____
_____

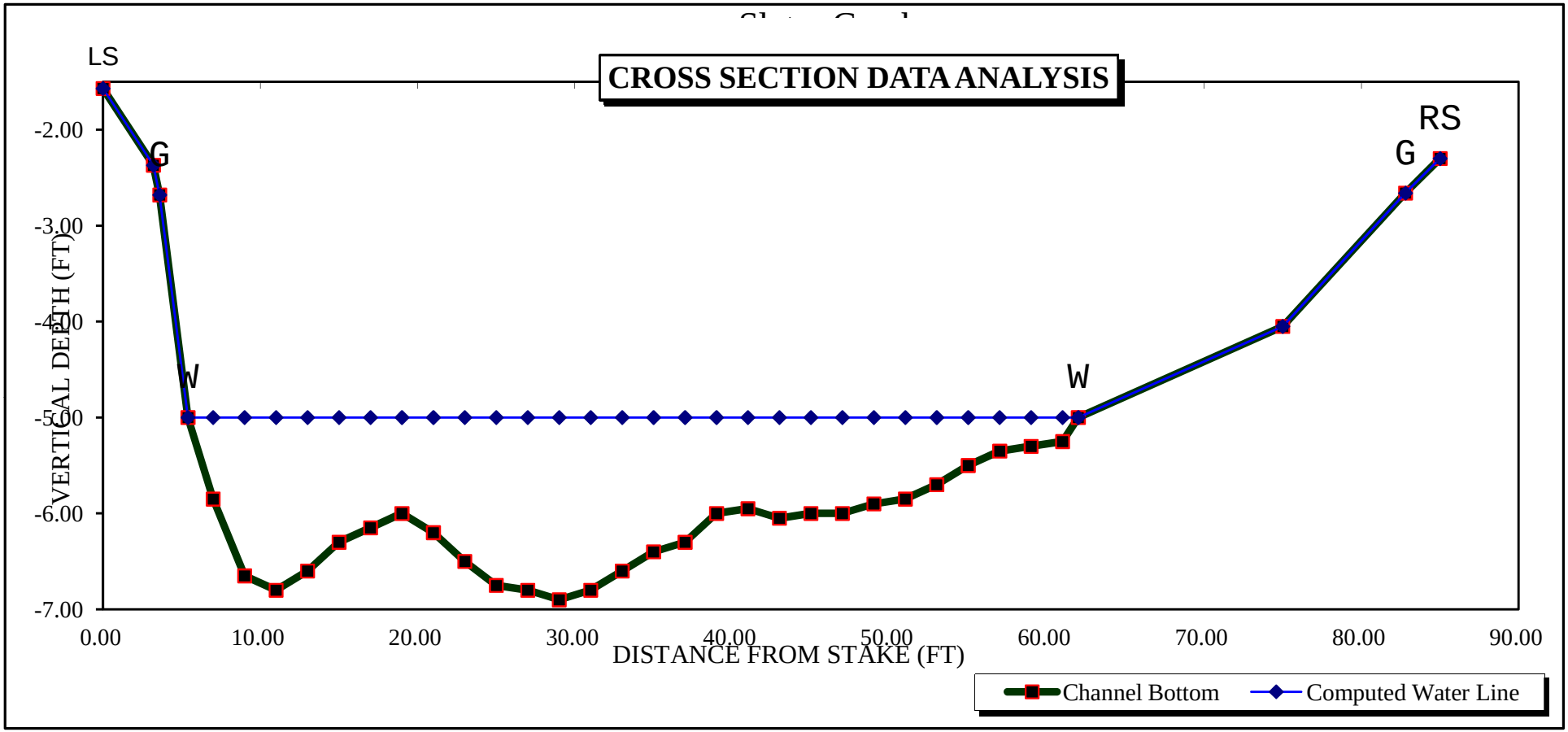
RECOMMENDATION BY: ..... AGENCY..... DATE:.....

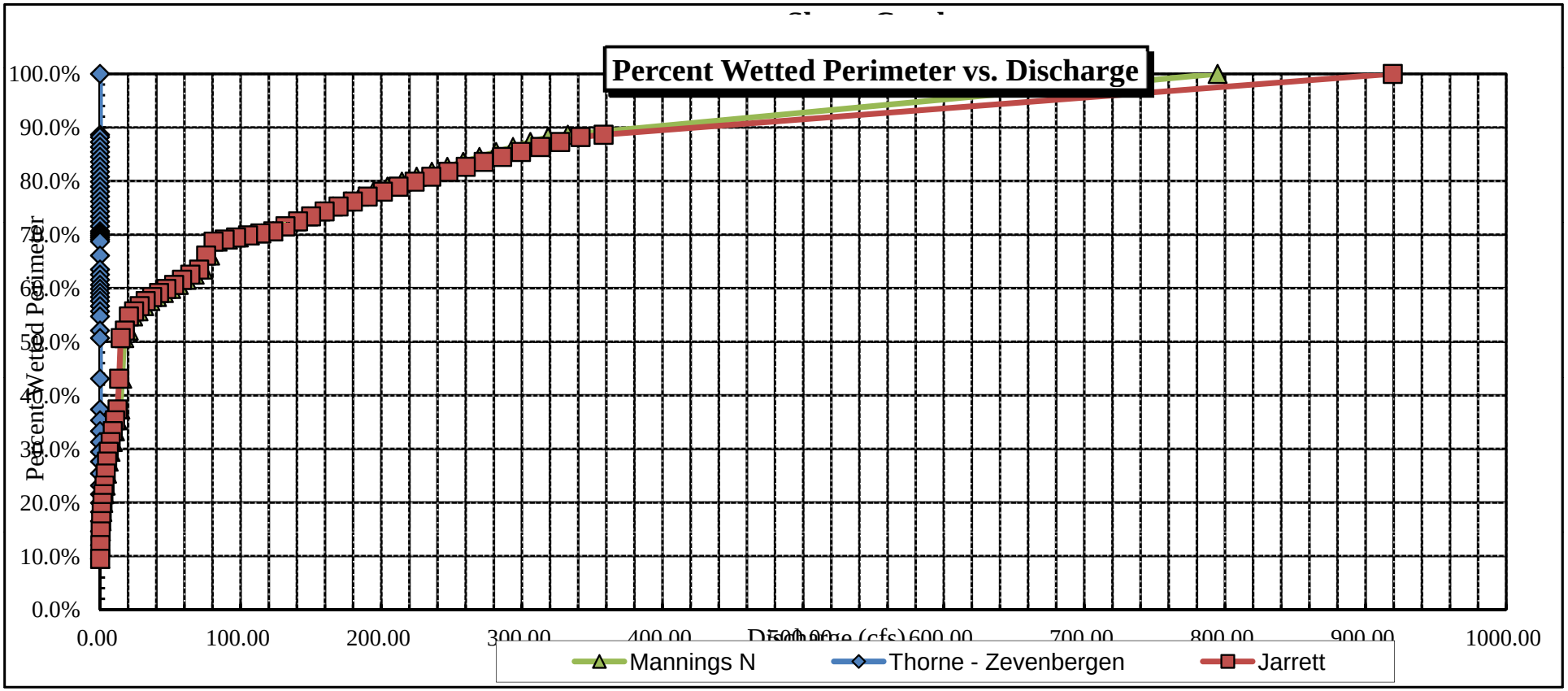
CWCB REVIEW BY: ..... DATE:.....

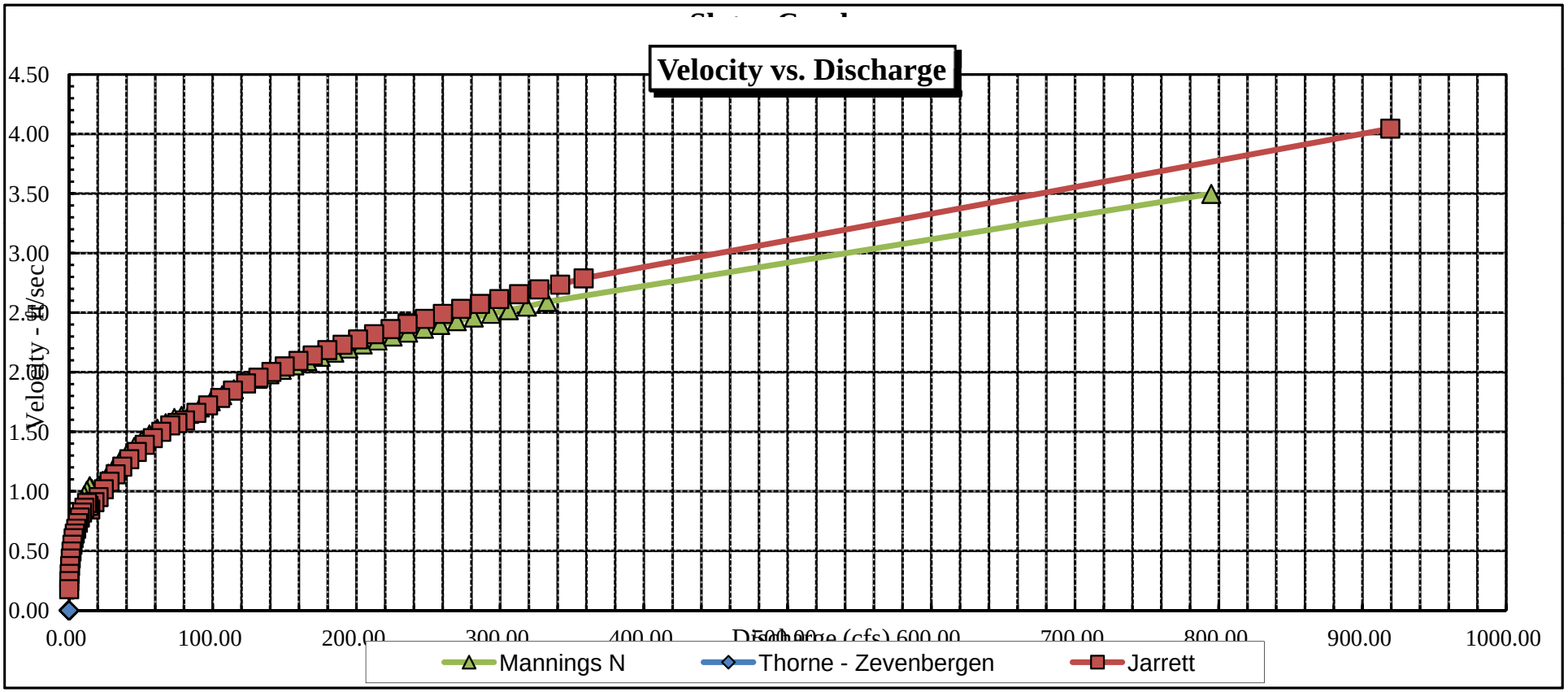
STREAM NAME: Slater Creek
XS LOCATION: 200 ft ds from Mary Hoffman Ditch hdgt
XS NUMBER: 1 Jarrett Variable Manning's n Correction Applied

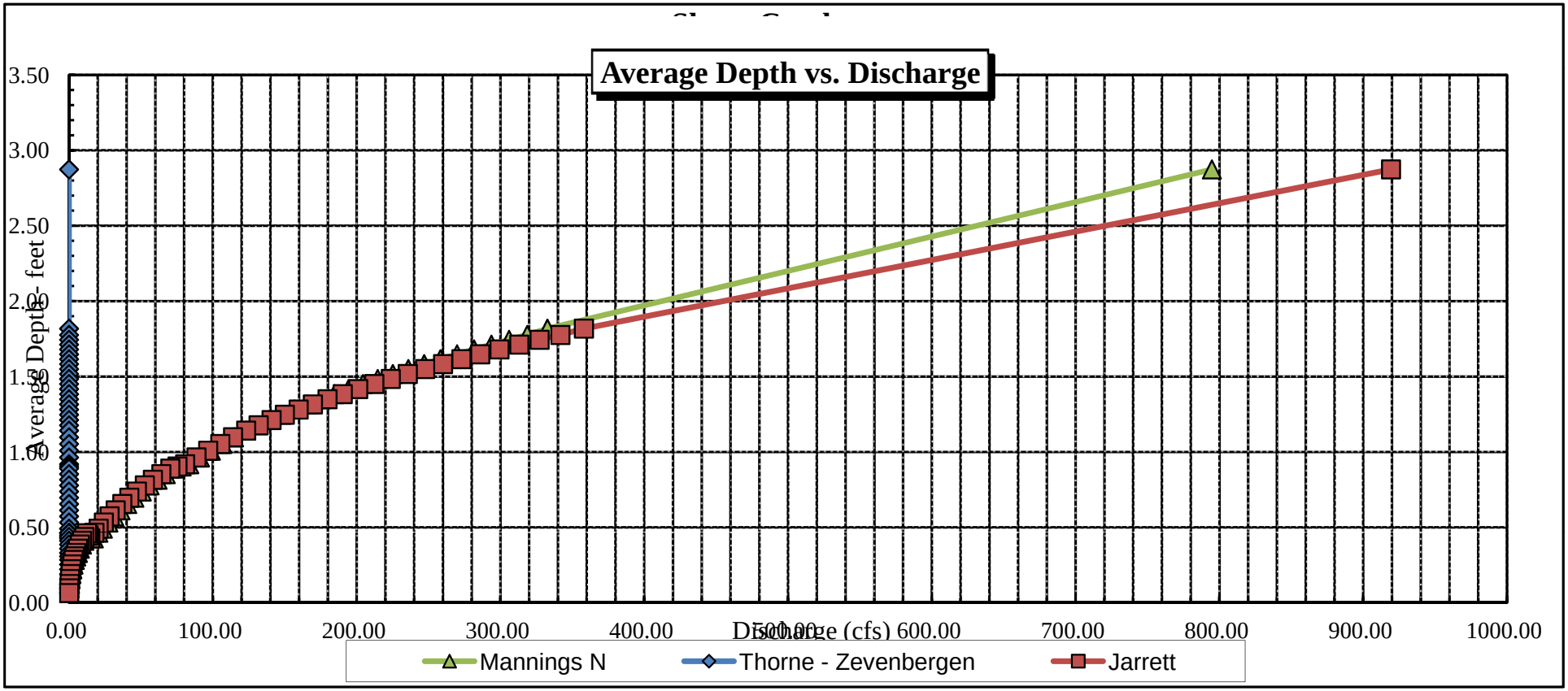
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

