COLORADO PARKS & WILDLIFE

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Phone (303) 297-1192
cpw.state.co.us

December 30, 2013

Ms. Linda Bassi
Colorado Water Conservation Board
Stream and Lake Protection Section
1313 Sherman Street, Room 723
Denver, Colorado 80203

Re: Colorado Parks and Wildlife Instream Flow Recommendations for Meadow Creek – Garfield County

Dear Linda,

The purpose of this letter is to formally transmit Colorado Parks and Wildlife's (CPW) Instream Flow Recommendations for Meadow Creek. CPW has collected and reviewed data, including stream cross section information and natural environment data, needed to quantify the instream flow requirements for this reach of Meadow Creek. CPW has conducted a preliminary evaluation of the stream hydrology and has subsequently consulted with CWCB staff where we reviewed their water availability analysis to determine if water is physically available for an instream flow appropriation. Meadow Creek should be considered for inclusion in the Instream Flow Program (ISFP) because CPW is of the opinion that it has a natural environment that can be preserved to a reasonable degree with an instream flow water right.

The State of Colorado's ISFP was created in 1973 when the Colorado General Assembly 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 Colorado Water Conservation Board (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. CPW is recommending this segment of Meadow Creek to the Board for inclusion into the ISFP. As stated in the attached report, CPW is interested in entering into discussions with the CWCB regarding our reservoir at the upper end of this instream flow segment and how it might be operated in the future to ensure that the instream flow needs of Meadow Creek are met.

CPW is forwarding this instream flow recommendation to the Board to meet Colorado's policy "… that the wildlife and their environment are to be protected, preserved,

STATE OF COLORADO
John W. Hickenlooper, Governor • Mike King, Executive Director, Department of Natural Resources
Bob D. Broscheid, Director, Colorado Parks and Wildlife
Parks and Wildlife Commission: Robert W. Bray • Chris Castilian, Secretary • Jeanne Horne
Bill Kane, Chair • Gaspar Perricone • James Pribyl • John Singletary
Mark Smith, Vice-Chair • James Vigil • Dean Wingfield • Michelle Zimmerman
Ex Officio Members: Mike King and John Salazar

enhanced, and managed for the use, benefit, and enjoyment of the people of this state and its visitors … and that, to carry out such a 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.). CPW's Strategic Plan goes on to state that "[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." CPW has long been of the opinion that the ISFP is a critical habitat protection program for the water dependant natural environment.

The information contained in the attached report forms the basis for the instream flow recommendation to be considered by the Board. It is CPW staff's opinion that the information is sufficient for the Board to support the findings required in the ISFP statutes and in Rule 5 (i) of the Instream Flow Rules.

Natural Environment: This stream reach is important to CPW because it supports a naturally reproducing population of brook trout (*Salvelinus fontinalis*) and a population of rainbow trout *(Oncorhynchus mykiss)*.

Initial Flow Recommendations: Initial CPW flow recommendations (prior to any water availability considerations) were 2.1 cfs for the summer months and 1.3 cfs for the winter months.

Final Flow Recommendations after Water Availability Consultations with CWCB Staff: After meeting with staff about the hydrology of Meadow Creek, there wasn't a need for CPW to revise our flow recommendations. The initial recommendations appear to be available at least 50% of the time based on all available hydrologic data.

If you have any questions regarding the attached information or the instream flow recommendations, please contact me at (303)-291-7260.

Sincerely,

Jay W. Skinner

Jay W. Skinner
Colorado Parks and Wildlife
Instream Flow Program Coordinator

cc: Chad Bishop, CPW Assistant Director – Wildlife and Natural Resources Branch
Alex Davis, CPW Water Resources Section Manager
Regional Staff

Stream: Meadow Creek

Executive Summary

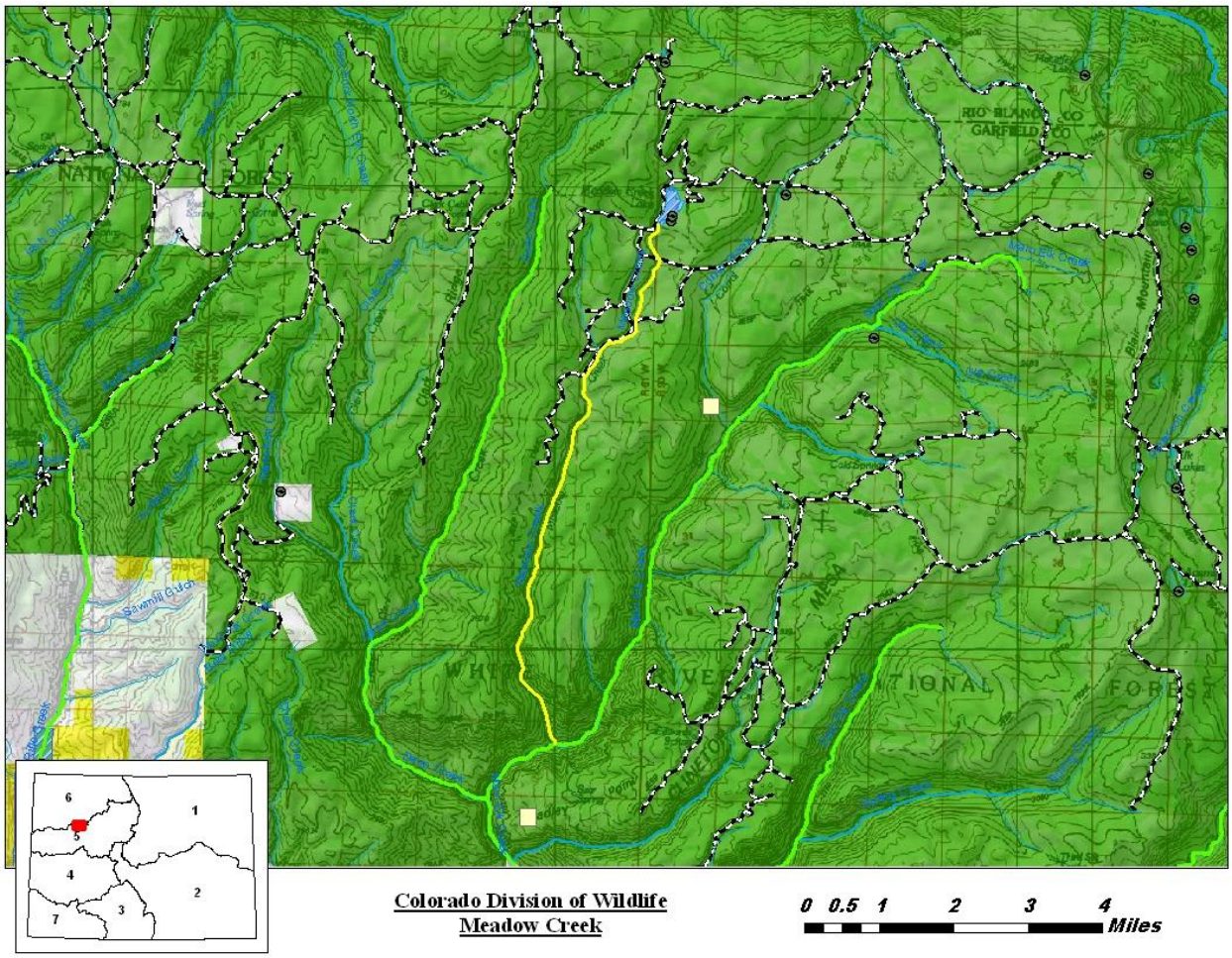
Water Division: 5
Water District: 39
CPW#: 21131

Segment: Outlet Meadow Creek Reservoir to Main Elk Creek

Upper Terminus: Meadow Creek Reservoir
Latitude: 39º 48’ 24.3”N Longitude: 107º 32’ 43.7"W

Lower Terminus: Main Elk Creek
Latitude: 39º 42’ 18.6”N Longitude: 107º 34’ 03.5"W

ISF Appropriation: 2.1 cfs (04/01 – 09/30)
1.3 cfs (10/01 – 03/31)



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 Meadow Creek to the Board for inclusion into the ISFP. Meadow 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 Meadow Creek beginning at the outlet of Meadow Creek Reservoir (a facility built and owned by CPW) and extending downstream to the confluence with Main Elk Creek. The proposed segment is in Garfield County north of the Town of New Castle. The recommendation for this segment is discussed below.

Instream Flow Recommendation(s)

The CDOW is recommending 2.1 cfs, summer, and 1.3 cfs, winter, based on data collection efforts. This recommendation is based on the physical and biological data collected by CPW staff. to date and does not incorporate any water availability constraints.

- 2.1 cubic feet per second is required to maintain the three principal hydraulic criteria of average depth, average velocity and percent wetted perimeter;
- 1.3 cubic feet per second is required to maintain two of the three principal hydraulic criteria.

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
Outlet of Meadow Creek Reservoir	Main Elk Creek	8.0	0%	100%

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

Biological and Field Survey Data

In August of 2010, CPW collected stream cross section information, natural environment data, and other data needed to quantify the instream flow needs for this reach of Meadow Creek. Meadow Creek is classified as a small stream (between 10 to 19 feet wide) and fishery surveys indicate the stream environment of Meadow Creek supports brook trout (*Salvelinus fontinalis*) and rainbow trout (*Oncorhynchus mykiss*) (See CPW Fish Survey in Appendix B).

Field Survey Data

CDOW 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, one data set was 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	8/18/2010	1.6	4.0 – 0.6	2.1	1.3

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

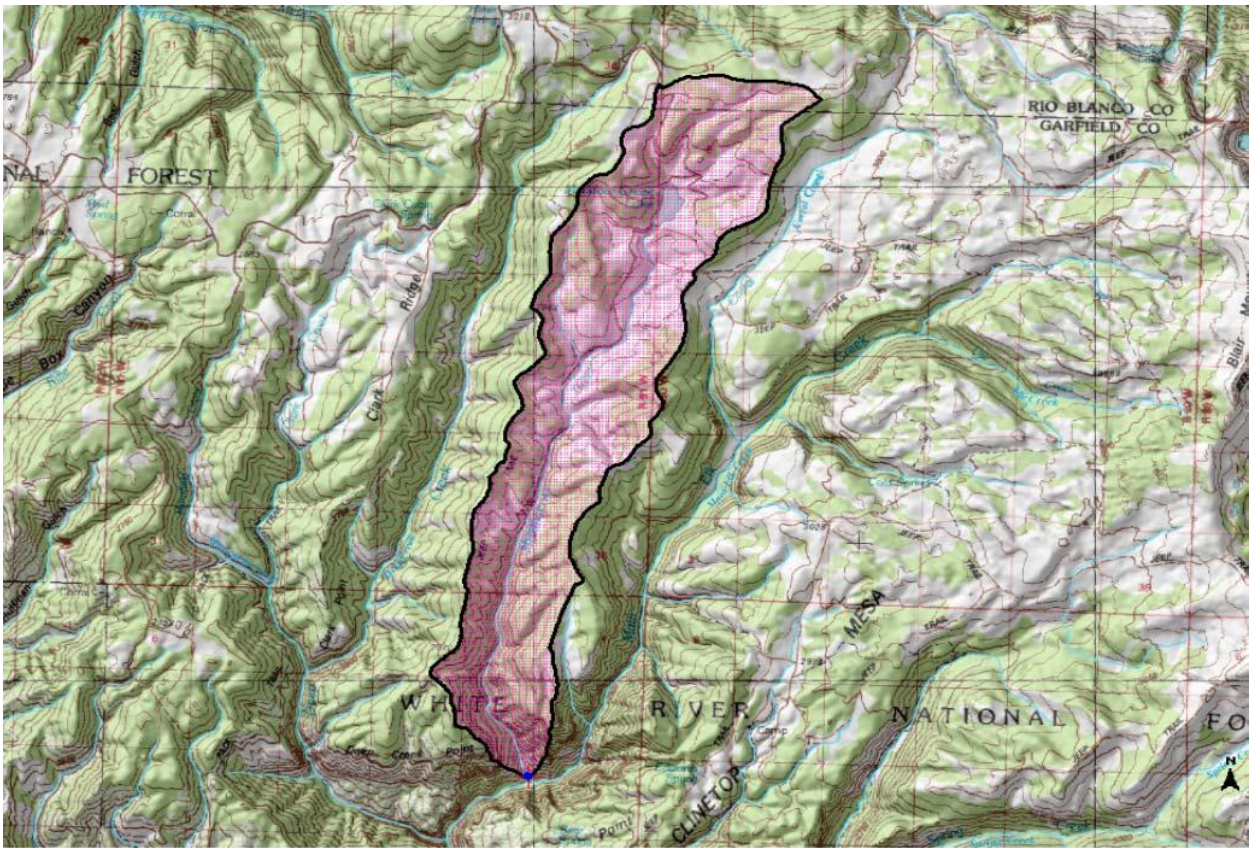
Biologic Flow Recommendation

The summer flow recommendation which met 3 of 3 criteria is 2.1 cfs. 2.1 cfs is within the accuracy range of the R2CROSS model. The winter flow recommendation which met 2 of 3 criteria is 1.3 cfs. 1.3 cfs is within the accuracy range of the R2CROSS model (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 Main Elk Creek, near New Castle, CO (#09086470), which has a drainage area of 91.4 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 Meadow Creek is 12.4 square miles. The period of record for the Main Elk Creek gage was 1990 to 1997, the period of record used by staff in their analysis was 1990 to 1997, or 7

years of record. Table 2 below displays the estimated flow of Meadow Creek at the lower terminus of the instream flow reach in terms of a percentage of exceedence.



