Stream: Beaver Creek

Executive Summary

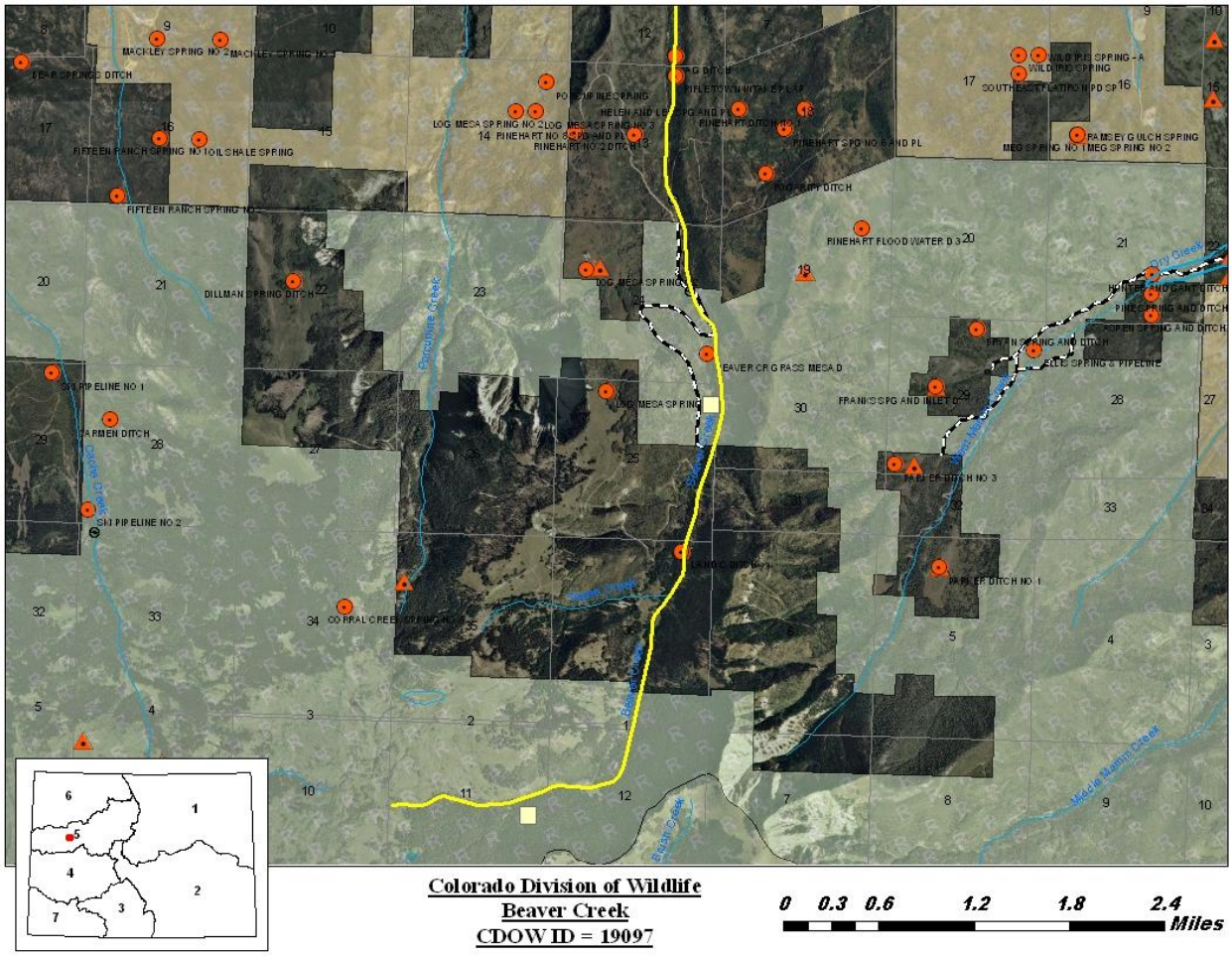
Water Division: 5
Water District: 45
CDOW#: 19097

Segment: Headwaters to the Dame Ditch Headgate

Upper Terminus: Headwaters
Latitude: 39º 22’ 39.8”N Longitude: 107º 51’ 45.0"W

Lower Terminus: The Dame Ditch Headgate
Latitude: 39º 28’ 06”N Longitude: 107º 49’ 06"W

ISF Appropriation: 4.75 cfs (05/01 – 06/30)
2.85 cfs (07/01 – 07/31)
1.00 cfs (08/01 – 11/30)
0.70 cfs (12/01 – 04/30)



The information contained in this report and the associated instream flow file folder forms the basis for the instream flow recommendation to be considered by the Colorado Water Conservation Board (Board). The investigations related to this instream flow recommendation were initiated prior to the statutory merging of two divisions within the Colorado Department of Natural Resources; in 2011, the Division of Wildlife and the Division of Parks and Outdoor Recreation merged to form Colorado Parks and Wildlife (CPW). It is the CPW staff's opinion that the information contained in this report is sufficient for the Board's staff to initiate an instream flow appropriation and address the findings required in Rule 5(i) of the Instream Flow Rules.

The State of Colorado's Instream Flow Program (ISFP) was created in 1973 when the Colorado State Legislature recognized "the need to correlate the activities of mankind with some reasonable preservation of the natural environment" (see 37-92-102 (3) C.R.S.). The statute vests the Board with the exclusive authority to appropriate and acquire instream flow and natural lake level water rights. In order to encourage other entities to participate in Colorado's ISFP, the statute directs the Board to request instream flow recommendations from other state and federal agencies. The CPW is recommending this segment of Beaver Creek to the Board for inclusion into the ISFP. Beaver Creek should be considered for inclusion into the ISFP because it has a

natural environment that can be preserved to a reasonable degree with an instream flow water right.

The CPW is forwarding this stream flow recommendation to the Board to meet Colorado's policy "… that the wildlife and their environment are to be protected, preserved, enhanced, and managed for the use, benefit, and enjoyment of the people of this state and its visitors … and that, to carry out such program and policy, there shall be a continuous operation of planning, acquisition, and development of wildlife habitats and facilities for wildlife-related opportunities" (See §33-1-101 (1) C.R.S.). The CPW Strategic Plan states "[h]ealthy aquatic environments are essential to maintain healthy and viable fisheries, and critical for self-sustaining populations…by protecting and enhancing the quality and quantity of aquatic habitats."

The subject of this report is a segment of Beaver Creek beginning at its headwaters and extending downstream to the Dame Ditch Headgate below which the Division of Water Resources personnel identified a water availability problem. The proposed segment is located in Garfield County southwest of the Town of Rifle. The recommendation for this segment is discussed below.

Instream Flow Recommendation(s)

The CPW is recommending 4.75 cfs, summer, and 1.65 cfs, winter, based on data collection efforts. This recommendation is based on the physical and biological data collected to date and does not incorporate any water availability constraints.

- 4.75 cubic feet per second is required to maintain the three principal hydraulic criteria of average depth, average velocity and percent wetted perimeter;
- 1.65 cubic feet per second is required to maintain two of the three principal hydraulic criteria. This flow recommendation is an averaged value for two cross sections collected in 2010.

The modeling results from this survey effort are within the confidence interval produced by the R2CROSS model (see Table 1).

Land Status Review

Upper Terminus	Lower Terminus	Total Length (miles)	Land Ownership	
			% Private	% Public
Headwaters	Rifle Town Intake	6.1	21%	79%

100% of the public lands are managed by the USFS.

Biological and Field Survey Data

In July and August of 2010, CPW collected field data at two locations on Beaver Creek. Measurements included stream cross section information, natural environment data, and other data needed to quantify the instream flow needs for this reach of Beaver Creek. Beaver Creek is classified as a medium stream (between 20 to 35 feet wide) and fishery surveys indicate the

stream environment of the Beaver Creek supports Colorado River cutthroat trout (*Oncorhynchus clarkii pleuriticus*) and brown trout (*Salmo trutta*) (See CDOW Fish Survey in Appendix B).

Field Survey Data

CPW staff used the R2CROSS methodology to quantify the amount of water required to preserve the natural environment to a reasonable degree. The R2CROSS method requires that stream discharge and channel profile data be collected in a riffle stream habitat type. Riffles are most easily visualized, as the stream habitat type that would dry up first should streamflow cease. This type of hydraulic data collection consists of setting up a transect in a riffle or other hydraulic control, surveying the stream channel geometry, and measuring the stream discharge. Appendix B contains copies of field data collected for this proposed segment.

Biological Flow Recommendation

The Board staff relies upon the biological expertise of the cooperating agencies to interpret output from the R2CROSS data collected to develop the initial, biologic instream flow recommendation. This initial recommendation is designed to address the unique biologic requirements of each stream without regard to water availability. Three hydraulic parameters - average depth, percent wetted perimeter, and average velocity are used to develop biologic instream flow recommendations. The CDOW (prior to the 2011 merger) determined that maintaining these three hydraulic parameters at adequate levels across riffle habitat types, aquatic habitat in pools and runs will also be maintained for most life stages of fish and aquatic invertebrates (Nehring 1979; Espegren 1996).

For this segment of stream, two data sets were collected with the results shown in Table 1 below. Table 1 shows who collected the data (Party), the date the data was collected, the measured discharge at the time of the survey (Q), the accuracy range of the predicted flows based on Manning's Equation (240% and 40% of Q), the summer flow recommendation based on meeting 3 of 3 hydraulic criteria and the winter flow recommendation based upon 2 of 3 hydraulic criteria.

Table 1: Data

Party	Date	Q	250%-40%	Summer (3/3)	Winter (2/3)
CDOW	7/7/2010	4.2	10.4 – 1.7	4.75	1.9
CDOW	8/18/2010	2.2	7.0 – 1.1	6.9^{R}	1.4

CDOW = Colorado Division of Wildlife R = Outside of R2X Accuracy Range

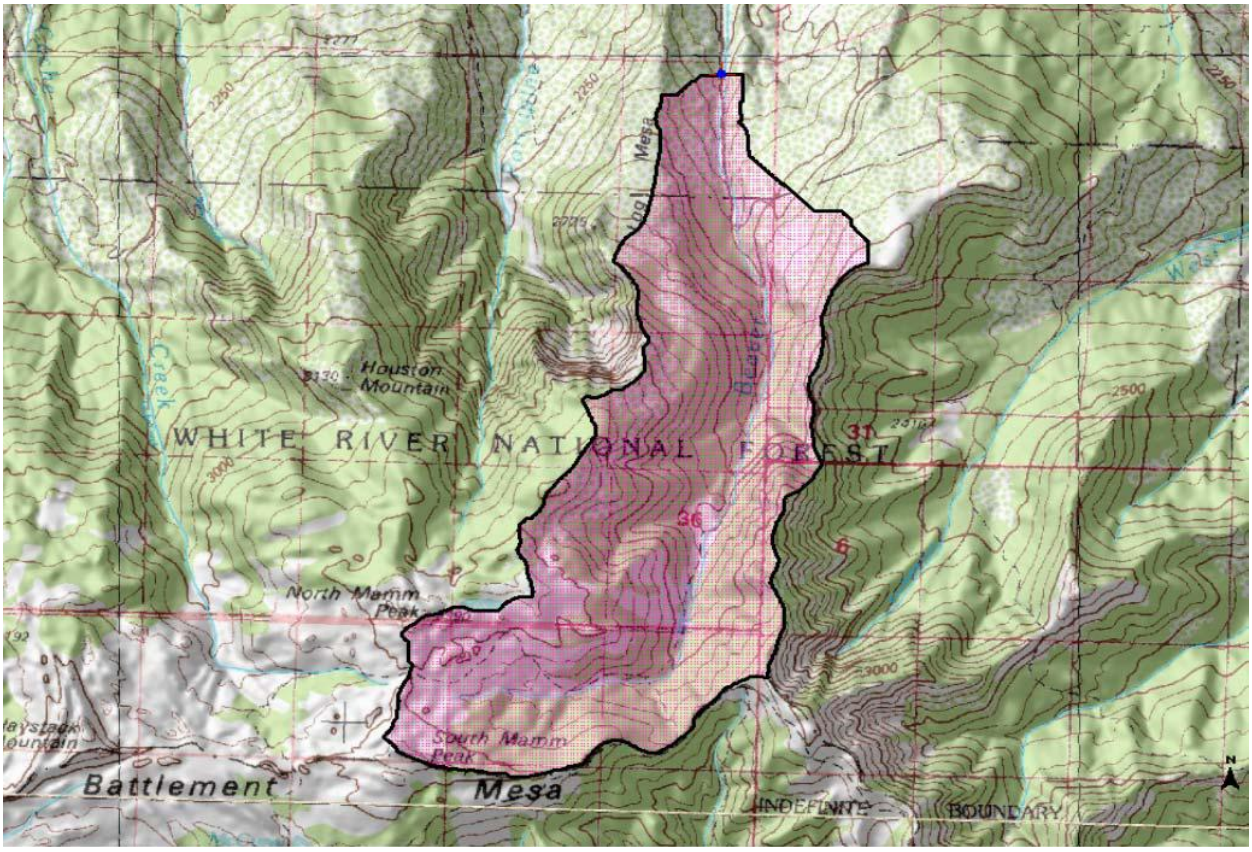
Biologic Flow Recommendation

The summer flow recommendation which met 3 of 3 hydraulic criteria and was within the accuracy range of the model ranged was 4.75 cfs. The winter flow recommendations which met 2 of 3 hydraulic criteria and that were within the accuracy range of the model ranged from 1.9 cfs to 1.4 cfs. Averaging the winter flow recommendations that fell within the accuracy range of the model resulted in a winter flow recommendation of 1.65 cfs (See Table 1).

Hydrologic Data

The CPW staff conducted a preliminary evaluation of the stream hydrology to determine if water was physically available for an instream flow appropriation. The hydrograph below was derived

from data collected by the USGS stream gage for Beaver Creek, near Rifle, CO (#09092500), which has a drainage area of 7.9 square miles (See Gage Summary in Appendix C) and by the USGS StreamStats Water Resources Web Application Program (see http://water.usgs.gov/osw/streamstats/index.html). The total drainage area upstream of this ISF segment of Beaver Creek is 7.3 square miles. The period of record for the Beaver Creek near Rifle gage was 1952 to 1982, the period of record used by staff in their analysis was 1952 to 1982, or 30 years of record. Table 2 below displays the estimated flow of Beaver Creek at the lower terminus of the instream flow reach in terms of a percentage of exceedence.



