United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Colorado State Office
2850 Youngfield Street
Lakewood, Colorado 80215-7093
www.blm.gov/co

TAKE PRIDE IN AMERICA

In Reply Refer To:
7250 (CO-932)

DEC 1 1 2009

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

Dear Ms. Bassi:

The Bureau of Land Management (BLM) is writing this letter to formally communicate its instream flow recommendation for two stream reaches on Cebolla Creek, located in Water Division 4.

Location and Land Status. Cebolla Creek is tributary to Blue Mesa Reservoir approximately 15 miles southwest of Gunnison. The creek is located within the upper Gunnison River watershed. This recommendation covers two stream reaches. The upper reach begins at the confluence with Brush Creek and extends downstream to the confluence with Spring Creek. The lower reach begins at the confluence with Spring Creek and extends downstream to the historic Cebolla Creek stream gage at Powderhorn (USGS 09121800).

In the upper reach, approximately 60 percent of the 10.0-mile reach is located on federal lands, while the remaining 40 percent is located on private lands. Approximately 85 percent of the federal lands are managed by the U.S. Forest Service, and 15 percent are managed by the BLM.

In the lower reach, approximately 30 percent of the 10.0-mile reach is located on federal lands managed by the BLM, and 10 percent of the reach is located within a state wildlife area managed by Colorado Division of Wildlife. The remaining 60 percent of the reach is located on private lands.

Biological Summary. Upper Segment - This segment of Cebolla Creek is a moderate gradient stream, with moderate substrate size, punctuated by large boulders. The creek is sometimes confined by a narrow canyon, but in other locations the creek supports extensive wetland communities on a broad valley floor. The riparian community is in good condition and is composed primarily of willow-alder and spruce-fir communities. With a combination of large woody debris and occasionally large boulders in the creek channel, the creek provides good pool habitat, velocity cover and overwintering habitat. Sufficient riffle habitat for spawning does not appear to be a limiting factor for the fish population. Fishery surveys indicate that the creek

supports a self-sustaining population of brown trout. The survey revealed a variety of age classes and individual specimens up to 16 inches in length. The BLM has implemented trout habitat improvement projects within this reach.

Lower Segment – The segment of Cebolla Creek is a moderate to high gradient, with much larger substrate size. Boulders in the stream channel, ranging from one to three feet in diameter, and are common. Throughout much of the reach, the creek is confined to a narrow canyon. The riparian community is in good condition, but is occasionally impacted by the close proximity of the county road in the canyon. The riparian community is similar to the upper reach, but the willow component of the community is less prominent. The combination of large woody debris and frequent large boulders in the creek channel provide good pool habitat, velocity cover, and overwintering habitat. In this reach, riffle habitat appears to be more limited, but it does not appear to be affecting the success of the fish population. Fishery surveys indicate that the creek supports a self-sustaining population of brown trout. The survey revealed a variety of age classes and individual specimens up to 14 inches in length. The Colorado Division of Wildlife has implemented trout habitat improvement projects within this reach.

R2Cross Analysis. Upper Segment - BLM collected the following R2Cross data from the creek:

Party	Date	Discharge	250%-40%	Summer (3/3)	Winter (2/3)
BLM	09/26/2006	42.23	16.9-105.6	36.02	Out of range
BLM	09/26/2006	42.56	17.0-106.4	17.29	Out of range
BLM	10/08/2008	32.10	12.8-80.2	21.65	Out of range
BLM	10/08/2008	30.78	12.3-77.0	25.46	14.28
BLM	10/08/2008	27.56	11.0-68.9	14.20	13.52

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

> 23.0 cubic feet per second is recommended during the high temperature period from May 1 through September 30. This recommendation was derived by averaging the results of the data sets and is driven by the depth criteria. Given the wide channel in riffle habitats, 23.0 cubic feet per second is required to meet the depth criteria and provide sufficient physical habitat that is usable by the fish population.
>
> 12.5 cubic feet per second is recommended from October 1 through November 15, which is the brown trout spawning period. It is important to protect a constant flow rate throughout the brown trout spawning period so that once spawning occurs, eggs are not dessicated before the winter icing period. This flow rate recommendation is driven by water availability, and it comes very close to meeting two of the three instream flow criteria.

7.5 cubic feet per second is recommended for the period from November 16 to April 1. This recommendation is driven by water availability. This flow rate should provide adequate flow through pools and prevent complete icing of riffles during winter to insure successful overwintering by the fish population.

16.5 cubic feet per second is recommended for the period from April 1 through April 30. This is the period when fish are starting to become active again after surviving the winter icing period. During this period, it is important to provide additional physical habitat for the fish population, so that it may begin active feeding and foraging. This flow rate recommendation is driven by water availability, and it meets two of the three instream flow criteria.

