



United States Department of the Interior

BUREAU OF LAND MANAGEMENT

Colorado State Office

2850 Youngfield Street

Lakewood, Colorado 80215-7210

www.co.blm.gov



In Reply Refer To:
7250 (CO-930)

DEC 22 2014

Ms. Linda Bassi
Colorado Water Conservation Board
1313 Sherman Street, Room 721
Denver, CO 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 Timber Springs Gulch, located in Water Division 5.

Location and Land Status. Timber Springs Gulch originates from a large series of springs directly north of Wilmore Lake, which is located along Interstate 70 near Edwards, Colorado. This recommendation covers a reach that starts at a large complex of springs located at UTM readings 360417mE 4392857mN (NAD 1983 Zone 13) and extends downstream to the BLM-private land boundary. This stream reach covers a distance of approximately 0.5 miles. The BLM and U.S. Forest Service manage all of the lands along this stream reach.

Biological Summary. Timber Springs Gulch is a cold-water, high gradient stream. It flows through a canyon with a valley floor approximately one-fourth mile in width. The stream cuts through alluvial deposits in the narrow valley and is not confined by bedrock in most locations. The stream generally has small-sized substrate, consisting of gravels and small cobbles, and small boulders. While riffle habitat is abundant, parts of the stream lack extensive pool habitat.

Fisheries surveys have revealed a self-sustaining population of native cutthroat trout. 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 blue spruce, willow species, and alder. The riparian community is in very good condition, and provides adequate shading and cover for fish habitat.

R2Cross Analysis. The BLM collected the following R2Cross data from Timber Springs Gulch:

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)
05/17/2013 #1	1.30 cfs	7.40 feet	1.34 cfs	1.88 cfs
05/17/2013 #2	1.34 cfs	7.60 feet	0.69 cfs	2.40 cfs
Averages:			1.01 cfs	2.14 cfs

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

1.3 cubic feet per second is recommended from April 1 to October 31. While 2.1 cubic feet per second would be required to meet all three instream flow criteria, it appears that the springs that feed this creek flow steadily year-round at 1.3 cfs. 1.3 cfs meets both the wetted perimeter and the average velocity criteria and provides an average depth 0.15 feet in riffles. The very stable flow rate of the creek allows the fishery to persist, even though depth conditions may not be optimal in all riffle locations.

1.0 cubic feet per second is recommended from November 1 to March 31. This recommendation is driven the average velocity criteria. This flow rate should prevent pools from freezing, allowing the fish population to successfully overwinter.

Water Availability. The BLM does not recommend relying exclusively upon traditional water availability analysis for this stream. The BLM's observation is that streamflow is provided exclusively by a large spring complex located at the upper terminus of the proposed reach. Above these springs, there is no active runoff channel, indicating that snowmelt runoff and upstream groundwater discharge do not play a significant role in the flow regime. However, the BLM does recommend reviewing diversions for Groff Ditch and Groff Ditch Cottonwood Enlargement, both of which are located downstream from the proposed instream flow reach. Groff Ditch has diversion records since the 1950s and the diversion records since 2006 contain winter diversions.

The BLM is not aware of any decreed water rights within the proposed instream flow reach.

Relationship to Land Management Plans. The BLM land use plan for this area calls for actions to maintain and enhance riparian and fisheries habitat. In general, any proposed new land use, such as right-of-way corridors or mineral development, must be implemented with no surface occupancy to avoid impacts to the creek. Any proposed land uses along this creek are also carefully reviewed and mitigated to prevent impacts to native cutthroat trout, which appear on the BLM's sensitive species list. Finally, the BLM land use plans contain require stipulations on land uses to avoid impacts to important spring-fed 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 the BLM's draft recommendation in February 2014. We thank both CPW 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,

Acting



Brian St. George
Deputy State Director
Resources and Fire Management

cc: Pauline Adams, Colorado River Valley Field Office
Tom Fresques, Colorado River Valley Field Office
Steve Bennett, Colorado River Valley Field Office
Joseph Meyer, Northwest District Office

Colorado River Valley Field Office Stream Surveys June 2012

Unnamed Tributary to Eagle River near Edwards, CO. - Water Code #(unknown)

An unnamed tributary to Wilmor Lake/Eagle River, located west of Edwards, CO and referred to locally as “Timber Springs Gulch” was sampled on June 21, 2012. This stream is located on BLM lands managed by the Colorado River Valley Field Office and USFS lands managed by the White River National Forest. Access to the stream was obtained through private property via permission from land owners in the Timber Springs subdivision. The unnamed tributary was historically a tributary to the Eagle River via Wilmore Lake, but is now mostly diverted to the east prior to reaching the lake/river. A 325-foot long reach was sampled and a two-pass removal population estimate was completed. In addition, 30 fin clips were collected from cutthroat trout within, above, and below the sample reach. Sampling was conducted via backpack electro-shocker. Personnel present were Tom Fresques, Pauline Adams, Gregor Dekleva, Andrea Sponseller and Kyle Bond.

A total of 52 fish were collected during the population estimate and 16 additional adult fish were collected for genetic analyses up and downstream of the 325-foot population estimate reach. All fish collected were Colorado River cutthroat trout.



Stream reach



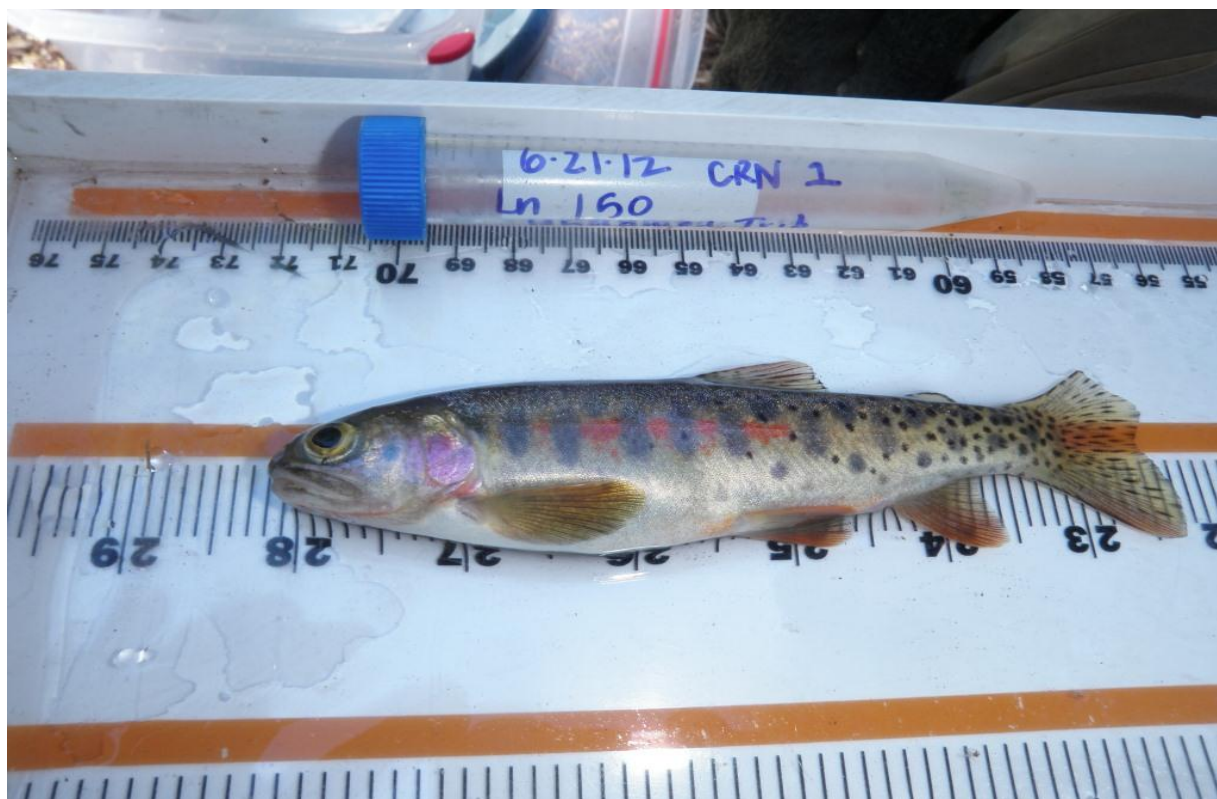
Stream habitat



Travertine cascade



2 pass removal- population estimate



Representative Cutthroat- Fin clip removed for genetic analysis



Fin-clipped cutthroat



Irrigation Ditch



Headgate

Population Estimate Data

STREAM SURVEY FISH SAMPLING FORM

2012

WATER Unnamed Tributary- Eagle River (Timber Spring) DATE 6/21/2012 GEAR BPE - 1

EFFORT 325ft. STATION # 1 CREW Fresques,Dekleva,Sponseller,Adams,Bond LOCATION BLM