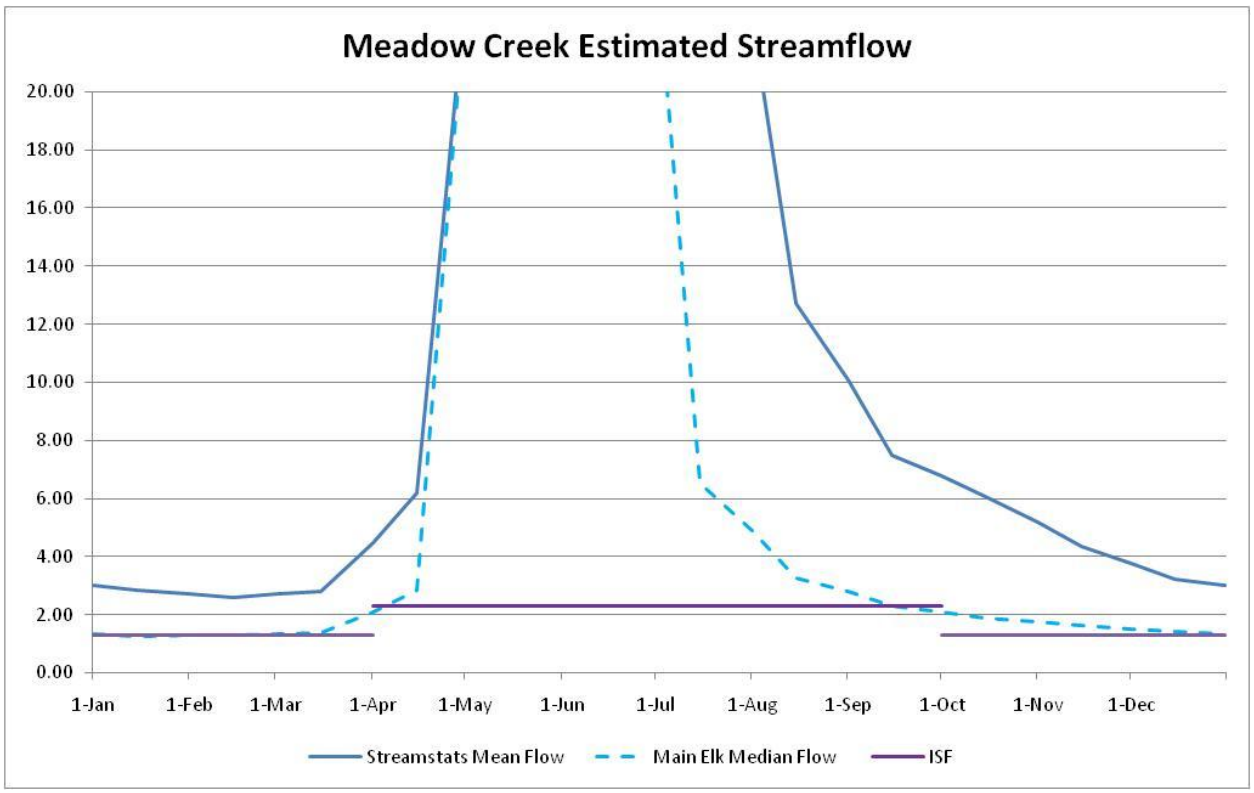

Meadow Creek Estimated Streamflow
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
Streamstats Mean Flow
Main Elk Median Flow
ISF

Table 2: Estimated Streamflow for Meadow Creek

Meadow Creek from Main Elk Creek Gage												
Exceedences	January	February	March	April	May	June	July	August	September	October	November	December
1%	1.9	1.8	3.0	22.3	145.2	153.0	48.6	8.9	12.0	2.8	2.6	1.9
5%	1.6	1.6	2.6	11.3	132.8	141.1	43.7	7.1	6.2	2.7	2.2	1.9
10%	1.5	1.5	1.8	8.5	114.2	111.5	22.8	5.4	3.4	2.6	2.0	1.8
20%	1.5	1.5	1.6	6.2	74.8	83.2	13.5	4.7	3.0	2.3	1.9	1.6
50%	1.3	1.3	1.4	2.8	44.8	42.7	6.5	3.3	2.3	1.9	1.6	1.4
80%	1.1	1.1	1.1	1.9	15.9	13.3	4.2	2.3	2.0	1.5	1.4	1.2
90%	1.0	0.9	0.9	1.6	9.3	9.0	3.4	2.2	2.0	1.5	1.3	1.1
95%	0.9	0.9	0.9	1.4	3.9	7.6	2.7	2.2	1.9	1.4	1.2	1.1
99%	0.8	0.9	0.9	1.2	2.5	6.1	2.3	2.0	1.9	1.3	1.2	1.1
Meadow Creek Streamstats Mean Flow												
	January	February	March	April	May	June	July	August	September	October	November	December
	2.8	2.6	2.8	6.2	41.5	82.9	32.3	12.7	7.5	6.1	4.4	3.2
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 2.1 cfs is available at least 50% of the time for the months of April through September. The winter flow recommendation of 1.3 cfs is available at least 50% of the time from October through March. After incorporating the above water availability constraints, the seasonal limits of the original instream flow recommendations were refined in the following manner:

- 2.10 cubic feet per second is recommended from April 1 through September 30;
- 1.30 cubic feet per second is recommended from October 1 through March 31.

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 any potential water availability problems due to existing diversions. Preliminarily, records indicate that there are no surface water diversions located within this reach of Meadow Creek. As stated above, CPW constructed and owns the water rights for Meadow Creek Reservoir. The 984 acre-foot Meadow Creek Reservoir has an appropriation date of September 13, 1954 and is decreed for piscatorial and recreational uses. In the future, CPW will work with the Board to operate Meadow Creek Reservoir in such a manner that the instream flow recommendations contained herein during times of shortage.

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Meadow Creek | CROSS-SECTION NO.:

CROSS-SECTION LOCATION: d/s of Meadow Lake

39 47 04.7 107 35 15.2

DATE: 7/20/11 | OBSERVERS: Uppendahl + Chestnut

LEGAL DESCRIPTION | ¼ SECTION: | SECTION: 13 | TOWNSHIP: 3 N/S | RANGE: 91 E/W | PM: 6

COUNTY: GARFIELD | WATERSHED: ELK CREEK | WATER DIVISION: 5 | DOW WATER CODE: 21131

MAP(S): USGS: | USFS:

SUPPLEMENTAL DATA

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

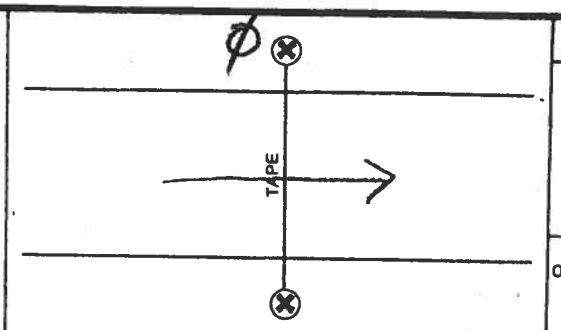
METER NUMBER: | DATE RATED: | CALIB/SPIN: ____ sec | TAPE WEIGHT: ____ lbs/foot | TAPE TENSION: ____ lbs

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	22.0	5.60
③ WS Downstream	19.5	6.06
SLOPE	.46/41.5	

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:

COMMENTS

FLOW Above Normal grass line

FORM #ISF ED 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Meadow Creek	CROSS-SECTION NO.:	DATE: 7/20/11	SHEET ___ OF ___

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

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)
S	0										
GL	1.55		5.84								
SWL	2.60		6.07	0				0			
	3.50		6.16	.10				.04			
	4.50		6.46	.40				.30			
	5.50		6.68	.60				.53			
	6.50		6.96	.80				.96			
	7.50		6.56	.40				1.71			
	8.50		6.91	.70				1.48			
	9.00		6.77	.60				1.40			
	9.50		6.87	.85				.68			
	10.00		6.89	.85				1.51			
	11.00		6.48	.50	S			2.14			
	11.5		6.96	.90				1.49			
	12.0		7.00	1.00				1.60			
	12.5		7.03	1.01				1.73			
	13.0		6.86	.90				1.85			
	13.5		6.76	.80				1.16			
	14.0		6.85	.80				.66			
(GL)	15.0		6.65	.70				.10			
	16.0		6.42	.50				0			
	17.0		6.39	.45				0			
	18.0		6.34	.40				0			
	19.0		6.38	.45				0			
WL	240		6.05	0				0			
GL	243		5.64								
	1	60	11	128		45-64		IIII	30		
	2	60	12	240		64-90		III	15		
	3	60	13	240		90-128		IIII	30		
	4	90	14	90		128-180		III	15		
	5	90	15	180		180-256		II	10		
	6	180	16	128							
	7	128	17	128							
	8	128	18	60							
	9	128	19	60							
	10	180	20	60							
TOTALS:											

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

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: MEADOW CREEK						CROSS-SECTION NO.: #2
CROSS-SECTION LOCATION: d/s of Meadow Lake						
39° 47' 04.7" 107° 33' 13.2"						
DATE: 8/18/10	OBSERVERS: UPPENDAHL					
LEGAL DESCRIPTION	¼ SECTION:	SECTION: 13	TOWNSHIP: 3 N/S	RANGE: 91 E/W	PM: 6	
COUNTY: GARFIELD	WATERSHED: ELK CREEK	WATER DIVISION: 5	DOW WATER CODE: 21131			
MAP(S):	USGS:					
	USFS:					

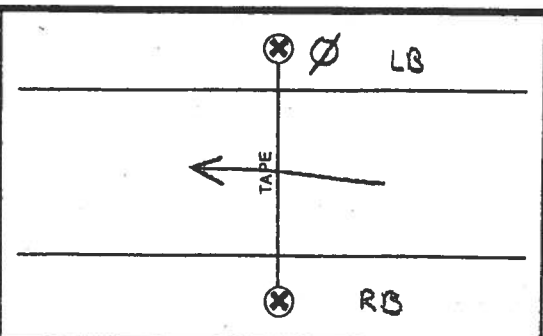
SUPPLEMENTAL DATA

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: 3	

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	9.0	6.83
③ WS Downstream	4.0	7.28
SLOPE	.45/13 = 0.035	