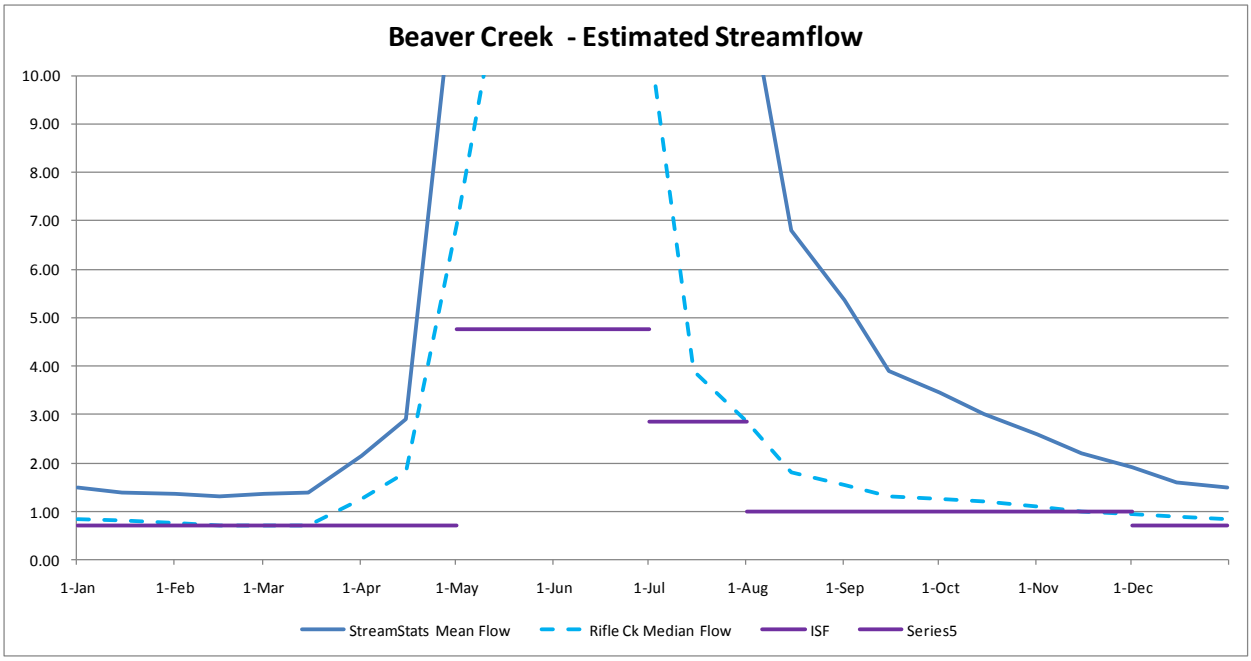

Beaver Creek - Estimated Streamflow
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
StreamStats Mean Flow
Rifle Ck Median Flow
ISF
Series5

Table 2: Estimated streamflow for Beaver Creek

Beaver Creek				Drainage Area = 7.3								
Exceedences	January	February	March	April	May	June	July	August	September	October	November	December
1%	1.7	1.3	2.1	13.9	55.4	55.4	29.3	5.1	4.2	3.9	2.3	1.8
5%	1.4	1.2	1.3	5.7	41.6	44.4	17.6	3.8	2.9	2.9	1.8	1.6
10%	1.2	1.1	1.1	4.2	31.4	37.9	12.9	3.2	2.6	2.6	1.6	1.3
20%	1.0	0.9	1.0	3.2	22.2	30.5	7.2	2.6	1.9	1.8	1.3	1.1
50%	0.8	0.7	0.7	1.8	12.0	17.6	3.9	1.8	1.3	1.2	1.0	0.9
80%	0.6	0.6	0.6	1.1	4.8	7.2	2.1	1.2	0.8	0.9	0.7	0.7
90%	0.6	0.5	0.6	0.8	3.2	5.4	1.7	1.0	0.7	0.7	0.6	0.6
95%	0.6	0.5	0.5	0.7	2.1	3.9	1.4	0.8	0.6	0.6	0.5	0.6
99%	0.5	0.4	0.4	0.6	1.1	0.9	0.6	0.5	0.5	0.5	0.3	0.4
Beaver Creek - Streamstats Mean Flow												
	January	February	March	April	May	June	July	August	September	October	November	December
	1.4	1.3	1.4	2.9	22.0	46.9	17.0	6.8	3.9	3.0	2.2	1.6
	Green indicates flow greater than summer flow recommendation and Yellow indicates flow greater than winter flow recommendation											

Table 2 shows that the summer flow recommendation of 4.75 cfs is available at least 50% of the time only during the months of May and June. The winter flow recommendation of 1.65 cfs is not available at least 50% of the time for any time during the typical winter months. These factors made it necessary for CPW to alter the initial flow recommendations to meet water availability requirements. Based on the above preliminary water availability analysis the summer recommendation was reduced to 2.85 cfs for the month of July and the winter recommendation was reduced from 1.65 cfs to 1.0 cfs August through November and then 0.7 cfs for the remainder of the year (December through April). After incorporating the above water availability constraints, the original instream flow recommendation was modified to the following:

- 4.75 cubic feet per second is recommended from May 1 through June 30;
- 2.85 cubic feet per second is recommended from July 1 through July 31;
- 1.00 cubic feet per second is recommended from August 1 through November 30;
- 0.70 cubic feet per second is recommended from December 1 through April 30.

However, if additional water is determined to be available in further investigations, the CPW would recommend appropriating the additional water up to the recommended flow amounts to preserve the natural environment to a reasonable degree.

Existing Water Right Information

CPW staff has analyzed the Division of Water Resources' water rights tabulation and will consult with the Division Engineer's Office (DEO) to identify or verify any potential water availability problems due to existing diversions. Records indicate that there are three surface water diversions located within this reach of Beaver Creek.

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: BEAVER CREEK							CROSS-SECTION NO.: 070710-2
CROSS-SECTION LOCATION: 39° 25' 21.0" 107° 49' 38.0"							
1st TURN OUT @ USFS SIGN							
DATE: 7/7/10	OBSERVERS: UPPENDAHL						
LEGAL DESCRIPTION	¼ SECTION: SE	SECTION: 24	TOWNSHIP: 7 N/S	RANGE: 94 E/W	PM: 6		
COUNTY: GARFIELD	WATERSHED: BEAVER CR	WATER DIVISION: 5	DOW WATER CODE: 19097				
MAP(S):	USGS:						
	USFS:						

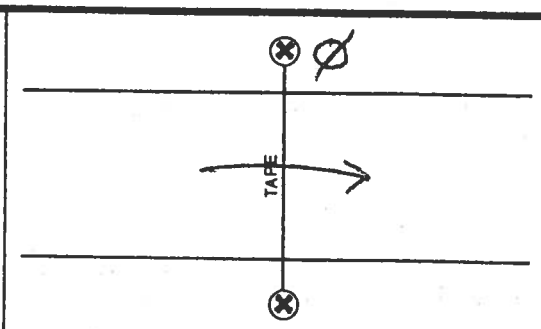
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES/NO	METER TYPE: MARSH - McBIRNEY			
METER NUMBER:	DATE RATED:	CALIB/SPIN: _____ sec	TAPE WEIGHT: _____ lbs/foot	TAPE TENSION: _____ lbs
CHANNEL BED MATERIAL SIZE RANGE:	PHOTOGRAPHS TAKEN: YES/NO	NUMBER OF PHOTOGRAPHS:		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	
⊗ Tape @ Stake RB	0.0	
① WS @ Tape LB/RB	0.0	
② WS Upstream	7.0	9.48
③ WS Downstream	8.5	9.72
SLOPE	0.24 / 15.5 = 0.015	

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 1-86

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: BEAVER CREEK | CROSS-SECTION NO.: 070710-2 | DATE: 7/7/10 | SHEET 1 OF 1

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) (LEFT) / RIGHT | Gage Reading: _____ ft | TIME: 12:00

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)
TOP PIN	Ø		7.50								
BASE PIN	Ø		7.70								
LL	0.5		7.70								
	1		7.83								
	1.5		8.29								
	2.3		8.43								
	2.6		8.88								
	4.4		8.88								
SW LB	4.5		9.67		Ø			Ø			
	5.8				.40			Ø			
	6.0				.40			.04			
	6.5				.40			.03			
	7				.50			1.23			
	7.5				.55			2.17			
	8				.50			0.53			
	8.5				.25			2.40			
	9				.20			1.64			
	9.5				.25			1.79			
BR	10				.20			Ø			
BR	10.5				.20			Ø			
BR	11.0				.30			Ø			
BR	11.5				.50			Ø			
BR	12				.60			Ø			
	12.5				.80			.22			
	13				.70			2.81			
	13.5				.35			2.34			
	14				.20			2.39			
	14.5				.50			1.82			
	15				.35			.98			
	15.5				.20			.33			
	16		9.67		Ø			Ø			
	16.5				.20			.40			
	17				.10			.10			
SW RB	17.4		9.67		Ø			Ø			
	18		9.27								
	19		9.10								
	20		9.10								
	20.5		8.71								
	21		8.36								
LL	22		7.96								
BASE PIN	25.4		7.77								
TOP PIN	25.4		7.56								
TOTALS:											

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

Data Input & Proofing

STREAM NAME:	BEAVER CREEK - 08/18/10
XS LOCATION:	39 25' 21.0" 107 49' 38.0
XS NUMBER:	81810
DATE:	8/18/2010
OBSERVERS:	UPPENDAHL
1/4 SEC:	SE
SECTION:	24
TWP:	7 S
RANGE:	94 W
PM:	6
COUNTY:	GARFIELD
WATERSHED:	BEAVER CREEK
DIVISION:	5
DOW CODE:	19097
USGS MAP:	
USFS MAP:	
	Level and Rod Survey
TAPE WT:	0.0106 lbs / ft
TENSION:	99999 lbs
SLOPE:	0.015483871 ft / ft

CHECKED BY:.....DATE.....

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

Total Data Points = 42

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
	TOP PIN	0.00	7.50			0.00	0.00	0.00
	B PIN	0.01	7.70			0.00	0.00	0.00
1	GL	0.50	7.70			0.00	0.00	0.00
		1.00	7.83			0.00	0.00	0.00
		1.50	8.29			0.00	0.00	0.00
		2.30	8.43			0.00	0.00	0.00
		2.60	8.88			0.00	0.00	0.00
		4.40	8.88			0.00	0.00	0.00
	SWL	4.50	9.75	0.00	0.00	0.00	0.00	0.00
		5.80	10.07	0.32	0.65	0.24	0.16	9.75
		6.00	10.07	0.32	0.65	0.11	0.07	9.75
		6.50	10.07	0.32	0.65	0.16	0.10	9.75
		7.00	10.17	0.42	0.65	0.21	0.14	9.75
		7.50	10.22	0.47	0.65	0.24	0.15	9.75
		8.00	10.17	0.42	0.65	0.21	0.14	9.75
		8.50	9.92	0.17	0.65	0.09	0.06	9.75
		9.00	9.87	0.12	0.65	0.06	0.04	9.75
		9.50	9.92	0.17	0.65	0.09	0.06	9.75
	ROCK	10.00	9.87	0.12	0.65	0.06	0.04	9.75
	ROCK	10.50	9.87	0.12	0.65	0.06	0.04	9.75
	ROCK	11.00	9.97	0.22	0.65	0.11	0.07	9.75
	ROCK	11.50	10.17	0.42	0.65	0.21	0.14	9.75
	ROCK	12.00	10.27	0.52	0.65	0.26	0.17	9.75
		12.50	10.47	0.72	0.65	0.36	0.23	9.75
		13.00	10.37	0.62	0.65	0.31	0.20	9.75
		13.50	10.02	0.27	0.65	0.14	0.09	9.75
		14.00	9.87	0.12	0.65	0.06	0.04	9.75
		14.50	10.17	0.42	0.65	0.21	0.14	9.75
		15.00	10.02	0.27	0.65	0.14	0.09	9.75
		15.50	9.87	0.12	0.65	0.06	0.04	9.75
		16.00	9.67	0.00	0.00	0.00	0.00	0.00
		16.50	9.87	0.12	0.65	0.06	0.04	9.75
		17.00	9.77	0.02	0.65	0.01	0.01	9.75
	SWL	17.40	9.75	0.00	0.00	0.00	0.00	0.00
		18.00	9.27			0.00	0.00	0.00
		19.00	9.10			0.00	0.00	0.00
		20.00	9.10			0.00	0.00	0.00
		20.50	8.71			0.00	0.00	0.00
		21.00	8.36			0.00	0.00	0.00
1	GL	22.00	7.96			0.00	0.00	0.00
	B PIN	25.40	7.77			0.00	0.00	0.00
	TOP PIN	25.41	7.56			0.00	0.00	0.00
					Totals	3.44	2.23	

COLORADO STREAM SURVEY E+C (1976 REVISION)

Surveyed by: Martinez, James

(X) if stream has no fishery value ☐

	Record Data
Code No.	19097
Date	10-9-79
Section No.	1
Stream Name:	Beaver Creek
Primary Drainage:	(Rifle Area)
Major Drainage	Colorado 32C
Lower terminus FISHERY	//////////
Location:	confluence with Colorado 32 R.
T.	6 S
R.	94 W
S.	22
Width	6
Elevation	5500
Flow (c.f.s.)	2.0
pH	
phth	
MO	
EDTA	
Conductivity	
X if stream profile obtained	
Upper terminus	//////////
Location:	Headwaters
T.	8 S
R.	94 W
S.	10
Width	2
Elevation	10,000
Flow	
pH	
phth	
MO	
EDTA	
Conductivity	
X if stream profile obtained	
Section Summary	//////////
Meander factor	1.1
Length in Miles	14.0
Width in feet	4
Acreage	6.5 (of 18)
Observed Flow	normal
X if inundated by reservoir	
Mileage unsectioned	12.0
Counties where section located	//////////
County	Garfield
Miles	14.0
County	
Miles	
County	
Miles	