#	Pass	species	length	weight	#	species	length	weight	Pass
1	1	CRN	118	14.4	26	CRN	103	10.3	1
2	1	CRN	189	68.7	27	CRN	82	5.6	1
3	1	CRN	149	54.3	28	CRN	136	25.8	1
4	1	CRN	156	53.7	29	CRN	168	41.8	1
5	1	CRN	192	61.1	30	CRN	176	53.8	1
6	1	CRN	113	12.6	31	CRN	131	21.4	1
7	1	CRN	137	20.6	32	CRN	197	58.3	1
8	1	CRN	192	53.7	33	CRN	141	22.9	1
9	1	CRN	164	35.2	34	CRN	126	19.3	1
10	1	CRN	168	40.9	35	CRN	79	4.6	1
11	1	CRN	225	122.7	36	CRN	132	18.3	1
12	1	CRN	157	38	37	CRN	118	15.1	1
13	1	CRN	164	42.6	38	CRN	136	22.5	1
14	1	CRN	167	43.8	39	CRN	189	68.7	1
15	1	CRN	104	8.8	40	CRN	117	13.4	1
16	1	CRN	91	7.7	41	CRN	128	12	1
17	1	CRN	133	20.8	42	CRN	112	13.1	1
18	1	CRN	86	7.6					
19	1	CRN	148	26.9					
20	1	CRN	190	64.4					
21	1	CRN	143	24.4					
22	1	CRN	121	15					
23	1	CRN	182	47.4					
24	1	CRN	207	79.8					
25	1	CRN	117	14.1					

#	Pass	species	length	weight		species	length	weight	Pass
43	2	CRN	150	33					
44	2	CRN	221	98.2					
45	2	CRN	180	54.2					
46	2	CRN	177	50.4					
47	2	CRN	134	22.6					
48	2	CRN	173	43					
49	2	CRN	97	6.6					
50	2	CRN	96	7.8					
51	2	CRN	100	9.5					
52	2	CRN	93	5.8					

CRN = Cutthroat Trout

GPS Coordinates: Population estimate GPS location- bottom of reach:
13S X:0360349 Y:4392151- top of reach- 13S X:0360360 Y:4392240

Notes: Stream Width Ave = 5.9 ft. Sample Reach 325 ft

Stream/Riparian Area Characteristics:

Slightly incised and braided channel with step-pool, travertine, silt/sandy bottom, mix riffles/pools with dense riparian: Alder, Hawthorne, Willows, Sedges, Carex, Thistle (Canada), Spruce Fir forest, Geranium, Rose. Visual estimate of flow: 1-2 cfs. Insects: Tricoptera, Ephemeroptera, Tipulidae

Water Quality:

Water Temperature = 11.6° C/ 52.8° F

Air Temperature = 78° F

pH = 9.16

Conductivity = 671 us

Total Dissolved Solids (TDS) = 476 ppm

Salinity = 371 ppm

Fin Clip Data

#	Fin Clip #	species	length			#	Fin Clip #	species	length
1	1	CRN	150	33		26	26	CRN	174
2	2	CRN	221	98.2		27	27	CRN	180
3	3	CRN	180	54.2		28	28	CRN	154

4	4	CRN	177	50.4		29	29	CRN	151
5	5	CRN	173	43		30	30	CRN	150
6	6	CRN	192	61.1					
7	7	CRN	197	58.3					
8	8	CRN	192	53.7					
9	9	CRN	190	64.4					
10	10	CRN	225	122.7					
11	11	CRN	207	79.8					
12	12	CRN	189	68.7					
13	13	CRN	176	53.8					
14	14	CRN	189	68.7					
15	15	CRN	193						
16	16	CRN	165						
17	17	CRN	190						
18	18	CRN	216						
19	19	CRN	173						
20	20	CRN	161						
21	21	CRN	216						
22	22	CRN	198						
23	23	CRN	185						
24	24	CRN	217						
25	25	CRN	185						

Notes: Fish 1-14 were collected in the population estimation reach. Fish 15-20 were collected below the reach. Fish 21-30 were collected from above the reach.

Discussion:

The unnamed tributary to Wilmor Lake is a high gradient step-pool channel confined by its V-shaped valley and fed primarily from contact springs along the east valley slope. This channel could more specifically be described as a Rosgen A4 type channel based on its low sinuosity, entrenchment, and steep channel gradient. Channel substrate consists of locally derived sandstone, shale, and limestone rocks. This channel is braided in the lower reaches of the drainage as a result of relic beaver activity and local geology including bedrock configurations and groundwater influence.

The contact springs at the headwaters of the perennial section (which is erroneously mapped as ephemeral on USGS maps) and at the beginning of the riparian corridor are responsible for maintenance of base flows and the establishment of riparian vegetation. Groundwater recharge is occurring higher up in the watershed through snowmelt and precipitation events. At the point of emergence, tufa formations were observed as a result of chemical dissolution and the associated

precipitation processes. More specifically, acidic groundwater (carbonic acid: H_2CO_3) has dissolved surrounding limestone rocks and the calcareous material is deposited where the spring emerges. In addition, the majority of the channel substrate is composed of limestone cobbles, gravel, and bedrock. Limestone's susceptibility to chemical weathering is the primary cause of the unique drainage pattern observed in the lower reaches (e.g. dissolution along pockets, fractures, etc.). Evidence of such processes was the presence of several dissolution holes in the channel bottom.

The riparian corridor is in very good condition. It is dominated by alder, hawthorne, willows, spruce, fir, geranium, rose, sedges, and thistle. Geology of the valley slopes are dominated by shale and sandstone colluvium with the occasional sandstone outcrop, while the drainage appears to be dominated by limestone as mentioned above. Pools were small but abundant in areas. Fish were found throughout the creek in each channel sampled. Sampling was difficult given the abundant woody cover, downed trees, and multiple channels.

The trout in this tributary were analyzed for genetic purity and lineage delineation and results suggest that they are pure Colorado River cutthroat trout – Blue Lineage fish. Blue Lineage fish are native to the White-Yampa river basins so it is apparent that these fish were stocked. The native lineage to the upper Colorado River would be Green Lineage. Fish collected were healthy and numerous with good age-class diversity. The stream flow appeared to be excellent, given the drought conditions persistent at the time of sampling. Insects observed included Tricoptera, Ephemeroptera, and Tipulidae, as well as snails and beetles.

Recommendations:

- Determine if fish entrainment into area ditches is occurring and if so to what degree
- Periodically sample the stream to assess fishery condition and trend
- Pursue Instream Flow recommendation

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

LOCATION INFORMATION

STREAM NAME: Timber Springs Gulch
XS LOCATION: 0.5 mile u/s from Timber Spring Subdiv.
XS NUMBER: 1

DATE: 17-May-13
OBSERVERS: R. Smith, P. Adams

1/4 SEC: SE SE
SECTION: 25
TWP: 4S
RANGE: 83W
PM: Sixth

COUNTY: Eagle
WATERSHED: Eagle River
DIVISION: 5
DOW CODE: not numbered

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: 0.088

INPUT DATA CHECKED BY:DATE.....

ASSIGNED TO:DATE.....

STREAM NAME: Timber Springs Gulch
 XS LOCATION: 0.5 mile u/s from Timber Spring Subdiv.
 XS NUMBER: 1

DATA POINTS= 25

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL
LS	0.00	6.35		
1 G	0.90	7.40		
W	1.00	7.95	0.00	0.00
	1.40	8.10	0.15	0.23
	1.80	8.10	0.15	0.48
	2.20	8.05	0.10	1.32
	2.60	8.05	0.10	0.20
	3.00	8.15	0.20	1.78
	3.40	8.10	0.15	0.00
	3.80	8.10	0.15	1.01
	4.20	8.10	0.15	1.89
	4.60	8.15	0.20	1.48
	5.00	8.15	0.20	1.31
	5.40	8.10	0.15	1.14
R	5.80	7.95	0.00	0.00
	6.20	8.15	0.20	0.04
	6.60	8.15	0.20	0.43
	7.00	8.25	0.30	1.19
	7.40	8.25	0.30	1.66
	7.80	8.25	0.30	0.86
	8.20	8.10	0.15	1.23
	8.60	8.05	0.10	0.69
W	9.20	7.95	0.00	0.00
1 G	10.50	7.40		
RS	12.60	6.48		

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%
0.43	0.15	0.06	0.01	1.1%
0.40	0.15	0.06	0.03	2.2%
0.40	0.10	0.04	0.05	4.1%
0.40	0.10	0.04	0.01	0.6%
0.41	0.20	0.08	0.14	10.9%
0.40	0.15	0.06	0.00	0.0%
0.40	0.15	0.06	0.06	4.7%
0.40	0.15	0.06	0.11	8.7%
0.40	0.20	0.08	0.12	9.1%
0.40	0.20	0.08	0.10	8.0%
0.40	0.15	0.06	0.07	5.3%
0.43		0.00	0.00	0.0%
0.45	0.20	0.08	0.00	0.2%
0.40	0.20	0.08	0.03	2.6%
0.41	0.30	0.12	0.14	11.0%
0.40	0.30	0.12	0.20	15.3%
0.40	0.30	0.12	0.10	7.9%
0.43	0.15	0.06	0.07	5.7%
0.40	0.10	0.05	0.03	2.6%
0.61		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%

TOTALS -----

8.38	0.3	1.31	1.30	100.0%
(Max.)				