SKETCH



LEGEND:
Stake ⊗
Station ①
Photo ◇
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:	CROSS-SECTION NO.:	DATE:	SHEET ___ OF ___
MEADOW CREEK		8/18/10	

BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE)	LEFT / RIGHT	Gage Reading: ____ ft	TIME: 17:00

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)
P,W	0		6.27								
	1.0		6.51								
GL	2.0		6.66								
	2.5		7.05								
	3.0		7.12								
SWL	3.5		7.23	0	0						
	4.0		7.35	.15	.40						
	4.5		7.35	.15	.40						
	5.0		7.20	0	0						
	5.5		7.50	.30	1.01						
	6.0		7.50	.30	.33						
	6.5		7.15	0	0						
	7.0		7.70	.50	.77						
	7.5		7.60	.40	2.04						
	8.0		7.55	.35	1.58						
	8.5		7.35	.15	.74						
	9.0		7.40	.20	1.67						
	9.5		7.50	.30	.10						
	10.0		7.55	.35	.27						
	10.5		7.30	.10	.86						
	11.0		7.45	.25	1.12						
SWL	11.5		7.17	0	0						
	12.0		7.13								
	13.0		7.02								
	14.0		6.75								
GL	15.0		6.55								
PIN	16.0		6.42								
TOTALS:										1.75	1.61

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

COLORADO STREAM SURVEY E + C (1976 REVISION)

Surveyed by: Bennett

(X) if stream has no fishery value ___

	Record Data
Code No.	21131
Date	7-27-79
Section No.	1
Stream Name:	Meadow Creek
Primary Drainage:	Main Elk Creek
Major Drainage	Colorado 32C
Lower terminus FISHERY	
Location:	confluence with main Elk Creek
T.	4 S
R.	91 W
S.	14
Width	14
Elevation	8,640
Flow (c.f.s.)	8
pH	
phth	
MO	
EDTA	
Conductivity	
X if stream profile obtained	
Upper terminus	
Location:	Headwaters (Meadbw Lake)
T.	3 S
R.	91 W
S.	12
Width	6
Elevation	9,600
Flow	3
pH	
phth	
MO	
EDTA	
Conductivity	
X if stream profile obtained	
Section Summary	
Meander factor	1.1
Length in Miles	8
Width in feet	10
Acreage	10
Observed Flow	normal
X if inundated by reservoir	
Mileage unsectioned	all
Counties where section located	
County	Garfield
Miles	8
County	
Miles	
County	
Miles	

	Record Data
Region	NW
Beaver Dams	
Number (count or estimate)	10
Estimated acreage	.2
Physical stream damage (% of section affected)	
Bank degredation	10
Channelization	
Dredging	
Mine tailing encroachment	
Road encroachment	
Accessibility (miles)	
Surfaced	
Non-Surfaced car	1
4-Wheel	
Established trail	
No established trail	7
Boat only	
No access	
Land Status and mileage	
USFS	8
BIM	
Municipal	
Div. of Wild.	
Private, no public access	
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	
Aquatic Vegetation	
Filamentous algae (x one)	
Absent	
Rare	x
Common	
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'	x
Minor 4-9'	
Very small stream < 4'	
Gradient (computer entry)	
Percent per mile	2.3

	Record Data
Fishery Value (X one)	////////////
None	
Poor	
Below average	
Average	
Above Average	x
Excellent	
Fishery Value - limiting	////////////
factors	////////////
Canyon Walls (lower section)	A-12
FISH SAMPLING	////////////
Lower or only station	////////////
Elevation	
Describe or map station location below	can't get to confluence

	Record Data
Upper Station	////////////
Elevation	
Describe or map station location below	1 mile below Meadow Lake

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	

Sampling method	Electro 50
Length - feet	300
Sampling adequate	X
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	

Combined stations	////////////
Estimated % fish biomass	////////////
Rough Fish	
Game Fish	100
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																
Brook																
Native																
Whitefish																
Total																
						UPPER STATION										
Rainbow																
Brown																
Brook		3		20		2	3	4	1	1						34
Native								1		1						2
Whitefish																
Total		3		20		2	3	5	1	2						36
						COMBINED STATIONS										
Rainbow																
Brown																
Brook																
Native																
Whitefish																
Total																

Area cowboy said the creek dryed 4 miles below lake in 77, but said he saw 10"-12" brook in lower canyon at spawning time.

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 platyrnynchus
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 pandrae
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 heteroleois
BMS _ Bigmouth Shiner Notropis dorsalis
SPS _ Spottail Shiner Notropis hudsonius
GDS _ Golden Shiner Notemigonus crysoleucas
T _ Tench Tinca tinca

ANTHERINIDAE

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 Pomixis 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 _ Kokaneee (Sockeye) Salmon Oncorhynchus nerka kennerlyi
WF _ Mountain Whitefish Prosopium williamsoni
LW _ Lake Whitefish Coregonus clupeaformis
BLC _ Bear Lake (Bonneville) Cisco Prosopium gemmifer
GO _ Golden Trout Salmo aguabonita
RGN _ Rio Grande Cutthroat Salmo clarki virginalis
CRN X 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 _ Brown Trout Salmo trutta
B X Brook (Trout) Char Salvelinus fontinalis
M _ Lake (Trout) Char Salvelinus namaycush
SPL _ Splake Salvelinus fontinalis x Salvelinus namayc
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 21131

'72-'73 Inventory S - _____

Stream Name Meadow Creek

Percent Open to Public 100%,
('72 Inventory)

1041 Form

Quality of Water 7,
Pool-riffle Ratio 5,
Temperature of Water 5,
Clarity of Water 6,
Fish Food Supply 5,
Condition of Fish 5,
Legal Access 10,
Physical Access* —,
Aesthetic Value 7,
Meanders Value 6,
Improvement Potential 7,

'72 Inventory

Stocking Status occas., (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 21131

STOCKING

STOCK 79-83 1 YRS

STOCKYRS Y N N N N

SPECIES-SIZE STOCKED:

B.2 ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

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

FISH SAMPLING

SAMPLE DATE: 07 / 27 / 79

METHODS: ELEC / CCEN ___ ___

	SPECIES	#TAKEN	AVG. LENGTH (cm)	RANGE (cm)	AVG. WT (g)	RANGE (g)	%TOTAL CATCH	R B N
1.	B..	34	12.7	5-25			94	
2.	CRN	2	22.9	20-25			6	
3.	R..	23	23.5					
4.								
5.								
6.								
7.								
8.								
9.								
10.								
11.								
12.								
13.								
14.								
15.								

CCEN

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

LOCATION INFORMATION

STREAM NAME:	Meadow Creek #1 081810
XS LOCATION:	below Meadow Lake 39 47 59.9 107 32 41.3
XS NUMBER:	#1 081810
DATE:	18-Aug-10
OBSERVERS:	Uppendahl
1/4 SEC:	0
SECTION:	13
TWP:	3 S
RANGE:	91 W
PM:	6
COUNTY:	GARFIELD
WATERSHED:	ELK CREEK
DIVISION:	5
DOW CODE:	21131
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:	0.00666667

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

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

STREAM NAME: Meadow Creek #1 081810
XS LOCATION: below Meadow Lake 39 47 59.9 107 32 41.3
XS NUMBER: #1 081810

DATA POINTS= 30

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	8.06			0.00		0.00	0.00	0.0%
1	GL	0.70	9.01			0.00		0.00	0.00	0.0%
		1.00	9.10			0.00		0.00	0.00	0.0%
	SWL	1.05	9.52	0.00	0.00	0.00		0.00	0.00	0.0%
		1.50	9.72	0.20	0.79	0.49	0.20	0.10	0.08	6.9%
		2.00	9.72	0.20	0.53	0.50	0.20	0.10	0.05	4.9%
		2.50	9.72	0.20	0.63	0.50	0.20	0.10	0.06	5.8%
		3.00	9.72	0.20	0.52	0.50	0.20	0.10	0.05	4.8%
		3.50	9.72	0.20	0.52	0.50	0.20	0.10	0.05	4.8%
		4.00	9.72	0.20	0.50	0.50	0.20	0.10	0.05	4.6%
		4.50	9.77	0.25	0.52	0.50	0.25	0.13	0.07	6.0%
		5.00	9.82	0.30	0.66	0.50	0.30	0.15	0.10	9.1%
		5.50	9.72	0.20	0.09	0.51	0.20	0.10	0.01	0.8%
		6.00	9.97	0.45	0.57	0.56	0.45	0.23	0.13	11.8%
	ROCK	6.50	9.31	0.00	0.00	0.83		0.00	0.00	0.0%
	ROCK	7.00	9.21	0.00	0.00	0.00		0.00	0.00	0.0%
		7.50	9.82	0.30	0.54	0.79	0.30	0.15	0.08	7.4%
		8.00	10.07	0.55	0.69	0.56	0.55	0.28	0.19	17.5%
		8.50	10.02	0.50	0.52	0.50	0.50	0.25	0.13	12.0%
		9.00	9.82	0.30	0.00	0.54	0.30	0.15	0.00	0.0%
		9.50	9.77	0.25	0.15	0.50	0.25	0.13	0.02	1.7%
		10.00	9.97	0.45	0.00	0.54	0.45	0.23	0.00	0.0%
	ROCK	10.50	9.38	0.00	0.00	0.77		0.00	0.00	0.0%
		11.00	9.72	0.20	0.19	0.60	0.20	0.10	0.02	1.7%
		11.50	9.62	0.10	0.05	0.51	0.10	0.05	0.00	0.2%
	SWL	12.00	9.52	0.00	0.00	0.51		0.00	0.00	0.0%
		14.00	9.28			0.00		0.00	0.00	0.0%
		15.00	9.05			0.00		0.00	0.00	0.0%
1	GL	15.50	8.95			0.00		0.00	0.00	0.0%
	BASE PIN	16.00	8.50			0.00		0.00	0.00	0.0%
	TOTALS ----------					11.72	0.55 (Max.)	2.52	1.09	100.0%

Manning's n = 0.1009
Hydraulic Radius= 0.21498127

STREAM NAME: Meadow Creek #1 081810
XS LOCATION: below Meadow Lake 39 47 59.9 107 32 41.3
XS NUMBER: #1 081810

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	2.52	2.40	-4.8%
9.27	2.52	5.20	106.4%
9.29	2.52	4.95	96.5%
9.31	2.52	4.70	86.7%
9.33	2.52	4.46	77.1%
9.35	2.52	4.23	67.7%
9.37	2.52	3.99	58.5%
9.39	2.52	3.77	49.4%
9.41	2.52	3.54	40.6%
9.43	2.52	3.32	31.9%
9.45	2.52	3.11	23.4%
9.47	2.52	2.90	15.1%
9.48	2.52	2.80	11.0%
9.49	2.52	2.70	7.0%
9.50	2.52	2.60	3.0%
9.51	2.52	2.50	-0.9%
9.52	2.52	2.40	-4.8%
9.53	2.52	2.30	-8.6%
9.54	2.52	2.21	-12.4%
9.55	2.52	2.11	-16.2%
9.56	2.52	2.02	-19.9%
9.57	2.52	1.93	-23.5%
9.59	2.52	1.75	-30.7%
9.61	2.52	1.57	-37.7%
9.63	2.52	1.40	-44.5%
9.65	2.52	1.23	-51.2%
9.67	2.52	1.07	-57.6%
9.69	2.52	0.91	-63.9%
9.71	2.52	0.75	-70.1%
9.73	2.52	0.63	-75.0%
9.75	2.52	0.54	-78.6%
9.77	2.52	0.45	-82.0%