	Record Data
Region	NW
Beaver Dams	//////////
Number (count or estimate)	6
Estimated acreage	0.1
Physical stream damage (% of section affected)	//////////
Bank degredation	
Channelization	
Dredging	
Mine tailing encroachment	
Road encroachment	
Accessibility (miles)	//////////
Surfaced	
Non-Surfaced car	
4-Wheel	~~2.0~~ 5.0
Established trail	
No established trail	7.0
Boat only	
No access	
Land Status and mileage	//////////
USFS	4.0
BLM	
Municipal	
Div. of Wild.	
Private, no public access	10.0
Private, open to public	
State Land Board	
County	
Mixed small tracts, open	
Mixed small tracts, closed	
Stocking	//////////
Miles creel size	
Miles fingerling	
Miles Fry	
Miles not stocked	14
Aquatic Vegetation	//////////
Filamentous algae (x one)	//////////
Absent	
Rare	
Common	X
Abundant	
Watercress	//////////
X if present	
Size Classification (X one)	//////////
Large river > 100'	
River 60-99'	
Large stream 36-59'	
Medium 20-35'	
Small 10-19'	
Minor 4-9'	
Very small stream < 4'	X
Gradient (computer entry)	//////////
Percent per mile	6.1

	Record Data
Fishery Value (X one)	//////////
None	
Poor	
Below average	
Average	X
Above Average	
Excellent	
Fishery Value - limiting	//////////
factors	//////////
Dense Riparian Vegetation	B-7
Poor fishability	A-10

FISH SAMPLING	//////////
Lower or only station	//////////
Elevation	
Describe or map station location below	

at confluence
with Road#824
Just below
guaging station

	Record Data
Upper Station	//////////
Elevation	
Describe or map station location below	

Sampling method	Electro 50
Length - feet	100
Sampling adequate	90
Sampling inadequate	
X if scales collected	
Estimated % fish biomass	//////////
Rough Fish	
Game Fish	100
Est. % rough fish biomass	//////////
Bullheads	
Carp	
Cottids	
Dace	
Minnows	
Suckers	
Sunfish	

Sampling method	
Length - feet	
Sampling adequate	
Sampling inadequate	
X if scales collected	
Estimated % fish biomass	//////////
Rough Fish	
Game Fish	
Est. % rough fish biomass	//////////
Bullheads	
Carp	
Cottids	
Dace	
Minnows	
Suckers	
Sunfish	
Combined stations	//////////
Estimated % fish biomass	//////////
Rough Fish	
Game Fish	
Est. % rough fish biomass	//////////
Bullheads	
Carp	
Cottids	
Dace	
Minnows	
Suckers	
Sunfish	
No. of game fish per mile.	6.0

Length-frequency distribution by one-inch size groups (1.0 - 1.9 etc.)

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	>15	Total
LOWER STATION																
Rainbow																
Brown							3	2	1	2	1					9 100%
Brook																
Native																
Whitefish																
Total							3	2	1	2	1					9
UPPER STATION																
Rainbow																
Brown																
Brook																
Native																
Whitefish																
Total																
COMBINED STATIONS																
Rainbow																
Brown																
Brook																
Native																
Whitefish																
Total																

The streamside was very brushy and fishing would have been difficult. Some good pools were present. The stream bed was almost entirely rock and appeared to be subject to high spring flows. The brown trout observed were in good condition.

could be cut + drink (Bonham)

If collected during a stream survey, indicate the presence of these species with an X.

CODE

CATOSTOMIDAE

- RCS _ River Carpsucker Carpiodes carpio carpio
- PCS _ Plains Carpsucker Carpiodes cyprinus
- WS _ White Sucker Catostomus commersoni
- FMS _ Flannelmouth Sucker Catostomus latipinnis
- LGS _ Western Longnose Sucker Catostomus catostomus
- BHS _ Bluehead Sucker Catostomus discobolus
- MOS _ Mountain Sucker Catostomus platyrhynchus
- RGS _ Rio Grande Sucker Catostomus plebius
- NR _ Northern Redhorse Moxostoma macrolepidotum
- RBS _ Razorback Sucker Xyrauchen texanus

CYPRINIDAE

- CP _ European Carp Cyprinus carpio
- GF _ Goldfish Carassius auratus
- ST _ Stoneroller Campostoma anomalum
- NRD _ Northern Redbelly Dace Phoxinus eos
- SRD _ Southern Redbelly Dace Phoxinus erythrogaster
- FD _ Finescale Dace Phoxinus neogaeus
- LD _ Longnose Dace Rhinichthys cataractae
- SD _ Colorado Speckled Dace Rhinichthys osculus
- SQ _ Colorado Squawfish Ptychocheilus lucius
- WA _ White Amur Ctenopharyngodon idella
- RGC _ Rio Grande Chub Gila pandorae
- RTC _ Roundtail Chub Gila robusta
- BC _ Bonytail Chub Gila elegans
- HPC _ Humpback Chub Gila cypha
- CRC _ Creek Chub Semotilus atromaculatus
- HRC _ Hornyhead Chub Nocomis biguttatus
- ASC _ Arkansas River Speckled Chub Hybopsis aestivalis tetranema
- FC _ Flathead Chub Hybopsis gracilis
- LC _ Lake Chub Couesius plumbeus
- SC _ Silver Chub Hybopsis storeriana
- SM _ Suckermouth Minnow Phenacobius mirabilis
- FM _ Fathead Minnow Pimephales promelas
- BM _ Brassy Minnow Hybognathus hankinsoni
- PM _ Plains Minnow Hybognathus placitus
- RSS _ Redside Shiner Richardsonius balteatus
- CS _ Common Shiner Notropis cornutus
- RS _ River Shiner Notropis blennius
- RDS _ Red Shiner Notropis lutrensis
- SS _ Sand Shiner Notropis stramineus
- BS _ Blacknose Shiner Notropis heterolepis
- BMS _ Bigmouth Shiner Notropis dorsalis
- SPS _ Spottail Shiner Notropis hudsonius
- GDS _ Golden Shiner Notemigonus crysoleucas
- T _ Tench Tinca tinca

ATHERINIDAE

- MS _ Mississippi Silverside Menidia audens

POECHILIIDAE

- MSQ _ Mosquitofish Gambusia affinis

CYPRINODONTIDAE

- CPK _ Central Plains Killifish Fundulus kansae
- PTM _ Plains Topminnow Fundulus sciadicus

PERCIDAE

- LP _ Logperch Percina caprodes
- YP _ Yellow perch Perca flavescens
- JD _ Johnny Darter Etheostoma nigrum
- ID _ Iowa Darter Etheostoma exile
- AD _ Arkansas Darter Etheostoma cragini
- POD _ Plains Orangethroat Darter Etheostoma spectabile pulchellum
- W _ Walleye Stizostedion vitreum
- SG _ Sauger Stizostedion canadense

SCIAENIDAE

- D _ Freshwater Drum Aplodinotus grunniens

CODE

PERCICHTHYIDAE

- WB _ White Bass Morone chrysops
- SB _ Striped Bass Morone saxatilis

COTTIDAE

- PS _ Piute Sculpin Cottus beldingi
- MTS _ Mottled Sculpin Cottus bairdi

CENTRARCHIDAE

- SNF _ Green Sunfish Lepomis cyanellus
- OS _ Orangespotted Sunfish Lepomis humilis
- PKS _ Pumpkinseed Lepomis gibbosus
- WKM _ Warmouth Lepomis gulosus
- BG _ Bluegill Lepomis macrochirus

- SP _ Sacramento Perch Archoplites interruptus
- RB _ Rock Bass Ambloplites rupestris
- WCR _ White Crappie Pomoxis annularis
- BCR _ Black Crappie Pomoxis nigromaculatus
- SMB _ Smallmouth Bass Micropterus dolomieui
- LMB _ Largemouth Bass Micropterus salmoides

GASTEROSTEIDAE

- BST _ Brook Stickleback Culaea inconstans

CICHLIDAE

- TIL _ Tilapia Sartherodon mossambica

CLUPEIDAE

- GS _ Gizzard Shad Dorosoma cepedianum
- THS _ Threadfin Shad Dorosoma petenense
- ALW _ Alewife Alosa pseudoharengus

OSMERIDAE

- AMS _ American Smelt Osmerus mordax

ESOCIDAE

- GRP _ Grass Pickerel Esox americanus vermiculatus
- NP _ Northern Pike Esox lucius

SALMONIDAE

- COH _ Coho (Silver) Salmon Oncorhynchus kisutch
- K _ Kokanee (Sockeye) Salmon Oncorhynchus nerka kennerlyi
- MF _ Mountain Whitefish Prosopium williamsoni
- LW _ Lake Whitefish Coregonus clupeaformis
- BLC _ Bear Lake (Bonneville) Cisco Prosopium gemmiferum
- GO _ Golden Trout Salmo aguabonita
- RGN _ Rio Grande Cutthroat Salmo clarki virginalis
- CRN _ Colorado Cutthroat Salmo clarki pleuriticus
- GRN _ Greenback Cutthroat Salmo clarki stomias
- SRC _ Snake River Cutthroat Salmo clarki
- N _ Yellowstone Cutthroat Salmo clarki lewisi
- R _ Rainbow Trout Salmo gairdneri
- L X Brown Trout Salmo trutta
- B _ Brook (Trout) Char Salvelinus fontinalis
- M _ Lake (Trout) Char Salvelinus namaycush
- SPL _ Splake Salvelinus fontinalis x Salvelinus namaycush
- GR _ Arctic Grayling Thymallus arcticus

ANGUILLIDAE

- EEL _ American Eel Anguilla rostrata

ICTALURIDAE

- CC _ Channel Catfish Ictalurus punctatus
- BCT _ Blue Catfish Ictalurus furcatus
- BB _ Black Bullhead Ictalurus melas
- YB _ Yellow Bullhead Ictalurus natalis
- BRB _ Brown Bullhead Ictalurus nebulosus
- FLC _ Flathead Catfish Pylodictis olivaris
- STP _ Stonecat Noturus flavus

'72-'73 FISHERIES INVENTORY / 1041 RELATED DATA

Stream Code 19097

'72-'73 Inventory S- _____

Stream Name Beaver Creek

Percent Open to Public 50 %, ('72 Inventory)

1041 Form

Quality of Water	10,
Pool-riffle Ratio	6,
Temperature of Water	10,
Clarity of Water	10,
Fish Food Supply	5,
Condition of Fish	8,
Legal Access	1,
Physical Access*	—,
Aesthetic Value	4,
Meanders Value	1,
Improvement Potential	8,

'72 Inventory

Stocking Status never, (regularly, occasionally, rarely or (never))

Population Status normal, ((normal,) over-populated, under-populated)

☐ MINIMUM STREAM FLOW DATA

SB-97 Computer run Step A

Maximum Channel Width _____,
Maximum Wetted Perimeter _____,
Maximum Depth _____,

"Filed on" Blue book

Decreed Flow _____,

Initial Month _____,
Initial Day _____,
Initial Year _____*

STOCKING AND FISH SAMPLING DATA

STREAM CODE 19097

STOCKING

STOCK 79-83 0 YRS

STOCKYRS N N N N N

SPECIES-SIZE STOCKED:

___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

FISH SAMPLING

SAMPLE DATE: 10 / 09 / 79

METHODS: ELEC ___ ___ ___ ___

	SPECIES	#TAKEN	AVG. LENGTH (cm)	RANGE (cm)	AVG. WT (g)	RANGE (g)	%TOTAL CATCH
1.	L..	9	21.7	18-28			100
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							
11.							
12.							
13.							
14.							
15.							

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

LOCATION INFORMATION

STREAM NAME:	BEAVER CREEK
XS LOCATION:	39 25' 21.0" 107 49' 38.0
XS NUMBER:	070710-2
DATE:	8-Jul-10
OBSERVERS:	UPPENDAHL
1/4 SEC:	SE
SECTION:	24
TWP:	7 S
RANGE:	94 W
PM:	6
COUNTY:	GARFIELD
WATERSHED:	BEAVER CREEK
DIVISION:	5
DOW CODE:	19097
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:	0.01548387