Manning's n = 0.1287
 Hydraulic Radius= 0.15637541

STREAM NAME: Timber Springs Gulch
 XS LOCATION: 0.5 mile u/s from Timber Spring Subdiv.
 XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	1.31	1.31	0.0%
7.70	1.31	3.44	162.6%
7.72	1.31	3.26	149.1%
7.74	1.31	3.09	135.7%
7.76	1.31	2.91	122.4%
7.78	1.31	2.74	109.2%
7.80	1.31	2.57	96.1%
7.82	1.31	2.40	83.0%
7.84	1.31	2.23	70.0%
7.86	1.31	2.06	57.1%
7.88	1.31	1.89	44.3%
7.90	1.31	1.72	31.5%
7.91	1.31	1.64	25.2%
7.92	1.31	1.56	18.9%
7.93	1.31	1.47	12.6%
7.94	1.31	1.39	6.3%
7.95	1.31	1.31	0.0%
7.96	1.31	1.23	-6.2%
7.97	1.31	1.15	-12.3%
7.98	1.31	1.07	-18.3%
7.99	1.31	0.99	-24.2%
8.00	1.31	0.92	-30.0%
8.02	1.31	0.77	-41.3%
8.04	1.31	0.63	-52.2%
8.06	1.31	0.49	-62.3%
8.08	1.31	0.37	-71.4%
8.10	1.31	0.27	-79.6%
8.12	1.31	0.20	-85.0%
8.14	1.31	0.14	-89.5%
8.16	1.31	0.10	-92.4%
8.18	1.31	0.07	-94.5%
8.20	1.31	0.05	-96.3%

WATERLINE AT ZERO

AREA ERROR = 7.950

STREAM NAME: Timber Springs Gulch
 XS LOCATION: 0.5 mile u/s from Timber Spring Subdiv.
 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	7.40	9.60	0.65	0.85	6.21	10.35	100.0%	0.60	15.12	2.44
	7.40	9.60	0.65	0.85	6.20	10.35	100.0%	0.60	15.12	2.44
	7.45	9.47	0.60	0.80	5.73	10.17	98.3%	0.56	13.38	2.34
	7.50	9.35	0.56	0.75	5.26	9.99	96.5%	0.53	11.74	2.23
	7.55	9.22	0.52	0.70	4.79	9.81	94.8%	0.49	10.19	2.13
	7.60	9.09	0.48	0.65	4.34	9.63	93.1%	0.45	8.72	2.01
	7.65	8.96	0.43	0.60	3.88	9.45	91.3%	0.41	7.36	1.89
	7.70	8.84	0.39	0.55	3.44	9.27	89.6%	0.37	6.08	1.77
	7.75	8.71	0.34	0.50	3.00	9.09	87.9%	0.33	4.91	1.64
	7.80	8.58	0.30	0.45	2.57	8.91	86.2%	0.29	3.84	1.49
	7.85	8.45	0.25	0.40	2.14	8.74	84.4%	0.25	2.88	1.34
	7.90	8.33	0.21	0.35	1.72	8.56	82.7%	0.20	2.03	1.18
WL	7.95	8.20	0.16	0.30	1.31	8.38	81.0%	0.16	1.30	0.99
	8.00	7.53	0.12	0.25	0.92	7.68	74.2%	0.12	0.76	0.83
	8.05	6.47	0.09	0.20	0.56	6.58	63.5%	0.08	0.37	0.66
	8.10	3.90	0.07	0.15	0.27	3.97	38.3%	0.07	0.15	0.57
	8.15	1.47	0.08	0.10	0.11	1.50	14.5%	0.08	0.07	0.61
	8.20	1.13	0.04	0.05	0.05	1.15	11.1%	0.04	0.02	0.41
	8.25	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Timber Springs Gulch
XS LOCATION: 0.5 mile u/s from Timber Spring Subdiv.
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)= 1.30 cfs
CALCULATED FLOW (Qc)= 1.30 cfs
(Qm-Qc)/Qm * 100 = 0.0 %

MEASURED WATERLINE (WLm)= 7.95 ft
CALCULATED WATERLINE (WLc)= 7.95 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= 0.99 ft/sec
MANNING'S N= 0.129
SLOPE= 0.088 ft/ft

.4 * Qm = 0.5 cfs
2.5 * Qm= 3.3 cfs

RECOMMENDED INSTREAM FLOW:
=====

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

RATIONALE FOR RECOMMENDATION:
=====

RECOMMENDATION BY: AGENCY..... DATE:.....
CWCB REVIEW BY: DATE:.....

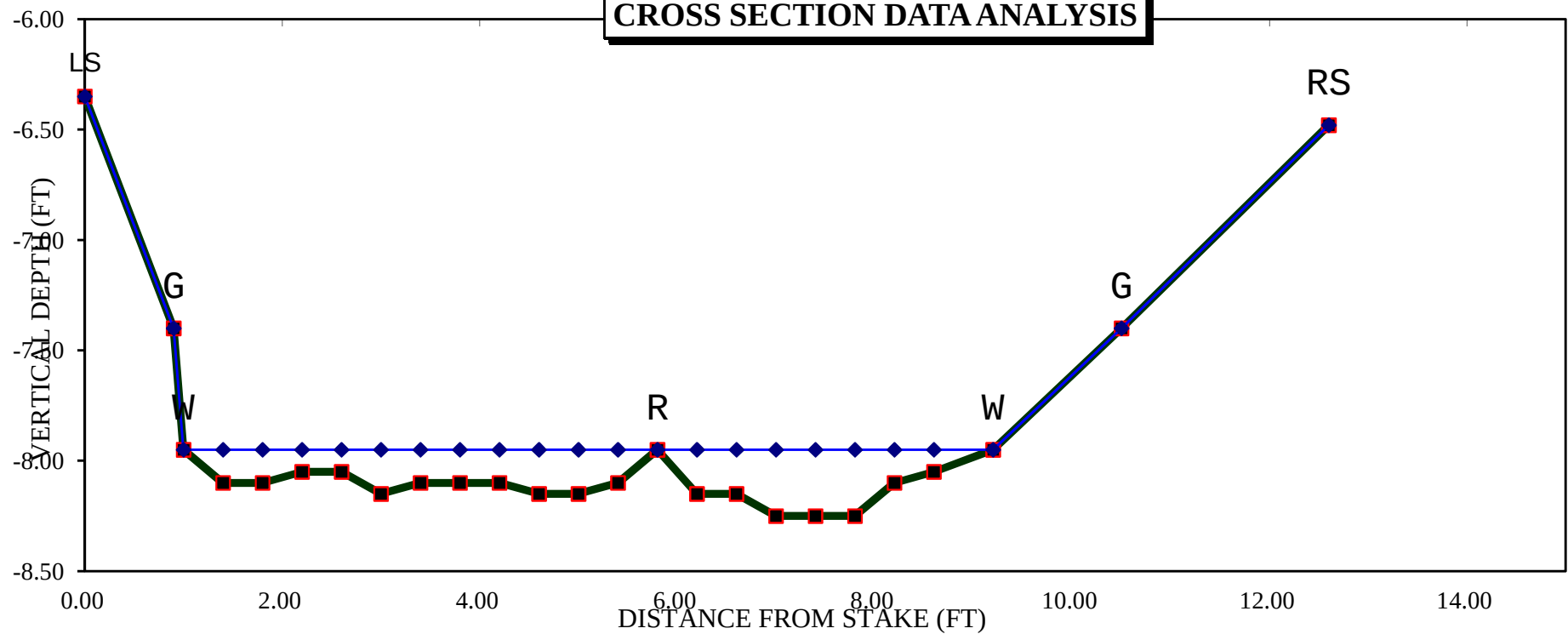
STREAM NAME: Timber Springs Gulch
 XS LOCATION: 0.5 mile u/s from Timber Spring Subdiv.
 XS NUMBER: 1 Jarrett Variable Manning's n Correction Applied

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	7.40	9.60	0.65	0.85	6.21	10.35	100.0%	0.60	18.74	3.02
	7.40	9.60	0.65	0.85	6.20	10.35	100.0%	0.60	18.74	3.02
	7.45	9.47	0.60	0.80	5.73	10.17	98.3%	0.56	16.43	2.87
	7.50	9.35	0.56	0.75	5.26	9.99	96.5%	0.53	14.26	2.71
	7.55	9.22	0.52	0.70	4.79	9.81	94.8%	0.49	12.22	2.55
	7.60	9.09	0.48	0.65	4.34	9.63	93.1%	0.45	10.33	2.38
	7.65	8.96	0.43	0.60	3.88	9.45	91.3%	0.41	8.59	2.21
	7.70	8.84	0.39	0.55	3.44	9.27	89.6%	0.37	6.98	2.03
	7.75	8.71	0.34	0.50	3.00	9.09	87.9%	0.33	5.53	1.84
	7.80	8.58	0.30	0.45	2.57	8.91	86.2%	0.29	4.23	1.65
	7.85	8.45	0.25	0.40	2.14	8.74	84.4%	0.25	3.09	1.44
	7.90	8.33	0.21	0.35	1.72	8.56	82.7%	0.20	2.11	1.23
WL	7.95	8.20	0.16	0.30	1.31	8.38	81.0%	0.16	1.30	0.99
	8.00	7.53	0.12	0.25	0.92	7.68	74.2%	0.12	0.73	0.80
	8.05	6.47	0.09	0.20	0.56	6.58	63.5%	0.08	0.33	0.60
	8.10	3.90	0.07	0.15	0.27	3.97	38.3%	0.07	0.13	0.50
	8.15	1.47	0.08	0.10	0.11	1.50	14.5%	0.08	0.06	0.55
	8.20	1.13	0.04	0.05	0.05	1.15	11.1%	0.04	0.02	0.34
	8.25	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