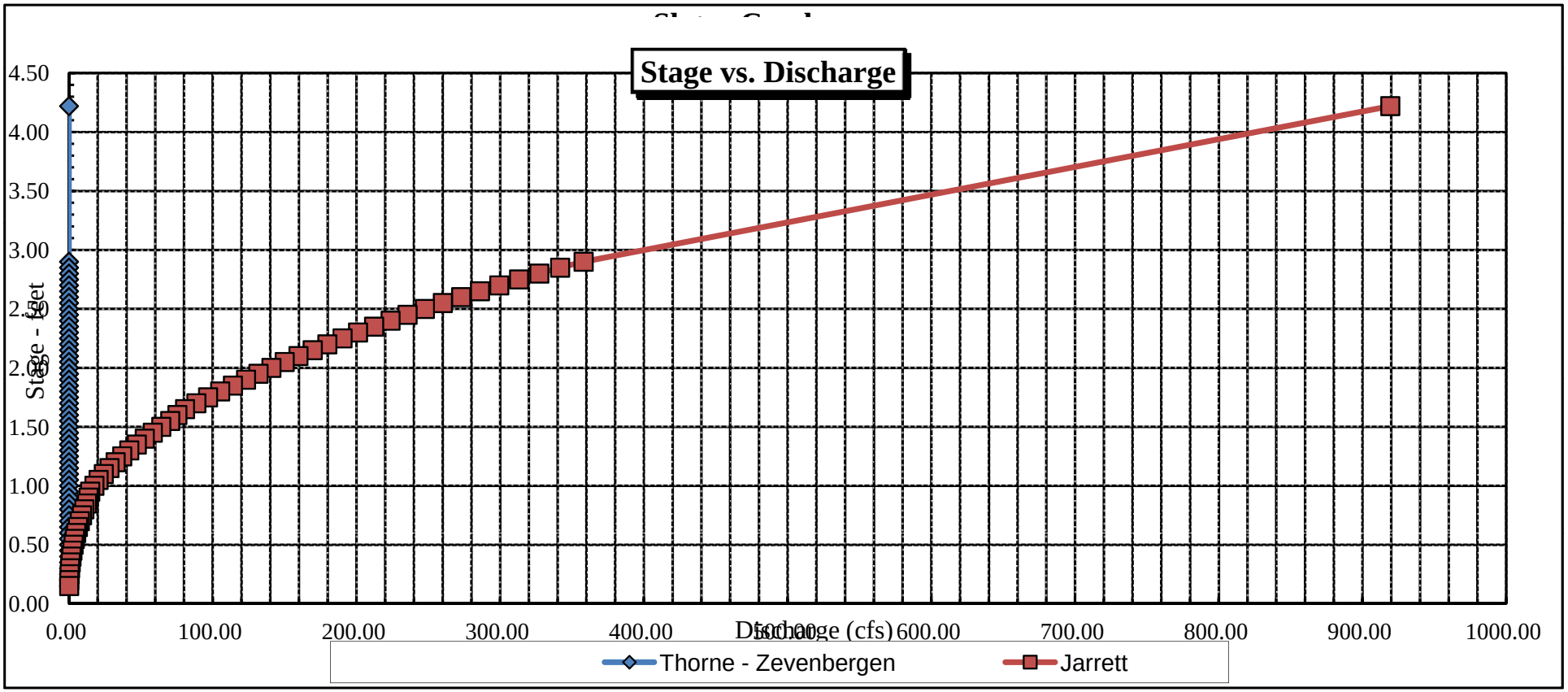
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	2.68	79.09	2.87	4.22	227.26	80.95	100.0%	2.81	919.30	4.05
	4.00	70.66	1.82	2.90	128.42	71.76	88.6%	1.79	358.06	2.79
	4.05	70.34	1.78	2.85	124.90	71.41	88.2%	1.75	341.68	2.74
	4.10	69.61	1.74	2.80	121.40	70.66	87.3%	1.72	327.24	2.70
	4.15	68.89	1.71	2.75	117.94	69.91	86.4%	1.69	313.14	2.66
	4.20	68.17	1.68	2.70	114.51	69.16	85.4%	1.66	299.38	2.61
	4.25	67.44	1.65	2.65	111.12	68.41	84.5%	1.62	285.95	2.57
	4.30	66.72	1.62	2.60	107.77	67.66	83.6%	1.59	272.85	2.53
	4.35	66.00	1.58	2.55	104.45	66.91	82.7%	1.56	260.09	2.49
	4.40	65.28	1.55	2.50	101.17	66.16	81.7%	1.53	247.65	2.45
	4.45	64.55	1.52	2.45	97.92	65.42	80.8%	1.50	235.53	2.41
	4.50	63.83	1.48	2.40	94.71	64.67	79.9%	1.46	223.74	2.36
	4.55	63.11	1.45	2.35	91.54	63.92	79.0%	1.43	212.27	2.32
	4.60	62.38	1.42	2.30	88.40	63.17	78.0%	1.40	201.12	2.28
	4.65	61.66	1.38	2.25	85.30	62.42	77.1%	1.37	190.29	2.23
	4.70	60.94	1.35	2.20	82.24	61.67	76.2%	1.33	179.77	2.19
	4.75	60.21	1.32	2.15	79.21	60.92	75.3%	1.30	169.57	2.14
	4.80	59.49	1.28	2.10	76.21	60.17	74.3%	1.27	159.67	2.10
	4.85	58.77	1.25	2.05	73.26	59.42	73.4%	1.23	150.09	2.05
	4.90	58.05	1.21	2.00	70.34	58.67	72.5%	1.20	140.81	2.00
	4.95	57.32	1.18	1.95	67.45	57.92	71.6%	1.16	131.83	1.95
WL	5.00	56.60	1.14	1.90	64.60	57.17	70.6%	1.13	123.16	1.91
	5.05	56.31	1.10	1.85	61.78	56.86	70.2%	1.09	114.03	1.85
	5.10	56.01	1.05	1.80	58.97	56.55	69.9%	1.04	105.22	1.78
	5.15	55.72	1.01	1.75	56.18	56.24	69.5%	1.00	96.73	1.72
	5.20	55.42	0.96	1.70	53.40	55.92	69.1%	0.95	88.58	1.66
	5.25	55.13	0.92	1.65	50.64	55.61	68.7%	0.91	80.76	1.59
	5.30	53.04	0.90	1.60	47.93	53.50	66.1%	0.90	75.43	1.57
	5.35	50.94	0.89	1.55	45.34	51.40	63.5%	0.88	70.42	1.55
	5.40	50.18	0.85	1.50	42.81	50.62	62.5%	0.85	64.22	1.50
	5.45	49.42	0.82	1.45	40.32	49.85	61.6%	0.81	58.30	1.45
	5.50	48.66	0.78	1.40	37.87	49.07	60.6%	0.77	52.66	1.39
	5.55	48.06	0.74	1.35	35.45	48.46	59.9%	0.73	47.17	1.33
	5.60	47.47	0.70	1.30	33.06	47.85	59.1%	0.69	41.96	1.27
	5.65	46.88	0.65	1.25	30.70	47.24	58.4%	0.65	37.04	1.21
	5.70	46.28	0.61	1.20	28.37	46.63	57.6%	0.61	32.42	1.14
	5.75	45.52	0.57	1.15	26.08	45.86	56.6%	0.57	28.18	1.08
	5.80	44.76	0.53	1.10	23.82	45.08	55.7%	0.53	24.22	1.02
	5.85	44.00	0.49	1.05	21.60	44.31	54.7%	0.49	20.55	0.95
	5.90	41.88	0.46	1.00	19.45	42.17	52.1%	0.46	17.68	0.91
	5.95	40.75	0.43	0.95	17.39	41.04	50.7%	0.42	14.73	0.85
	6.00	34.63	0.45	0.90	15.45	34.90	43.1%	0.44	13.58	0.88
	6.05	30.00	0.46	0.85	13.84	30.25	37.4%	0.46	12.49	0.90
	6.10	28.37	0.44	0.80	12.38	28.61	35.3%	0.43	10.67	0.86
	6.15	26.75	0.41	0.75	11.00	26.97	33.3%	0.41	9.03	0.82
	6.20	25.12	0.39	0.70	9.70	25.33	31.3%	0.38	7.56	0.78
	6.25	23.67	0.36	0.65	8.48	23.85	29.5%	0.36	6.22	0.73
	6.30	22.21	0.33	0.60	7.34	22.37	27.6%	0.33	5.03	0.69
	6.35	20.42	0.31	0.55	6.27	20.56	25.4%	0.30	4.05	0.65
	6.40	18.62	0.28	0.50	5.29	18.75	23.2%	0.28	3.21	0.61
	6.45	17.33	0.25	0.45	4.40	17.44	21.5%	0.25	2.42	0.55
	6.50	16.04	0.22	0.40	3.56	16.13	19.9%	0.22	1.76	0.49
	6.55	14.68	0.19	0.35	2.79	14.75	18.2%	0.19	1.22	0.44
	6.60	13.32	0.16	0.30	2.09	13.37	16.5%	0.16	0.78	0.37
	6.65	11.80	0.12	0.25	1.46	11.83	14.6%	0.12	0.45	0.31
	6.70	9.73	0.10	0.20	0.93	9.76	12.1%	0.09	0.23	0.25
	6.75	7.67	0.06	0.15	0.49	7.68	9.5%	0.06	0.09	0.18


CROSS SECTION DATA ANALYSIS
LS
G
W
W
G
RS
-2.00
-3.00
-4.00
-5.00
-6.00
-7.00
VERTICAL DEPTH (FT)
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Percent Wetted Perimeter vs. Discharge
Percent Wetted Perimeter
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
0.00
100.00
200.00
300.00
400.00
500.00
600.00
700.00
800.00
900.00
1000.00
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
Velocity - ft/sec
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.00
100.00
200.00
300.00
400.00
500.00
600.00
700.00
800.00
900.00
1000.00
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
Average Depth - feet
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.00
100.00
200.00
300.00
400.00
500.00
600.00
700.00
800.00
900.00
1000.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Stage - feet
0.00
100.00
200.00
300.00
400.00
500.00
600.00
700.00
800.00
900.00
1000.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Slater Creek | CROSS-SECTION NO.: 1

CROSS-SECTION LOCATION: 0.5 miles downstream from confluence with Lake Creek - at very large composite boulder

DATE: 7-8-15 | OBSERVERS: R. Smith, E. Scherff

LEGAL DESCRIPTION	¼ SECTION:	SECTION:	TOWNSHIP:	RANGE:	PM:
	NE	23	11 N/S	89 E/W	6th

COUNTY:	WATERSHED:	WATER DIVISION:	DOW WATER CODE:
Moffat	Little Snake	6	21953

MAP(S): USGS: 13T 302950 4530369

USFS:

SUPPLEMENTAL DATA

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

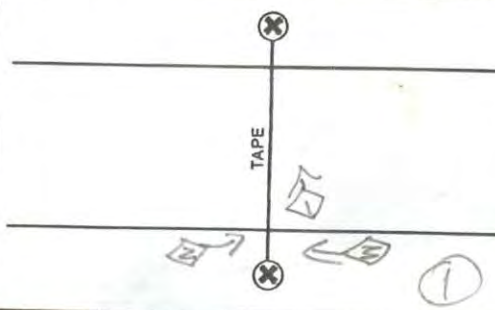
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: surveyed ____ lbs/foot	TAPE TENSION: surveyed ____ lbs

CHANNEL BED MATERIAL SIZE RANGE: cobbles 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	8.40 / 8.40
② WS Upstream	48.0	8.15
③ WS Downstream	53.0	9.00
SLOPE	1.45 / 101.0 = 0.014	

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:

mayfly, caddisfly, stonefly - abundant

COMMENTS

Riparian = Alder - Willow - Narrowleaf Cottonwood

FORM #ISF FD 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Slater Creek | CROSS-SECTION NO.: 1 | DATE: 7-8-15 | SHEET ___ OF ___

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: LEFT / RIGHT (0.0 AT STAKE) | Gage Reading: _____ ft | TIME: 9:30 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)
LS	0.0		4.67								
G	1.6		6.50								
	3.5		7.32								
	6.0		8.04								
W	6.9		8.40								
	8		8.80	0.4				0.31			
	9		9.00	0.6				1.05			
	11		9.0	0.6				0.57			
	13		8.7	0.3				0.28			
	15		8.95	0.55				0.23			
	17		9.20	0.80				1.19			
	19		9.10	0.70				1.27			
	21		9.10	0.70				1.24			
	23		9.15	1.05				1.44			
	25		9.05	0.65				1.46			
	27		9.40	1.00				2.09			
	29		9.30	0.9				0.89			
	31		9.20	0.8				1.29			
	33		9.0	0.6				1.55			
	35		9.1	0.7				0.60			
	37		9.1	0.7				1.31			
	39		9.25	0.85				1.63			
	41		9.25	0.85				1.87			
	43		9.40	1.00				2.07			
	44		9.30	0.9				1.78			
	45		9.6	1.2				1.80			
	46		9.3	0.9				2.01			
	47		9.25	0.85				3.03			
	48		9.3	0.9				2.21			
	49		9.4	1.0				2.14			
	50		9.3	0.9				2.42			
	51		9.3	0.9				0.48			
	53		8.75	0.35				1.88			
W	55.3		8.40								
	57.0		8.06								
	58.6		7.30								
G	60.0		6.60								
RS	65.6		4.84								
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:	Slater Creek
XS LOCATION:	0.5 mi dwnstr fr conf w Lake Creek
XS NUMBER:	1
DATE:	8-Jul-15
OBSERVERS:	R. Smith, E. Scherff
1/4 SEC:	NE
SECTION:	23
TWP:	11N
RANGE:	89W
PM:	Sixth
COUNTY:	Moffat
WATERSHED:	Little Snake River
DIVISION:	6
DOW CODE:	21953
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

		*** NOTE ***
		Leave TAPE WT and TENSION
		at defaults for data collected
TAPE WT:	0.0106	with a survey level and rod
TENSION:	99999	

CHANNEL PROFILE DATA

SLOPE:	0.014

INPUT DATA CHECKED BY: .....DATE.....