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

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

STREAM NAME: BEAVER CREEK
XS LOCATION: 39 25' 21.0" 107 49' 38.0
XS NUMBER: 070710-2

DATA POINTS= 42

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
	TOP PIN	0.00	7.50			0.00		0.00	0.00	0.0%
	B PIN	0.01	7.70			0.00		0.00	0.00	0.0%
1	GL	0.50	7.70			0.00		0.00	0.00	0.0%
		1.00	7.83			0.00		0.00	0.00	0.0%
		1.50	8.29			0.00		0.00	0.00	0.0%
		2.30	8.43			0.00		0.00	0.00	0.0%
		2.60	8.88			0.00		0.00	0.00	0.0%
		4.40	8.88			0.00		0.00	0.00	0.0%
	SWL	4.50	9.67	0.00	0.00	0.00		0.00	0.00	0.0%
		5.80	10.07	0.40	0.00	1.36	0.40	0.30	0.00	0.0%
		6.00	10.07	0.40	0.04	0.20	0.40	0.14	0.01	0.1%
		6.50	10.07	0.40	0.03	0.50	0.40	0.20	0.01	0.1%
		7.00	10.17	0.50	1.23	0.51	0.50	0.25	0.31	7.4%
		7.50	10.22	0.55	2.17	0.50	0.55	0.28	0.60	14.3%
		8.00	10.17	0.50	0.53	0.50	0.50	0.25	0.13	3.2%
		8.50	9.92	0.25	2.40	0.56	0.25	0.13	0.30	7.2%
		9.00	9.87	0.20	1.64	0.50	0.20	0.10	0.16	3.9%
		9.50	9.92	0.25	1.79	0.50	0.25	0.13	0.22	5.4%
	ROCK	10.00	9.87	0.20	0.00	0.50	0.20	0.10	0.00	0.0%
	ROCK	10.50	9.87	0.20	0.00	0.50	0.20	0.10	0.00	0.0%
	ROCK	11.00	9.97	0.30	0.00	0.51	0.30	0.15	0.00	0.0%
	ROCK	11.50	10.17	0.50	0.00	0.54	0.50	0.25	0.00	0.0%
	ROCK	12.00	10.27	0.60	0.00	0.51	0.60	0.30	0.00	0.0%
		12.50	10.47	0.80	0.22	0.54	0.80	0.40	0.09	2.1%
		13.00	10.37	0.70	2.81	0.51	0.70	0.35	0.98	23.6%
		13.50	10.02	0.35	2.34	0.61	0.35	0.18	0.41	9.8%
		14.00	9.87	0.20	2.39	0.52	0.20	0.10	0.24	5.7%
		14.50	10.17	0.50	1.82	0.58	0.50	0.25	0.46	10.9%
		15.00	10.02	0.35	0.98	0.52	0.35	0.18	0.17	4.1%
		15.50	9.87	0.20	0.33	0.52	0.20	0.10	0.03	0.8%
		16.00	9.67	0.00	0.00	0.54		0.00	0.00	0.0%
		16.50	9.87	0.20	0.40	0.54	0.20	0.10	0.04	1.0%
		17.00	9.77	0.10	0.10	0.51	0.10	0.04	0.00	0.1%
	SWL	17.40	9.67	0.00	0.00	0.41		0.00	0.00	0.0%
		18.00	9.27			0.00		0.00	0.00	0.0%
		19.00	9.10			0.00		0.00	0.00	0.0%
		20.00	9.10			0.00		0.00	0.00	0.0%
		20.50	8.71			0.00		0.00	0.00	0.0%
		21.00	8.36			0.00		0.00	0.00	0.0%
1	GL	22.00	7.96			0.00		0.00	0.00	0.0%
	B PIN	25.40	7.77			0.00		0.00	0.00	0.0%
	TOP PIN	25.41	7.56			0.00		0.00	0.00	0.0%
	TOTALS ----------					13.51	0.8 (Max.)	4.36	4.16	100.0%

Manning's n = 0.0912
Hydraulic Radius= 0.32279587

STREAM NAME: BEAVER CREEK
XS LOCATION: 39 25' 21.0" 107 49' 38.0
XS NUMBER: 070710-2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	4.36	4.36	0.0%
9.42	4.36	7.64	75.1%
9.44	4.36	7.37	69.0%
9.46	4.36	7.10	63.0%
9.48	4.36	6.84	56.9%
9.50	4.36	6.58	50.8%
9.52	4.36	6.31	44.8%
9.54	4.36	6.05	38.8%
9.56	4.36	5.79	32.8%
9.58	4.36	5.53	26.8%
9.60	4.36	5.27	20.8%
9.62	4.36	5.01	14.8%
9.63	4.36	4.88	11.9%
9.64	4.36	4.75	8.9%
9.65	4.36	4.62	5.9%
9.66	4.36	4.49	3.0%
9.67	4.36	4.36	0.0%
9.68	4.36	4.23	-2.9%
9.69	4.36	4.10	-5.9%
9.70	4.36	3.98	-8.7%
9.71	4.36	3.85	-11.6%
9.72	4.36	3.73	-14.4%
9.74	4.36	3.49	-20.0%
9.76	4.36	3.25	-25.5%
9.78	4.36	3.02	-30.8%
9.80	4.36	2.79	-36.1%
9.82	4.36	2.56	-41.2%
9.84	4.36	2.35	-46.2%
9.86	4.36	2.13	-51.1%
9.88	4.36	1.93	-55.6%
9.90	4.36	1.76	-59.7%
9.92	4.36	1.60	-63.4%

WATERLINE AT ZERO
AREA ERROR = 9.670

STREAM NAME: BEAVER CREEK
XS LOCATION: 39 25' 21.0" 107 49' 38.0
XS NUMBER: 070710-2 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	7.96	20.86	1.58	2.51	33.03	23.00	100.0%	1.44	85.23	2.58
	8.67	18.10	1.06	1.80	19.26	19.79	86.1%	0.97	38.34	1.99
	8.72	17.99	1.02	1.75	18.35	19.65	85.4%	0.93	35.57	1.94
	8.77	17.90	0.98	1.70	17.46	19.51	84.8%	0.89	32.87	1.88
	8.82	17.80	0.93	1.65	16.56	19.37	84.2%	0.86	30.27	1.83
	8.87	17.70	0.89	1.60	15.68	19.22	83.6%	0.82	27.75	1.77
	8.92	15.83	0.94	1.55	14.87	17.29	75.2%	0.86	27.26	1.83
	8.97	15.76	0.89	1.50	14.08	17.16	74.6%	0.82	25.01	1.78
	9.02	15.68	0.85	1.45	13.29	17.03	74.0%	0.78	22.85	1.72
	9.07	15.61	0.80	1.40	12.51	16.90	73.5%	0.74	20.76	1.66
	9.12	14.45	0.81	1.35	11.75	15.68	68.2%	0.75	19.66	1.67
	9.17	14.15	0.78	1.30	11.04	15.33	66.6%	0.72	17.97	1.63
	9.22	13.85	0.75	1.25	10.34	14.98	65.1%	0.69	16.36	1.58
	9.27	13.55	0.71	1.20	9.65	14.63	63.6%	0.66	14.83	1.54
	9.32	13.47	0.67	1.15	8.97	14.49	63.0%	0.62	13.22	1.47
	9.37	13.39	0.62	1.10	8.30	14.35	62.4%	0.58	11.69	1.41
	9.42	13.31	0.57	1.05	7.64	14.21	61.8%	0.54	10.23	1.34
	9.47	13.23	0.53	1.00	6.97	14.07	61.2%	0.50	8.85	1.27
	9.52	13.14	0.48	0.95	6.31	13.93	60.6%	0.45	7.55	1.20
	9.57	13.06	0.43	0.90	5.66	13.79	59.9%	0.41	6.34	1.12
	9.62	12.98	0.39	0.85	5.01	13.65	59.3%	0.37	5.20	1.04
WL	9.67	12.90	0.34	0.80	4.36	13.51	58.7%	0.32	4.16	0.95
	9.72	12.29	0.30	0.75	3.73	12.86	55.9%	0.29	3.31	0.89
	9.77	11.67	0.27	0.70	3.13	12.22	53.1%	0.26	2.56	0.82
	9.82	11.01	0.23	0.65	2.56	11.52	50.1%	0.22	1.91	0.74
	9.87	9.85	0.21	0.60	2.03	10.33	44.9%	0.20	1.39	0.69
	9.92	7.52	0.21	0.55	1.60	7.95	34.6%	0.20	1.11	0.70
	9.97	6.59	0.19	0.50	1.24	6.97	30.3%	0.18	0.80	0.64
	10.02	5.79	0.16	0.45	0.93	6.11	26.5%	0.15	0.54	0.58
	10.07	4.38	0.15	0.40	0.66	4.63	20.1%	0.14	0.37	0.55
	10.12	3.58	0.13	0.35	0.46	3.77	16.4%	0.12	0.23	0.50
	10.17	2.79	0.11	0.30	0.30	2.91	12.7%	0.10	0.14	0.45
	10.22	1.46	0.13	0.25	0.20	1.56	6.8%	0.13	0.10	0.51
	10.27	1.14	0.12	0.20	0.13	1.22	5.3%	0.11	0.06	0.46
	10.32	0.95	0.08	0.15	0.08	1.00	4.4%	0.08	0.03	0.38
	10.37	0.75	0.05	0.10	0.04	0.78	3.4%	0.05	0.01	0.27
	10.42	0.38	0.03	0.05	0.01	0.39	1.7%	0.02	0.00	0.17
	10.47	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: BEAVER CREEK
XS LOCATION: 39 25' 21.0" 107 49' 38.0
XS NUMBER: 070710-2

SUMMARY SHEET

MEASURED FLOW (Qm)=	4.16	cfs
CALCULATED FLOW (Qc)=	4.16	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	9.67	ft
CALCULATED WATERLINE (WLc)=	9.67	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.80	ft
MAX CALCULATED DEPTH (Dc)=	0.80	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	0.95	ft/sec
MANNING'S N=	0.091	
SLOPE=	0.01548387	ft/ft
.4 * Qm =	1.7	cfs
2.5 * Qm=	10.4	cfs