CROSS SECTION DATA ANALYSIS



Channel Bottom Computed Water Line

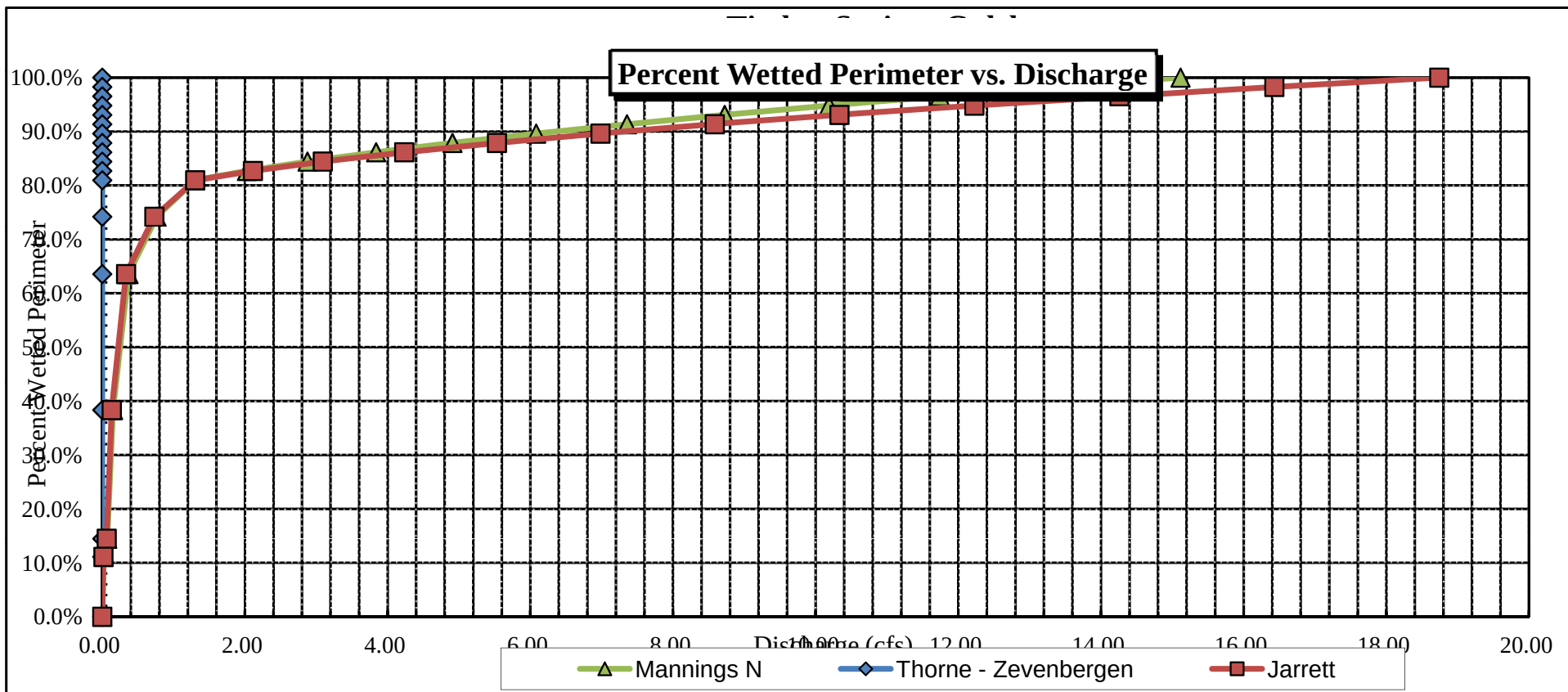
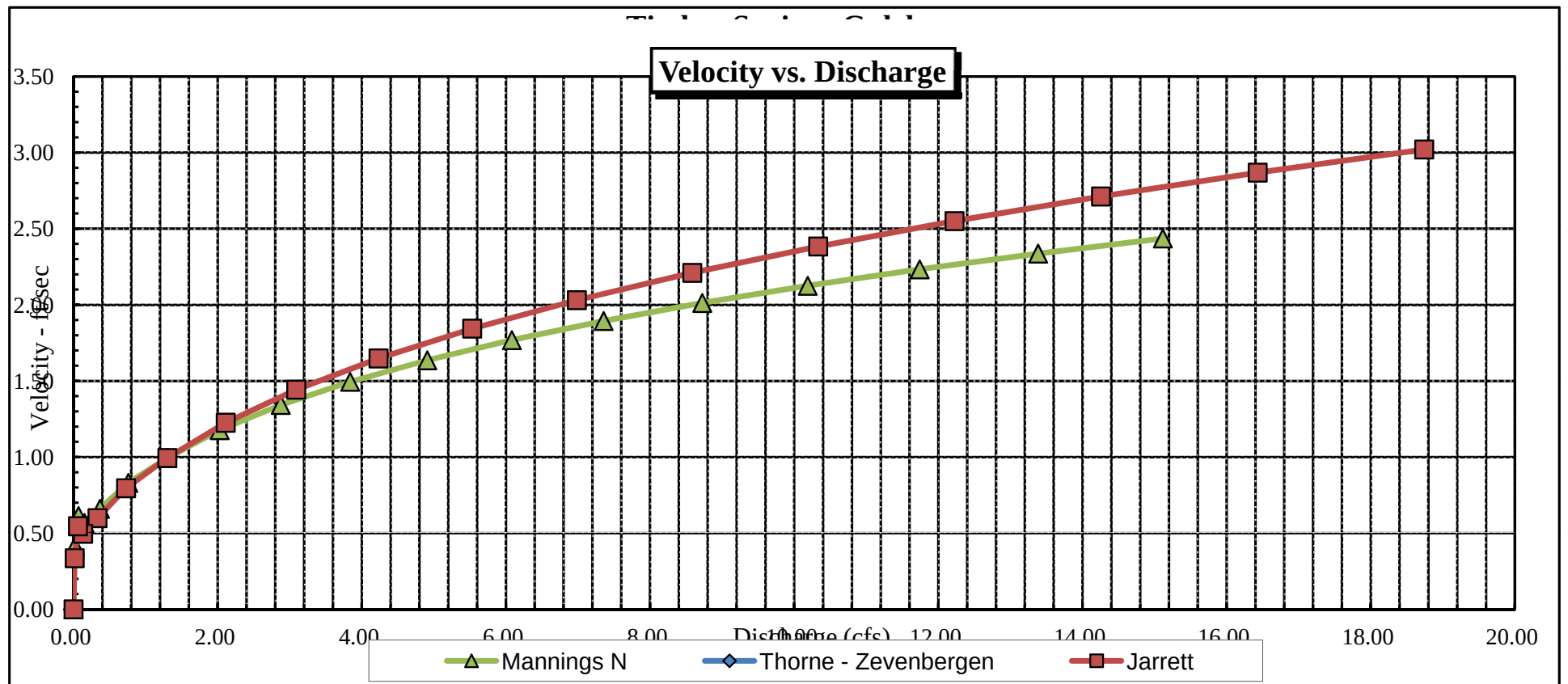
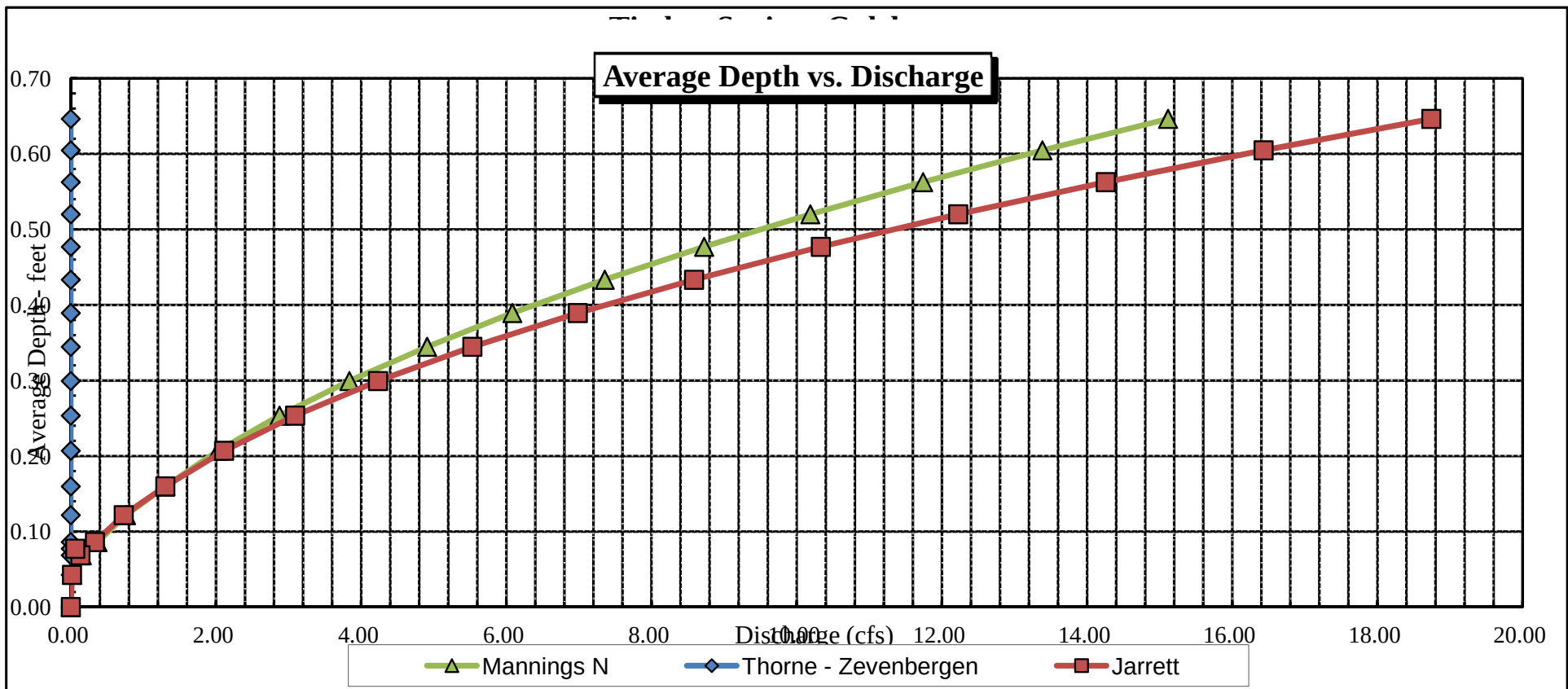
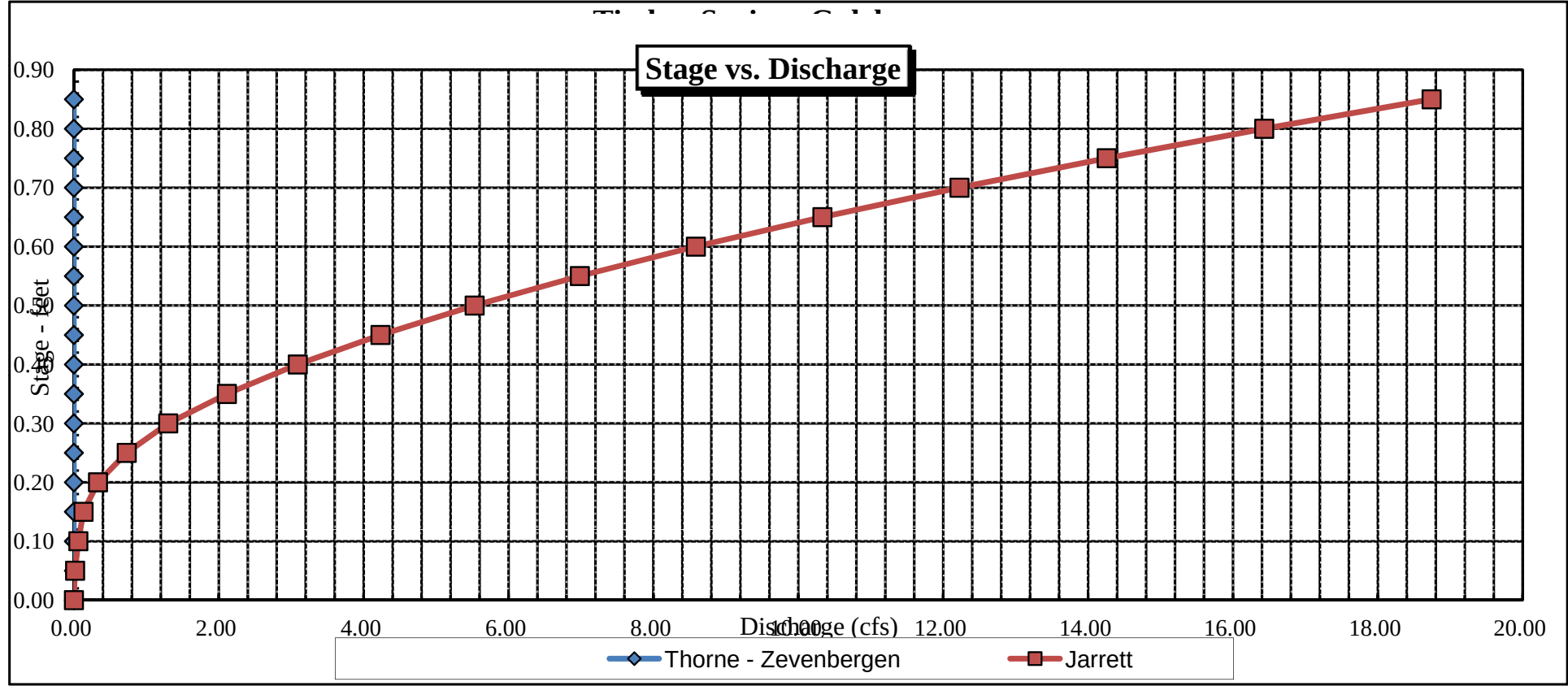