WATERLINE AT ZERO
AREA ERROR = 9.508

STREAM NAME: Meadow Creek #1 081810
XS LOCATION: below Meadow Lake 39 47 59.9 107 32 41.3
XS NUMBER: #1 081810 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	9.01	14.50	0.60	1.06	8.74	16.21	100.0%	0.54	6.96	0.80
	9.06	14.11	0.57	1.01	8.06	15.81	97.5%	0.51	6.19	0.77
	9.11	13.75	0.54	0.96	7.36	15.43	95.2%	0.48	5.41	0.73
	9.16	13.53	0.49	0.91	6.68	15.16	93.5%	0.44	4.65	0.70
	9.21	13.30	0.45	0.86	6.01	14.88	91.8%	0.40	3.95	0.66
	9.26	12.80	0.42	0.81	5.36	14.31	88.2%	0.37	3.35	0.62
	9.31	12.18	0.39	0.76	4.73	13.60	83.9%	0.35	2.82	0.59
	9.36	11.67	0.35	0.71	4.14	13.00	80.2%	0.32	2.32	0.56
	9.41	11.10	0.32	0.66	3.57	12.31	76.0%	0.29	1.88	0.53
	9.46	10.48	0.29	0.61	3.03	11.56	71.3%	0.26	1.49	0.49
WL	9.51	9.87	0.26	0.56	2.52	10.81	66.7%	0.23	1.15	0.46
	9.56	9.29	0.22	0.51	2.04	10.13	62.5%	0.20	0.84	0.41
	9.61	8.74	0.18	0.46	1.59	9.47	58.4%	0.17	0.58	0.37
	9.66	8.18	0.14	0.41	1.17	8.81	54.3%	0.13	0.36	0.31
	9.71	7.62	0.10	0.36	0.77	8.15	50.3%	0.09	0.19	0.25
	9.76	4.25	0.12	0.31	0.51	4.69	28.9%	0.11	0.14	0.27
	9.81	2.81	0.12	0.26	0.33	3.14	19.4%	0.10	0.09	0.27
	9.86	2.02	0.10	0.21	0.21	2.26	13.9%	0.09	0.05	0.25
	9.91	1.49	0.08	0.16	0.12	1.64	10.1%	0.08	0.03	0.21
	9.96	0.96	0.06	0.11	0.06	1.01	6.3%	0.06	0.01	0.19
	10.01	0.66	0.03	0.06	0.02	0.68	4.2%	0.03	0.00	0.13
	10.06	0.15	0.01	0.01	0.00	0.15	0.9%	0.01	0.00	0.04

STREAM NAME: Meadow Creek #1 081810
XS LOCATION: below Meadow Lake 39 47 59.9 107 32 41.3
XS NUMBER: #1 081810

SUMMARY SHEET

MEASURED FLOW (Qm)=	1.09	cfs
CALCULATED FLOW (Qc)=	1.15	cfs
(Qm-Qc)/Qm * 100 =	-5.5	%
MEASURED WATERLINE (WLm)=	9.52	ft
CALCULATED WATERLINE (WLc)=	9.51	ft
(WLm-WLc)/WLm * 100 =	0.1	%
MAX MEASURED DEPTH (Dm)=	0.55	ft
MAX CALCULATED DEPTH (Dc)=	0.56	ft
(Dm-Dc)/Dm * 100	-2.2	%
MEAN VELOCITY=	0.46	ft/sec
MANNING'S N=	0.101	
SLOPE=	0.00666667	ft/ft
.4 * Qm =	0.4	cfs
2.5 * Qm=	2.7	cfs

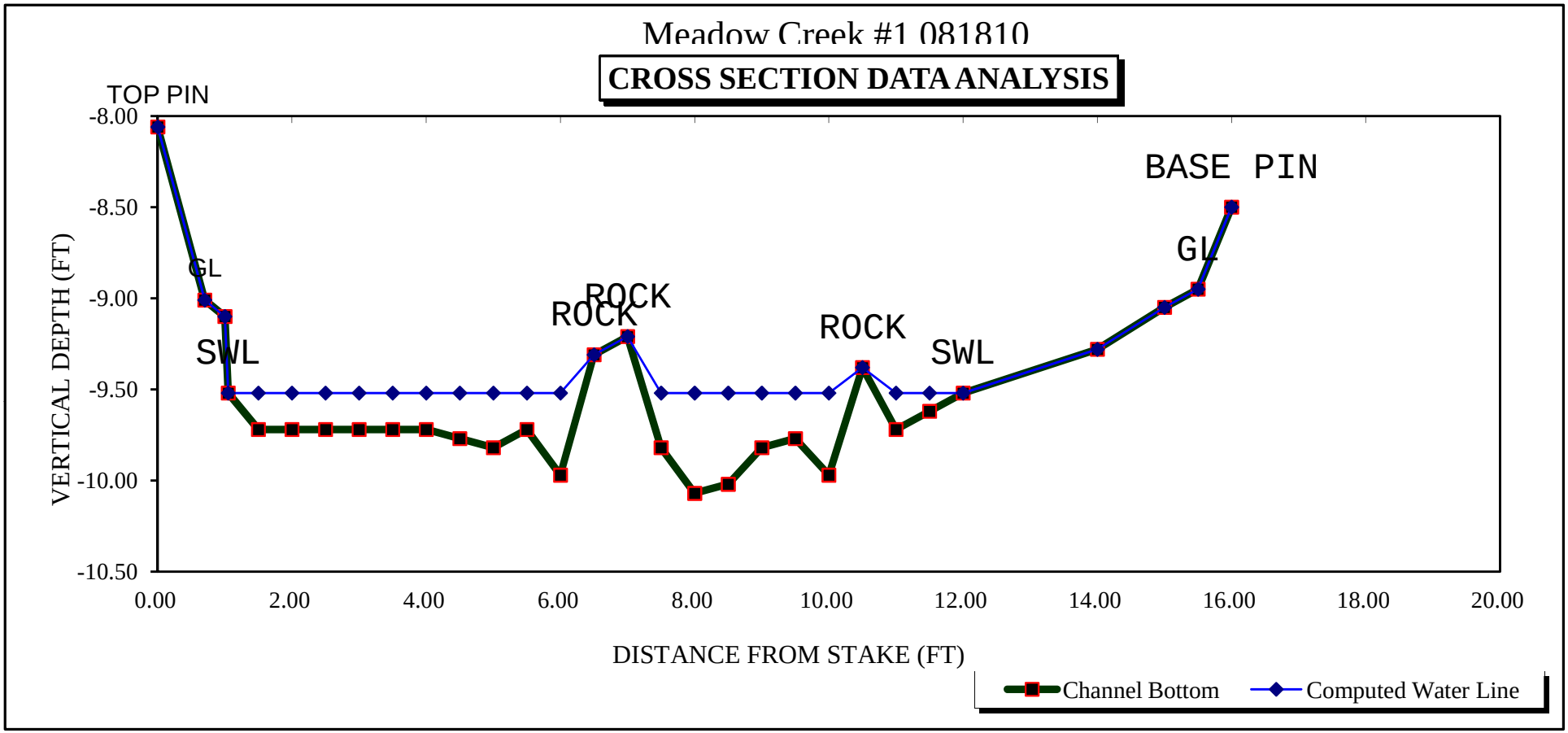
RECOMMENDED INSTREAM FLOW:
=============================

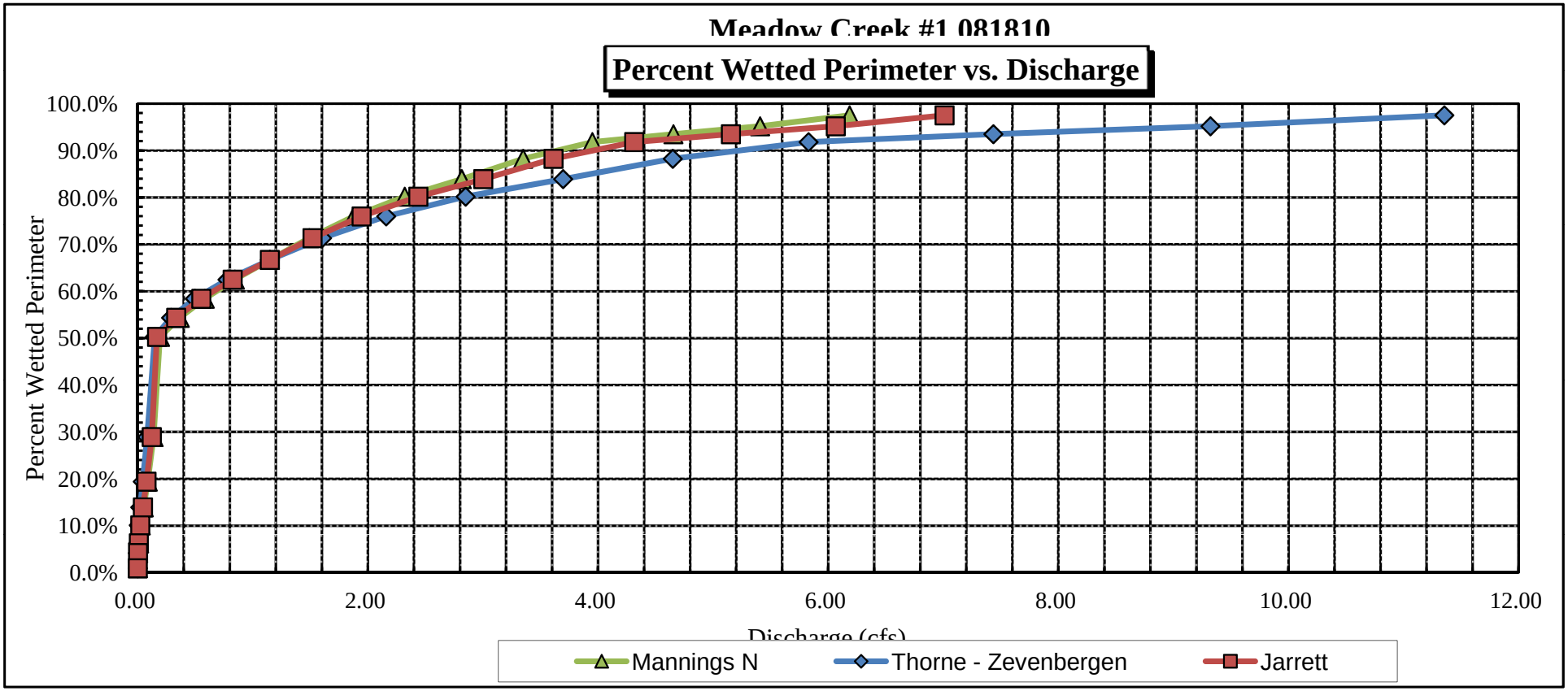
FLOW (CFS)	PERIOD
===========	========
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________