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

FLOW (CFS)	PERIOD
___________	___________
___________	___________
___________	___________
___________	___________

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

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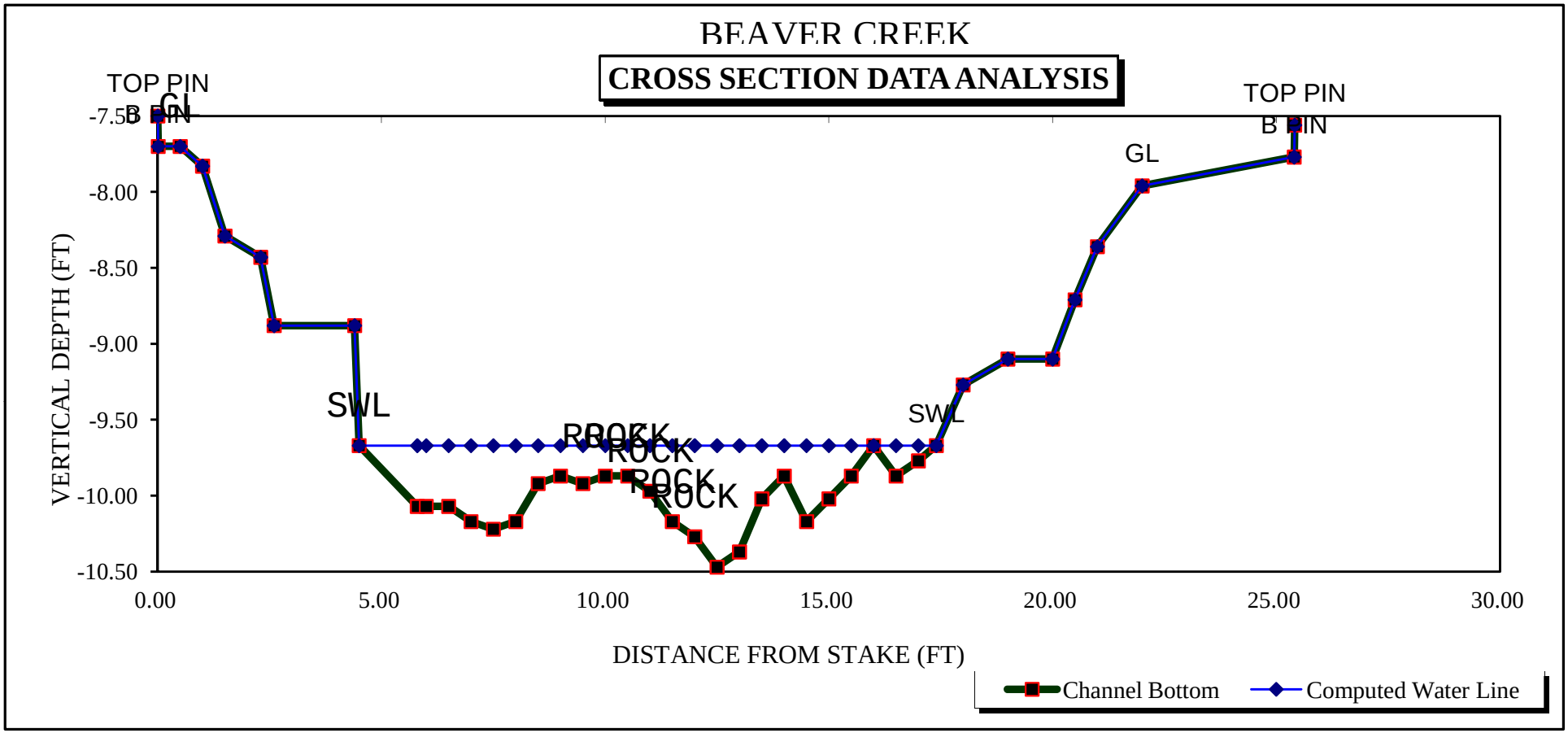
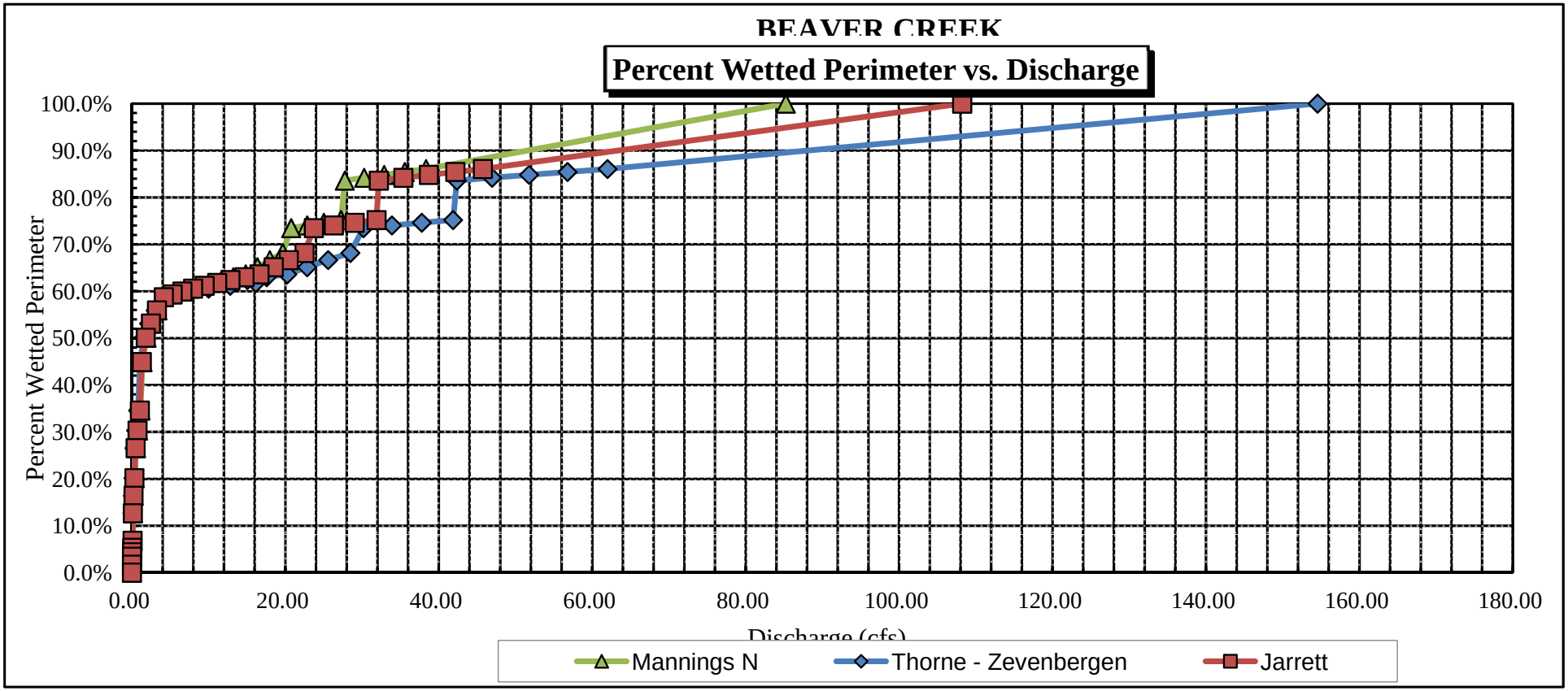
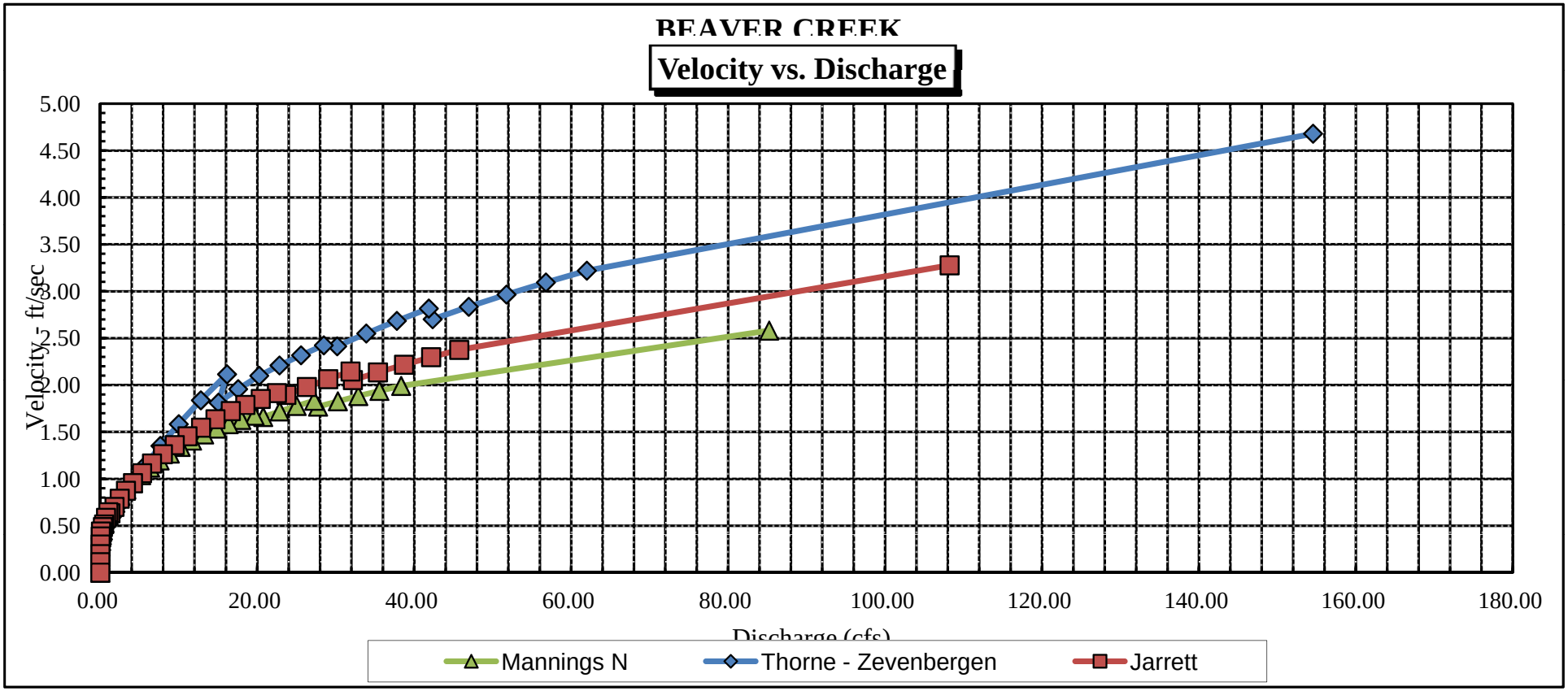
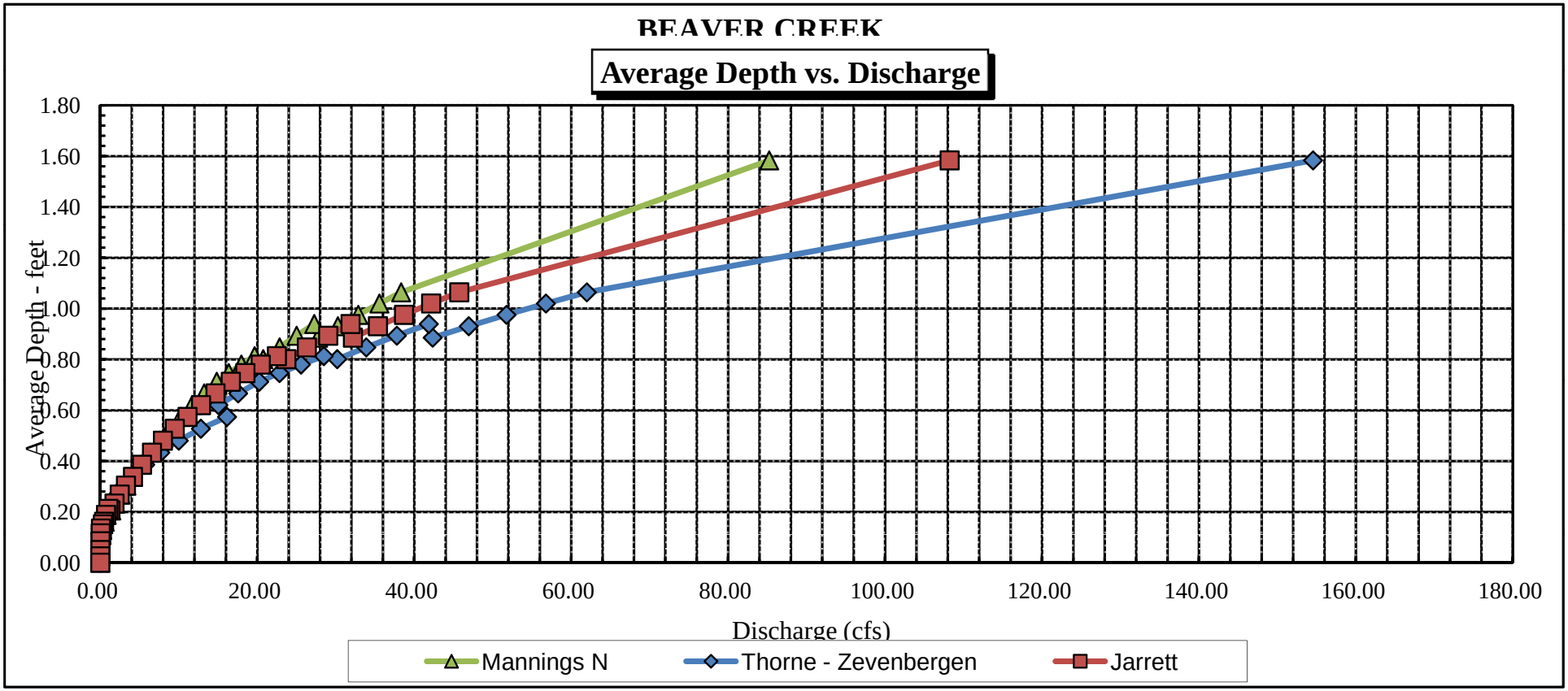
RECOMMENDATION BY: ……………………………………… AGENCY……………………………………… DATE:………………………

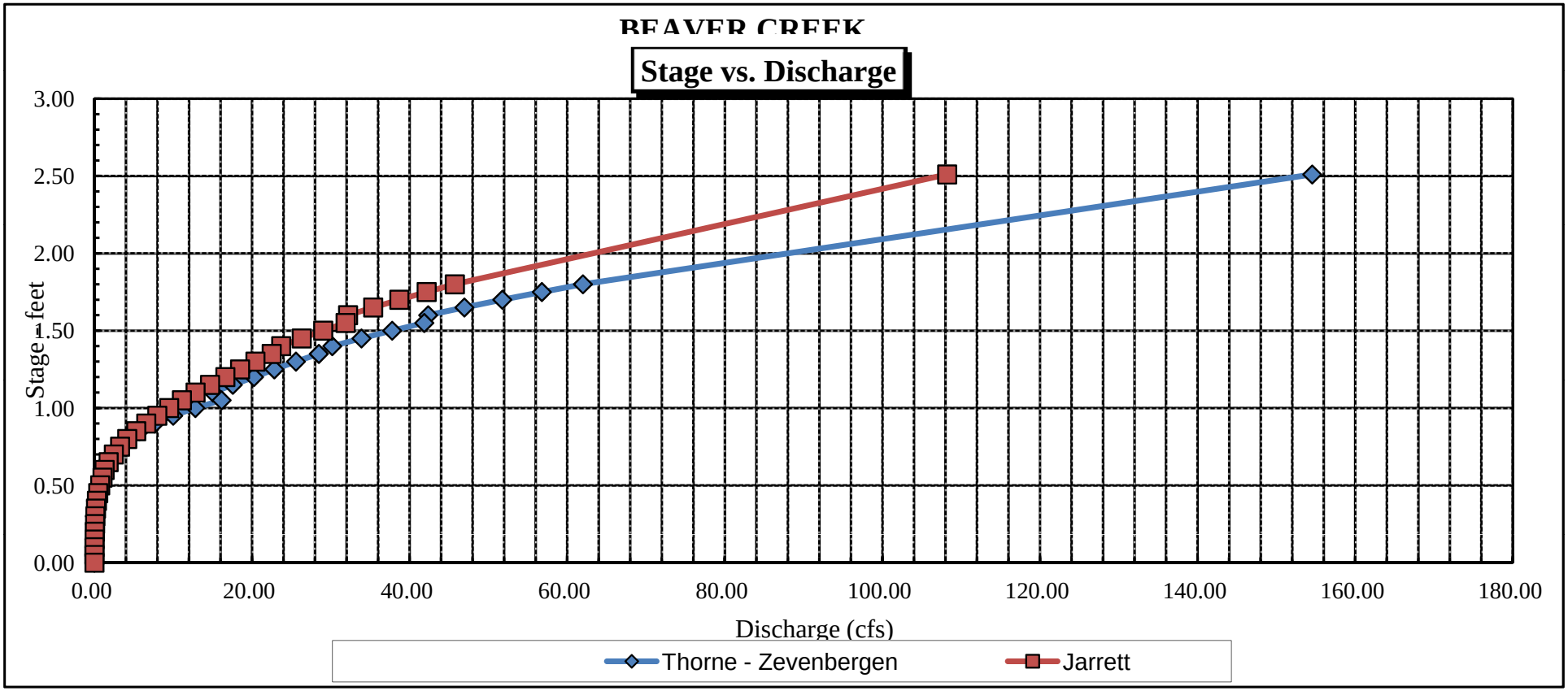
CWCB REVIEW BY: …………………………………………………………………………………… DATE:………………………


BEAVER CREEK
CROSS SECTION DATA ANALYSIS
TOP PIN
B PIN
GL
TOP PIN
B PIN
GL
SWL
SWL
ROCK
ROCK
ROCK
ROCK
-7.50
-8.00
-8.50
-9.00
-9.50
-10.00
-10.50
VERTICAL DEPTH (FT)
0.00
5.00
10.00
15.00
20.00
25.00
30.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


BEAVER CREEK
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
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


BEAVER CREEK
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
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


BEAVER CREEK
Average Depth vs. Discharge
Average Depth - feet
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


BEAVER CREEK
Stage vs. Discharge
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Stage - feet
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

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

LOCATION INFORMATION

STREAM NAME:	BEAVER CREEK - 08/18/10
XS LOCATION:	39 25' 21.0" 107 49' 38.0
XS NUMBER:	81810
DATE:	18-Aug-10
OBSERVERS:	UPPENDAHL
1/4 SEC:	SE
SECTION:	24
TWP:	7 S
RANGE:	94 W
PM:	6
COUNTY:	GARFIELD
WATERSHED:	BEAVER CREEK
DIVISION:	5
DOW CODE:	19097
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