FIGURE 10-1









FIELD DATA FOR INSTREAM FLOW DETERMINATIONS



COLORADO WATER
CONSERVATION BOARD

LOCATION INFORMATION

STREAM NAME: <u>Timber Springs Gulch</u>		CROSS-SECTION NO. <u>1</u>
CROSS-SECTION LOCATION: <u>0.5 mile upstream from Timber Springs Subdivision</u>		
DATE: <u>5-17-13</u>	OBSERVERS: <u>R. Smith, P. Adams</u>	
LEGAL DESCRIPTION	% SECTION: <u>SESE</u>	SECTION: <u>25</u>
TOWNSHIP: <u>4 N(S)</u>	RANGE: <u>83 E(W)</u>	PM: <u>Stark</u>
COUNTY: <u>Eagle</u>	WATERSHED: <u>Eagle</u>	WATER DIVISION: <u>5</u>
DOW WATER CODE: <u>not numbered</u>		
MAP(S):	USGS: <u>GPS Zone 13</u>	<u>39° 40' 13.95" N</u>
USFS: <u>2,330 meters</u>	<u>106° 37' 40.94" W</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: _____ lbs/100'	TAPE TENSION: _____ lbs
CHANNEL BED MATERIAL SIZE RANGE: <u>gravels</u>	PHOTOGRAPHS TAKEN: ☒ YES ☐ NO
NUMBER OF PHOTOGRAPHS: <u>3</u>	

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)	SKETCH	LEGEND: Stake (X) Station (1) Photo (1) Direction of Flow (arrow)
(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>7.95/7.95</u>		
(2) WS Upstream	<u>20.0</u>	<u>5.70</u>		
(3) WS Downstream	<u>6.0</u>	<u>7.00</u>		
SLOPE	<u>2.30/26.0 = .088</u>			

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																	
<u>mayfly caddisfly</u>																	

COMMENTS

Temp = <u>11.5° C</u>	Upper Terminus
Cond = <u>608</u>	N <u>39° 40' 26.90"</u>
Salinity = <u>0.3 ppt</u>	W <u>106° 37' 38.95"</u>
pH = <u>8.35</u>	

DISCHARGE/CROSS SECTION NOTES

[illegible]

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

LOCATION INFORMATION

STREAM NAME: Timber Springs Gulch
XS LOCATION: 0.25 miles u/s fr Timber Spgs. Subdiv.
XS NUMBER: 2

DATE: 17-May-13
OBSERVERS: R. Smith, P. Adams

1/4 SEC: SE SE
SECTION: 25
TWP: 4S
RANGE: 83W
PM: Sixth

COUNTY: Eagle
WATERSHED: Eagle River
DIVISION: 5
DOW CODE: not numbered

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: 0.11

INPUT DATA CHECKED BY:DATE.....

ASSIGNED TO:DATE.....