ASSIGNED TO: ….....……..…….....DATE.....

STREAM NAME: Slater Creek
XS LOCATION: 0.5 mi dwnstr fr conf w Lake Creek
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
	LS	0.00	4.67			0.00		0.00	0.00	0.0%
1	G	1.60	6.50			0.00		0.00	0.00	0.0%
		3.50	7.32			0.00		0.00	0.00	0.0%
		6.00	8.04			0.00		0.00	0.00	0.0%
	W	6.90	8.40	0.00	0.00	0.00		0.00	0.00	0.0%
		8.00	8.80	0.40	0.31	1.17	0.40	0.42	0.13	0.3%
		9.00	9.00	0.60	1.05	1.02	0.60	0.90	0.95	1.9%
		11.00	9.00	0.60	0.57	2.00	0.60	1.20	0.68	1.4%
		13.00	8.70	0.30	0.28	2.02	0.30	0.60	0.17	0.3%
		15.00	8.95	0.55	0.23	2.02	0.55	1.10	0.25	0.5%
		17.00	9.20	0.80	1.19	2.02	0.80	1.60	1.90	3.8%
		19.00	9.10	0.70	1.27	2.00	0.70	1.40	1.78	3.5%
		21.00	9.10	0.70	1.24	2.00	0.70	1.40	1.74	3.4%
		23.00	9.45	1.05	1.44	2.03	1.05	2.10	3.02	6.0%
		25.00	9.05	0.65	1.46	2.04	0.65	1.30	1.90	3.8%
		27.00	9.40	1.00	2.09	2.03	1.00	2.00	4.18	8.3%
		29.00	9.30	0.90	0.89	2.00	0.90	1.80	1.60	3.2%
		31.00	9.20	0.80	1.29	2.00	0.80	1.60	2.06	4.1%
		33.00	9.00	0.60	1.55	2.01	0.60	1.20	1.86	3.7%
		35.00	9.10	0.70	0.60	2.00	0.70	1.40	0.84	1.7%
		37.00	9.10	0.70	1.31	2.00	0.70	1.40	1.83	3.6%
		39.00	9.25	0.85	1.63	2.01	0.85	1.70	2.77	5.5%
		41.00	9.25	0.85	1.87	2.00	0.85	1.70	3.18	6.3%
		43.00	9.40	1.00	2.07	2.01	1.00	1.50	3.11	6.2%
		44.00	9.30	0.90	1.78	1.00	0.90	0.90	1.60	3.2%
		45.00	9.60	1.20	1.80	1.04	1.20	1.20	2.16	4.3%
		46.00	9.30	0.90	2.01	1.04	0.90	0.90	1.81	3.6%
		47.00	9.25	0.85	3.03	1.00	0.85	0.85	2.58	5.1%
		48.00	9.30	0.90	2.21	1.00	0.90	0.90	1.99	3.9%
		49.00	9.40	1.00	2.14	1.00	1.00	1.00	2.14	4.2%
		50.00	9.30	0.90	2.42	1.00	0.90	0.90	2.18	4.3%
		51.00	9.30	0.90	0.48	1.00	0.90	1.35	0.65	1.3%
		53.00	8.75	0.35	1.88	2.07	0.35	0.75	1.41	2.8%
	W	55.30	8.40	0.00	0.00	2.33		0.00	0.00	0.0%
		57.00	8.06			0.00		0.00	0.00	0.0%
		58.60	7.30			0.00		0.00	0.00	0.0%
1	G	60.00	6.60			0.00		0.00	0.00	0.0%
	RS	65.60	4.84			0.00		0.00	0.00	0.0%
	TOTALS ----------					48.88	1.2	35.07	50.47	100.0%
							(Max.)			

Manning's n = 0.0979
Hydraulic Radius= 0.71749867

STREAM NAME: Slater Creek
XS LOCATION: 0.5 mi dwnstr fr conf w Lake Creek
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	35.07	35.07	0.0%
8.15	35.07	47.41	35.2%
8.17	35.07	46.40	32.3%
8.19	35.07	45.40	29.5%
8.21	35.07	44.40	26.6%
8.23	35.07	43.41	23.8%
8.25	35.07	42.42	20.9%
8.27	35.07	41.43	18.1%
8.29	35.07	40.44	15.3%
8.31	35.07	39.46	12.5%
8.33	35.07	38.48	9.7%
8.35	35.07	37.50	6.9%
8.36	35.07	37.02	5.5%
8.37	35.07	36.53	4.2%
8.38	35.07	36.04	2.8%
8.39	35.07	35.56	1.4%
8.40	35.07	35.07	0.0%
8.41	35.07	34.59	-1.4%
8.42	35.07	34.11	-2.8%
8.43	35.07	33.63	-4.1%
8.44	35.07	33.14	-5.5%
8.45	35.07	32.67	-6.9%
8.47	35.07	31.71	-9.6%
8.49	35.07	30.76	-12.3%
8.51	35.07	29.81	-15.0%
8.53	35.07	28.86	-17.7%
8.55	35.07	27.92	-20.4%
8.57	35.07	26.98	-23.1%
8.59	35.07	26.05	-25.7%
8.61	35.07	25.12	-28.4%
8.63	35.07	24.19	-31.0%
8.65	35.07	23.26	-33.7%

WATERLINE AT ZERO
AREA ERROR = 8.400

STREAM NAME: Slater Creek
XS LOCATION: 0.5 mi dwnstr fr conf w Lake Creek
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	6.60	58.17	2.27	3.00	131.94	59.34	100.0%	2.22	403.60	3.06
	7.40	54.61	1.59	2.20	86.79	55.44	93.4%	1.57	210.12	2.42
	7.45	54.33	1.55	2.15	84.07	55.14	92.9%	1.52	199.96	2.38
	7.50	54.05	1.51	2.10	81.36	54.84	92.4%	1.48	190.02	2.34
	7.55	53.77	1.46	2.05	78.66	54.54	91.9%	1.44	180.30	2.29
	7.60	53.50	1.42	2.00	75.98	54.25	91.4%	1.40	170.79	2.25
	7.65	53.22	1.38	1.95	73.31	53.95	90.9%	1.36	161.50	2.20
	7.70	52.94	1.33	1.90	70.66	53.65	90.4%	1.32	152.44	2.16
	7.75	52.66	1.29	1.85	68.02	53.35	89.9%	1.27	143.59	2.11
	7.80	52.38	1.25	1.80	65.39	53.06	89.4%	1.23	134.98	2.06
	7.85	52.10	1.20	1.75	62.78	52.76	88.9%	1.19	126.58	2.02
	7.90	51.82	1.16	1.70	60.18	52.46	88.4%	1.15	118.42	1.97
	7.95	51.54	1.12	1.65	57.60	52.17	87.9%	1.10	110.48	1.92
	8.00	51.27	1.07	1.60	55.03	51.87	87.4%	1.06	102.78	1.87
	8.05	51.00	1.03	1.55	52.47	51.58	86.9%	1.02	95.30	1.82
	8.10	50.65	0.99	1.50	49.93	51.22	86.3%	0.97	88.14	1.77
	8.15	50.27	0.94	1.45	47.41	50.83	85.7%	0.93	81.26	1.71
	8.20	49.90	0.90	1.40	44.90	50.44	85.0%	0.89	74.61	1.66
	8.25	49.52	0.86	1.35	42.42	50.05	84.3%	0.85	68.21	1.61
	8.30	49.15	0.81	1.30	39.95	49.66	83.7%	0.80	62.05	1.55
	8.35	48.77	0.77	1.25	37.50	49.27	83.0%	0.76	56.13	1.50
WL	8.40	48.40	0.72	1.20	35.07	48.88	82.4%	0.72	50.47	1.44
	8.45	47.93	0.68	1.15	32.66	48.40	81.6%	0.67	45.12	1.38
	8.50	47.47	0.64	1.10	30.28	47.92	80.8%	0.63	40.03	1.32
	8.55	47.00	0.59	1.05	27.92	47.45	80.0%	0.59	35.20	1.26
	8.60	46.54	0.55	1.00	25.58	46.97	79.1%	0.54	30.63	1.20
	8.65	46.07	0.50	0.95	23.26	46.49	78.3%	0.50	26.33	1.13
	8.70	45.60	0.46	0.90	20.97	46.01	77.5%	0.46	22.30	1.06
	8.75	44.40	0.42	0.85	18.72	44.79	75.5%	0.42	18.79	1.00
	8.80	43.35	0.38	0.80	16.53	43.72	73.7%	0.38	15.52	0.94
	8.85	42.19	0.34	0.75	14.39	42.53	71.7%	0.34	12.54	0.87
	8.90	41.02	0.30	0.70	12.31	41.35	69.7%	0.30	9.85	0.80
	8.95	39.86	0.26	0.65	10.29	40.16	67.7%	0.26	7.45	0.72
	9.00	36.69	0.23	0.60	8.32	36.98	62.3%	0.23	5.53	0.66
	9.05	34.61	0.19	0.55	6.54	34.89	58.8%	0.19	3.85	0.59
	9.10	27.99	0.17	0.50	4.88	28.25	47.6%	0.17	2.71	0.56
	9.15	24.42	0.15	0.45	3.57	24.65	41.5%	0.14	1.76	0.49
	9.20	20.85	0.12	0.40	2.43	21.05	35.5%	0.12	1.04	0.43
	9.25	16.18	0.09	0.35	1.46	16.35	27.6%	0.09	0.52	0.36
	9.30	10.51	0.07	0.30	0.77	10.66	18.0%	0.07	0.24	0.31
	9.35	6.19	0.06	0.25	0.35	6.30	10.6%	0.06	0.09	0.26
	9.40	1.87	0.08	0.20	0.15	1.94	3.3%	0.08	0.05	0.32
	9.45	1.00	0.08	0.15	0.08	1.04	1.8%	0.07	0.02	0.31
	9.50	0.67	0.05	0.10	0.03	0.70	1.2%	0.05	0.01	0.24
	9.55	0.33	0.03	0.05	0.01	0.35	0.6%	0.02	0.00	0.15
	9.60	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Slater Creek
XS LOCATION: 0.5 mi dwnstr fr conf w Lake Creek
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	50.47	cfs
CALCULATED FLOW (Qc)=	50.47	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	8.40	ft
CALCULATED WATERLINE (WLc)=	8.40	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	1.20	ft
MAX CALCULATED DEPTH (Dc)=	1.20	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	1.44	ft/sec
MANNING'S N=	0.098	
SLOPE=	0.014	ft/ft
.4 * Qm =	20.2	cfs
2.5 * Qm=	126.2	cfs