TAPE WT:	0.0106
TENSION:	99999

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

CHANNEL PROFILE DATA

SLOPE:	0.01548387

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

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

STREAM NAME: BEAVER CREEK - 08/18/10
XS LOCATION: 39 25' 21.0" 107 49' 38.0
XS NUMBER: 81810

DATA POINTS= 42

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
	TOP PIN	0.00	7.50			0.00		0.00	0.00	0.0%
	B PIN	0.01	7.70			0.00		0.00	0.00	0.0%
1	GL	0.50	7.70			0.00		0.00	0.00	0.0%
		1.00	7.83			0.00		0.00	0.00	0.0%
		1.50	8.29			0.00		0.00	0.00	0.0%
		2.30	8.43			0.00		0.00	0.00	0.0%
		2.60	8.88			0.00		0.00	0.00	0.0%
		4.40	8.88			0.00		0.00	0.00	0.0%
	SWL	4.50	9.75	0.00	0.00	0.00		0.00	0.00	0.0%
		5.80	10.07	0.32	0.65	1.34	0.32	0.24	0.16	7.0%
		6.00	10.07	0.32	0.65	0.20	0.32	0.11	0.07	3.3%
		6.50	10.07	0.32	0.65	0.50	0.32	0.16	0.10	4.7%
		7.00	10.17	0.42	0.65	0.51	0.42	0.21	0.14	6.1%
		7.50	10.22	0.47	0.65	0.50	0.47	0.24	0.15	6.8%
		8.00	10.17	0.42	0.65	0.50	0.42	0.21	0.14	6.1%
		8.50	9.92	0.17	0.65	0.56	0.17	0.09	0.06	2.5%
		9.00	9.87	0.12	0.65	0.50	0.12	0.06	0.04	1.7%
		9.50	9.92	0.17	0.65	0.50	0.17	0.09	0.06	2.5%
	ROCK	10.00	9.87	0.12	0.65	0.50	0.12	0.06	0.04	1.7%
	ROCK	10.50	9.87	0.12	0.65	0.50	0.12	0.06	0.04	1.7%
	ROCK	11.00	9.97	0.22	0.65	0.51	0.22	0.11	0.07	3.2%
	ROCK	11.50	10.17	0.42	0.65	0.54	0.42	0.21	0.14	6.1%
	ROCK	12.00	10.27	0.52	0.65	0.51	0.52	0.26	0.17	7.6%
		12.50	10.47	0.72	0.65	0.54	0.72	0.36	0.23	10.5%
		13.00	10.37	0.62	0.65	0.51	0.62	0.31	0.20	9.0%
		13.50	10.02	0.27	0.65	0.61	0.27	0.14	0.09	3.9%
		14.00	9.87	0.12	0.65	0.52	0.12	0.06	0.04	1.7%
		14.50	10.17	0.42	0.65	0.58	0.42	0.21	0.14	6.1%
		15.00	10.02	0.27	0.65	0.52	0.27	0.14	0.09	3.9%
		15.50	9.87	0.12	0.65	0.52	0.12	0.06	0.04	1.7%
		16.00	9.67	0.00	0.00	0.54		0.00	0.00	0.0%
		16.50	9.87	0.12	0.65	0.54	0.12	0.06	0.04	1.7%
		17.00	9.77	0.02	0.65	0.51	0.02	0.01	0.01	0.3%
	SWL	17.40	9.75	0.00	0.00	0.40		0.00	0.00	0.0%
		18.00	9.27			0.00		0.00	0.00	0.0%
		19.00	9.10			0.00		0.00	0.00	0.0%
		20.00	9.10			0.00		0.00	0.00	0.0%
		20.50	8.71			0.00		0.00	0.00	0.0%
		21.00	8.36			0.00		0.00	0.00	0.0%
1	GL	22.00	7.96			0.00		0.00	0.00	0.0%
	B PIN	25.40	7.77			0.00		0.00	0.00	0.0%
	TOP PIN	25.41	7.56			0.00		0.00	0.00	0.0%
	TOTALS ----------					13.47	0.72	3.44	2.23	100.0%
							(Max.)			

Manning's n = 0.1144
Hydraulic Radius= 0.25501276

STREAM NAME: BEAVER CREEK - 08/18/10
XS LOCATION: 39 25' 21.0" 107 49' 38.0
XS NUMBER: 81810

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	3.44	3.41	-0.7%
9.50	3.44	6.66	93.9%
9.52	3.44	6.40	86.2%
9.54	3.44	6.14	78.6%
9.56	3.44	5.87	70.9%
9.58	3.44	5.61	63.2%
9.60	3.44	5.35	55.6%
9.62	3.44	5.08	48.0%
9.64	3.44	4.82	40.4%
9.66	3.44	4.56	32.8%
9.68	3.44	4.30	25.2%
9.70	3.44	4.04	17.7%
9.71	3.44	3.92	14.0%
9.72	3.44	3.79	10.3%
9.73	3.44	3.66	6.6%
9.74	3.44	3.54	2.9%
9.75	3.44	3.41	-0.7%
9.76	3.44	3.29	-4.3%
9.77	3.44	3.17	-7.8%
9.78	3.44	3.05	-11.3%
9.79	3.44	2.93	-14.7%
9.80	3.44	2.82	-18.0%
9.82	3.44	2.59	-24.6%
9.84	3.44	2.37	-31.1%
9.86	3.44	2.15	-37.4%
9.88	3.44	1.95	-43.3%
9.90	3.44	1.77	-48.6%
9.92	3.44	1.60	-53.3%
9.94	3.44	1.46	-57.6%
9.96	3.44	1.31	-61.7%
9.98	3.44	1.18	-65.6%
10.00	3.44	1.05	-69.3%

WATERLINE AT ZERO
AREA ERROR = 9.748

STREAM NAME: BEAVER CREEK - 08/18/10
XS LOCATION: 39 25' 21.0" 107 49' 38.0
XS NUMBER: 81810 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	7.96	20.86	1.59	2.51	33.12	23.09	100.0%	1.43	68.09	2.06
	8.75	17.94	1.00	1.72	17.95	19.66	85.1%	0.91	27.29	1.52
	8.80	17.84	0.96	1.67	17.05	19.52	84.5%	0.87	25.19	1.48
	8.85	17.74	0.91	1.62	16.16	19.38	83.9%	0.83	23.15	1.43
	8.90	15.86	0.97	1.57	15.31	17.44	75.5%	0.88	22.69	1.48
	8.95	15.79	0.92	1.52	14.52	17.31	75.0%	0.84	20.87	1.44
	9.00	15.72	0.87	1.47	13.73	17.18	74.4%	0.80	19.12	1.39
	9.05	15.65	0.83	1.42	12.95	17.05	73.8%	0.76	17.42	1.35
	9.10	15.58	0.78	1.37	12.17	16.92	73.2%	0.72	15.79	1.30
	9.15	14.29	0.80	1.32	11.44	15.58	67.4%	0.73	15.06	1.32
	9.20	13.99	0.77	1.27	10.74	15.23	65.9%	0.71	13.75	1.28
	9.25	13.69	0.73	1.22	10.04	14.88	64.4%	0.68	12.49	1.24
	9.30	13.52	0.69	1.17	9.37	14.65	63.4%	0.64	11.23	1.20
	9.35	13.45	0.65	1.12	8.69	14.52	62.9%	0.60	9.98	1.15
	9.40	13.38	0.60	1.07	8.02	14.39	62.3%	0.56	8.78	1.09
	9.45	13.31	0.55	1.02	7.35	14.26	61.8%	0.52	7.64	1.04
	9.50	13.24	0.51	0.97	6.69	14.13	61.2%	0.47	6.57	0.98
	9.55	13.18	0.46	0.92	6.03	14.00	60.6%	0.43	5.56	0.92
	9.60	13.11	0.41	0.87	5.37	13.87	60.1%	0.39	4.61	0.86
	9.65	13.04	0.36	0.82	4.72	13.74	59.5%	0.34	3.74	0.79
	9.70	12.83	0.32	0.77	4.07	13.46	58.3%	0.30	2.96	0.73
WL	9.75	12.51	0.27	0.72	3.44	13.06	56.5%	0.26	2.28	0.66
	9.80	11.52	0.25	0.67	2.84	12.04	52.1%	0.24	1.75	0.62
	9.85	10.82	0.21	0.62	2.28	11.31	49.0%	0.20	1.27	0.56
	9.90	8.68	0.21	0.57	1.78	9.13	39.5%	0.20	0.97	0.54
	9.95	7.10	0.20	0.52	1.40	7.49	32.4%	0.19	0.74	0.53
	10.00	6.20	0.17	0.47	1.07	6.54	28.3%	0.16	0.51	0.48
	10.05	5.41	0.14	0.42	0.78	5.69	24.6%	0.14	0.33	0.43
	10.10	3.93	0.14	0.37	0.55	4.15	18.0%	0.13	0.23	0.42
	10.15	3.13	0.12	0.32	0.37	3.29	14.2%	0.11	0.14	0.38
	10.20	2.04	0.12	0.27	0.24	2.16	9.3%	0.11	0.09	0.37
	10.25	1.28	0.12	0.22	0.16	1.37	5.9%	0.12	0.06	0.38
	10.30	1.03	0.10	0.17	0.10	1.10	4.8%	0.09	0.03	0.33
	10.35	0.84	0.07	0.12	0.05	0.88	3.8%	0.06	0.01	0.25
	10.40	0.54	0.04	0.07	0.02	0.56	2.4%	0.03	0.00	0.17
	10.45	0.16	0.01	0.02	0.00	0.17	0.7%	0.01	0.00	0.08

STREAM NAME: BEAVER CREEK - 08/18/10
XS LOCATION: 39 25' 21.0" 107 49' 38.0
XS NUMBER: 81810

SUMMARY SHEET

MEASURED FLOW (Qm)=	2.23	cfs
CALCULATED FLOW (Qc)=	2.28	cfs
(Qm-Qc)/Qm * 100 =	-2.1	%
MEASURED WATERLINE (WLm)=	9.75	ft
CALCULATED WATERLINE (WLc)=	9.75	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.72	ft
MAX CALCULATED DEPTH (Dc)=	0.72	ft
(Dm-Dc)/Dm * 100	-0.3	%
MEAN VELOCITY=	0.66	ft/sec
MANNING'S N=	0.114	
SLOPE=	0.01548387	ft/ft
.4 * Qm =	0.9	cfs
2.5 * Qm=	5.6	cfs