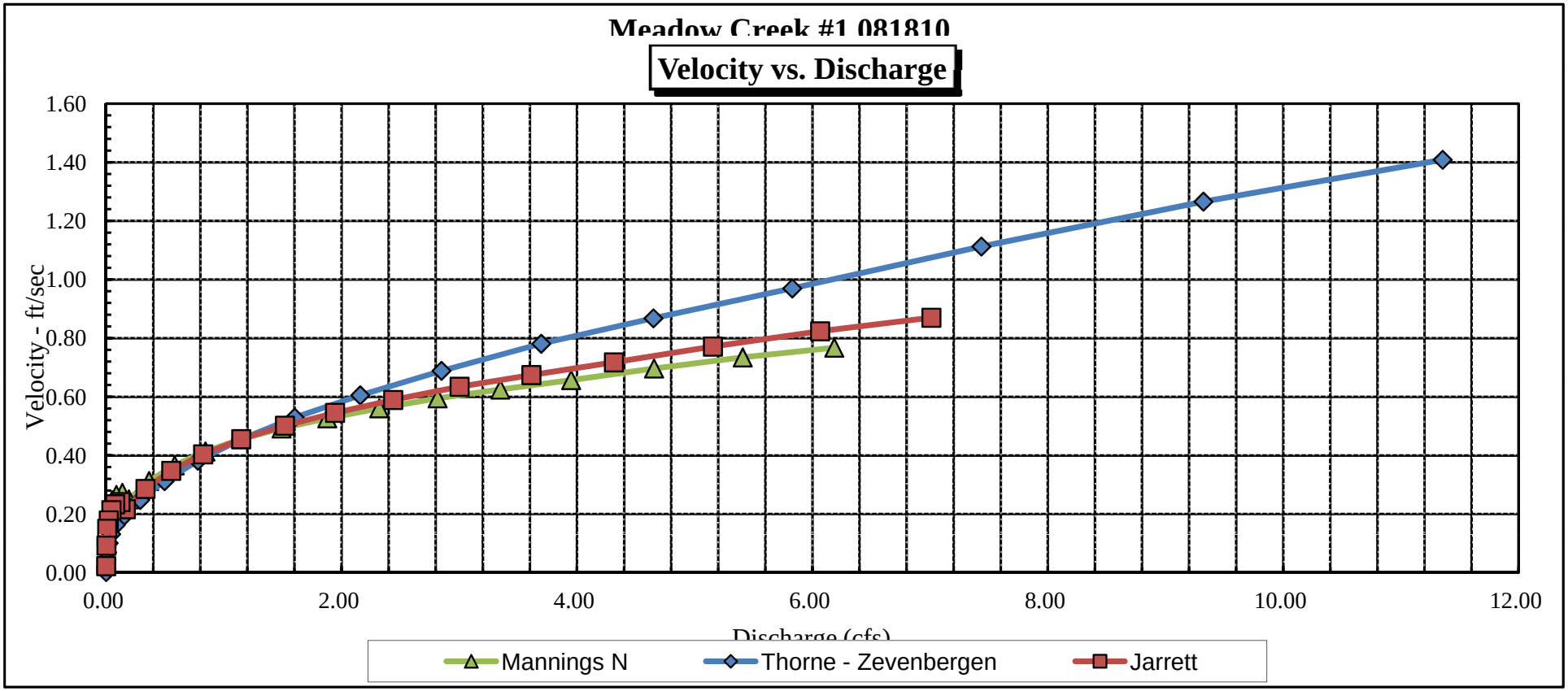
RATIONALE FOR RECOMMENDATION:
=============================

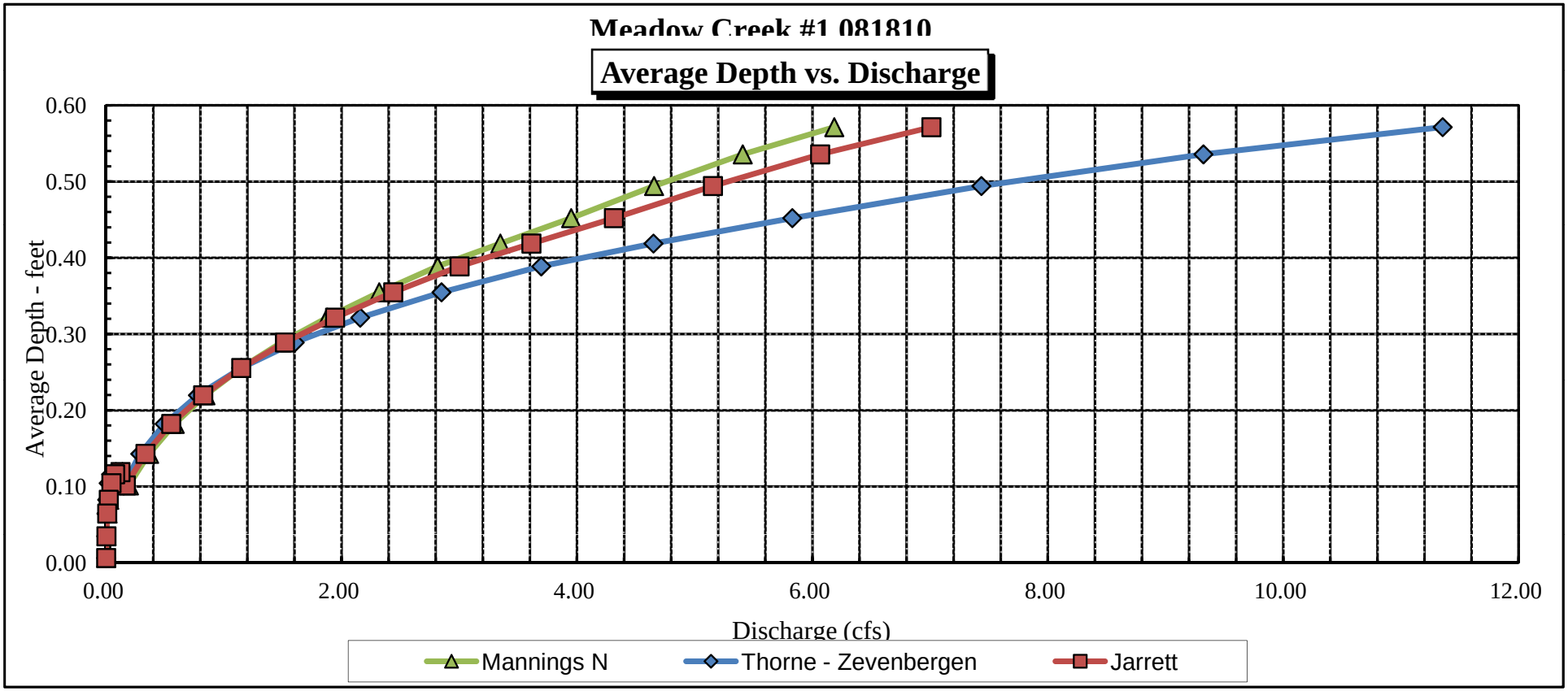
RECOMMENDATION BY: ………………...………..……............................... AGENCY..……………………......…......…...…....... DATE:......…..…......……………

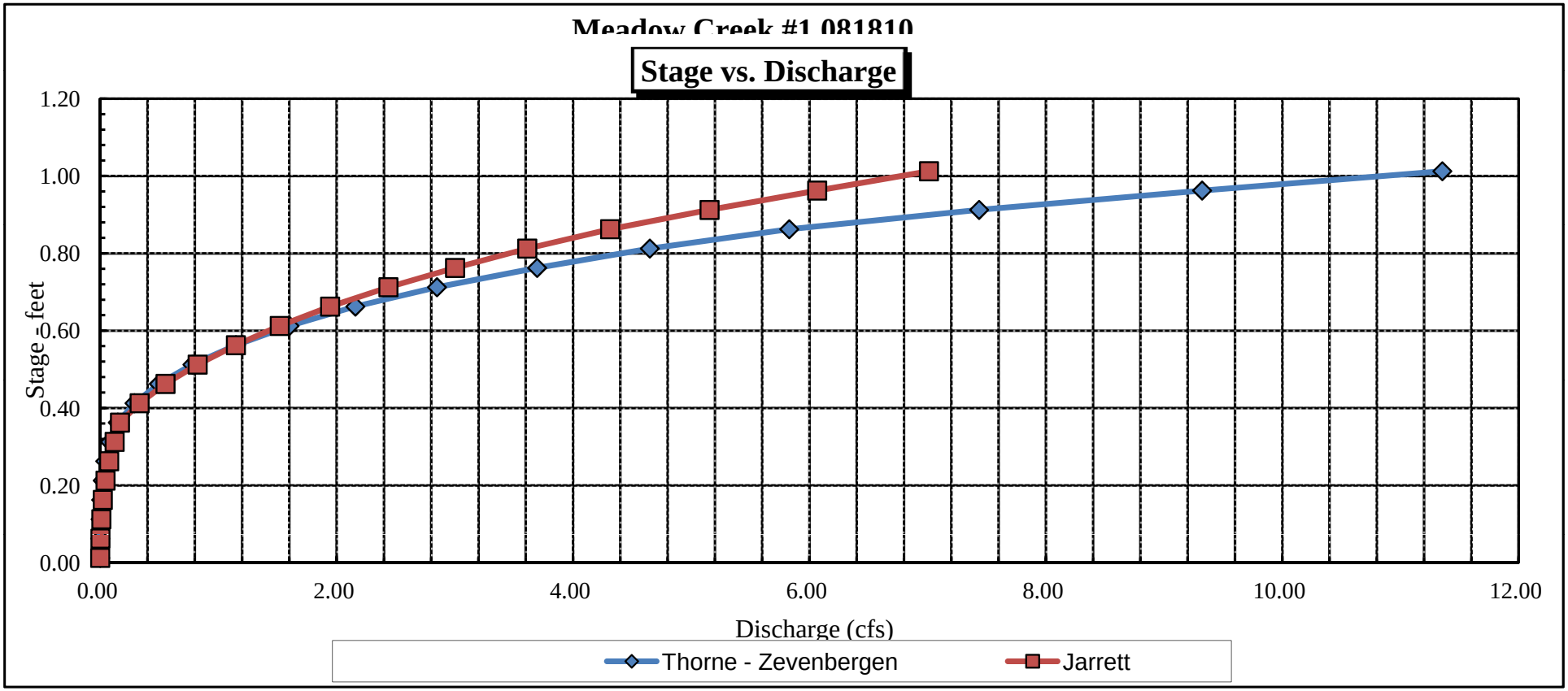
CWCB REVIEW BY: ..……………………….....………………………………………………..…............ DATE:.................…………….…


Meadow Creek #1 081810
CROSS SECTION DATA ANALYSIS
TOP PIN
BASE PIN
GL
SWL
ROCK
ROCK
ROCK
SWL
GL
VERTICAL DEPTH (FT)
-8.00
-8.50
-9.00
-9.50
-10.00
-10.50
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Meadow Creek #1 081810
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
2.00
4.00
6.00
8.00
10.00
12.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Meadow Creek #1 081810
Velocity vs. Discharge
Velocity - ft/sec
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Meadow Creek #1 081810
Average Depth vs. Discharge
Average Depth - feet
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Meadow Creek #1 081810
Stage vs. Discharge
1.20
1.00
0.80
0.60
0.40
0.20
0.00
Stage - feet
0.00
2.00
4.00
6.00
8.00
10.00
12.00
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:	Meadow Creek #2 081810
XS LOCATION:	below Meadow Lake 39 47 04.7 107 33 13.2
XS NUMBER:	#2 081810
DATE:	18-Aug-10
OBSERVERS:	Uppendahl
1/4 SEC:	0
SECTION:	13
TWP:	3 S
RANGE:	91 W
PM:	6
COUNTY:	GARFIELD
WATERSHED:	ELK CREEK
DIVISION:	5
DOW CODE:	21131
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:	0.03461538

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

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

STREAM NAME: Meadow Creek #2 081810
XS LOCATION: below Meadow Lake 39 47 04.7 107 33 13.2
XS NUMBER: #2 081810