RECOMMENDED INSTREAM FLOW:
=============================

FLOW (CFS)	PERIOD

RATIONALE FOR RECOMMENDATION:
=============================

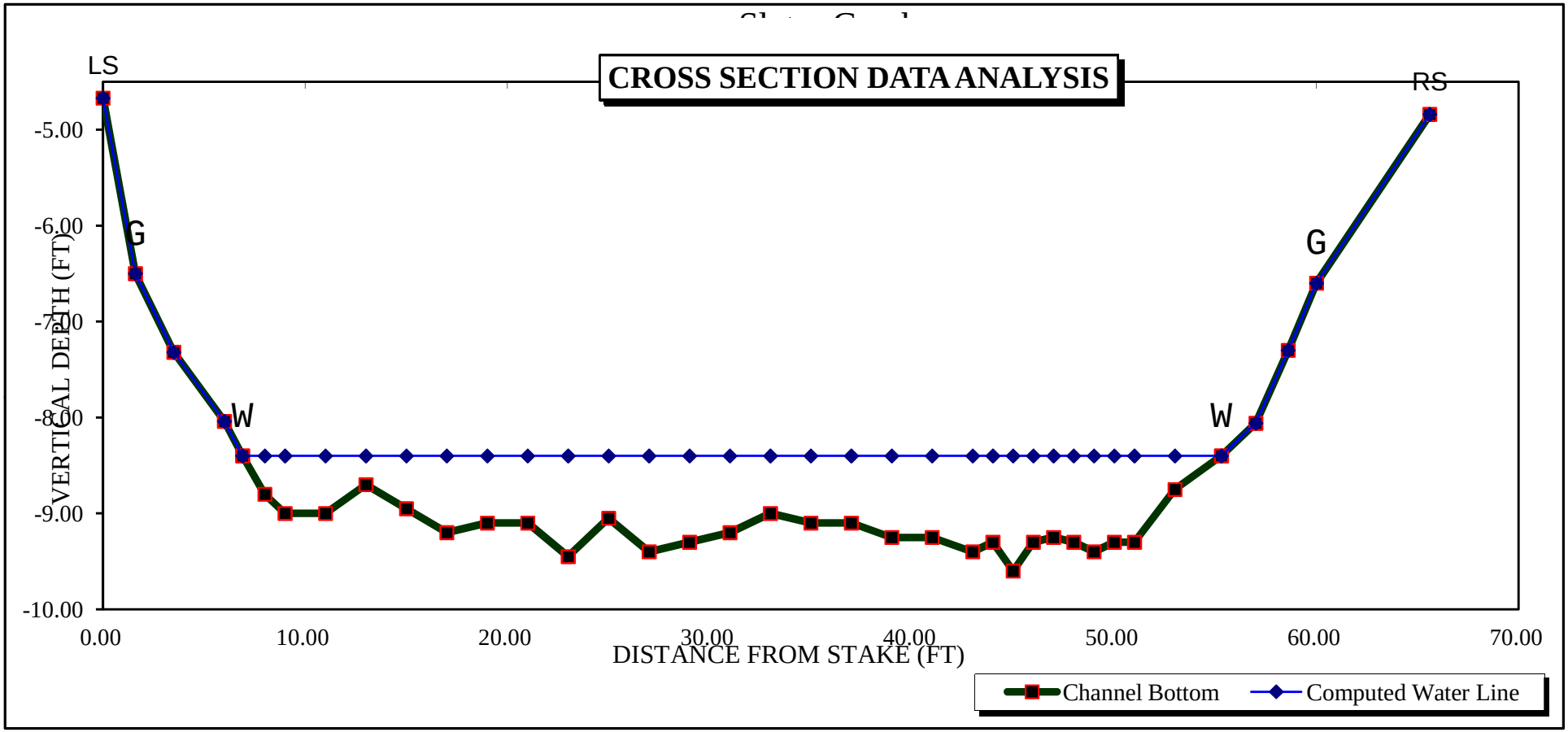
RECOMMENDATION BY: ……………………………………………………… AGENCY……………………………………………… DATE:………………………………

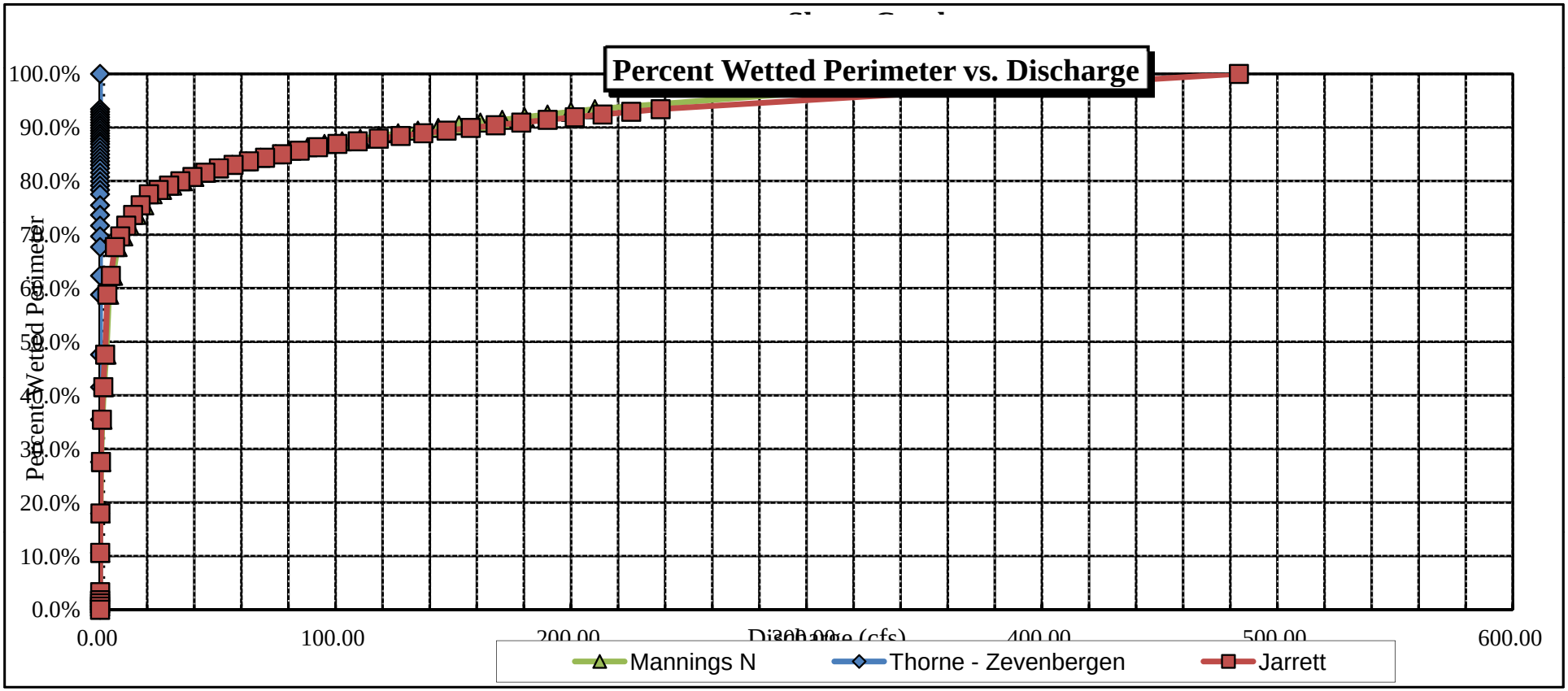
CWCB REVIEW BY: …… DATE:………………………………

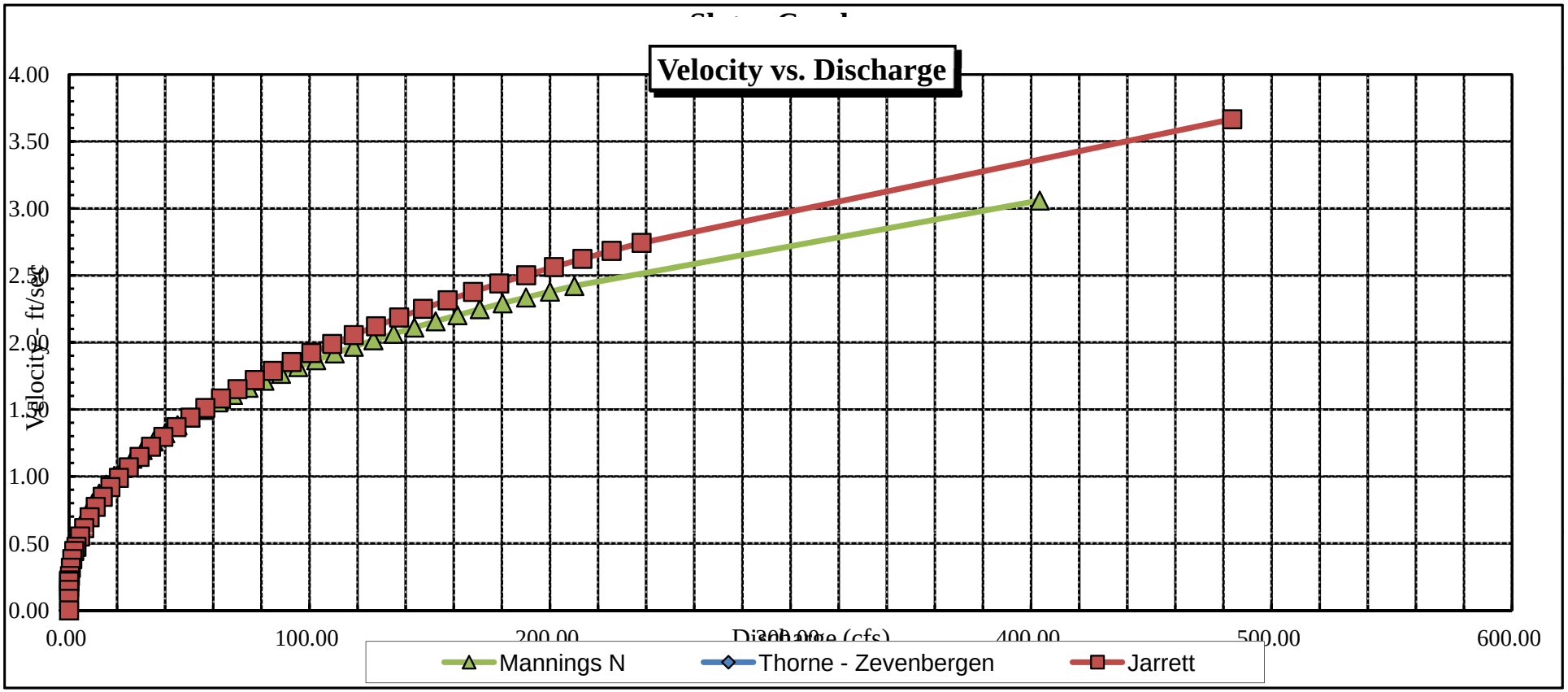
STREAM NAME: Slater Creek
XS LOCATION: 0.5 mi dwnstr fr conf w Lake Creek
XS NUMBER: 1 Jarrett Variable Manning's n Correction Applied

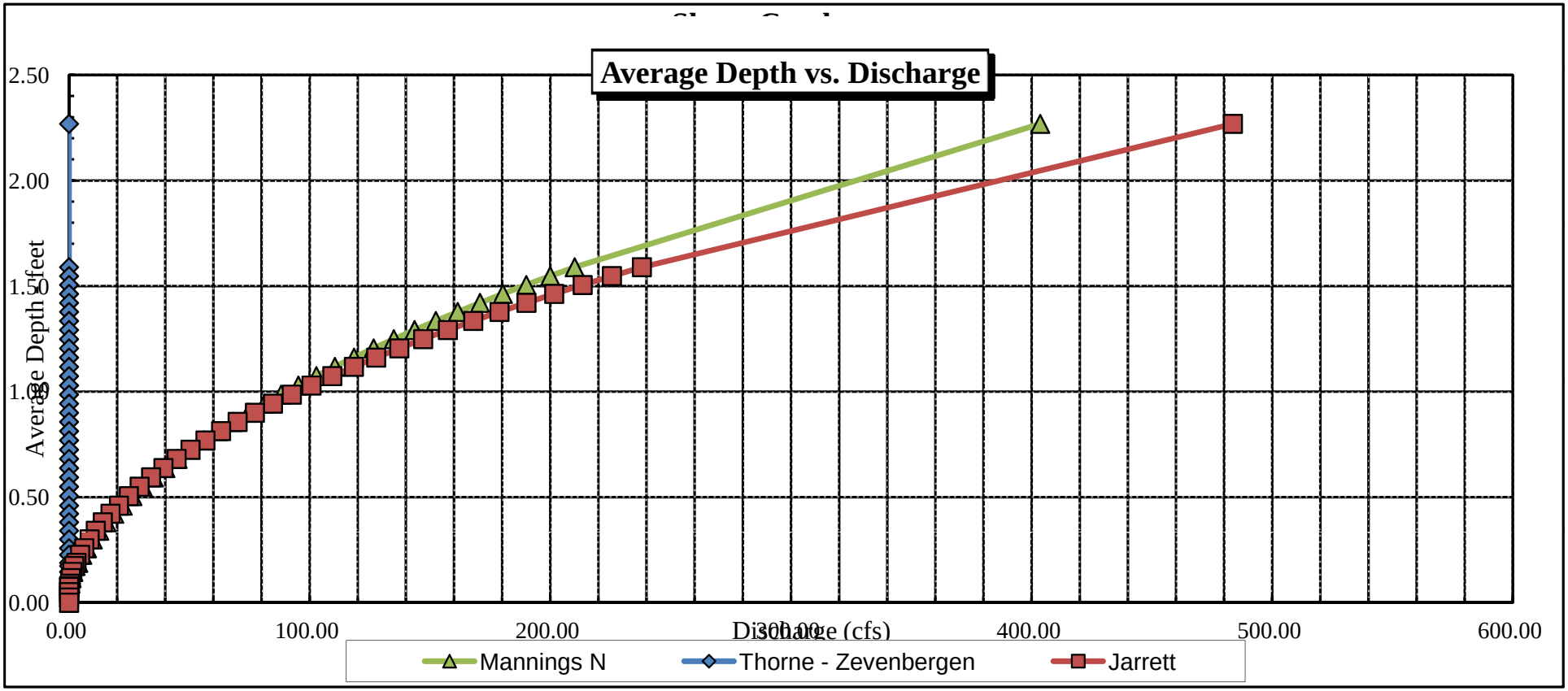
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