Lower Segment – the BLM collected the following R2Cross data from the creek:

Party	Date	Discharge	250%-40%	Summer (3/3)	Winter (2/3)
BLM	10/08/2008	39.80	15.9-99.5	31.73	Out of range
BLM	10/08/2008	41.85	16.7-104.6	28.72	Out of range
BLM	10/08/2008	35.10	14.0-87.8	17.10	14.13

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

26.0 cubic feet per second is recommended during the high temperature period from April 1 through September 30. This recommendation was derived by averaging the results of the data sets, and is driven by the depth criteria. Given the wide creek channel in riffle habitats, 26.0 cubic feet per second is required to meet the depth criteria and provide sufficient physical habitat that is usable by the fish population.

22.0 cubic feet per second is recommended from October 1 through November 15, which is the brown trout spawning period. It is important to protect a constant flow rate throughout the brown trout spawning period so that once spawning occurs, eggs are not dessicated before the winter icing period. This flow rate recommendation is driven by water availability, and it meets two of the three instream flow criteria.

13.5 cubic feet second is recommended for the period from November 16 to March 31. This recommendation is driven by water availability, but it comes very close to meeting two of the three instream flow criteria. This flow rate should provide adequate flow through pools and prevent complete icing of riffles during winter to insure successful overwintering by the fish population.

Water Availability. In 1980, the Colorado Water Conservation Board (CWCB) appropriated two instream flow water rights on Cebolla Creek, above and below the segments recommended in this letter:

- Confluence of East Fork and West Fork Cebolla Creek to confluence with Brush Creek – 4.0 cubic feet per second, year round.

- Confluence with Powderhorn Creek to Blue Mesa Reservoir – 26 cubic feet per second from May 1 to September 30 and 14 cubic feet per second from October 1 to April 30.

The BLM has identified the following water rights within the upper reach:

Upper Cebolla Ditch – 22 cubic feet per second
Maybell Ditch No. 1 – 5.7 cubic feet per second
Hatcher Ditch – 6.0 cubic feet per second
Stavely Ditch – 2.35 cubic feet per second
Wrights Cathedral Ditch – 1.0 cubic feet per second

There are also numerous water rights located upstream of the proposed reach on tributaries to Cebolla Creek, including Mineral Creek and Pasture Creek.

The BLM has identified the following water rights within the lower reach:

Cebolla Creek Ditch – 1.57 cubic feet per second
Warrant Ditch – 9.0 cubic feet per second
Youmans Ditches No. 1 -4 – 34.25 cubic feet per second
WS Thompson Ditch – 3.5 cubic feet per second
Ferris Ditch - 1.8 cubic feet per second
Hopfer Ditch – 2.5 cubic feet per second
East Ditch – 4.0 cubic feet per second
West Ditch – 6.0 cubic feet per second
Johnson West Side Ditch – 2.5 cubic feet per second
East Dempsey Ditch – 2.5 cubic feet per second

There are two important facts concerning the water rights in these two reaches. First, all of the water rights appear to irrigate lands close to Cebolla Creek, so the creek accumulates return flows from those irrigation practices. Second, all the identified water rights within the two reaches are junior to a total of 36.67 cubic feet per second water right located downstream near the community of Powderhorn. It is highly likely that the calling rights near Powderhorn call for a flow rate that is equal to or greater to the proposed instream flow appropriation during times of low stream flows.

The BLM does not recommend using historic stream gages within this watershed for water

availability analysis. The historic Cebolla Creek Gage (USGS 09121800), which was operated for four years from 1960 through 1963, lacks a sufficient period of record to provide reliable data for a full range of water supply conditions. The BLM also recommends against using the Cebolla Creek at Powderhorn, CO gage (USGS gage 09122000) because this gage is heavily influenced by agricultural irrigation operations near Powderhorn. Instead, the BLM recommends using the historic gage Cochetopa Creek gage below Rock Creek near Parlin, CO. This gage has a long period of record, and measures the next watershed immediately to the east of Cebolla Creek. An adjustment to the Cochetopa Creek gage can be performed to reflect the different size of the Cebolla Creek watershed.

Relationship to Management Plans. Under the current resource management plan, Cebolla Creek is managed to maintain and improve the aquatic wildlife population. The BLM has made significant investment in fish habitat improvements in the creek. The creek is also managed for dispersed recreation and concentrated recreation, since it is adjacent to an easily accessible county road. For example, the BLM maintains a public campground within the lower reach. The BLM management plan specifically calls for instream flow recommendations on creeks within this management unit that support fisheries.

Data sheets, R2Cross output, fishery survey information, and photographs of the cross section were included with the BLM's draft recommendation in February 2009. We thank both the Division of Wildlife and the Water Conservation Board for their cooperation in this effort.

If you have any questions regarding our instream flow recommendation, please contact Roy Smith at 303-239-3940.

Sincerely,

Linda Anania

Linda Anania
Deputy State Director, Resources and Fire

cc: Brian St. George, Gunnison Field Office Manager
Andrew Breibart, Gunnison Field Office

DRAFT INSTREAM FLOW RECOMMENDATION

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

Dear Ms. Bassi:

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Location and Land Status. Cebolla Creek is tributary to Blue Mesa Reservoir approximately 15 miles southwest of Gunnison. The creek is located within the upper Gunnison River watershed. This recommendation covers two stream reaches. The upper reach begins at the confluence with Brush Creek and extends downstream to the confluence with Spring Creek. The lower reach begins at the confluence with Spring Creek and extends downstream to the historic Cebolla Creek stream gage at Powderhorn (USGS 09121800).