DATA POINTS= 27

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
	PIN	0.00	6.27			0.00		0.00	0.00	0.0%
		1.00	6.51			0.00		0.00	0.00	0.0%
1	GL	2.00	6.66			0.00		0.00	0.00	0.0%
		2.50	7.05			0.00		0.00	0.00	0.0%
		3.00	7.12			0.00		0.00	0.00	0.0%
	SWL	3.50	7.23	0.00	0.00	0.00		0.00	0.00	0.0%
		4.00	7.35	0.15	0.40	0.51	0.15	0.08	0.03	1.9%
		4.50	7.35	0.15	0.40	0.50	0.15	0.08	0.03	1.9%
	ROCK	5.00	7.20	0.00	0.00	0.52		0.00	0.00	0.0%
		5.50	7.50	0.30	1.01	0.58	0.30	0.15	0.15	9.4%
		6.00	7.50	0.30	0.33	0.50	0.30	0.15	0.05	3.1%
	ROCK	6.50	7.15	0.00	0.00	0.61		0.00	0.00	0.0%
		7.00	7.70	0.50	0.77	0.74	0.50	0.25	0.19	12.0%
		7.50	7.60	0.40	2.04	0.51	0.40	0.20	0.41	25.4%
		8.00	7.55	0.35	1.58	0.50	0.35	0.18	0.28	17.2%
		8.50	7.35	0.15	0.74	0.54	0.15	0.08	0.06	3.5%
		9.00	7.40	0.20	1.67	0.50	0.20	0.10	0.17	10.4%
		9.50	7.50	0.30	0.10	0.51	0.30	0.15	0.02	0.9%
		10.00	7.55	0.35	0.27	0.50	0.35	0.18	0.05	2.9%
		10.50	7.30	0.10	0.86	0.56	0.10	0.05	0.04	2.7%
		11.00	7.45	0.25	1.12	0.52	0.25	0.13	0.14	8.7%
	SWL	11.50	7.17	0.00	0.00	0.57		0.00	0.00	0.0%
		12.00	7.13			0.00		0.00	0.00	0.0%
		13.00	7.02			0.00		0.00	0.00	0.0%
		14.00	6.75			0.00		0.00	0.00	0.0%
1	GL	15.00	6.55			0.00		0.00	0.00	0.0%
	PIN	16.00	6.42			0.00		0.00	0.00	0.0%
	TOTALS ----------					8.69	0.5 (Max.)	1.75	1.61	100.0%

Manning's n = 0.1035
Hydraulic Radius= 0.20131519

STREAM NAME: Meadow Creek #2 081810
XS LOCATION: below Meadow Lake 39 47 04.7 107 33 13.2
XS NUMBER: #2 081810

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	1.75	1.61	-7.8%
6.97	1.75	3.98	127.6%
6.99	1.75	3.77	115.3%
7.01	1.75	3.55	103.1%
7.03	1.75	3.34	91.0%
7.05	1.75	3.14	79.2%
7.07	1.75	2.93	67.6%
7.09	1.75	2.74	56.3%
7.11	1.75	2.55	45.5%
7.13	1.75	2.36	35.0%
7.15	1.75	2.19	24.9%
7.17	1.75	2.02	15.1%
7.18	1.75	1.93	10.4%
7.19	1.75	1.85	5.8%
7.20	1.75	1.77	1.2%
7.21	1.75	1.69	-3.4%
7.22	1.75	1.61	-7.8%
7.23	1.75	1.54	-12.2%
7.24	1.75	1.46	-16.6%
7.25	1.75	1.39	-20.8%
7.26	1.75	1.31	-25.0%
7.27	1.75	1.24	-29.0%
7.29	1.75	1.10	-37.0%
7.31	1.75	0.97	-44.6%
7.33	1.75	0.84	-51.9%
7.35	1.75	0.72	-58.7%
7.37	1.75	0.62	-64.7%
7.39	1.75	0.53	-69.9%
7.41	1.75	0.44	-74.7%
7.43	1.75	0.37	-78.9%
7.45	1.75	0.30	-82.8%
7.47	1.75	0.24	-86.2%

WATERLINE AT ZERO
AREA ERROR = 7.198

STREAM NAME: Meadow Creek #2 081810
XS LOCATION: below Meadow Lake 39 47 04.7 107 33 13.2
XS NUMBER: #2 081810 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	6.66	12.45	0.60	1.04	7.52	13.35	100.0%	0.56	13.70	1.82
	6.70	12.21	0.58	1.00	7.05	13.09	98.1%	0.54	12.48	1.77
	6.75	11.90	0.54	0.95	6.45	12.76	95.6%	0.51	10.94	1.70
	6.80	11.65	0.50	0.90	5.86	12.48	93.5%	0.47	9.46	1.61
	6.85	11.40	0.46	0.85	5.29	12.21	91.5%	0.43	8.08	1.53
	6.90	11.15	0.42	0.80	4.72	11.93	89.4%	0.40	6.80	1.44
	6.95	10.90	0.38	0.75	4.17	11.66	87.4%	0.36	5.62	1.35
	7.00	10.65	0.34	0.70	3.63	11.39	85.3%	0.32	4.53	1.25
	7.05	10.25	0.30	0.65	3.11	10.97	82.2%	0.28	3.58	1.15
	7.10	9.45	0.28	0.60	2.62	10.16	76.2%	0.26	2.83	1.08
	7.15	8.65	0.25	0.55	2.16	9.36	70.1%	0.23	2.18	1.01
WL	7.20	7.99	0.22	0.50	1.75	8.64	64.7%	0.20	1.61	0.92
	7.25	7.32	0.19	0.45	1.37	7.90	59.2%	0.17	1.13	0.83
	7.30	6.66	0.15	0.40	1.02	7.16	53.6%	0.14	0.74	0.73
	7.35	5.74	0.12	0.35	0.71	6.14	46.0%	0.12	0.45	0.63
	7.40	4.07	0.12	0.30	0.47	4.38	32.8%	0.11	0.29	0.61
	7.45	3.13	0.09	0.25	0.29	3.33	25.0%	0.09	0.16	0.53
	7.50	2.44	0.06	0.20	0.15	2.57	19.2%	0.06	0.06	0.41
	7.55	1.17	0.06	0.15	0.08	1.25	9.4%	0.06	0.03	0.41
	7.60	0.62	0.05	0.10	0.03	0.67	5.0%	0.05	0.01	0.34
	7.65	0.31	0.03	0.05	0.01	0.34	2.5%	0.02	0.00	0.22
	7.70	0.01	0.00	0.00	0.00	0.02	0.1%	0.00	0.00	0.03

STREAM NAME: Meadow Creek #2 081810
XS LOCATION: below Meadow Lake 39 47 04.7 107 33 13.2
XS NUMBER: #2 081810

SUMMARY SHEET

MEASURED FLOW (Qm)=	1.61	cfs
CALCULATED FLOW (Qc)=	1.61	cfs
(Qm-Qc)/Qm * 100 =	-0.4	%
MEASURED WATERLINE (WLm)=	7.22	ft
CALCULATED WATERLINE (WLc)=	7.20	ft
(WLm-WLc)/WLm * 100 =	0.2	%
MAX MEASURED DEPTH (Dm)=	0.50	ft
MAX CALCULATED DEPTH (Dc)=	0.50	ft
(Dm-Dc)/Dm * 100	-0.5	%
MEAN VELOCITY=	0.92	ft/sec
MANNING'S N=	0.103	
SLOPE=	0.03461538	ft/ft
.4 * Qm =	0.6	cfs
2.5 * Qm=	4.0	cfs

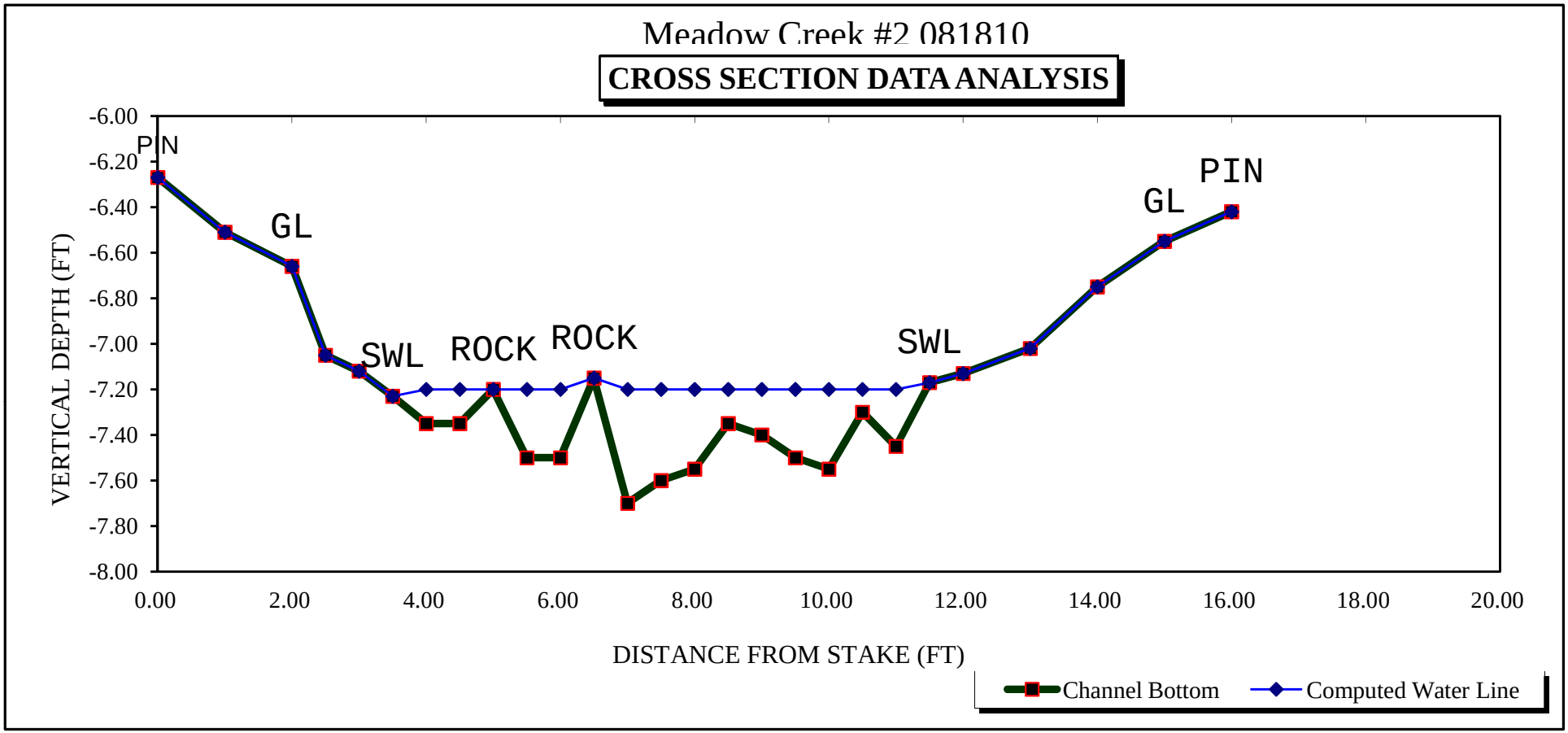
RECOMMENDED INSTREAM FLOW:
=============================