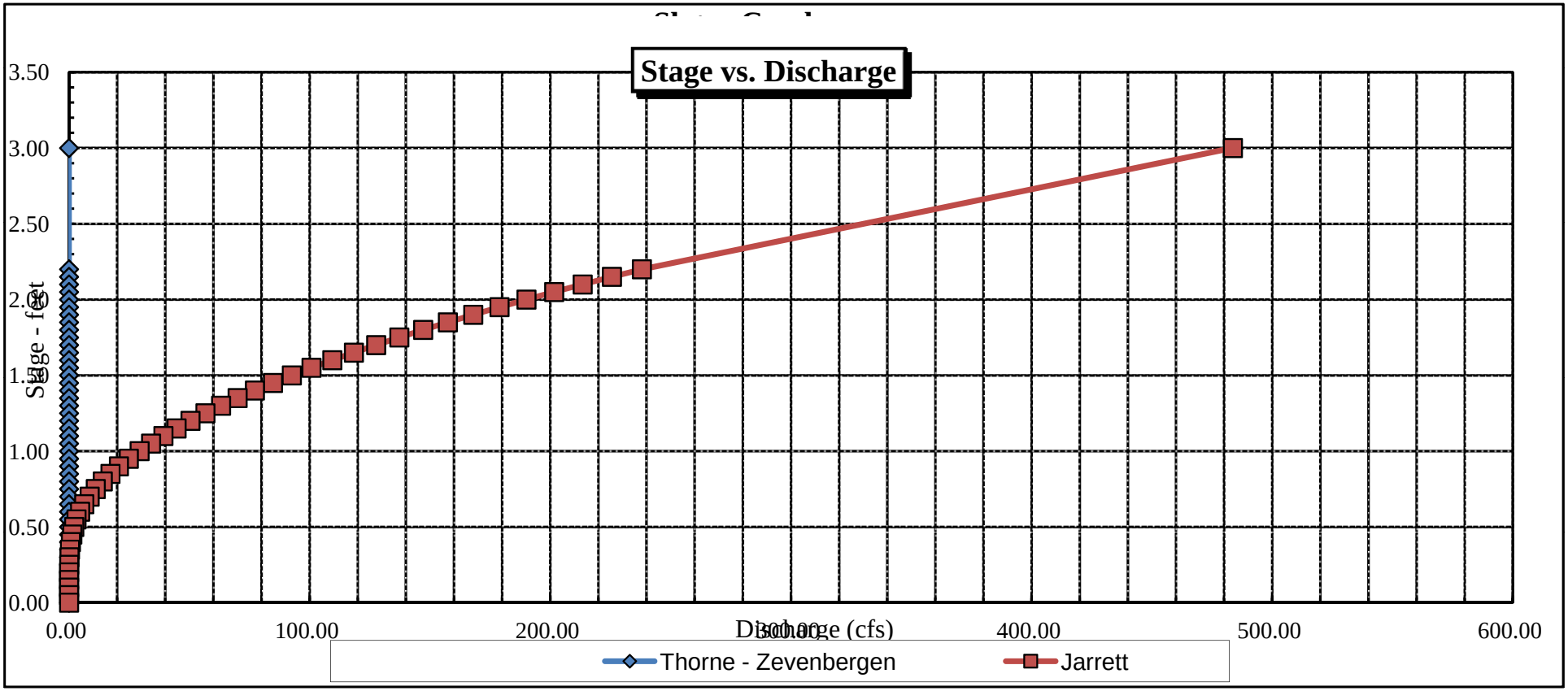
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	6.60	58.17	2.27	3.00	131.94	59.34	100.0%	2.22	483.67	3.67
	7.40	54.61	1.59	2.20	86.79	55.44	93.4%	1.57	238.06	2.74
	7.45	54.33	1.55	2.15	84.07	55.14	92.9%	1.52	225.60	2.68
	7.50	54.05	1.51	2.10	81.36	54.84	92.4%	1.48	213.44	2.62
	7.55	53.77	1.46	2.05	78.66	54.54	91.9%	1.44	201.60	2.56
	7.60	53.50	1.42	2.00	75.98	54.25	91.4%	1.40	190.08	2.50
	7.65	53.22	1.38	1.95	73.31	53.95	90.9%	1.36	178.88	2.44
	7.70	52.94	1.33	1.90	70.66	53.65	90.4%	1.32	167.99	2.38
	7.75	52.66	1.29	1.85	68.02	53.35	89.9%	1.27	157.43	2.31
	7.80	52.38	1.25	1.80	65.39	53.06	89.4%	1.23	147.18	2.25
	7.85	52.10	1.20	1.75	62.78	52.76	88.9%	1.19	137.25	2.19
	7.90	51.82	1.16	1.70	60.18	52.46	88.4%	1.15	127.65	2.12
	7.95	51.54	1.12	1.65	57.60	52.17	87.9%	1.10	118.37	2.06
	8.00	51.27	1.07	1.60	55.03	51.87	87.4%	1.06	109.42	1.99
	8.05	51.00	1.03	1.55	52.47	51.58	86.9%	1.02	100.77	1.92
	8.10	50.65	0.99	1.50	49.93	51.22	86.3%	0.97	92.57	1.85
	8.15	50.27	0.94	1.45	47.41	50.83	85.7%	0.93	84.74	1.79
	8.20	49.90	0.90	1.40	44.90	50.44	85.0%	0.89	77.23	1.72
	8.25	49.52	0.86	1.35	42.42	50.05	84.3%	0.85	70.05	1.65
	8.30	49.15	0.81	1.30	39.95	49.66	83.7%	0.80	63.19	1.58
	8.35	48.77	0.77	1.25	37.50	49.27	83.0%	0.76	56.67	1.51
WL	8.40	48.40	0.72	1.20	35.07	48.88	82.4%	0.72	50.47	1.44
	8.45	47.93	0.68	1.15	32.66	48.40	81.6%	0.67	44.68	1.37
	8.50	47.47	0.64	1.10	30.28	47.92	80.8%	0.63	39.22	1.30
	8.55	47.00	0.59	1.05	27.92	47.45	80.0%	0.59	34.10	1.22
	8.60	46.54	0.55	1.00	25.58	46.97	79.1%	0.54	29.31	1.15
	8.65	46.07	0.50	0.95	23.26	46.49	78.3%	0.50	24.85	1.07
	8.70	45.60	0.46	0.90	20.97	46.01	77.5%	0.46	20.74	0.99
	8.75	44.40	0.42	0.85	18.72	44.79	75.5%	0.42	17.24	0.92
	8.80	43.35	0.38	0.80	16.53	43.72	73.7%	0.38	14.00	0.85
	8.85	42.19	0.34	0.75	14.39	42.53	71.7%	0.34	11.12	0.77
	8.90	41.02	0.30	0.70	12.31	41.35	69.7%	0.30	8.56	0.70
	8.95	39.86	0.26	0.65	10.29	40.16	67.7%	0.26	6.32	0.61
	9.00	36.69	0.23	0.60	8.32	36.98	62.3%	0.23	4.59	0.55
	9.05	34.61	0.19	0.55	6.54	34.89	58.8%	0.19	3.10	0.47
	9.10	27.99	0.17	0.50	4.88	28.25	47.6%	0.17	2.16	0.44
	9.15	24.42	0.15	0.45	3.57	24.65	41.5%	0.14	1.37	0.38
	9.20	20.85	0.12	0.40	2.43	21.05	35.5%	0.12	0.77	0.32
	9.25	16.18	0.09	0.35	1.46	16.35	27.6%	0.09	0.37	0.26
	9.30	10.51	0.07	0.30	0.77	10.66	18.0%	0.07	0.16	0.21
	9.35	6.19	0.06	0.25	0.35	6.30	10.6%	0.06	0.06	0.17
	9.40	1.87	0.08	0.20	0.15	1.94	3.3%	0.08	0.03	0.22
	9.45	1.00	0.08	0.15	0.08	1.04	1.8%	0.07	0.02	0.21
	9.50	0.67	0.05	0.10	0.03	0.70	1.2%	0.05	0.01	0.15
	9.55	0.33	0.03	0.05	0.01	0.35	0.6%	0.02	0.00	0.09
	9.60	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!


CROSS SECTION DATA ANALYSIS
LS
RS
G
W
W
G
-5.00
-6.00
-7.00
-8.00
-9.00
-10.00
VERTICAL DEPTH (FT)
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Percent Wetted Perimeter vs. Discharge
Percent Wetted Perimeter
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
0.00
100.00
200.00
400.00
500.00
600.00
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
Velocity - ft/sec
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.00
100.00
200.00
300.00
400.00
500.00
600.00
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
Average Depth (feet
2.50
2.00
1.50
1.00
0.50
0.00
0.00
100.00
200.00
300.00
400.00
500.00
600.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Stage vs. Discharge
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Stage - feet
0.00
100.00
200.00
300.00
400.00
500.00
600.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Slater Creek					CROSS-SECTION NO.: 2	
CROSS-SECTION LOCATION: 200 ft. downstream from Mary Hoffman Ditch headgate						
DATE: 7-8-15	OBSERVERS: R. Smith, E. Scharff					
LEGAL DESCRIPTION	¼ SECTION: NE	SECTION: 4	TOWNSHIP: 11 N/S	RANGE: 89 E/W	PM: 6th	
COUNTY: Moffat	WATERSHED: Little Snake	WATER DIVISION: 6	DOW WATER CODE: 21953			
MAP(S):	USGS:					
	USFS:					

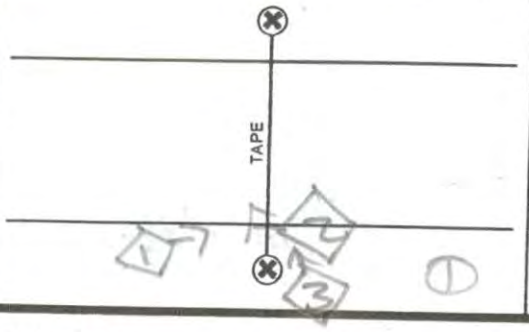
SUPPLEMENTAL DATA

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: sand to 8" cobble	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	5.10 / 5.10
2 WS Upstream	40.5	5.00
3 WS Downstream	59.0	5.30
SLOPE	0.30 / 99.5 = 0.003	

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

FORM #ISF FD 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Slater Creek | CROSS-SECTION NO.: 2 | DATE: 7-8-15 | SHEET ___ OF ___

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT | Gage Reading: _____ft | TIME: 12:20 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)
LS	0.0		0.92								
G	1.8		2.70								
	3.3		4.22								
W	4.5		5.10	ϕ				ϕ			
	7		6.10	1.0				1.43			
	9		6.35	1.25				1.21			
	11		4.05	.95				.92			
	13		5.9	.8				.79			
	15		5.8	.7				.33			
	17		5.6	.5				.12			
	19		5.55	.45				.46			
	21		5.75	.65				1.27			
	23		6.1	1.0				1.79			
	25		6.3	1.2				1.84			
	27		6.25	1.15				2.05			
	29		6.2	1.1				2.3			
	31		6.05	.95				2.09			
	33		5.95	.85				2.11			
	35		5.7	.6				2.32			
	37		5.7	.6				2.01			
	39		5.65	.55				1.93			
	41		5.6	.5				.48			
	43		5.7	.6				1.75			
	45		5.6	.5				1.82			
	47		5.6	.5				1.42			
	49		5.4	.3				.35			
	51		5.3	.2				.28			
	53		5.35	.25				.40			
	55		5.2	.10				.13			
	57		5.15	.05				ϕ			
	59		5.15	.05				ϕ			
W	60.3		5.10	ϕ				ϕ			
	62		4.75								
	67		4.32								
	70.5		3.96								
	73.5		3.55								
	75		3.50								
G	78		2.76								
RS	83.9		1.65								
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:	Slater Creek
XS LOCATION:	200 ft dwnstr fr Hoffman Ditch hdgt
XS NUMBER:	2
DATE:	8-Jul-15
OBSERVERS:	R. Smith, E. Scherff
1/4 SEC:	NE
SECTION:	4
TWP:	11N
RANGE:	89W
PM:	Sixth
COUNTY:	Moffat
WATERSHED:	Little Snake River
DIVISION:	6
DOW CODE:	21953
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

		*** NOTE ***
		Leave TAPE WT and TENSION
		at defaults for data collected
TAPE WT:	0.0106	with a survey level and rod
TENSION:	99999	

CHANNEL PROFILE DATA

SLOPE:	0.003

INPUT DATA CHECKED BY: .....DATE.....

ASSIGNED TO: ….....……..…….....DATE.....