In the upper reach, approximately 60 percent of the 10.0-mile reach is located on federal lands, while the remaining 40 percent is located on private lands. Approximately 85% of the federal lands are managed by the U.S. Forest Service, and 15% are managed by the BLM.

In the lower reach, approximately 30% of the 10.0-mile reach is located on federal lands managed by BLM, and 10% of the reach is located within a state wildlife area managed by Colorado Division of Wildlife. The remaining 60% of the reach is located on private lands.

Biological Summary.

Upper Segment - This segment of Cebolla Creek is a moderate gradient stream, with moderate substrate size, punctuated by large boulders. The creek is sometimes confined by a narrow canyon, but in other locations the creek supports extensive wetland communities on a broad valley floor. The riparian community is in good condition and is composed primarily of willow-alder and spruce-fir communities. With a combination of large woody debris and occasionally large boulders in the creek channel, the creek provides good pool habitat for velocity cover and for overwintering. Sufficient riffle habitat for spawning does not appear to be a limiting factor for the fish population. Fishery surveys indicate that the creek supports a self-sustaining population of brown trout. The survey revealed a variety of age classes and individual specimens up to 16 inches in length. The BLM has implemented trout habitat improvement projects within this reach.

Lower Segment – The segment of Cebolla Creek is a moderate to high gradient, with much larger substrate size. Boulders ranging from one to three feet in diameter in the stream channel are common. Throughout much of the reach, the creek is confined to a narrow canyon. The riparian

community is in good condition, but is occasionally impacted by the close proximity of the county road in the canyon. The riparian community is similar to the upper reach, but the willow component of the community is less prominent. The combination of large woody debris and frequent large boulders in the creek channel provide good pool habitat for velocity cover and overwintering. In this reach, riffle habitat appears to be more limited, but it does not appear to be affecting the success of the fish population. Fishery surveys indicate that the creek supports a self-sustaining population of brown trout. The survey revealed a variety of age classes and individual specimens up to 14 inches in length. The Colorado Division of Wildlife has implemented trout habitat improvement projects within this reach.

R2Cross Analysis.

Upper Segment - BLM collected the following R2Cross data from the creek:

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BLM	10/08/2008	27.56	11.0-68.9	14.20	13.52

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

> 23.0 cubic feet per second is recommended during the high temperature period from May 1 through November 15. This recommendation was derived by averaging the results of the data sets. The recommendation is driven by the depth criteria. Given the wide creek channel in riffle habitats, 23.0 cfs is required to meet the depth criteria and provide sufficient physical habitat that is usable by the fish population. If possible, it is important to protect a constant flow rate for the brown trout spawning period, which can extend through November 15.
>
> 14.0 cubic feet second is recommended for the period from November 16 to April 30. This recommendation is driven by the average velocity criteria. This flow should provide adequate flow through pools and prevent complete icing of riffles during winter to insure successful overwintering by the fish population.

Lower Segment - BLM collected the following R2Cross data from the creek:

Party	Date	Discharge	250%-40%	Summer (3/3)	Winter (2/3)
BLM	10/08/2008	39.80	15.9-99.5	31.73	Out of range
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following flows are needed to protect the fishery and natural environment to a reasonable degree.

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>
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Water Availability. In 1980, the CWCB appropriated two instream flow water rights on Cebolla Creek, above and below the segments recommended in this letter:

- Confluence of East Fork and West Fork Cebolla Creek to confluence with Brush Creek – 4.0 cfs, year round

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West Ditch – 6.0 cfs

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There are two important facts concerning the water rights in these two reaches. First, all of the water rights appear to irrigate lands close to Cebolla Creek, so the creek accumulates return flows from those irrigation practices. Second, all the identified water rights within the two reaches are junior to a total of 36.67 cfs water right located downstream near the community of Powderhorn. It is highly likely that the calling rights near Powderhorn call for a flow rate that is equal to or greater to the proposed instream flow appropriation during times of low stream flows.

BLM recommends using the historic Cebolla Creek Gage (USGS 09121800), which was operated for four years from 1960 through 1963, to calculate water availability. A basin apportionment analytical approach would be required to apply this data to the upper reach. It is important to note that this gage record appears to incorporate hydrologic impacts from operations of all the significant ditches within the recommended reach, because all of those ditches were constructed well before 1960. Even though this gage was operated for only four years, it may the best available data on water availability. BLM recommends against using the Cebolla Creek at Powderhorn, CO gage (USGS gage 09122000) because this gage is heavily influenced by agricultural irrigation operations near Powderhorn.

Relationship to Management Plans. Under the current resource management plan, Cebolla Creek is managed to maintain and improve the aquatic wildlife population. BLM has made significant investment in fish habitat improvements in the creek. The creek is also managed for dispersed recreation and concentrated recreation, since it is adjacent to an easily accessible county road. For example, BLM maintains a public campground within the lower reach. The BLM management plan specifically calls for instream flow recommendations on creeks within this management unit that support fisheries.