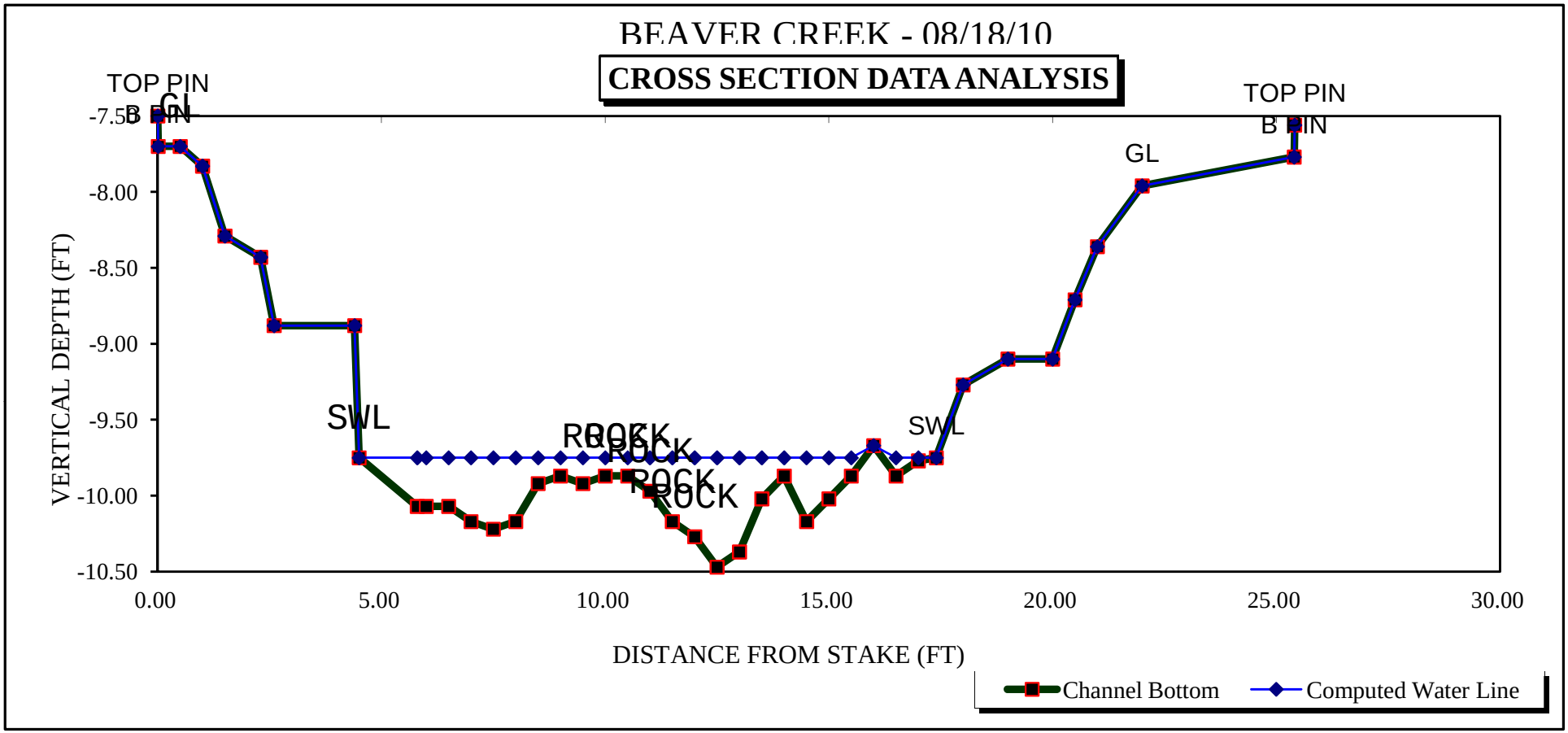
RECOMMENDED INSTREAM FLOW:
==========

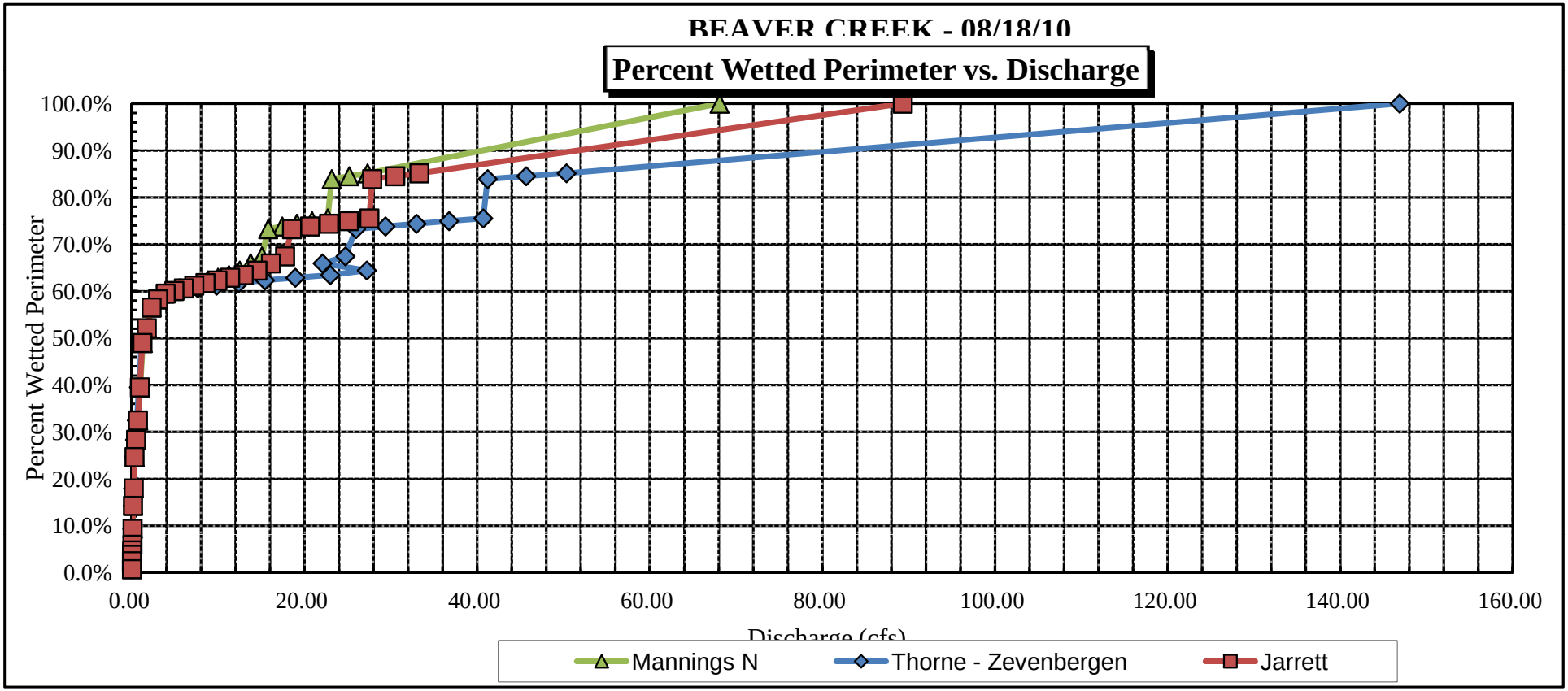
FLOW (CFS)	PERIOD
==========	========
_____	_____
_____	_____
_____	_____
_____	_____

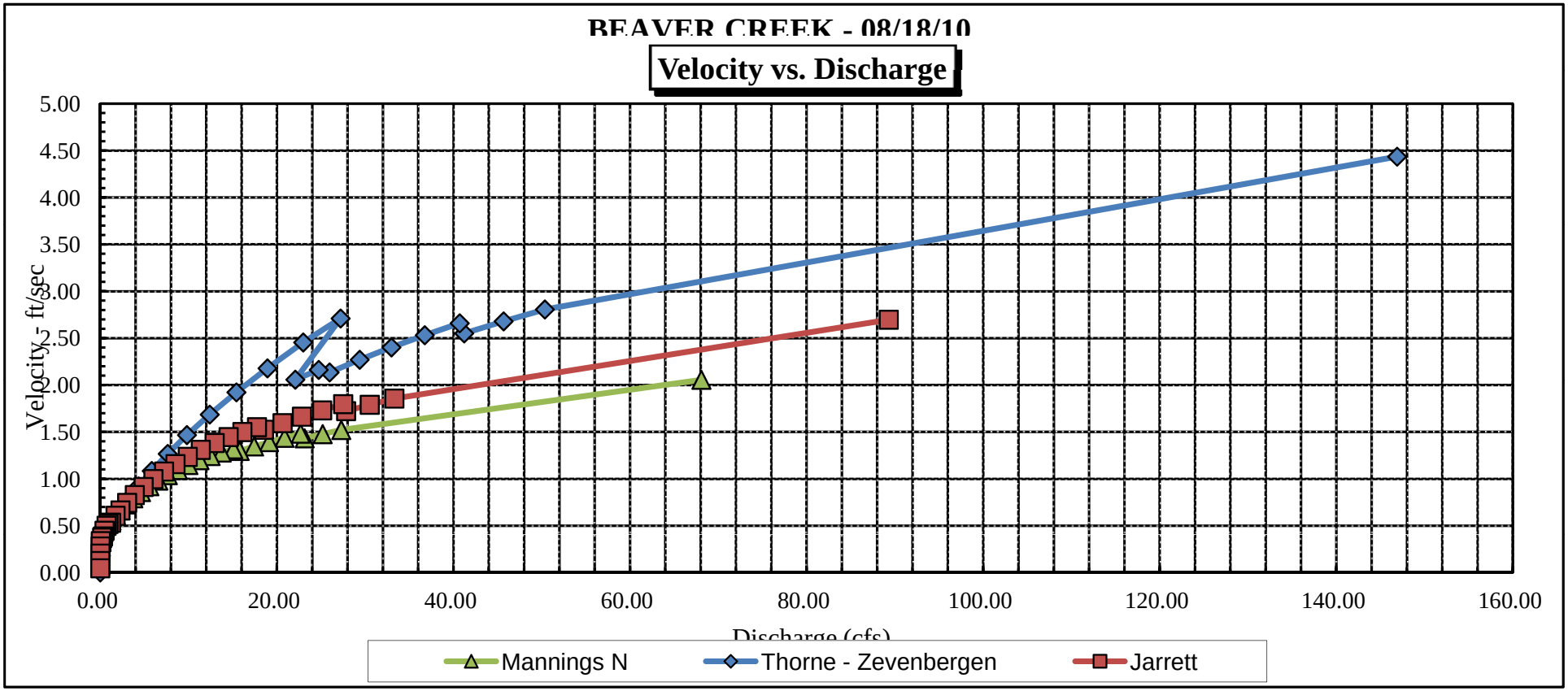
RATIONALE FOR RECOMMENDATION:
==========

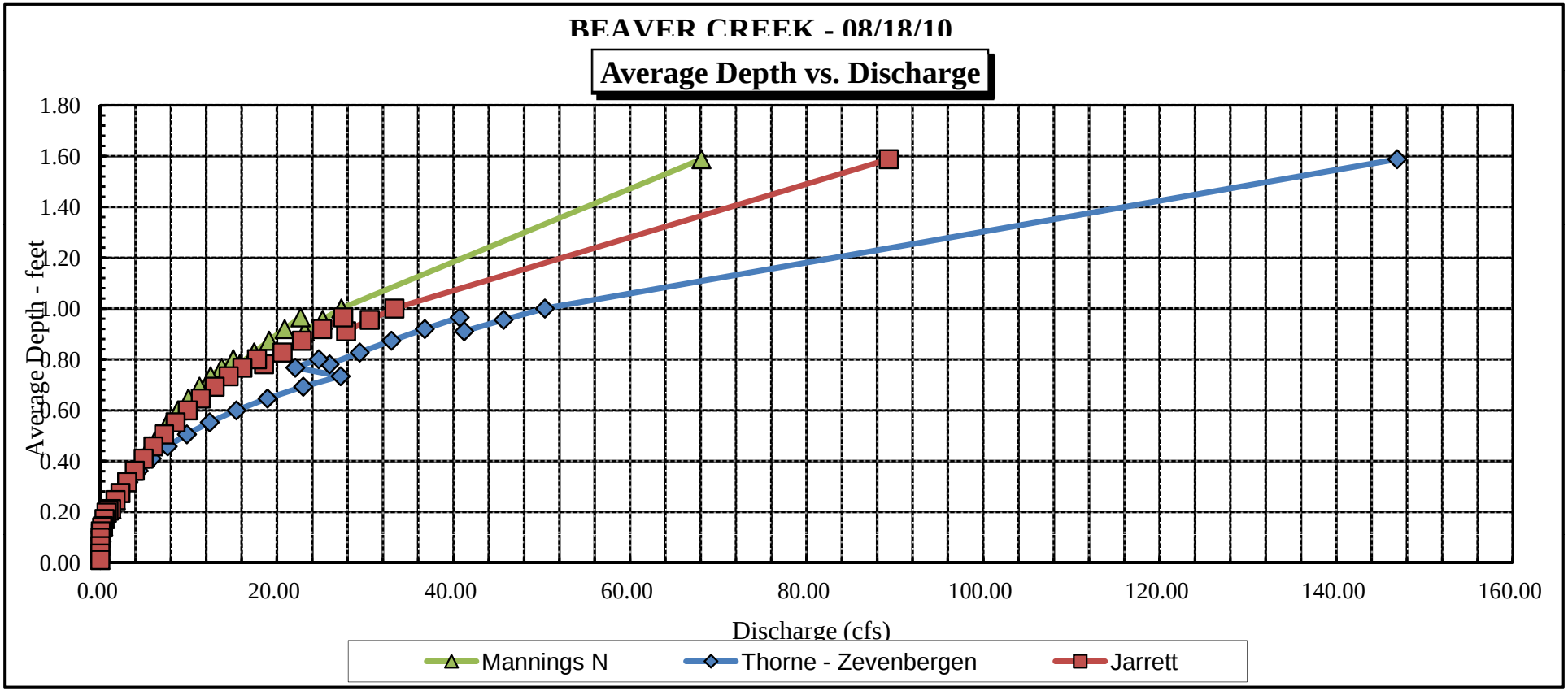
RECOMMENDATION BY: ..... AGENCY..... DATE:.....

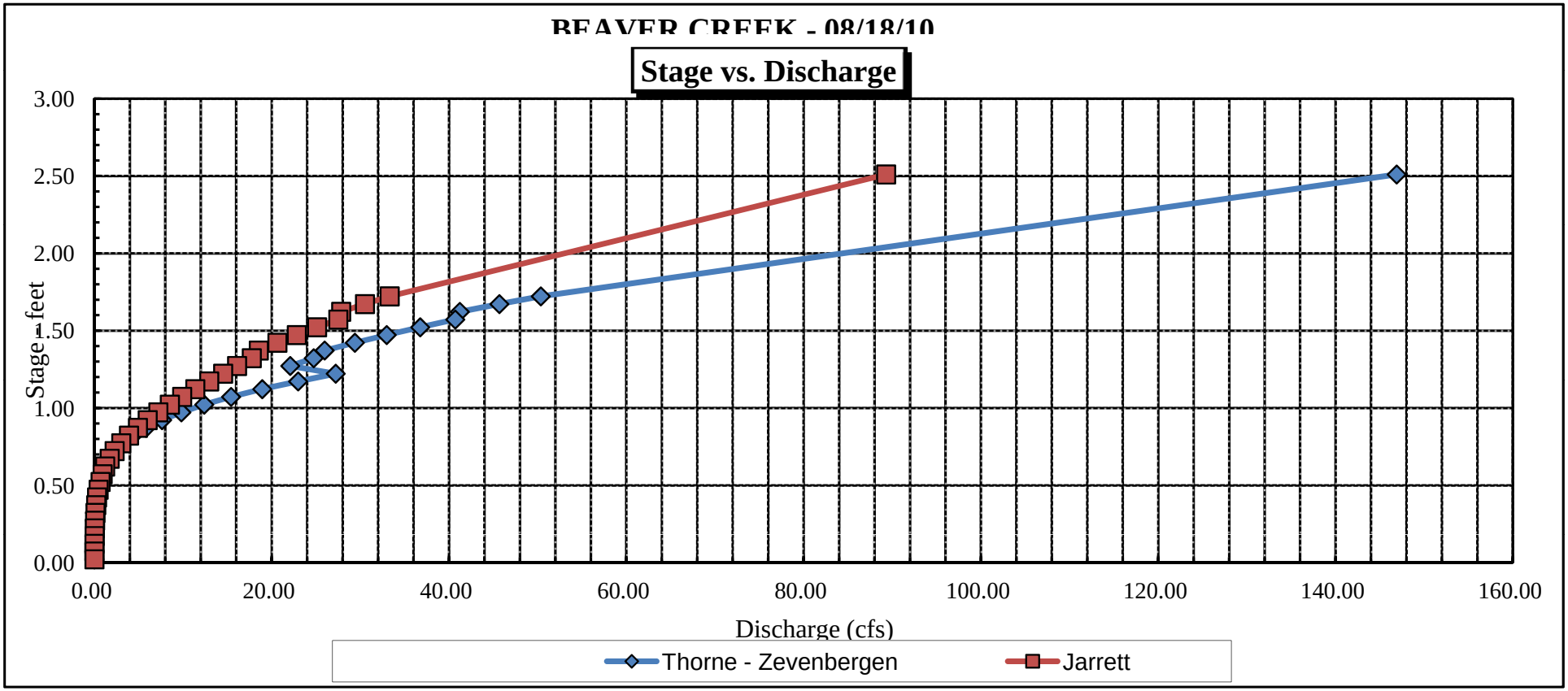
CWCB REVIEW BY: ..... DATE:.....