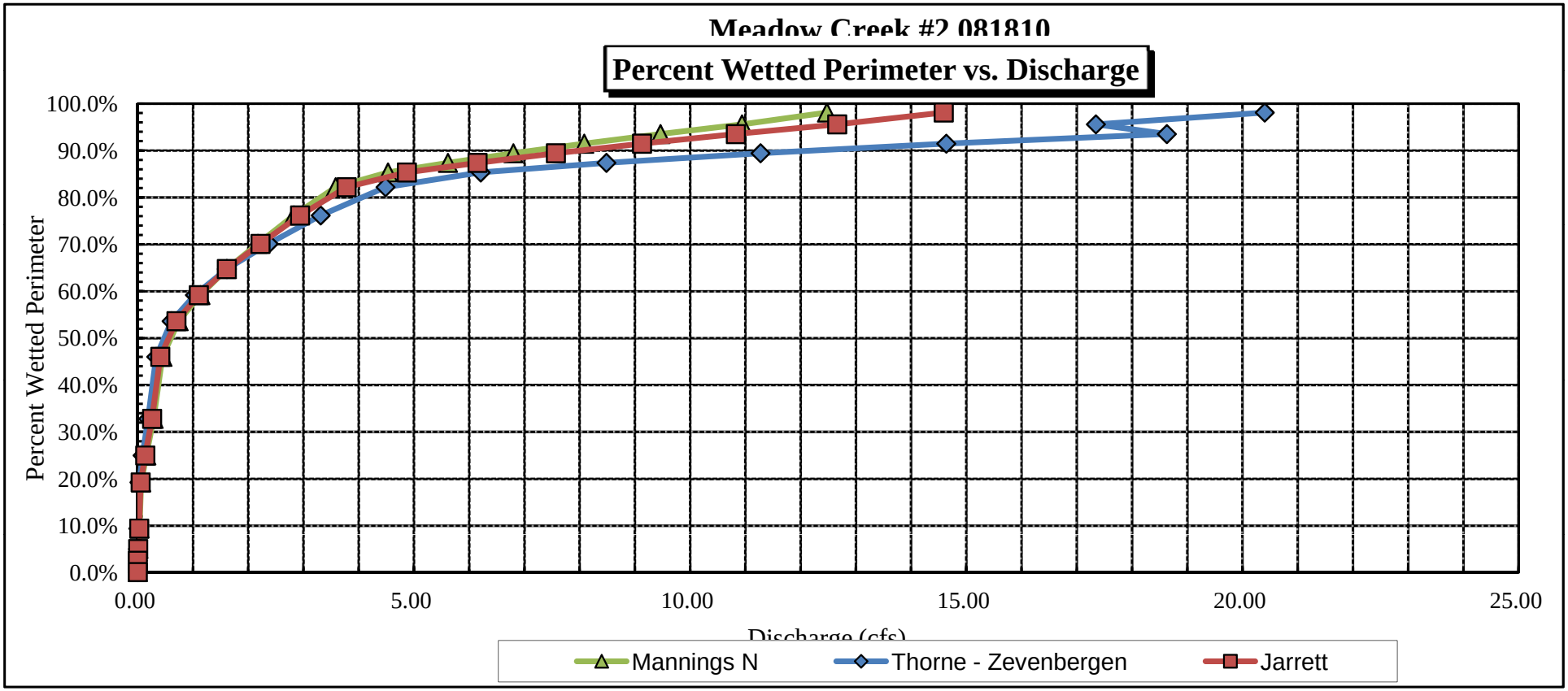
FLOW (CFS)	PERIOD
===========	========
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________

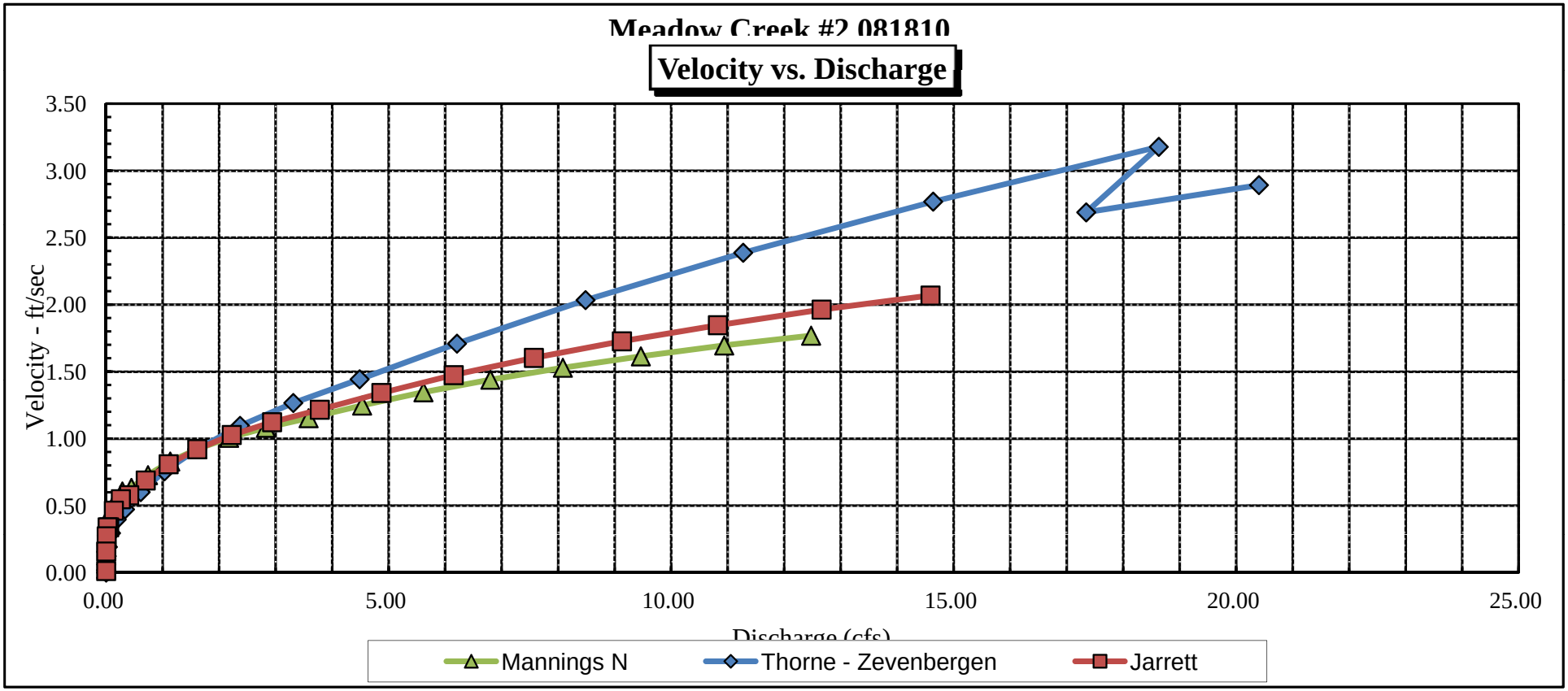
RATIONALE FOR RECOMMENDATION:
=============================

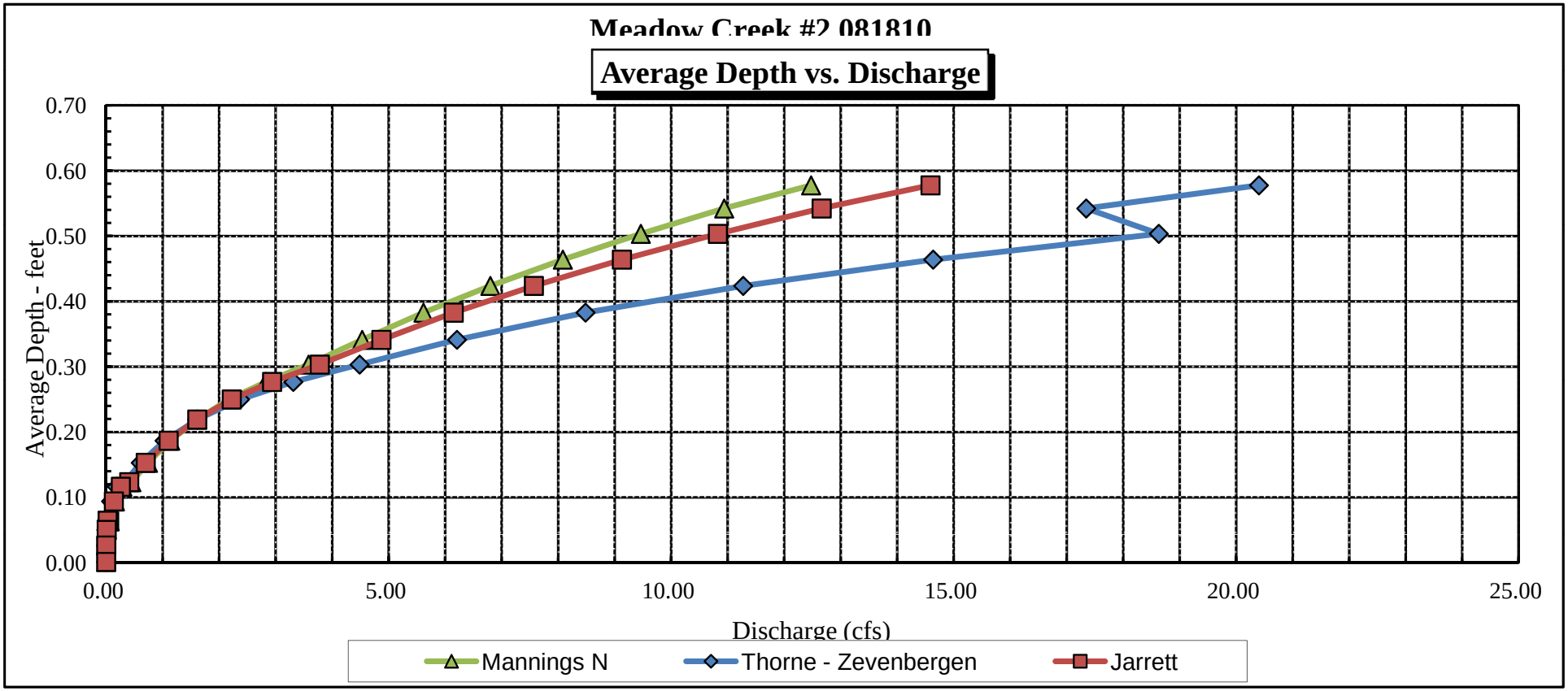
RECOMMENDATION BY: ………………...………..…............................... AGENCY..……………………......…....…...….…...... DATE:.......….....….......……………

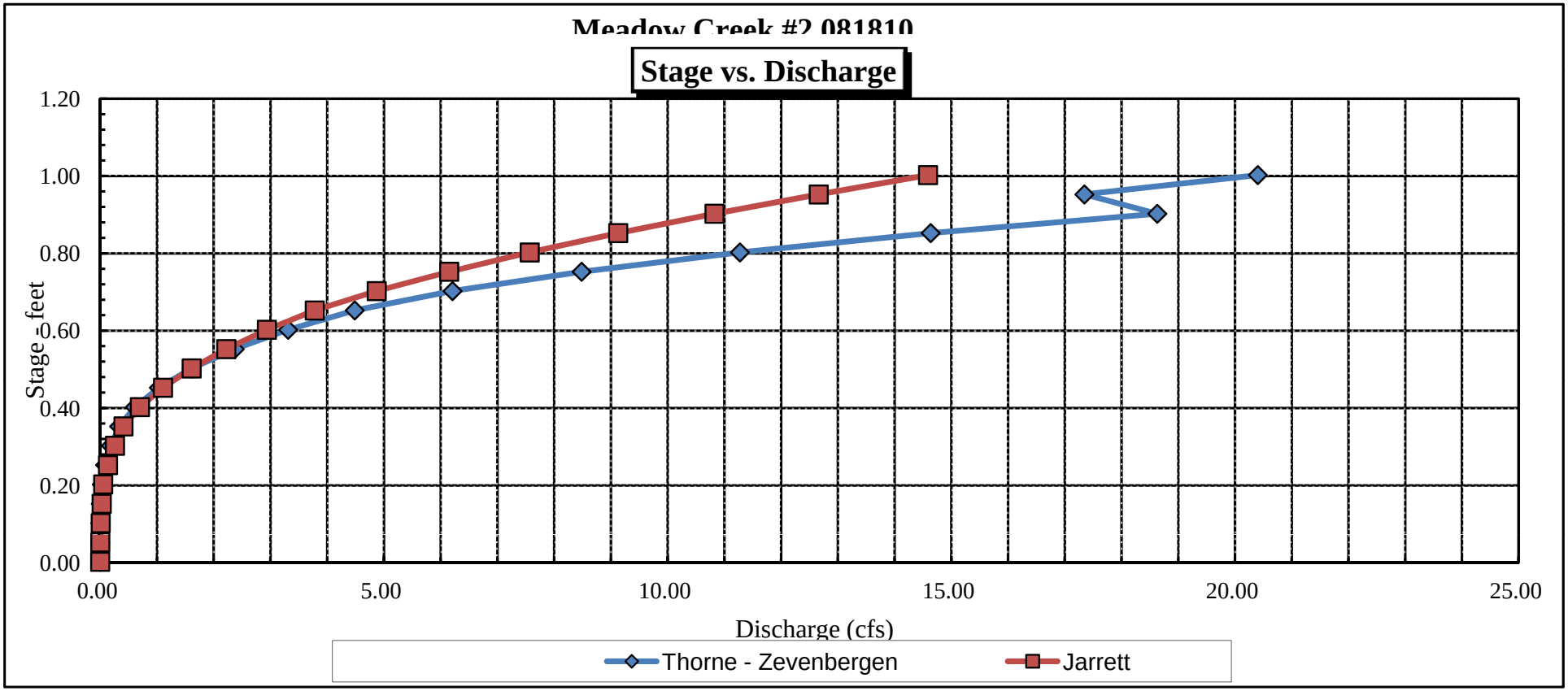
CWCB REVIEW BY: ..…………………………....………………………………………………...…............. DATE:.................…………….…..