Data sheets, R2Cross output, fishery survey information, and photographs of the cross section were included with BLM's draft recommendation in February 2009. We thank both the Division of Wildlife and the Water Conservation Board for their cooperation in this effort.

If you have any questions regarding our instream flow recommendation, please contact Roy Smith at 303-239-3940.

Sincerely,

Linda Anania
Deputy State Director
Resources and Fire

cc: Art Hayes, Gunnison Field Office
Field Office Manager, Gunnison Field Office

Gunnison Field Office Stream Surveys
October 2008

Cebolla Creek - Water Code #38895

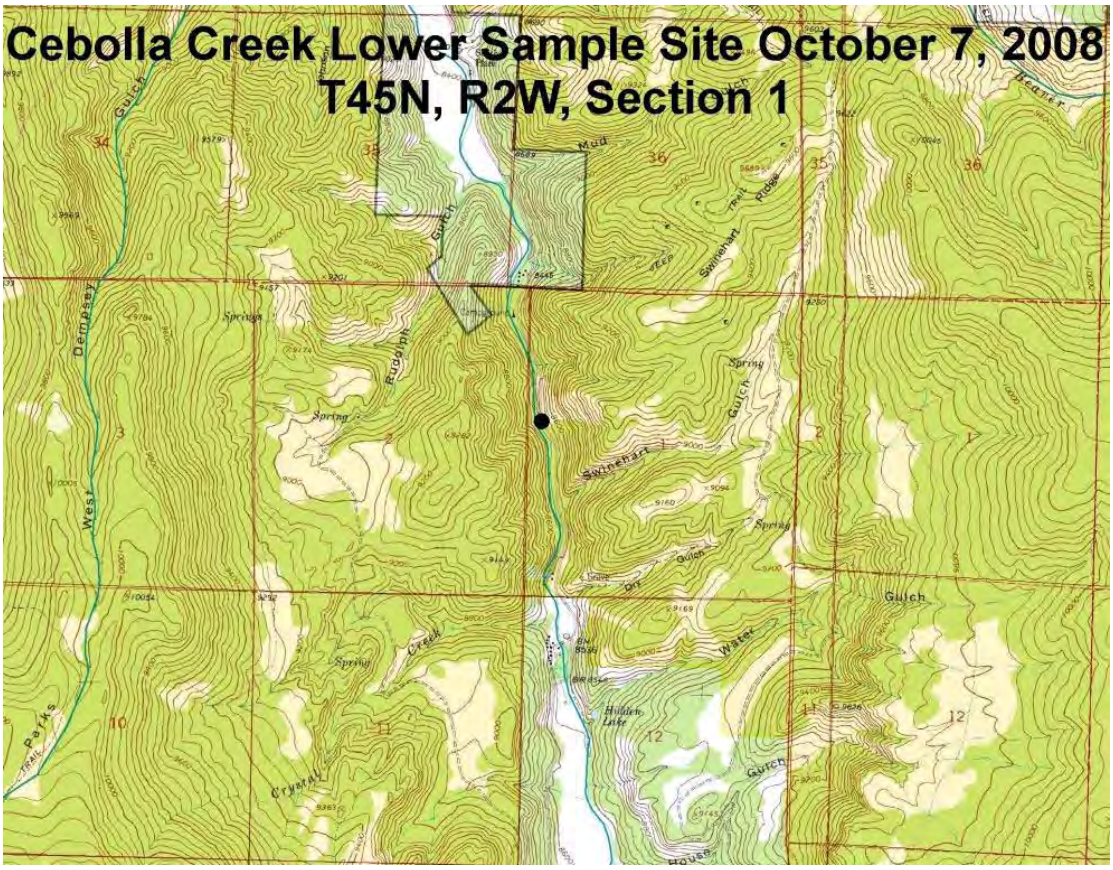
Cebolla creek, located west of Lake City, CO on lands managed by the BLM's Gunnison Field Office, was sampled on October 7, 2008. Sampling was conducted to determine fishery status and species composition. Presence/absence sampling was done in support of the Colorado BLM in-stream flow program. A one-pass sampling effort was completed. Sampling was conducted via backpack electro-shocker and approximately 40 feet of stream was sampled at one lower site and approximately 150 feet at one upper site. Personnel present were Jay Thompson, Roy Smith, Art Hayes, Tom Fresques, and Gregor Dekleva. A population estimate was not conducted due to the width of the stream and lack of equipment. Cebolla creek is tributary to Blue Mesa Reservoir and then the Gunnison River.