BEAVER CREEK - 08/18/10
CROSS SECTION DATA ANALYSIS
TOP PIN
B PIN
GL
SWL
ROCK
ROCK
ROCK
ROCK
SWL
GL
TOP PIN
B PIN
VERTICAL DEPTH (FT)
-7.50
-8.00
-8.50
-9.00
-9.50
-10.00
-10.50
0.00
5.00
10.00
15.00
20.00
25.00
30.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


BEAVER CREEK - 08/18/10
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
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


BEAVER CREEK - 08/18/10
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
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


BEAVER CREEK - 08/18/10
Average Depth vs. Discharge
Average Depth - feet
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


BEAVER CREEK - 08/18/10
Stage vs. Discharge
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Stage - feet
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

USGS Colorado StreamStats

Streamstats Ungaged Site Report

Date: Thu Jan 13 2011 14:05:16 Mountain Standard Time
Site Location: Colorado
NAD27 Latitude: 39.4452 (39 26 43)
NAD27 Longitude: -107.8321 (-107 49 56)
NAD83 Latitude: 39.4452 (39 26 43)
NAD83 Longitude: -107.8327 (-107 49 58)
Drainage Area: 7.26 mi2

Peak-Flows Basin Characteristics

100% Mountain Region Peak Flow (7.26 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	7.26	1	1060
Mean Basin Slope from 10m DEM (percent)	30	7.6	60.2
Mean Annual Precipitation (inches)	30.40	18	47

Low-Flows Basin Characteristics

100% Mountain Region Min Flow (7.26 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	7.26	1	1060
Mean Annual Precipitation (inches)	30.40	18	47
Mean Basin Elevation (feet)	9590	8600	12000

Flow-Duration Basin Characteristics

100% Mountain Region Flow Duration (7.26 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	7.26	1	1060
Mean Annual Precipitation (inches)	30.44	18	47

Maximum-Flows Basin Characteristics

100% Mountain Region Max Flow (7.26 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	7.26	1	1060
Mean Annual Precipitation (inches)	30.44	18	47

Mean-Flows Basin Characteristics

100% Mountain Region Mean Flow (7.26 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	7.26	1	1060
Mean Annual Precipitation (inches)	30.44	18	47

Peak-Flows Streamflow Statistics

Statistic	Flow (ft^3/s)	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
PK2	97	49			
PK5	136	44			
PK10	160	41			

PK25	191	40			
PK50	225	39			
PK100	248	36			
PK200	267	36			
PK500	308	33			

Low-Flows Streamflow Statistics

Statistic	Flow (ft^3/s)	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
M7D2Y	0.38	89			
M7D10Y	0.19	150			
M7D50Y	0.24	130			

Flow-Duration Streamflow Statistics

Statistic	Flow (ft^3/s)	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
D10	26.3	19			
D25	6.53	29			
D50	2.31	29			
D75	1.25	39			
D90	0.7	72			

Maximum-Flows Streamflow Statistics

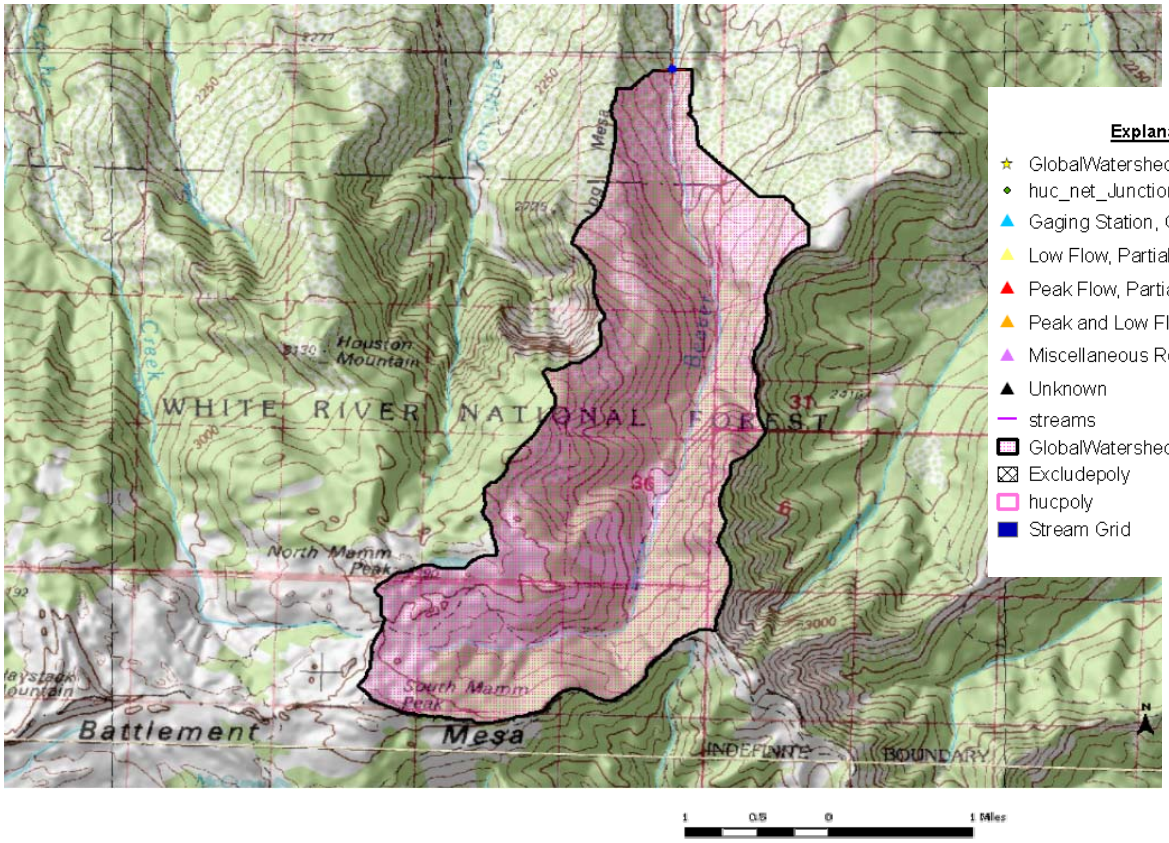
Statistic	Flow (ft^3/s)	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
V7D2Y	63.3	46			
V7D10Y	98.2	35			
V7D50Y	132	31			

Mean-Flows Streamflow Statistics

Statistic	Flow (ft^3/s)	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
Q1	1.44	24			
Q2	1.33	26			
Q3	1.41	24			
Q4	2.91	19			
Q5	22.2	21			
Q6	46.9	21			
Q7	17	56			
Q8	6.84	61			
Q9	3.9	32			
QA	9.65	11			
Q10	3.04	19			
Q11	2.21	21			
Q12	1.64	21			

USGS Colorado StreamStats

StreamStats Print Page



12/21/2010 3:52:51 PM

StreamStats Data-Collection Station Report

USGS Station Number	09089000
Station Name	WEST DIVIDE CREEK BL WILLOW CREEK, NR RAVEN, CO.

Click here to link to available data on NWIS-Web for this site.

Descriptive Information

Station Type	Gaging Station, continuous record
Regulated?	Undefined
Period of Record	
Remarks	
Latitude (degrees NAD83)	39.27554
Longitude (degrees NAD83)	-107.5201
Hydrologic unit code	14010005
Local Basin	-
County	-
MCD	-
Directions to station	

Physical Characteristics

Characteristic Name	Value	Units	Citation Number
Drainage_Area	34.900	square miles	31
Elevation_of_10_and_85_points	8660.00	feet	31
Main_Channel_Length	7.9000	miles	31

Mean_Basin_Elevation	8800.00	feet	31
Percent_Forest	90.000	percent	31
Percent_Lakes_and_Ponds	0.0000	percent	31
Percent_Storage	0.0000	percent	31
Stream_Slope_10_and_85_Method	187.000	feet per mi	31

Streamflow Statistics

Statistic Name	Value	Units	Citation Number
Peak-Flow Statistics			
10_Year_Peak_Flood	669.000	cubic feet per second	31
100_Year_Peak_Flood	1030.00	cubic feet per second	31
2_Year_Peak_Flood	365.000	cubic feet per second	31
200_Year_Peak_Flood	1140.00	cubic feet per second	31
25_Year_Peak_Flood	819.000	cubic feet per second	31
5_Year_Peak_Flood	548.000	cubic feet per second	31
50_Year_Peak_Flood	928.000	cubic feet per second	31
500_Year_Peak_Flood	1270.00	cubic feet per second	31
Log_Mean_of_Annual_Peaks	2.5512	Log base 10	31
Log_Skew_of_Annual_Peaks	0.1106	Log base 10	31
Log_STD_of_Annual_Peaks	0.2202	Log base 10	31
Mean_Annual_Flood	234.000	cubic feet per second	31
Peak_years_with_historic_adjustment	0.0000	years	31
Systematic_peak_years	16.000	years	31
WRC_Mean	2.5512	Log base 10	31
WRC_Skew	-0.3000	Log base 10	31
WRC_STD	0.2202	Log base 10	31
Flow-Duration Statistics			
1_Percent_Duration	295	cubic feet per second	41
10_Percent_Duration	98	cubic feet per second	41
20_Percent_Duration	37.7	cubic feet per second	41
25_Percent_Duration	15	cubic feet per second	41

30_Percent_Duration	7.7	cubic feet per second	41
40_Percent_Duration	3.6	cubic feet per second	41
5_Percent_Duration	160	cubic feet per second	41
50_Percent_Duration	2.4	cubic feet per second	41
60_Percent_Duration	1.6	cubic feet per second	41
70_Percent_Duration	1.2	cubic feet per second	41
75_Percent_Duration	1	cubic feet per second	41
80_Percent_Duration	0.8	cubic feet per second	41
90_Percent_Duration	0.4	cubic feet per second	41
95_Percent_Duration	0.3	cubic feet per second	41
99_Percent_Duration	0	cubic feet per second	41
General Flow Statistics			
Average_daily_streamflow	27.731	cubic feet per second	41
Maximum_daily_flow	585	cubic feet per second	41
Minimum_daily_flow	0	cubic feet per second	41
Std_Dev_of_daily_flows	59.811	cubic feet per second	41
Base Flow Statistics			
Average_BFI_value	0.552	dimensionless	42
Number_of_years_to_compute_BFI	16	years	42
Std_dev_of_annual_BFI_values	0.115	dimensionless	42
Precipitation Statistics			
24_Hour_2_Year_Precipitation	1.6000	inches	31
Mean_Annual_Precipitation	32.000	inches	31
Temperature Statistics			
Mean_Min_January_Temperature	3.0000	degrees F	31

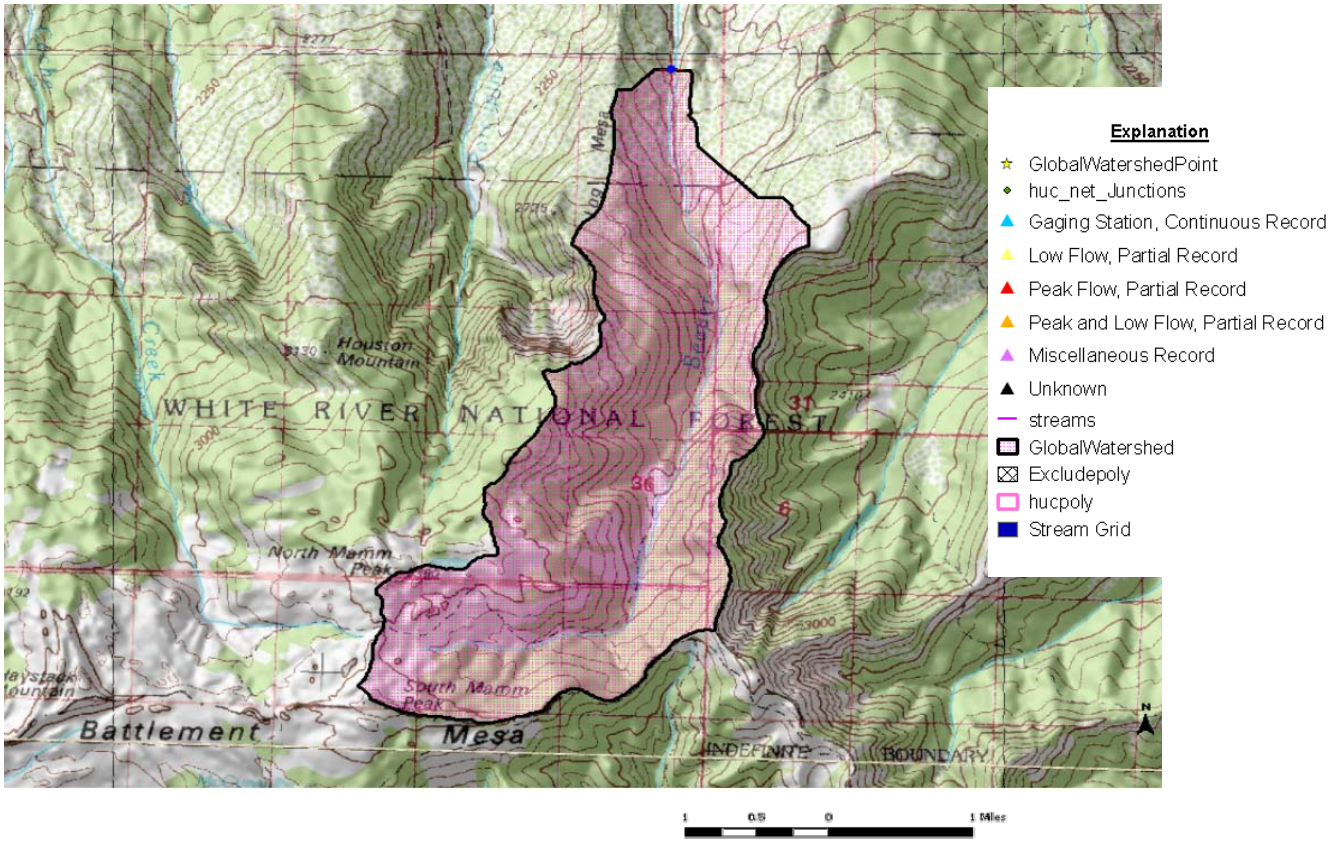
Citations

Citation Number	Citation Name and URL
31	Imported from Basin Characteristics file
41	Wolock, D.M., 2003, Flow characteristics at U.S. Geological Survey streamgages in the conterminous United States: U.S. Geological Survey Open-File Report 03-146, digital data set, available on World Wide Web at URL http://water.usgs.gov/lookup/getspatial?qsitesdd

42 Wolock, D.M., 2003, Base-flow index grid for the conterminous United States: U.S. Geological Survey Open-File Report 03-263, digital data set, available on World Wide Web at URL http://water.usgs.gov/lookup/getspatial?bfi48grd

USGS Colorado StreamStats

StreamStats Print Page



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