STREAM NAME: Slater Creek
XS LOCATION: 200 ft dwnstr fr Hoffman Ditch hdgt
XS NUMBER: 2

DATA POINTS= 39

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
	LS	0.00	0.92			0.00		0.00	0.00	0.0%
1	G	1.80	2.70			0.00		0.00	0.00	0.0%
		3.30	4.22			0.00		0.00	0.00	0.0%
	W	4.50	5.10	0.00	0.00	0.00		0.00	0.00	0.0%
		7.00	6.10	1.00	1.43	2.69	1.00	2.25	3.22	6.3%
		9.00	6.35	1.25	1.21	2.02	1.25	2.50	3.03	5.9%
		11.00	6.05	0.95	0.92	2.02	0.95	1.90	1.75	3.4%
		13.00	5.90	0.80	0.79	2.01	0.80	1.60	1.26	2.5%
		15.00	5.80	0.70	0.33	2.00	0.70	1.40	0.46	0.9%
		17.00	5.60	0.50	0.12	2.01	0.50	1.00	0.12	0.2%
		19.00	5.55	0.45	0.46	2.00	0.45	0.90	0.41	0.8%
		21.00	5.75	0.65	1.27	2.01	0.65	1.30	1.65	3.2%
		23.00	6.10	1.00	1.79	2.03	1.00	2.00	3.58	7.0%
		25.00	6.30	1.20	1.84	2.01	1.20	2.40	4.42	8.7%
		27.00	6.25	1.15	2.05	2.00	1.15	2.30	4.72	9.3%
		29.00	6.20	1.10	2.30	2.00	1.10	2.20	5.06	9.9%
		31.00	6.05	0.95	2.09	2.01	0.95	1.90	3.97	7.8%
		33.00	5.95	0.85	2.11	2.00	0.85	1.70	3.59	7.0%
		35.00	5.70	0.60	2.32	2.02	0.60	1.20	2.78	5.5%
		37.00	5.70	0.60	2.01	2.00	0.60	1.20	2.41	4.7%
		39.00	5.65	0.55	1.93	2.00	0.55	1.10	2.12	4.2%
		41.00	5.60	0.50	0.48	2.00	0.50	1.00	0.48	0.9%
		43.00	5.70	0.60	1.75	2.00	0.60	1.20	2.10	4.1%
		45.00	5.60	0.50	1.82	2.00	0.50	1.00	1.82	3.6%
		47.00	5.60	0.50	1.42	2.00	0.50	1.00	1.42	2.8%
		49.00	5.40	0.30	0.35	2.01	0.30	0.60	0.21	0.4%
		51.00	5.30	0.20	0.28	2.00	0.20	0.40	0.11	0.2%
		53.00	5.35	0.25	0.40	2.00	0.25	0.50	0.20	0.4%
		55.00	5.20	0.10	0.18	2.01	0.10	0.20	0.04	0.1%
		57.00	5.15	0.05	0.00	2.00	0.05	0.10	0.00	0.0%
		59.00	5.15	0.05	0.00	2.00	0.05	0.08	0.00	0.0%
	W	60.30	5.10	0.00	0.00	1.30		0.00	0.00	0.0%
		62.00	4.75			0.00		0.00	0.00	0.0%
		67.00	5.32			0.00		0.00	0.00	0.0%
		70.50	3.96			0.00		0.00	0.00	0.0%
		73.50	3.55			0.00		0.00	0.00	0.0%
		75.00	3.50			0.00		0.00	0.00	0.0%
1	G	78.00	2.76			0.00		0.00	0.00	0.0%
	RS	83.90	1.65			0.00		0.00	0.00	0.0%
	TOTALS ----------					56.15	1.25 (Max.)	34.93	50.93	100.0%

Manning's n = 0.0407
Hydraulic Radius= 0.62211649

STREAM NAME: Slater Creek
XS LOCATION: 200 ft dwnstr fr Hoffman Ditch hdgt
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	34.93	35.21	0.8%
4.85	34.93	50.33	44.1%
4.87	34.93	49.08	40.5%
4.89	34.93	47.84	36.9%
4.91	34.93	46.60	33.4%
4.93	34.93	45.37	29.9%
4.95	34.93	44.15	26.4%
4.97	34.93	42.94	22.9%
4.99	34.93	41.73	19.5%
5.01	34.93	40.53	16.0%
5.03	34.93	39.33	12.6%
5.05	34.93	38.15	9.2%
5.06	34.93	37.55	7.5%
5.07	34.93	36.97	5.8%
5.08	34.93	36.38	4.1%
5.09	34.93	35.79	2.5%
5.10	34.93	35.21	0.8%
5.11	34.93	34.63	-0.9%
5.12	34.93	34.05	-2.5%
5.13	34.93	33.48	-4.2%
5.14	34.93	32.91	-5.8%
5.15	34.93	32.34	-7.4%
5.17	34.93	31.27	-10.5%
5.19	34.93	30.21	-13.5%
5.21	34.93	29.18	-16.5%
5.23	34.93	28.16	-19.4%
5.25	34.93	27.15	-22.3%
5.27	34.93	26.15	-25.1%
5.29	34.93	25.16	-28.0%
5.31	34.93	24.19	-30.8%
5.33	34.93	23.24	-33.5%
5.35	34.93	22.33	-36.1%

WATERLINE AT ZERO
AREA ERROR = 5.105

STREAM NAME: Slater Creek
XS LOCATION: 200 ft dwnstr fr Hoffman Ditch hdgt
XS NUMBER: 2 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	2.76	76.14	2.57	3.59	195.72	77.83	100.0%	2.51	724.06	3.70
	4.10	66.94	1.48	2.25	99.09	67.92	87.3%	1.46	254.98	2.57
	4.15	66.76	1.43	2.20	95.75	67.72	87.0%	1.41	241.30	2.52
	4.20	66.59	1.39	2.15	92.41	67.51	86.7%	1.37	227.93	2.47
	4.25	66.39	1.34	2.10	89.09	67.29	86.5%	1.32	214.89	2.41
	4.30	66.20	1.30	2.05	85.77	67.07	86.2%	1.28	202.17	2.36
	4.35	66.00	1.25	2.00	82.47	66.84	85.9%	1.23	189.78	2.30
	4.40	65.80	1.20	1.95	79.17	66.62	85.6%	1.19	177.70	2.24
	4.45	65.61	1.16	1.90	75.89	66.40	85.3%	1.14	165.95	2.19
	4.50	65.41	1.11	1.85	72.61	66.18	85.0%	1.10	154.53	2.13
	4.55	65.21	1.06	1.80	69.35	65.95	84.7%	1.05	143.45	2.07
	4.60	65.02	1.02	1.75	66.09	65.73	84.5%	1.01	132.70	2.01
	4.65	64.82	0.97	1.70	62.84	65.51	84.2%	0.96	122.29	1.95
	4.70	64.62	0.92	1.65	59.61	65.29	83.9%	0.91	112.23	1.88
	4.75	64.36	0.88	1.60	56.38	65.00	83.5%	0.87	102.59	1.82
	4.80	63.48	0.84	1.55	53.19	64.09	82.3%	0.83	93.96	1.77
	4.85	62.60	0.80	1.50	50.03	63.17	81.2%	0.79	85.68	1.71
	4.90	61.73	0.76	1.45	46.93	62.26	80.0%	0.75	77.75	1.66
	4.95	60.85	0.72	1.40	43.86	61.35	78.8%	0.71	70.16	1.60
	5.00	59.97	0.68	1.35	40.84	60.44	77.7%	0.68	62.92	1.54
	5.05	59.09	0.64	1.30	37.86	59.53	76.5%	0.64	56.03	1.48
WL	5.10	58.11	0.60	1.25	34.93	58.51	75.2%	0.60	49.55	1.42
	5.15	54.05	0.59	1.20	32.09	54.43	69.9%	0.59	45.13	1.41
	5.20	51.48	0.57	1.15	29.45	51.84	66.6%	0.57	40.41	1.37
	5.25	50.12	0.54	1.10	26.91	50.46	64.8%	0.53	35.40	1.32
	5.30	48.48	0.50	1.05	24.44	48.79	62.7%	0.50	30.83	1.26
	5.35	44.77	0.49	1.00	22.12	45.06	57.9%	0.49	27.53	1.24
	5.40	43.69	0.46	0.95	19.91	43.97	56.5%	0.45	23.48	1.18
	5.45	43.07	0.41	0.90	17.74	43.34	55.7%	0.41	19.56	1.10
	5.50	42.44	0.37	0.85	15.60	42.70	54.9%	0.37	15.95	1.02
	5.55	41.58	0.32	0.80	13.49	41.82	53.7%	0.32	12.70	0.94
	5.60	36.27	0.32	0.75	11.50	36.50	46.9%	0.32	10.66	0.93
	5.65	31.14	0.32	0.70	9.82	31.35	40.3%	0.31	9.06	0.92
	5.70	24.36	0.34	0.65	8.40	24.55	31.5%	0.34	8.22	0.98
	5.75	22.85	0.32	0.60	7.22	23.03	29.6%	0.31	6.66	0.92
	5.80	21.49	0.28	0.55	6.11	21.65	27.8%	0.28	5.26	0.86
	5.85	19.68	0.26	0.50	5.08	19.82	25.5%	0.26	4.10	0.81
	5.90	17.90	0.23	0.45	4.14	18.02	23.2%	0.23	3.11	0.75
	5.95	16.37	0.20	0.40	3.28	16.47	21.2%	0.20	2.24	0.68
	6.00	14.29	0.18	0.35	2.51	14.38	18.5%	0.17	1.57	0.63
	6.05	12.28	0.15	0.30	1.85	12.34	15.9%	0.15	1.05	0.56
	6.10	10.82	0.12	0.25	1.27	10.87	14.0%	0.12	0.61	0.48
	6.15	8.92	0.09	0.20	0.78	8.96	11.5%	0.09	0.31	0.39
	6.20	6.89	0.06	0.15	0.38	6.92	8.9%	0.06	0.11	0.29
	6.25	3.66	0.03	0.10	0.12	3.68	4.7%	0.03	0.02	0.20
	6.30	0.66	0.02	0.05	0.02	0.67	0.9%	0.02	0.00	0.16

STREAM NAME: Slater Creek
XS LOCATION: 200 ft dwnstr fr Hoffman Ditch hdgt
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	50.93	cfs
CALCULATED FLOW (Qc)=	49.55	cfs
(Qm-Qc)/Qm * 100 =	2.7	%
MEASURED WATERLINE (WLm)=	5.10	ft
CALCULATED WATERLINE (WLc)=	5.10	ft
(WLm-WLc)/WLm * 100 =	-0.1	%
MAX MEASURED DEPTH (Dm)=	1.25	ft
MAX CALCULATED DEPTH (Dc)=	1.25	ft
(Dm-Dc)/Dm * 100	0.4	%
MEAN VELOCITY=	1.42	ft/sec
MANNING'S N=	0.041	
SLOPE=	0.003	ft/ft
.4 * Qm =	20.4	cfs
2.5 * Qm=	127.3	cfs

RECOMMENDED INSTREAM FLOW:
=============================

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

RATIONALE FOR RECOMMENDATION:
=============================

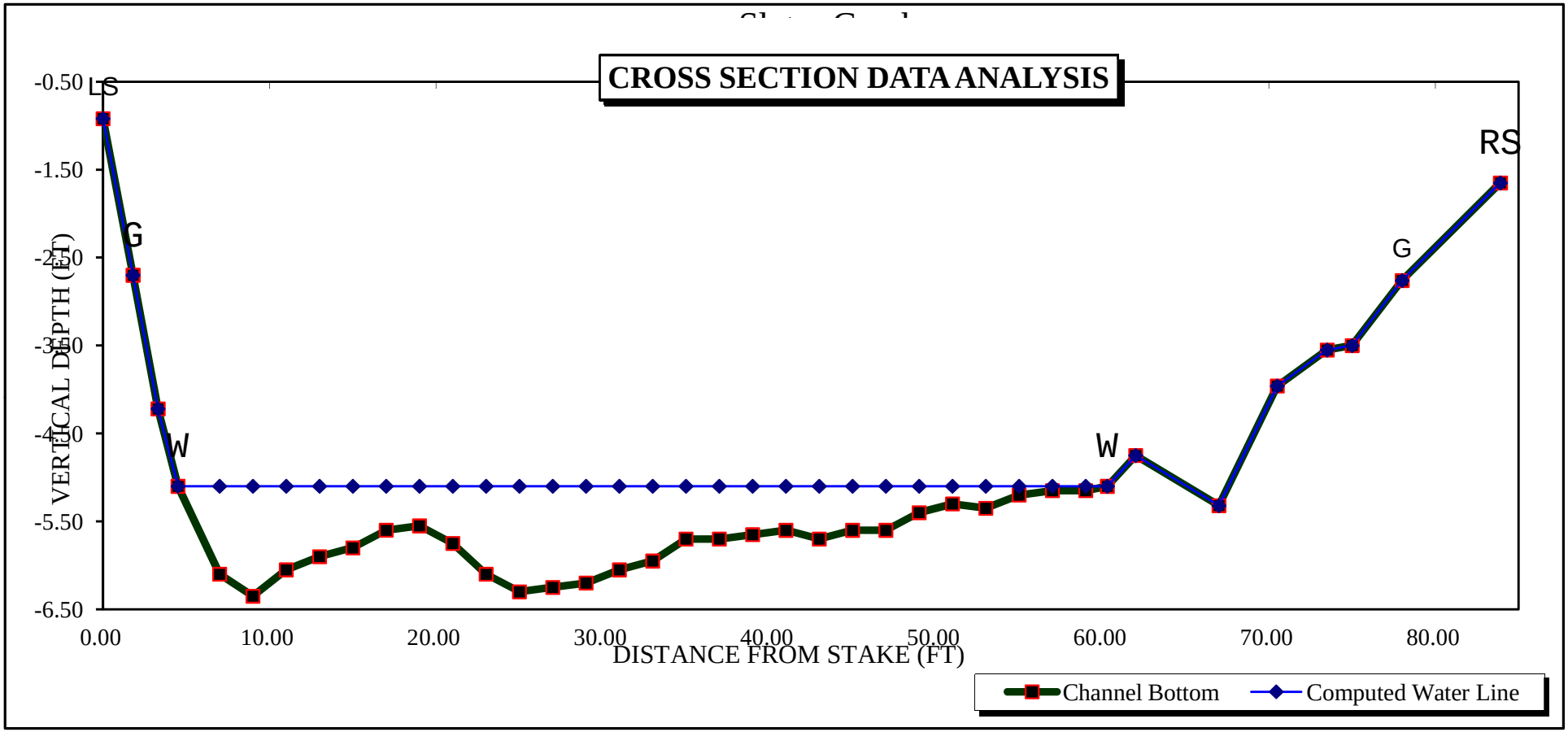
RECOMMENDATION BY: ……………………...………..……............................... AGENCY...……………………......……....…...…….…...... DATE:.......…...…......……………