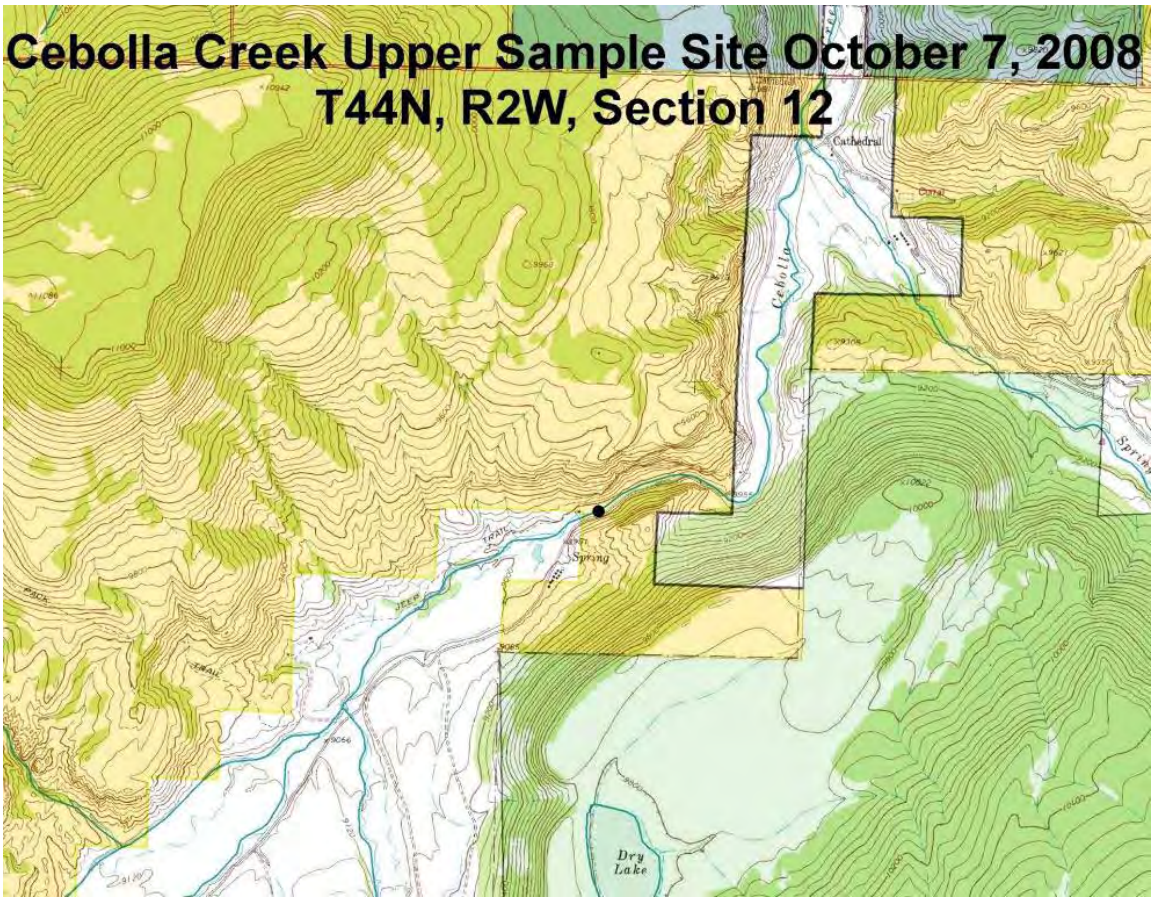
Lower Site on Cebolla creek

Brown trout *(Salmo trutta)*

Upper site on Cebolla creek

Fish collected




Cebolla Creek Upper Sample Site October 7, 2008
T44N, R2W, Section 12
Cathedral
Canal
Cebolla
Spring
Dry
Lake

STREAM SURVEY FISH SAMPLING FORM

WATER Cebolla Creek H2O CODE 38895 DATE 10/7/2008

GEAR BPE EFFORT ~40 feet STATION # 1 PASS # 1

CREW Fresques, Dekleva, Thompson, DRAINAGE Gunnison LOCATION GPS

Pass	species	length	weight		species	length	weight	Pass
1	LOC	83			LOC	136		1
1	LOC	80			LOC	144		1
1	LOC	87			LOC	93		1
1	LOC	367			LOC	122		1
1	LOC	210			LOC	126		1
1	LOC	153			LOC	27		1
1	LOC	77			LOC	77		1
1	LOC	69			LOC	73		1
1	LOC	522			LOC	88		1
1	LOC	83						

GPS Location: See Map

Notes: Stream Width 25 ft. Sample Reach 40 ft.

Conductivity: Electroshocker settings

STREAM SURVEY FISH SAMPLING FORM

WATER Cebolla Creek H2O CODE 38895 DATE 10/7/2008

GEAR BPE EFFORT ~150 feet STATION # 2 PASS # 1

CREW Dekleva, Hayes DRAINAGE Gunnison LOCATION GPS

Pass	species	length	weight		species	length	weight	Pass
1	LOC	400			LOC	61		1
1	LOC	285			LOC	85		1
1	LOC	263			LOC	98		1
1	LOC	134			LOC	77		1
1	LOC	69			LOC	87		1
1	LOC	73						

GPS Location: See Map

Notes: Stream Width 25 ft. Sample Reach 150 ft.

Conductivity: Electroshocker settings

Discussion:
The lower sample site provided an excellent variety of riffles, runs, and pools. Macro-invertebrates were abundant including a variety of Mayfly nymphs, Caddis nymphs, and a large amount of snails. The riparian area was also in excellent condition. Plant species present were Blue spruce, Alder, Carrex species, Horsetail, Current, and Reed grass. The only fish species collected was Brown trout *(Salmo trutta)*, and a variety of age and size classes were present.