STREAM NAME: Timber Springs Gulch
 XS LOCATION: 0.25 miles u/s fr Timber Spgs. Subdiv.
 XS NUMBER: 2

DATA POINTS= 29

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	4.38			0.00		0.00	0.00	0.0%
1	G	0.40	4.65			0.00		0.00	0.00	0.0%
	W	0.60	5.00	0.00	0.00	0.00		0.00	0.00	0.0%
		0.90	5.10	0.10	0.46	0.32	0.10	0.03	0.01	1.0%
		1.20	5.15	0.15	1.20	0.30	0.15	0.05	0.05	4.0%
		1.50	5.15	0.15	0.81	0.30	0.15	0.05	0.04	2.7%
		1.80	5.10	0.10	1.68	0.30	0.10	0.03	0.05	3.8%
		2.10	5.15	0.15	2.22	0.30	0.15	0.05	0.10	7.4%
		2.40	5.20	0.20	2.32	0.30	0.20	0.06	0.14	10.4%
		2.70	5.20	0.20	1.73	0.30	0.20	0.06	0.10	7.7%
		3.00	5.20	0.20	1.24	0.30	0.20	0.06	0.07	5.5%
		3.30	5.15	0.15	1.19	0.30	0.15	0.05	0.05	4.0%
		3.60	5.10	0.10	1.44	0.30	0.10	0.03	0.04	3.2%
		3.90	5.10	0.10	0.90	0.30	0.10	0.03	0.03	2.0%
		4.20	5.10	0.10	0.87	0.30	0.10	0.03	0.03	1.9%
		4.50	5.10	0.10	0.56	0.30	0.10	0.03	0.02	1.3%
		4.80	5.05	0.05	0.22	0.30	0.05	0.02	0.00	0.2%
		5.10	5.05	0.05	0.34	0.30	0.05	0.02	0.01	0.4%
		5.40	5.10	0.10	0.81	0.30	0.10	0.03	0.02	1.8%
		5.70	5.10	0.10	1.04	0.30	0.10	0.03	0.03	2.3%
		6.00	5.10	0.10	1.43	0.30	0.10	0.03	0.04	3.2%
		6.30	5.20	0.20	1.33	0.32	0.20	0.06	0.08	5.9%
		6.60	5.20	0.20	1.65	0.30	0.20	0.06	0.10	7.4%
		6.90	5.25	0.25	1.52	0.30	0.25	0.08	0.11	8.5%
		7.20	5.30	0.30	1.26	0.30	0.30	0.09	0.11	8.4%
		7.50	5.30	0.30	0.88	0.30	0.30	0.11	0.09	6.9%
	W	7.90	4.95	0.00	0.00	0.53		0.00	0.00	0.0%
1	G	8.00	4.68			0.00		0.00	0.00	0.0%
	RS	8.60	4.46			0.00		0.00	0.00	0.0%
TOTALS -----						7.51	0.3	1.05	1.34	100.0%
						(Max.)				
						Manning's n =		0.1038		
						Hydraulic Radius=		0.13990031		

STREAM NAME: Timber Springs Gulch
 XS LOCATION: 0.25 miles u/s fr Timber Spgs. Subdiv.
 XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	1.05	1.22	16.5%
4.73	1.05	3.08	193.2%
4.75	1.05	2.93	178.8%
4.77	1.05	2.78	164.5%
4.79	1.05	2.63	150.3%
4.81	1.05	2.48	136.0%
4.83	1.05	2.33	121.8%
4.85	1.05	2.18	107.7%
4.87	1.05	2.03	93.5%
4.89	1.05	1.88	79.4%
4.91	1.05	1.74	65.4%
4.93	1.05	1.59	51.4%
4.94	1.05	1.52	44.4%
4.95	1.05	1.44	37.4%
4.96	1.05	1.37	30.4%
4.97	1.05	1.30	23.4%
4.98	1.05	1.22	16.5%
4.99	1.05	1.15	9.5%
5.00	1.05	1.08	2.6%
5.01	1.05	1.01	-4.3%
5.02	1.05	0.93	-11.1%
5.03	1.05	0.86	-17.9%
5.05	1.05	0.72	-31.5%
5.07	1.05	0.59	-44.3%
5.09	1.05	0.46	-56.3%
5.11	1.05	0.35	-67.0%
5.13	1.05	0.27	-74.7%
5.15	1.05	0.20	-81.2%
5.17	1.05	0.14	-86.4%
5.19	1.05	0.10	-90.8%
5.21	1.05	0.06	-94.2%
5.23	1.05	0.04	-95.9%

WATERLINE AT ZERO

AREA ERROR = 4.999

STREAM NAME: Timber Springs Gulch
 XS LOCATION: 0.25 miles u/s fr Timber Spgs. Subdiv.
 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	4.68	7.58	0.45	0.62	3.42	8.16	100.0%	0.42	9.09	2.66
	4.70	7.57	0.43	0.60	3.28	8.12	99.5%	0.40	8.50	2.59
	4.75	7.52	0.39	0.55	2.90	8.01	98.1%	0.36	6.99	2.41
	4.80	7.47	0.34	0.50	2.52	7.90	96.8%	0.32	5.61	2.22
	4.85	7.42	0.29	0.45	2.15	7.79	95.4%	0.28	4.34	2.02
	4.90	7.38	0.24	0.40	1.78	7.68	94.1%	0.23	3.20	1.79
	4.95	7.33	0.19	0.35	1.41	7.57	92.7%	0.19	2.20	1.55
WL	5.00	7.24	0.14	0.30	1.05	7.43	91.1%	0.14	1.35	1.29
	5.05	7.04	0.10	0.25	0.69	7.20	88.2%	0.10	0.69	1.00
	5.10	5.95	0.06	0.20	0.37	6.07	74.4%	0.06	0.28	0.74
	5.15	3.05	0.06	0.15	0.19	3.14	38.4%	0.06	0.13	0.72
	5.20	1.93	0.04	0.10	0.07	1.98	24.3%	0.03	0.03	0.50
	5.25	0.67	0.04	0.05	0.02	0.69	8.4%	0.04	0.01	0.52
	5.30	0.31	0.00	0.00	0.00	0.31	3.8%	0.00	0.00	0.05

STREAM NAME: Timber Springs Gulch
XS LOCATION: 0.25 miles u/s fr Timber Spgs. Subdiv.
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	1.34 cfs
CALCULATED FLOW (Qc)=	1.35 cfs
(Qm-Qc)/Qm * 100 =	-0.6 %
MEASURED WATERLINE (WLm)=	4.98 ft
CALCULATED WATERLINE (WLc)=	5.00 ft
(WLm-WLc)/WLm * 100 =	-0.5 %
MAX MEASURED DEPTH (Dm)=	0.30 ft
MAX CALCULATED DEPTH (Dc)=	0.30 ft
(Dm-Dc)/Dm * 100	-0.4 %
MEAN VELOCITY=	1.29 ft/sec
MANNING'S N=	0.104
SLOPE=	0.11 ft/ft
.4 * Qm =	0.5 cfs
2.5 * Qm=	3.4 cfs

RECOMMENDED INSTREAM FLOW:
=====

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

RATIONALE FOR RECOMMENDATION:
=====

[illegible]

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

CWCB REVIEW BY: DATE:.....

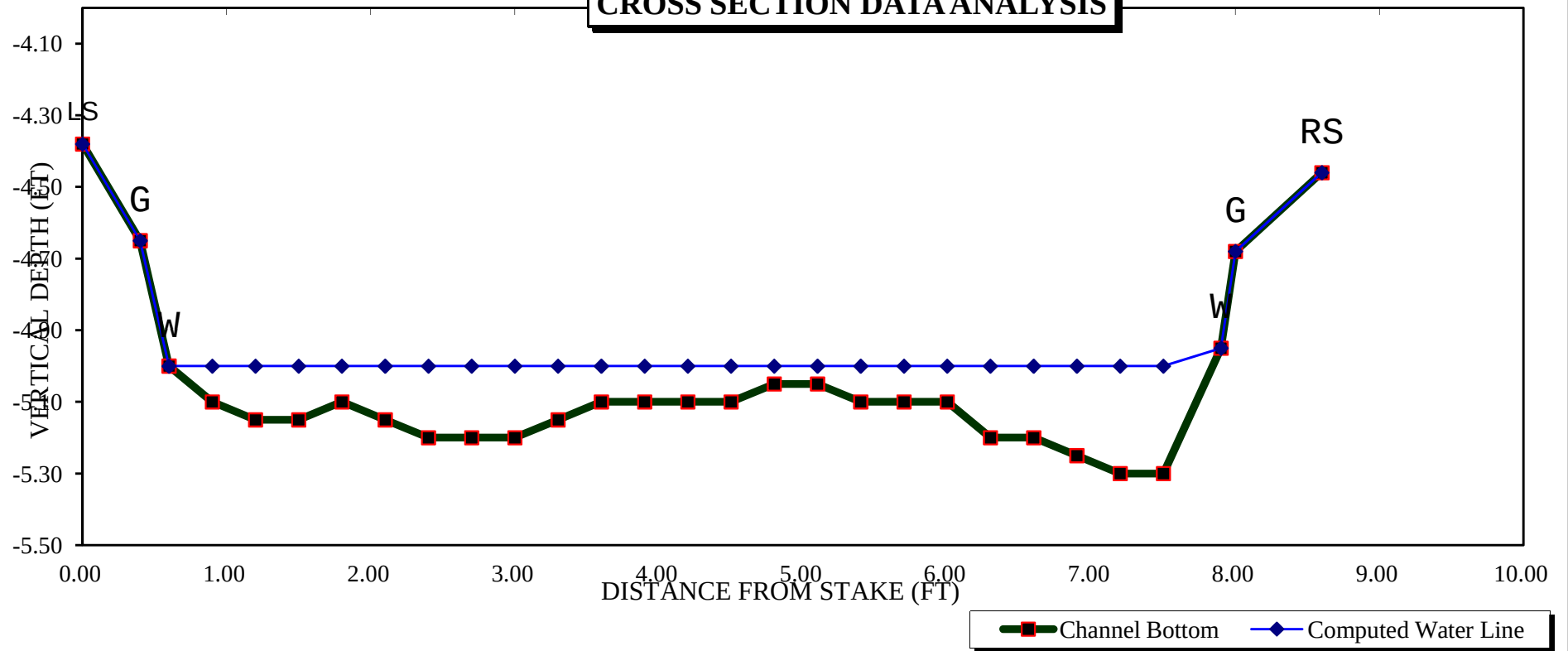
STREAM NAME: Timber Springs Gulch
 XS LOCATION: 0.25 miles u/s fr Timber Spgs. Subdiv.
 XS NUMBER: 2 Jarrett Variable Manning's n Correction Applied