Meadow Creek #2 081810
CROSS SECTION DATA ANALYSIS
PIN
GL
SWL
ROCK
ROCK
SWL
GL
PIN
-6.00
-6.20
-6.40
-6.60
-6.80
-7.00
-7.20
-7.40
-7.60
-7.80
-8.00
VERTICAL DEPTH (FT)
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Meadow Creek #2 081810
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
5.00
10.00
15.00
20.00
25.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett

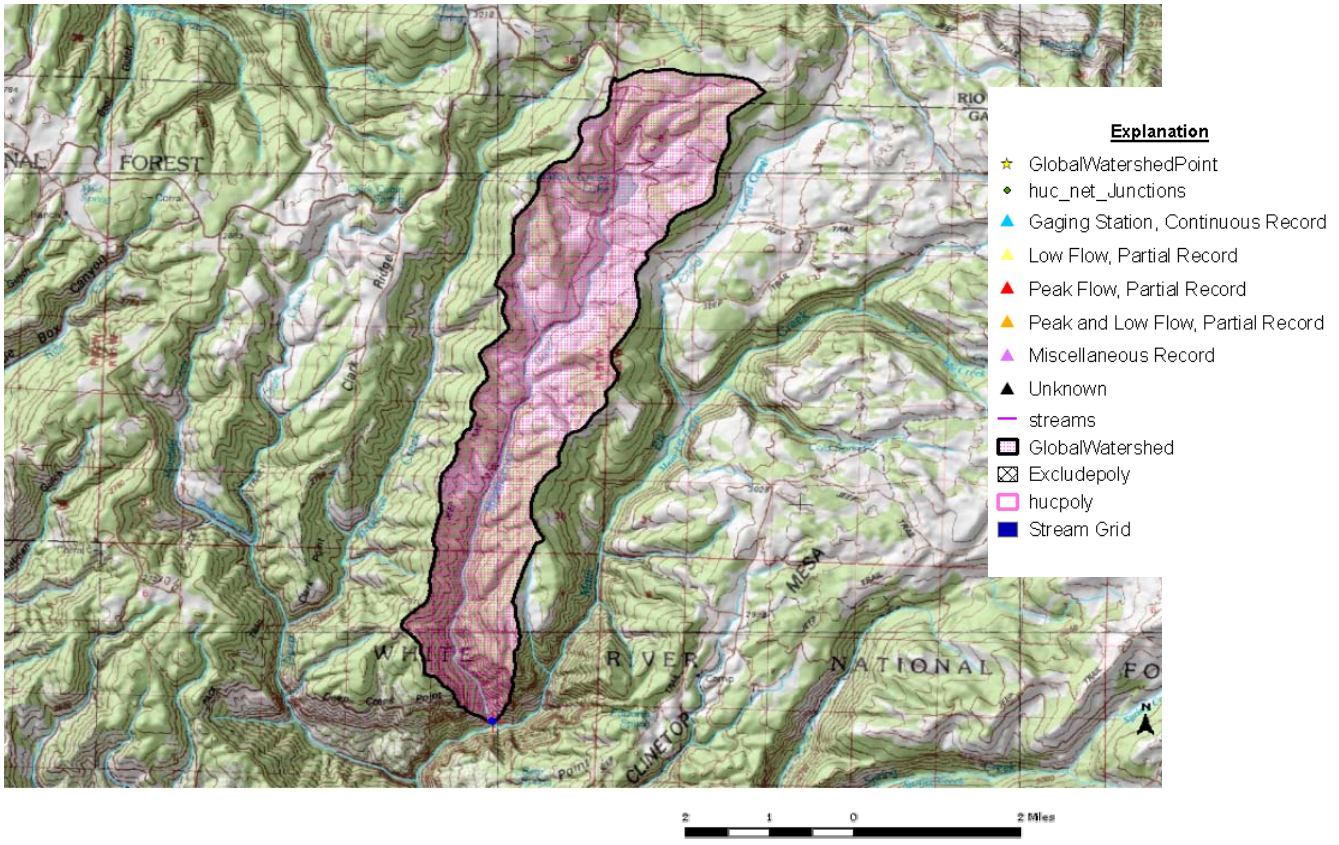

Meadow Creek #2 081810
Velocity vs. Discharge
Velocity - ft/sec
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.00
5.00
10.00
15.00
20.00
25.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Meadow Creek #2 081810
Average Depth vs. Discharge
Average Depth - feet
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00
5.00
10.00
15.00
20.00
25.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Meadow Creek #2 081810
Stage vs. Discharge
1.20
1.00
0.80
0.60
0.40
0.20
0.00
Stage - feet
0.00
5.00
10.00
15.00
20.00
25.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett

USGS Colorado StreamStats

StreamStats Print Page



12/21/2010 4:23:23 PM

Streamstats Ungaged Site Report

Date: Tue Dec 21 2010 16:24:56 Mountain Standard Time
Site Location: Colorado
NAD27 Latitude: 39.7060 (39 42 22)
NAD27 Longitude: -107.5673 (-107 34 02)
NAD83 Latitude: 39.7060 (39 42 21)
NAD83 Longitude: -107.5679 (-107 34 04)
Drainage Area: 12.4 mi2

Peak-Flows Basin Characteristics

99% Mountain Region Peak Flow (12.3 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	12.4	1	1060
Mean Basin Slope from 10m DEM (percent)	26.1	7.6	60.2
Mean Annual Precipitation (inches)	33.07	18	47

1% Northwest Region Peak Flow (0.13 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	12.4	1	5250
Percent above 7500 ft (percent)	98.9	0	99
Mean Annual Precipitation (inches)	33.07	8	49

Low-Flows Basin Characteristics

99% Mountain Region Min Flow (12.3 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	12.4	1	1060
Mean Annual Precipitation (inches)	33.07	18	47
Mean Basin Elevation (feet)	9380	8600	12000

1% Northwest Region Min Flow (0.13 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	12.4	5	5250
Mean Basin Elevation (feet)	9380	6880	10480

Flow-Duration Basin Characteristics

99% Mountain Region Flow Duration (12.3 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	12.4	1	1060
Mean Annual Precipitation (inches)	33.12	18	47

1% Northwest Region Flow Duration (0.13 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	12.4	1	5250
Mean Annual Precipitation (inches)	33.12	8	49

Maximum-Flows Basin Characteristics

99% Mountain Region Max Flow (12.3 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	12.4	1	1060

Mean Annual Precipitation (inches)	33.07	18	47

1% Northwest Region Max Flow (0.13 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	12.4	5	5250
Mean Annual Precipitation (inches)	33.07	8	49
Percent above 7500 ft (percent)	98.9	0	99

Mean-Flows Basin Characteristics

99% Mountain Region Mean Flow (12.3 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	12.4	1	1060
Mean Annual Precipitation (inches)	33.12	18	47

1% Northwest Region Mean Flow (0.13 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	12.4	1	5250
Mean Annual Precipitation (inches)	33.12	8	49

Peak-Flows Streamflow Statistics Area-Averaged

Statistic	Flow (ft^3/s)	Prediction Error (percent)	Equivalent years of record
PK2	171	50	
PK5	234	44	
PK10	274	41	
PK25	318	40	
PK50	371	39	
PK100	407	36	
PK200	436	36	
PK500	495	33	

Peak-Flows Streamflow Statistics Mountain Region Peak Flow

Statistic	Flow (ft^3/s)	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
PK2	172	49			
PK5	235	44			
PK10	275	41			
PK25	319	40			
PK50	373	39			
PK100	409	36			
PK200	437	36			
PK500	496	33			

Peak-Flows Streamflow Statistics Northwest Region Peak Flow

Statistic	Flow (ft^3/s)	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
PK2	131	110			
PK5	200	88			
PK10	248	79			
PK25	314	74			
PK50	367	74			

PK100	425	75			
PK200	468	76			
PK500	559	79			

Low-Flows Streamflow Statistics Area-Averaged

Statistic	Flow (ft^3/s)	Prediction Error (percent)	Equivalent years of record
M7D2Y	0.68	90	
M7D10Y	0.38	150	
M7D50Y	0.49	130	

Low-Flows Streamflow Statistics Mountain Region Min Flow

Statistic	Flow (ft^3/s)	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
M7D2Y	0.67	89			
M7D10Y	0.37	150			
M7D50Y	0.49	130			

Low-Flows Streamflow Statistics Northwest Region Min Flow

Statistic	Flow (ft^3/s)	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
M7D2Y	1.52	210			
M7D10Y	0.77	280			
M7D50Y	0.51	340			

Flow-Duration Streamflow Statistics Area-Averaged

Statistic	Flow (ft^3/s)	Prediction Error (percent)	Equivalent years of record
D10	50.8	19	
D25	12.8	29	
D50	4.42	29	
D75	2.41	40	
D90	1.44	74	

Flow-Duration Streamflow Statistics Mountain Region Flow Duration

Statistic	Flow (ft^3/s)	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
D10	51.2	19			
D25	12.9	29			
D50	4.45	29			
D75	2.42	39			
D90	1.45	72			

Flow-Duration Streamflow Statistics Northwest Region Flow Duration

Statistic	Flow (ft^3/s)	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
D10	33.7	52			
D25	8.8	56			
D50	3.69	66			
D75	2.05	91			
D90	1.37	220			

Maximum-Flows Streamflow Statistics Area-Averaged

Statistic	Flow (ft^3/s)	Prediction Error (percent)	Equivalent years of record
V7D2Y	116	46	
V7D10Y	179	35	
V7D50Y	237	31	

Maximum-Flows Streamflow Statistics Mountain Region Max Flow

Statistic	Flow (ft^3/s)	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
V7D2Y	117	46			
V7D10Y	180	35			
V7D50Y	238	31			

Maximum-Flows Streamflow Statistics Northwest Region Max Flow

Statistic	Flow (ft^3/s)	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
V7D2Y	80.8	86			
V7D10Y	136	59			
V7D50Y	211	51			

Mean-Flows Streamflow Statistics Area-Averaged

Statistic	Flow (ft^3/s)	Prediction Error (percent)	Equivalent years of record
Q1	2.82	24	
Q2	2.59	26	
Q3	2.8	24	
Q4	6.19	19	
Q5	41.4	21	
Q6	82.2	21	
Q7	32.1	56	
Q8	12.6	61	
Q9	7.44	33	
QA	17.8	11	
Q10	6.01	20	
Q11	4.32	21	
Q12	3.18	21	

Mean-Flows Streamflow Statistics Mountain Region Mean Flow

Statistic	Flow (ft^3/s)	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
Q1	2.84	24			
Q2	2.61	26			
Q3	2.81	24			
Q4	6.18	19			
Q5	41.5	21			
Q6	82.9	21			
Q7	32.3	56			
Q8	12.7	61			
Q9	7.49	32			
QA	17.9	11			
	6.05				

Q10		19			
Q11	4.35	21			
Q12	3.2	21			

Mean-Flows Streamflow Statistics Northwest Region Mean Flow

Statistic	Flow (ft^3/s)	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
Q1	2.53	66			
Q2	2.28	56			
Q3	2.79	43			
Q4	9.58	66			
Q5	47.8	47			
Q6	39.6	61			
Q7	17.2	52			
Q8	7.94	78			
Q9	5.54	99			
QA	12.8	29			
Q10	4.44	85			
Q11	3.06	66			
Q12	2.4	61