The upper site sampled on Cebolla creek also provided an excellent variety of riffles, runs, and pools. Several rock structures constructed by Art Hayes contained the majority of the larger fish collected. Macro-invertebrates were abundant including a variety of Mayfly nymphs, Caddis nymphs, and a large amount of snails. The riparian area was also in excellent condition. Plant species present were Willows, Shrubby cinquefoil, Alder, including lots of young Alders, Spruce, Bull rush, and Reed grass. Brown trout also were the only species collected with a variety of age classes represented.

Recommendations:

- Pursue instream-flow recommendations for each reach
- Continue periodic monitoring of stream habitats to ensure stream and riparian conditions remain healthy

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Ceballa Creek						CROSS-SECTION NO.: 2
CROSS-SECTION LOCATION: upper 0.5 mile upstream from [illegible] ranch ground						
DATE: 10-8-09	OBSERVERS: A. Cayes, [illegible]					
LEGAL DESCRIPTION	¼ SECTION: SW	SECTION: 1	TOWNSHIP: 45 (N)/S	RANGE: 2 E(W)	PM: NM	
COUNTY: Hinsdale	WATERSHED: Gunnison	WATER DIVISION: 4	DOW WATER CODE: 38895			
MAP(S):	USGS:					
	USFS:					

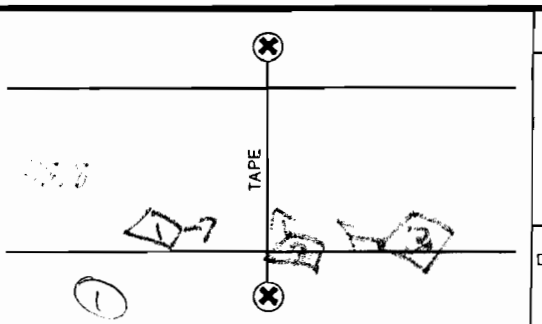
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES / NO	METER TYPE: M - M			
METER NUMBER:	DATE RATED:	CALIB/SPIN: _____ sec	TAPE WEIGHT: _____ lbs/foot	TAPE TENSION: Survey _____ lbs
CHANNEL BED MATERIAL SIZE RANGE: gravel to [illegible] (and boulders	PHOTOGRAPHS TAKEN: YES/NO	NUMBER OF PHOTOGRAPHS: 3		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
(X) Tape @ Stake LB	0.0	surveyed
(X) Tape @ Stake RB	0.0	survey
(1) WS @ Tape LB/RB	0.0	5.34, 5.35
(2) WS Upstream	13.0	5.26
(3) WS Downstream	46.0	5.72
SLOPE	0.46 / 61.0 = .008	

SKETCH



AQUATIC SAMPLING SUMMARY

STREAM ELECTROFISHED: (YES)/NO	DISTANCE ELECTROFISHED: _____ ft	FISH CAUGHT: YES/NO	WATER CHEMISTRY SAMPLED: (YES)/NO

LENGTH - FREQUENCY DISTRIBUTION BY ONE-INCH SIZE GROUPS (1.0-1.9, 2.0-2.9, ETC.)

SPECIES (FILL IN)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	>15	TOTAL

AQUATIC INSECTS IN STREAM SECTION BY COMMON OR SCIENTIFIC ORDER NAME:

mayfly, caddisfly, stonefly, snails

COMMENTS

TDS = 100
Ph = 8.9
Temp = 36°C

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Cebolla Creek - lower	CROSS-SECTION NO.: 2	DATE: [illegible]	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME: 11:50

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
LS	2.0		3.00								
	3.4		3.55								
	3.6		[illegible]								
W	4.0		5.35								
	5		5.70	.35				1.49			
	7		6.05	.70				1.59			
	9		6.35	1.00				1.34			
	11		5.85	.5				2.20			
	13		6.25	.9				1.97			
	15		6.15	.8				1.90			
	17		6.35	1.0				1.85			
	19		6.25	.9				1.82			
	21		6.30	.95				1.62			
	23		6.05	.70				1.77			
	25		5.85	.50				1.88			
	27		6.05	.70				1.59			
	29		5.95	.60				1.95			
	31		5.85	.50				1.89			
	33		5.70	.35				1.74			
	35		5.55	.20				2.03			
	37		5.55	.20				0.97			
	39		5.55	.20				1.67			
	41		5.55	.20				1.31			
	43		5.80	.45				1.05			
	45		5.95	.60				1.51			
	47		6.00	.65				0.11			
W	48.5		5.35								
G	49.5		4.36								
	49.7		4.52								
RS	51.7		3.82								
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: Cebolla Creek - lower						CROSS-SECTION NO: 1
CROSS-SECTION LOCATION: 1/4 mile upstream from BLM Campground						
DATE: 10-8-08	OBSERVERS: R. Smith, A. Hayes					
LEGAL DESCRIPTION	¼ SECTION: SW	SECTION: 1	TOWNSHIP: 45 (N) S	RANGE: 2E (W)	PM: N.M.	
COUNTY: Hinsdale	WATERSHED: Gunnison	WATER DIVISION: 4	DOW WATER CODE: 38595			
MAP(S): USGS:			320164			
USFS:			422-897			