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	4.68	7.58	0.45	0.62	3.42	8.16	100.0%	0.42	10.82	3.16
	4.70	7.57	0.43	0.60	3.28	8.12	99.5%	0.40	10.05	3.07
	4.75	7.52	0.39	0.55	2.90	8.01	98.1%	0.36	8.13	2.80
	4.80	7.47	0.34	0.50	2.52	7.90	96.8%	0.32	6.39	2.53
	4.85	7.42	0.29	0.45	2.15	7.79	95.4%	0.28	4.83	2.24
	4.90	7.38	0.24	0.40	1.78	7.68	94.1%	0.23	3.46	1.94
	4.95	7.33	0.19	0.35	1.41	7.57	92.7%	0.19	2.30	1.62
WL	5.00	7.24	0.14	0.30	1.05	7.43	91.1%	0.14	1.35	1.29
	5.05	7.04	0.10	0.25	0.69	7.20	88.2%	0.10	0.65	0.94
	5.10	5.95	0.06	0.20	0.37	6.07	74.4%	0.06	0.24	0.65
	5.15	3.05	0.06	0.15	0.19	3.14	38.4%	0.06	0.12	0.63
	5.20	1.93	0.04	0.10	0.07	1.98	24.3%	0.03	0.03	0.40
	5.25	0.67	0.04	0.05	0.02	0.69	8.4%	0.04	0.01	0.41
	5.30	0.31	0.00	0.00	0.00	0.31	3.8%	0.00	0.00	0.02

CROSS SECTION DATA ANALYSIS



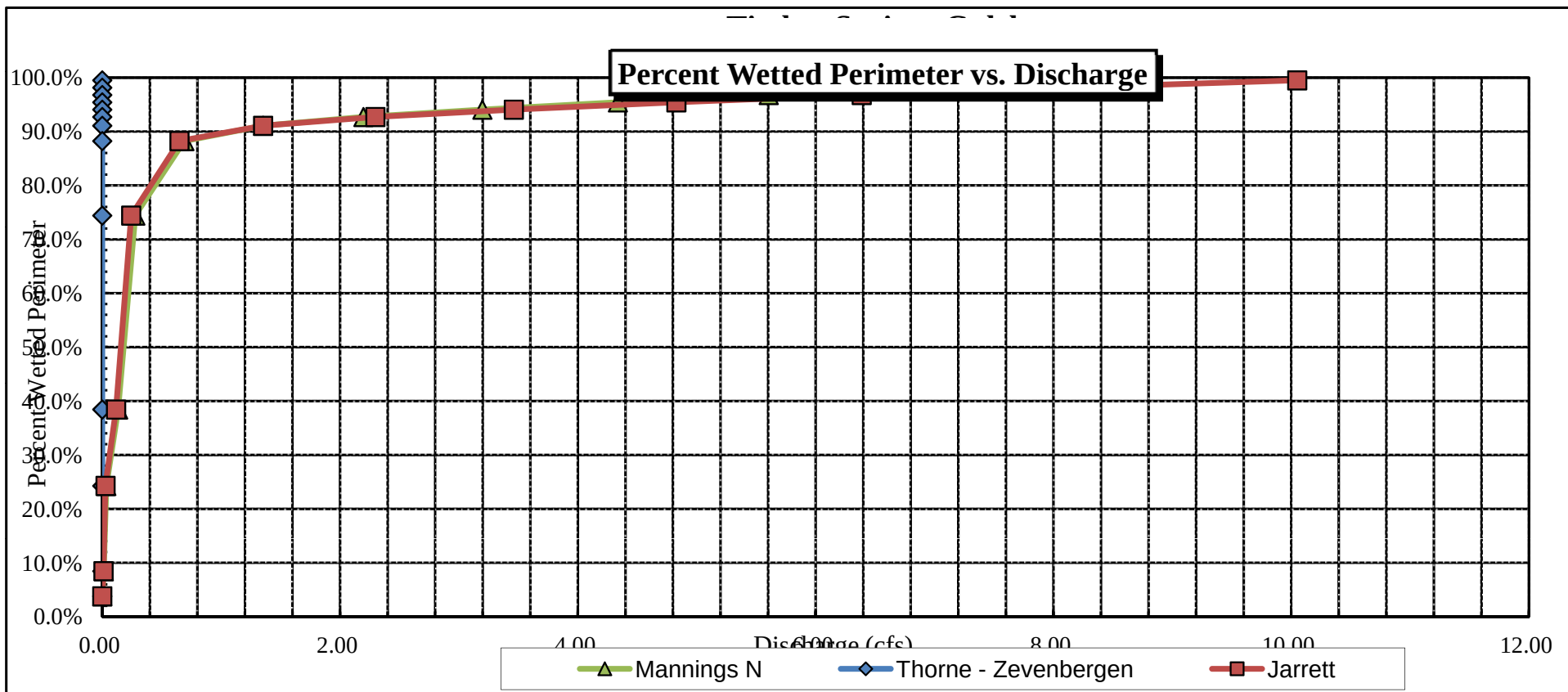
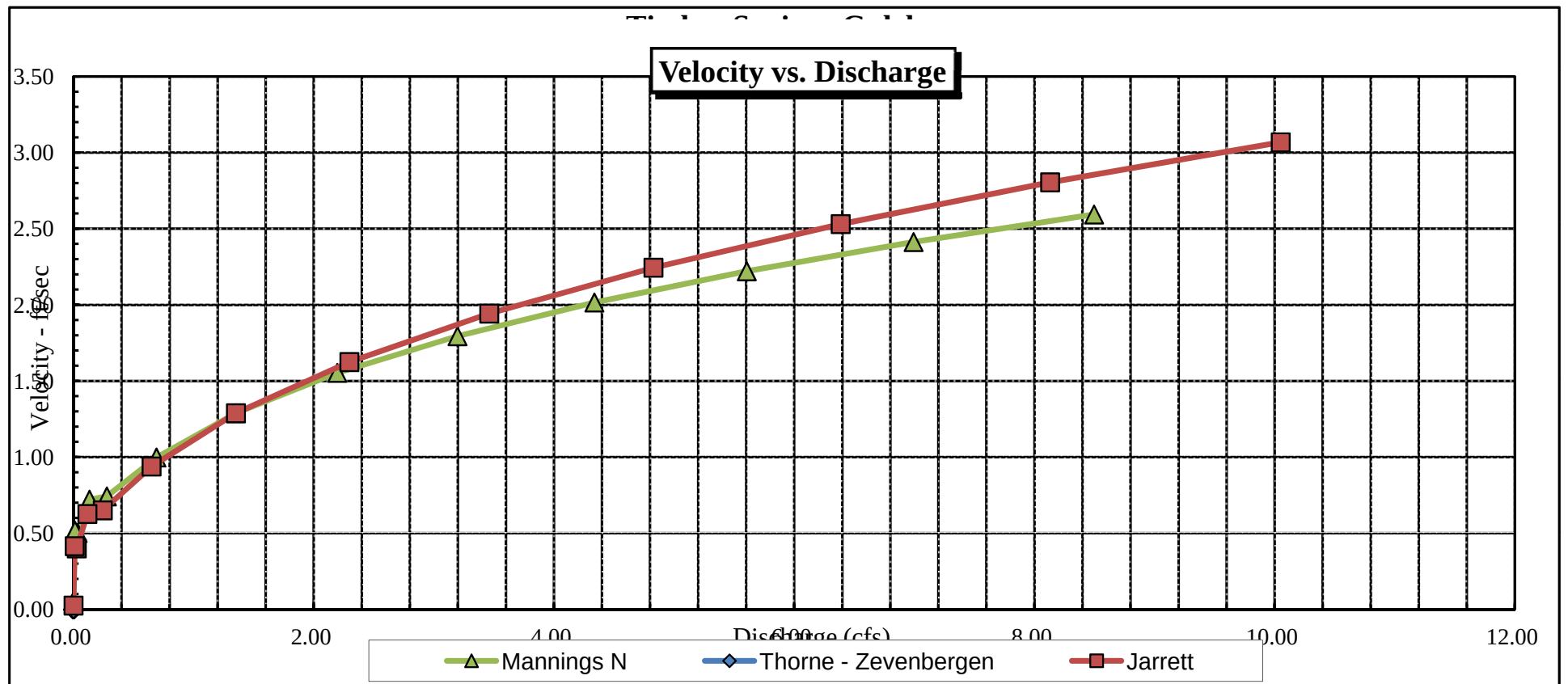
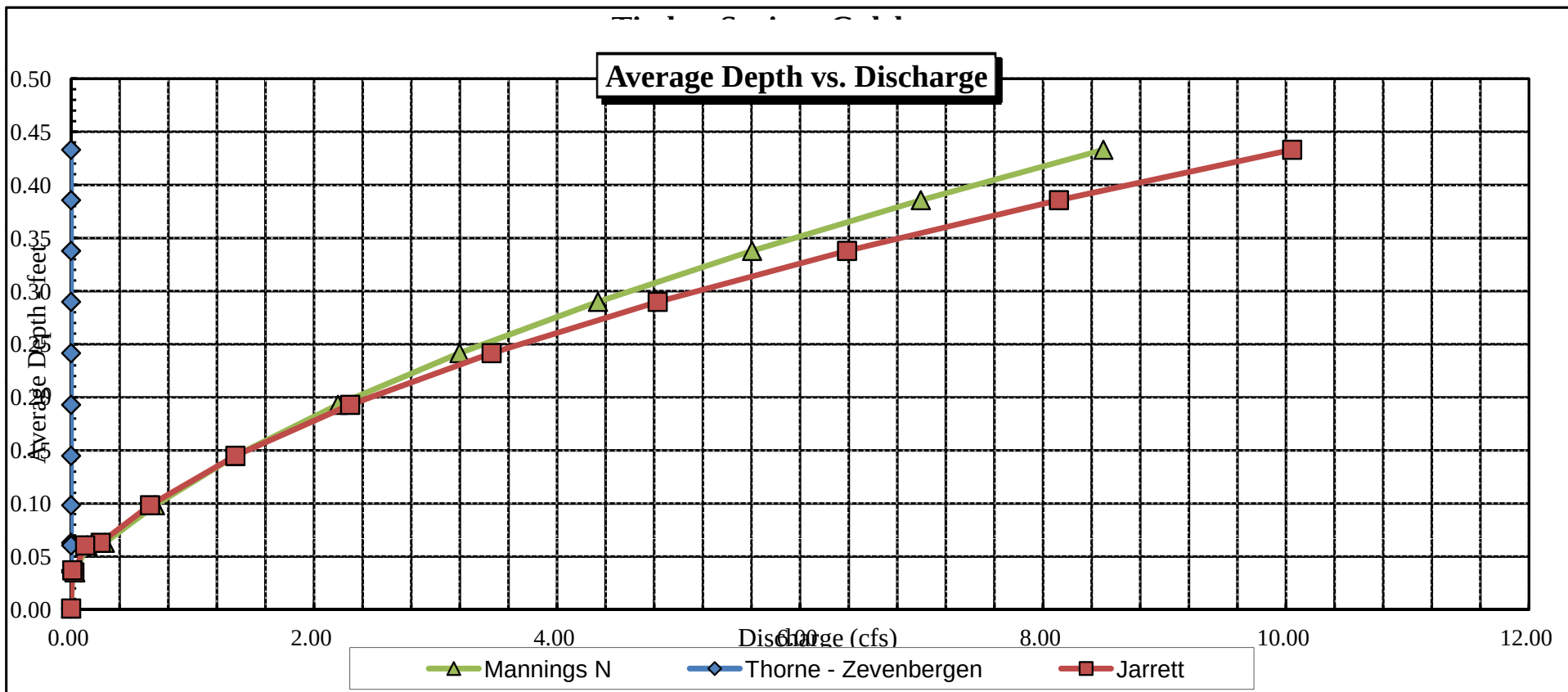
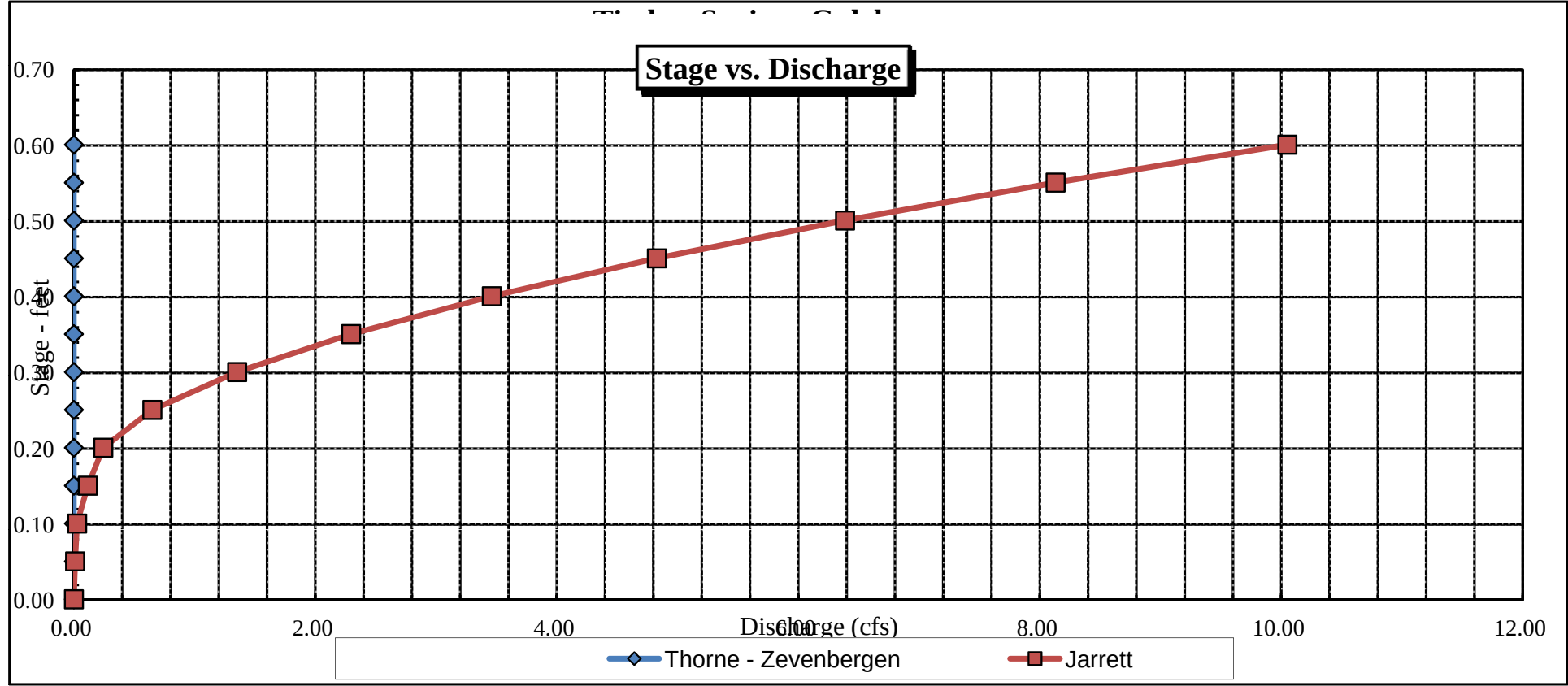