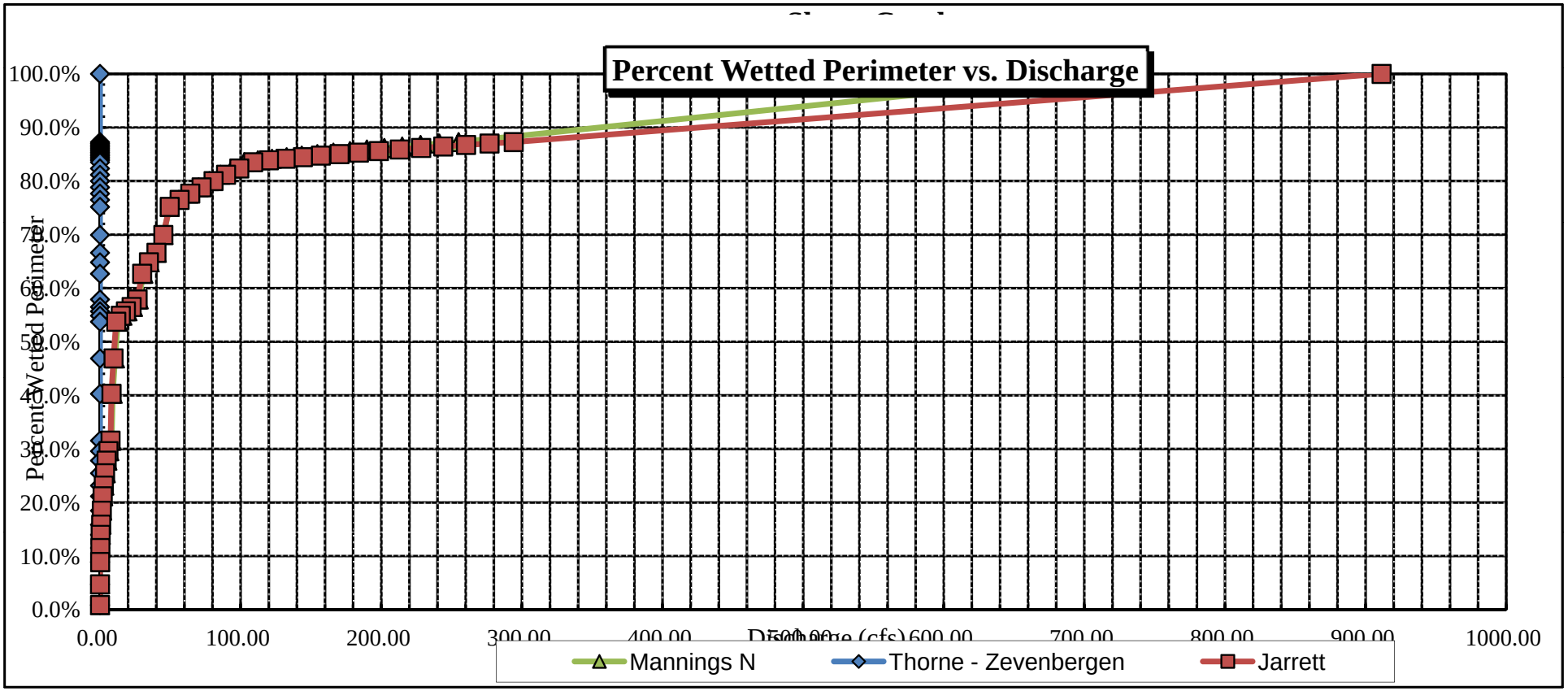
CWCB REVIEW BY: ..……………………………....……………………………………………………...…............. DATE:.................…………….....…

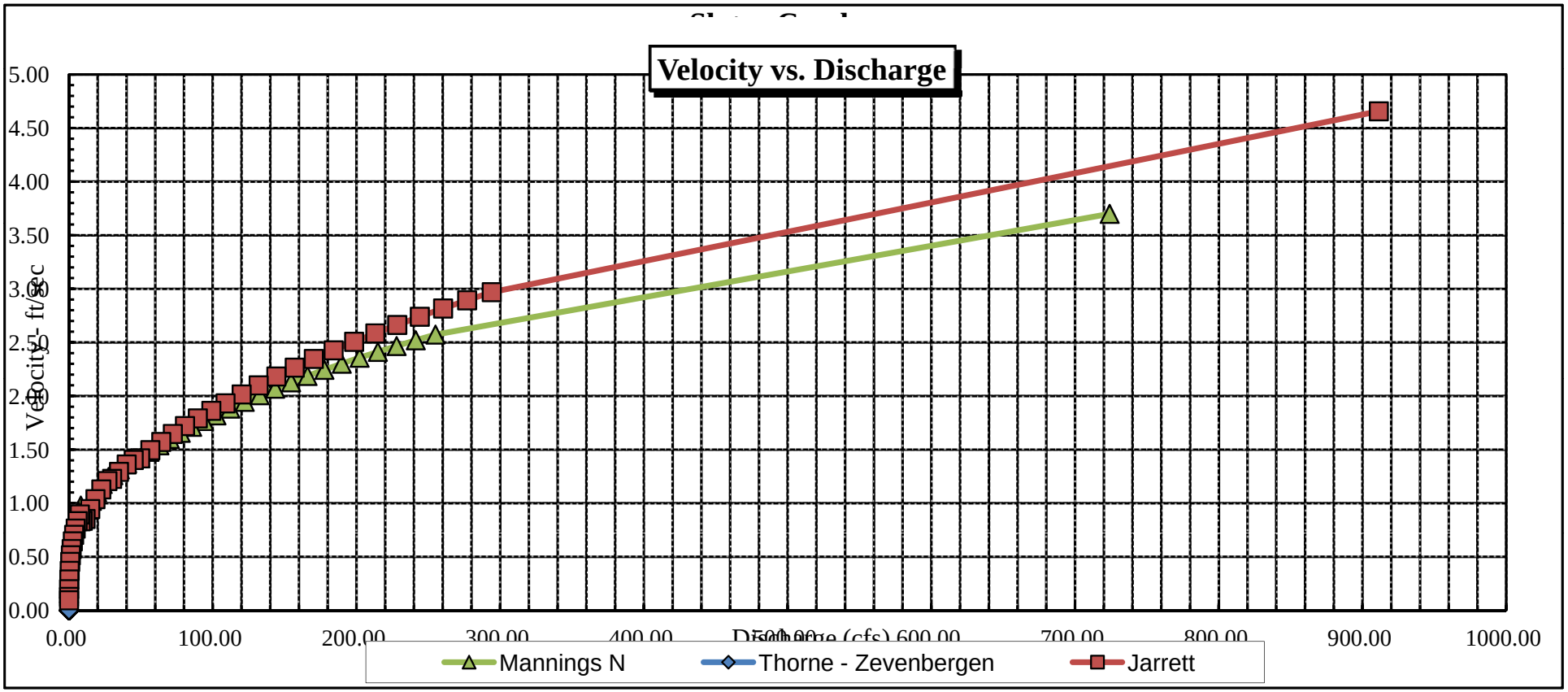
STREAM NAME: Slater Creek
XS LOCATION: 200 ft dwnstr fr Hoffman Ditch hdgt
XS NUMBER: 2 Jarrett Variable Manning's n Correction Applied

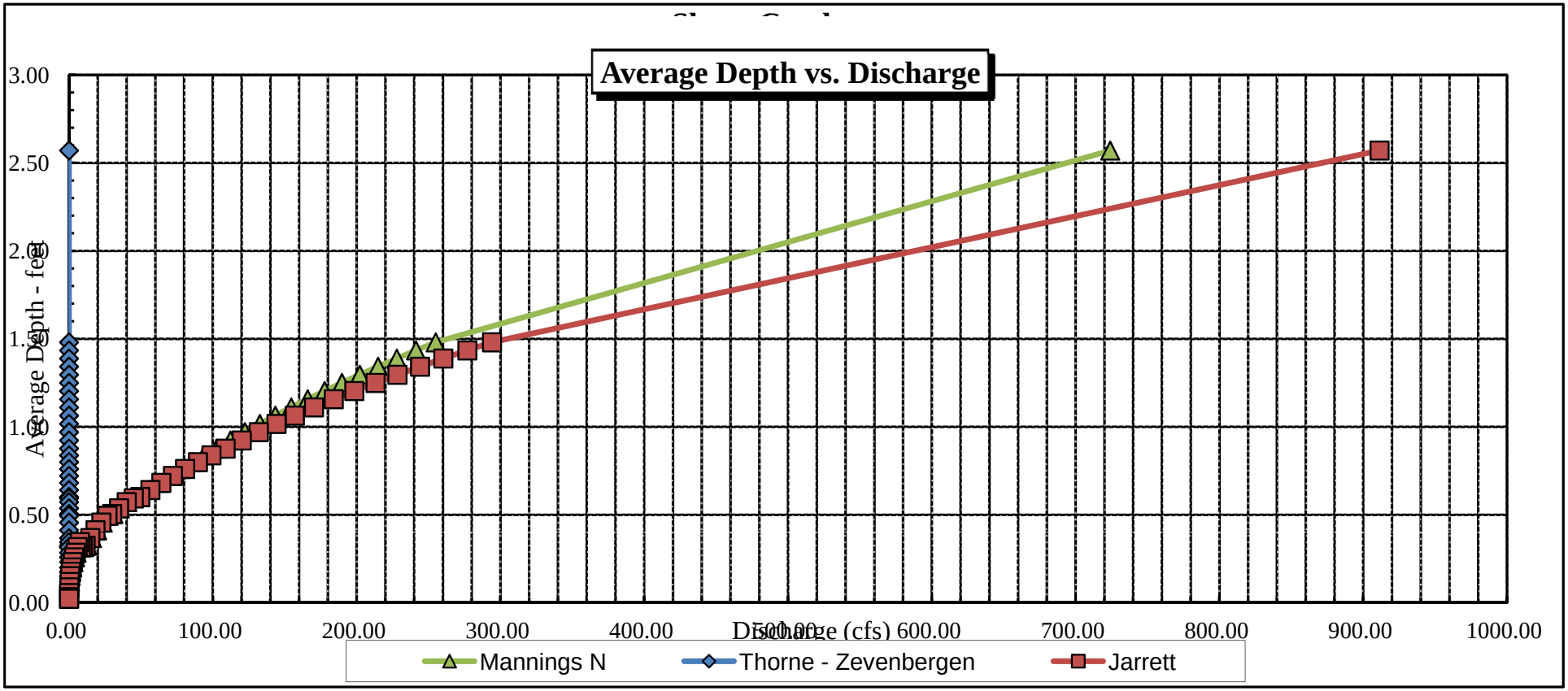
GL = lowest Grassline elevation corrected for sag
STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