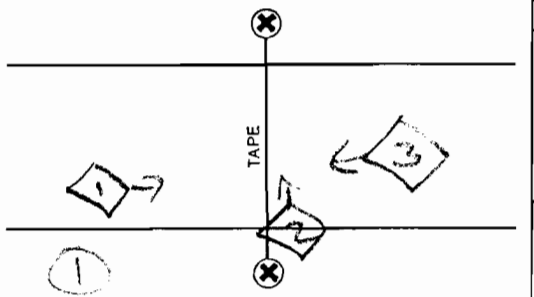
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: (YES) / NO	METER TYPE: M-M			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: surveyed ____ lbs/foot	TAPE TENSION: surveyed ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: gravel to 18" boulders	PHOTOGRAPHS TAKEN: (YES)/NO	NUMBER OF PHOTOGRAPHS: 3		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	surveyed
⊗ Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB	0.0	5.80 / 5.78
② WS Upstream	18.0	5.54
③ WS Downstream	16.0	6.00
SLOPE	0.46 / 34.0 = .014	

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
see attached																	

AQUATIC INSECTS IN STREAM SECTION BY COMMON OR SCIENTIFIC ORDER NAME:

mayfly, caddisfly, stonefly, snails

COMMENTS

TDS = 100
Ph = 8.9
Temp = 36° F

FORM #ISF ED 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Cebolla Ck. | CROSS-SECTION NO.: 1 | DATE: 10-8-08 | SHEET ___ OF ___

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT | Gage Reading: _____ ft | TIME: 11:00 am

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
RS	2.0		2.3								
G	3.3		5.2								
W	11.5		5.8								
	13		5.9	.1				1.30			
	15		6.7	.85				1.91			
	17		6.5	.70				2.18			
	19		6.4	.60				2.44			
	21		6.4	.60				2.11			
	23		6.5	.80				1.77			
	25		6.3	.50				1.43			
	27		6.3	.50				0.91			
	29		6.5	.70				2.16			
	31		6.10	.30				1.96			
	33		6.05	.25				1.09			
	35		6.20	.40				2.58			
	36		6.50	.70				1.79			
	37		6.25	.45				3.11			
	38		6.45	.65				1.09			
	39		6.50	.70				2.67			
	40		6.65	.85				3.03			
	41		6.80	1.00				2.62			
	42		6.70	.90				3.38			
	43		6.85	1.05				1.59			
	44		6.70	.90				0.27			
	46		6.40	.60				0.18			
	48		6.00	.20				0.70			
	50		6.20	.40				0.44			
	52		5.90	.10				∅			
W	54.1		5.80								
G	56.0		5.22								
LS	56.5		3.74								
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: Cebolla Creek - lower						CROSS-SECTION NO.: 3	
CROSS-SECTION LOCATION: in Mason Family State Wildlife Area							
DATE: 10-8-08	OBSERVERS: A. Hayes, R. Smith						
LEGAL DESCRIPTION	¼ SECTION: NE	SECTION: 36	TOWNSHIP: 45 (N)/S	RANGE: 2 E/(W)	PM: NM		
COUNTY: Hinsdale	WATERSHED: Gunnison	WATER DIVISION: 4	DOW WATER CODE: 38895				
MAP(S): USGS:	321555						
USFS:	4220217						

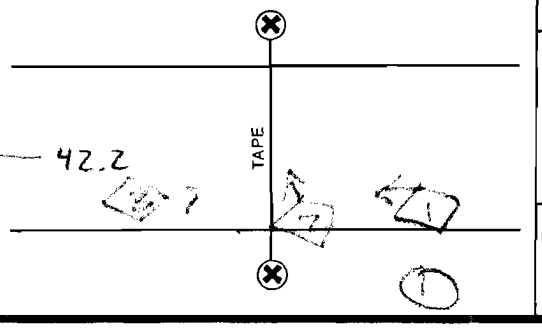
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: (YES)/NO	METER TYPE: M-M			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: surveyed ____ lbs/foot	TAPE TENSION: surveyed ____ lbs
CHANNEL BED MATERIAL SIZE RANGE: gravel to 2-foot boulders	PHOTOGRAPHS TAKEN (YES)/NO	NUMBER OF PHOTOGRAPHS: 3		

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	surveyed
⊗ Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB	0.0 11.1	7.45/7.45
② WS Upstream	22.0	7.70
③ WS Downstream	16.0	7.41
SLOPE	0.29/36.0 = .008	

SKETCH



LEGEND:
- Stake ⊗
- Station ①
- Photo ①→
- Direction of Flow

AQUATIC SAMPLING SUMMARY

STREAM ELECTROFISHED: YES/(NO)	DISTANCE ELECTROFISHED: ____ ft	FISH CAUGHT: YES/NO	WATER CHEMISTRY SAMPLED: (YES)/NO

LENGTH - FREQUENCY DISTRIBUTION BY ONE-INCH SIZE GROUPS (1.0-1.9, 2.0-2.9, ETC.)