FIGURE 10-1









FIELD DATA FOR INSTREAM FLOW DETERMINATIONS



COLORADO WATER
CONSERVATION BOARD

LOCATION INFORMATION

STREAM NAME: <u>Timber Springs Gulch</u>		CROSS-SECTION NO.: <u>2</u>
CROSS-SECTION LOCATION: <u>0.25 miles upstream from Timber Spgs. Subdivision</u>		
DATE: <u>5-17-13</u>	OBSERVERS: <u>R. Smith, P. Adams</u>	
LEGAL DESCRIPTION	1/4 SECTION: <u>SE SE</u>	SECTION: <u>25</u>
COUNTY: <u>Eagle</u>	WATERSHED: <u>Eagle</u>	TOWNSHIP: <u>4N S</u>
RANGE: <u>83E W</u>		PM: <u>6:41</u>
WATER DIVISION: <u>5</u>		DOW WATER CODE: <u>not numbered</u>
MAP(S):	USGS: <u>GPS 39° 40' 07.85"</u>	
	USFS: <u>106° 37' 40.48"</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
TAPED WEIGHT: <u>suveyed</u> lbs/foot		TAPED TENSION: <u>suveyed</u> lbs
CHANNEL BED MATERIAL SIZE RANGE: <u>gravel & encrusted branches</u>		PHOTOGRAPHS TAKEN: ☒ YES ☐ NO
		NUMBER OF PHOTOGRAPHS: <u>3</u>

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)	SKETCH
⊗ Tape @ Stake LB	0.0	<u>suveyed</u>	
⊗ Tape @ Stake RB	0.0	<u>suveyed</u>	
① WS @ Tape LB/RB	0.0	<u>5.00 / 4.95</u>	
② WS Upstream	<u>7.5'</u>	<u>3.42</u>	
③ WS Downstream	<u>25.0</u>	<u>7.02</u>	
SLOPE	<u>3.6 / 32.5' = .110</u>		

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																	
<u>mayfly, caddisfly</u>																	

COMMENTS

Temp: _____	<u>Spruce - Alder Riparian</u>
pH: _____	First Headgate = <u>360363</u>
Cond: _____	<u>4392044</u>
Salinity: _____	

DISCHARGE/CROSS SECTION NOTES

[illegible]