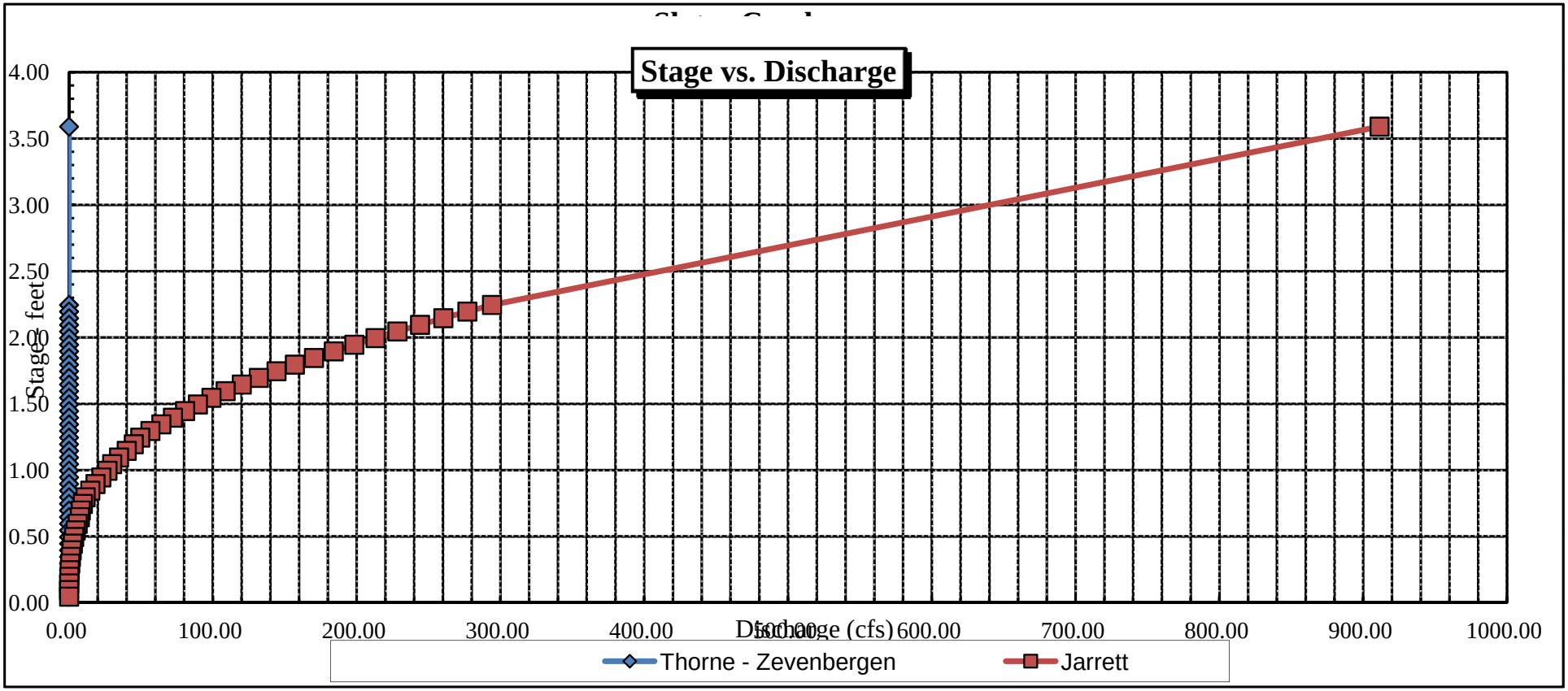
	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	2.76	76.14	2.57	3.59	195.72	77.83	100.0%	2.51	911.36	4.66
	4.10	66.94	1.48	2.25	99.09	67.92	87.3%	1.46	294.16	2.97
	4.15	66.76	1.43	2.20	95.75	67.72	87.0%	1.41	276.99	2.89
	4.20	66.59	1.39	2.15	92.41	67.51	86.7%	1.37	260.29	2.82
	4.25	66.39	1.34	2.10	89.09	67.29	86.5%	1.32	244.09	2.74
	4.30	66.20	1.30	2.05	85.77	67.07	86.2%	1.28	228.38	2.66
	4.35	66.00	1.25	2.00	82.47	66.84	85.9%	1.23	213.15	2.58
	4.40	65.80	1.20	1.95	79.17	66.62	85.6%	1.19	198.39	2.51
	4.45	65.61	1.16	1.90	75.89	66.40	85.3%	1.14	184.12	2.43
	4.50	65.41	1.11	1.85	72.61	66.18	85.0%	1.10	170.34	2.35
	4.55	65.21	1.06	1.80	69.35	65.95	84.7%	1.05	157.04	2.26
	4.60	65.02	1.02	1.75	66.09	65.73	84.5%	1.01	144.24	2.18
	4.65	64.82	0.97	1.70	62.84	65.51	84.2%	0.96	131.93	2.10
	4.70	64.62	0.92	1.65	59.61	65.29	83.9%	0.91	120.12	2.02
	4.75	64.36	0.88	1.60	56.38	65.00	83.5%	0.87	108.91	1.93
	4.80	63.48	0.84	1.55	53.19	64.09	82.3%	0.83	99.05	1.86
	4.85	62.60	0.80	1.50	50.03	63.17	81.2%	0.79	89.65	1.79
	4.90	61.73	0.76	1.45	46.93	62.26	80.0%	0.75	80.70	1.72
	4.95	60.85	0.72	1.40	43.86	61.35	78.8%	0.71	72.21	1.65
	5.00	59.97	0.68	1.35	40.84	60.44	77.7%	0.68	64.17	1.57
	5.05	59.09	0.64	1.30	37.86	59.53	76.5%	0.64	56.60	1.49
WL	5.10	58.11	0.60	1.25	34.93	58.51	75.2%	0.60	49.55	1.42
	5.15	54.05	0.59	1.20	32.09	54.43	69.9%	0.59	45.04	1.40
	5.20	51.48	0.57	1.15	29.45	51.84	66.6%	0.57	40.09	1.36
	5.25	50.12	0.54	1.10	26.91	50.46	64.8%	0.53	34.77	1.29
	5.30	48.48	0.50	1.05	24.44	48.79	62.7%	0.50	29.98	1.23
	5.35	44.77	0.49	1.00	22.12	45.06	57.9%	0.49	26.68	1.21
	5.40	43.69	0.46	0.95	19.91	43.97	56.5%	0.45	22.46	1.13
	5.45	43.07	0.41	0.90	17.74	43.34	55.7%	0.41	18.41	1.04
	5.50	42.44	0.37	0.85	15.60	42.70	54.9%	0.37	14.74	0.95
	5.55	41.58	0.32	0.80	13.49	41.82	53.7%	0.32	11.51	0.85
	5.60	36.27	0.32	0.75	11.50	36.50	46.9%	0.32	9.62	0.84
	5.65	31.14	0.32	0.70	9.82	31.35	40.3%	0.31	8.17	0.83
	5.70	24.36	0.34	0.65	8.40	24.55	31.5%	0.34	7.51	0.89
	5.75	22.85	0.32	0.60	7.22	23.03	29.6%	0.31	6.01	0.83
	5.80	21.49	0.28	0.55	6.11	21.65	27.8%	0.28	4.66	0.76
	5.85	19.68	0.26	0.50	5.08	19.82	25.5%	0.26	3.58	0.70
	5.90	17.90	0.23	0.45	4.14	18.02	23.2%	0.23	2.67	0.64
	5.95	16.37	0.20	0.40	3.28	16.47	21.2%	0.20	1.88	0.57
	6.00	14.29	0.18	0.35	2.51	14.38	18.5%	0.17	1.29	0.51
	6.05	12.28	0.15	0.30	1.85	12.34	15.9%	0.15	0.84	0.45
	6.10	10.82	0.12	0.25	1.27	10.87	14.0%	0.12	0.47	0.37
	6.15	8.92	0.09	0.20	0.78	8.96	11.5%	0.09	0.23	0.29
	6.20	6.89	0.06	0.15	0.38	6.92	8.9%	0.06	0.08	0.20
	6.25	3.66	0.03	0.10	0.12	3.68	4.7%	0.03	0.01	0.13
	6.30	0.66	0.02	0.05	0.02	0.67	0.9%	0.02	0.00	0.09


CROSS SECTION DATA ANALYSIS
LS
G
W
W
G
RS
-0.50
-1.50
-2.50
-3.50
-4.50
-5.50
-6.50
VERTICAL DEPTH (FT)
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Percent Wetted Perimeter vs. Discharge
Percent Wetted Perimeter
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
0.00
100.00
200.00
300.00
400.00
500.00
600.00
700.00
800.00
900.00
1000.00
Mannings N
Thorne - Zevenbergen
Jarrett


Velocity vs. Discharge
Velocity - ft/sec
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.00
100.00
200.00
300.00
400.00
500.00
600.00
700.00
800.00
900.00
1000.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Average Depth vs. Discharge
Average Depth - feet
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.00
100.00
200.00
300.00
400.00
500.00
600.00
700.00
800.00
900.00
1000.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett

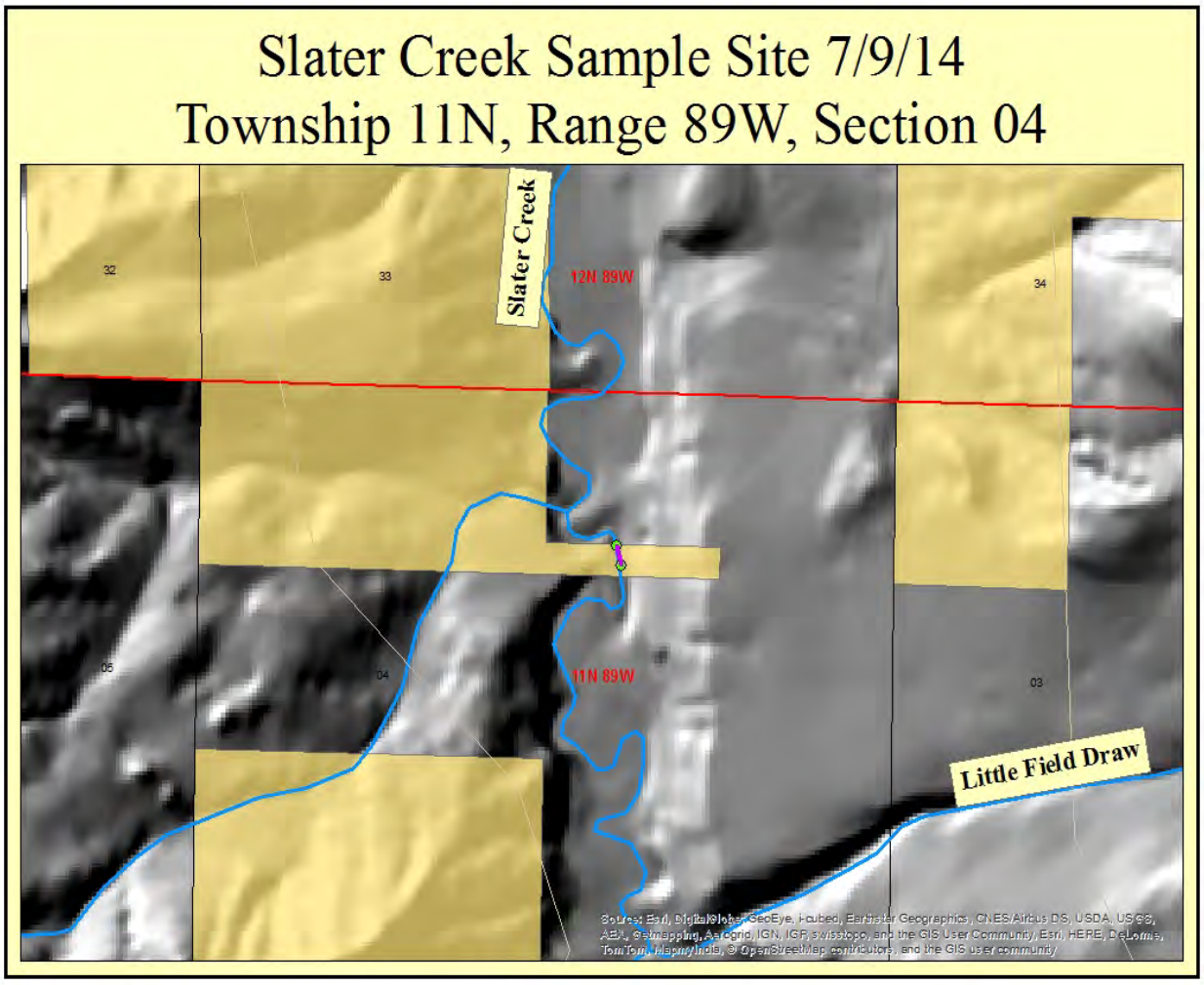

Stage vs. Discharge
Stage - feet
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.00
100.00
200.00
300.00
400.00
500.00
600.00
700.00
800.00
900.00
1000.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

Little Snake Field Office Stream Surveys

July, 2014

Slater Creek – Water Code: 21953

Slater Creek, located on BLM lands administered by the Little Snake Field Office, was sampled on July 9, 2014 on a small portion of BLM land located west of county road 1, northeast of Craig, CO. Slater creek is tributary to the Little Snake River. Sampling was conducted with one pass to determine species presence and composition. The stream was too wide to effectively sample with one backpack electroshocker, so a two-pass population estimate was not completed. Personnel present were Tom Fresques and Kristen Doyle, BLM.



Slater Creek looking downstream of sample site

Slater Creek looking upstream at sample site

Bluehead sucker

STREAM SURVEY FISH SAMPLING FORM 2014									
WATER: Slater Creek				**DATE: 7/9/14**			**GEAR: BPE-1**		
Crew: Fresques, Doyle					**Location: NE of Craig, CO**				
#	**Pass**	**Species**	**Length**	**Weight**	**#**	**Pass**	**Species**	**Length**	**Weight**
1	1	SPD	73	4	27	1	CRC	70	2.7
2	1	BHS	104	9.7	28	1	SPD	71	3.0
3	1	SPD	68	3.5	29	1	SPD	69	2.9
4	1	SPD	71	4	30	1	SPD	82	5
5	1	MTS	66	4.6	31	1	SPD	68	2.8
6	1	SPD	100	9.2	32	1	CRC	53	1.7
7	1	SPD	79	6.1	33	1	CRC	103	9.8
8	1	SPD	62	2.9	34	1	SPD	46	1.2
9	1	SPD	68	3.2	35	1	SPD	47	1.7
10	1	SPD	72	3.8	36	1	SPD	68	3.8
11	1	SPD	114	11.8	37	1	SPD	65	3.1
12	1	SPD	74	4.6	38	1	SPD	65	3.3
13	1	SPD	70	3	39	1	SPD	75	3.8
14	1	SPD	69	2.7	40	1	SPD	78	4.2
15	1	SPD	91	8.1	41	1	FMW	60	2.7
16	1	SPD	73	4.5	42	1	SPD	64	3.5
17	1	CRC	114	14.7	43	1	SPD	49	1.6

18	1	SPD	77	3.6	44	1	SPD	66	3
19	1	SPD	71	3.4	45	1	SPD	91	8.7
20	1	SPD	73	4.2	46	1	SPD	87	5.9
21	1	SPD	95	8.1	47	1	SPD	80	4.6
22	1	SPD	67	3.8	48	1	CRC		
23	1	SPD	66	2.8	49	1	SPD	44	0.9
24	1	SPD	46	0.9	50	1	SPD	58	2.5
25	1	SPD	91	6.7	51	1	SPD	47	1.1
26	1	SPD	72	3.1			SPD	47	1.2

GPS Coordinates: Start = 13N 0299482, 4534964 End = 13N 0299504, 4534918

H2O Temp:	**Reach Length**: Less than 100'	**Stream Widths**	1. 26.9'
Conductivity:	**Shocker Settings**:		2. 47.2'
Habitat (Riparian): Narrowleaf cottonwood, alder, sedge, rush, mare's tail. Very well vegetated, wide riparian area.			3. 34.6'
			4.
			5.
			Avg: 36.23'

Habitat (Stream): Small reach of BLM. Water diversion at upper end. Stream is wide and relatively shallow but a few meander bend poos were present. Bed is primarily cobble with some fine sediment. Low gradient reach other than the water diversion, stream was too wide for 1 shocker, missed fish. C channel.

Discussion:

Native species including speckled dace, mottled sculpin, and bluehead sucker were collected. Nonnative species collected included creek chub and fathead minnow. As noted, sampling was difficult with one shocker and fish were missed. Stream and riparian habitats were in good condition and consisted of large narrowleaf cottonwoods, willow, sedge, rush, and riparian grasses.

Recommendations:

- Sample this or a similar site with CPW with a bank rig unit to get better information and complete a two pass population estimate.

- Consider sampling in the spring under higher flows to attempt to document adult 3 Species use of this stream during the spawning season

- Periodically monitor stream and riparian habitats.