SPECIES (FILL IN)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	>15	TOTAL

AQUATIC INSECTS IN STREAM SECTION BY COMMON OR SCIENTIFIC ORDER NAME:

mayfly, caddisfly

COMMENTS

Temp = 42°
TDS = 100
PH = 8.7

FORM #ISF ED 1-85

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Cebolla Creek - lower	CROSS-SECTION NO.: 3	DATE: 10-8-08	SHEET ___ OF ___
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) LEFT / RIGHT	Gage Reading: _____ ft	TIME: 12:35 pm

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec): At Point	Velocity (ft/sec): Mean in Vertical	Area (ft^2)	Discharge (cfs)
LS+G	2.8		6.56								
W	11.1		7.45								
	12		7.65	.2				0.96			
	14		8.15	.7				0.82			
	16		8.40	.95				0.94			
	18		8.55	1.10				1.78			
	20		8.35	.90				2.14			
	22		8.50	1.05				2.25			
	24		8.25	.80				2.19			
	26		8.25	.80				1.84			
	28		8.05	.60				2.13			
	30		8.15	.70				1.96			
	32		8.10	.65				2.29			
35 >	34	7.9 >	7.95	.50	< .45			0.92	< 1.43		
37 >	36	7.95 >	7.95	.50	< .50			0.87	< 1.53		
	~~38~~		7.85	.40				2.23			
	40		7.75	.30				1.78			
	41		7.55	.10				0			
W	42.2		7.45								
G	48.4		6.53								
LS	48.6		5.98								
TOTALS:											

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

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

LOCATION INFORMATION

STREAM NAME:	Cebolla Creek - lower
XS LOCATION:	in Mason Family State Wildlife Area
XS NUMBER:	3
DATE:	8-Oct-08
OBSERVERS:	A. Hayes, R. Smith
1/4 SEC:	NE
SECTION:	36
TWP:	45N
RANGE:	2W
PM:	N.M.
COUNTY:	Hinsdale
WATERSHED:	Gunnison
DIVISION:	4
DOW CODE:	38895
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:	0.008

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

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

STREAM NAME: Cebolla Creek - lower
XS LOCATION: in Mason Family State Wildlife Area
XS NUMBER: 3

DATA POINTS= 23

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
1	LS & G	2.80	6.56			0.00		0.00	0.00	0.0%
	W	11.10	7.45			0.00		0.00	0.00	0.0%
		12.00	7.65	0.20	0.96	0.92	0.20	0.29	0.28	0.8%
		14.00	8.15	0.70	0.82	2.06	0.70	1.40	1.15	3.3%
		16.00	8.40	0.95	0.94	2.02	0.95	1.90	1.79	5.1%
		18.00	8.55	1.10	1.78	2.01	1.10	2.20	3.92	11.2%
		20.00	8.35	0.90	2.14	2.01	0.90	1.80	3.85	11.0%
		22.00	8.50	1.05	2.25	2.01	1.05	2.10	4.73	13.5%
		24.00	8.25	0.80	2.19	2.02	0.80	1.60	3.50	10.0%
		26.00	8.25	0.80	1.84	2.00	0.80	1.60	2.94	8.4%
		28.00	8.05	0.60	2.13	2.01	0.60	1.20	2.56	7.3%
		30.00	8.15	0.70	1.96	2.00	0.70	1.40	2.74	7.8%
		32.00	8.10	0.65	2.29	2.00	0.65	1.30	2.98	8.5%
		34.00	7.95	0.50	0.92	2.01	0.50	0.75	0.69	2.0%
		35.00	7.90	0.45	1.43	1.00	0.45	0.45	0.64	1.8%
		36.00	7.95	0.50	0.87	1.00	0.50	0.50	0.44	1.2%
		37.00	7.95	0.50	1.53	1.00	0.50	0.50	0.77	2.2%
		38.00	7.85	0.40	2.23	1.00	0.40	0.60	1.34	3.8%
		40.00	7.75	0.30	1.78	2.00	0.30	0.45	0.80	2.3%
		41.00	7.55	0.10	0.00	1.02	0.10	0.11	0.00	0.0%
	W	42.20	7.45			1.20		0.00	0.00	0.0%
1	G	48.40	6.53			0.00		0.00	0.00	0.0%
	RS	48.60	5.98			0.00		0.00	0.00	0.0%
	TOTALS ----------					31.29	1.1 (Max.)	20.15	35.10	100.0%

Manning's n = 0.0569
Hydraulic Radius= 0.6440064

STREAM NAME: Cebolla Creek - lower
XS LOCATION: in Mason Family State Wildlife Area
XS NUMBER: 3

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	20.15	20.15	0.0%
7.20	20.15	28.43	41.1%
7.22	20.15	27.73	37.6%
7.24	20.15	27.04	34.2%
7.26	20.15	26.35	30.8%
7.28	20.15	25.67	27.4%
7.30	20.15	25.00	24.0%
7.32	20.15	24.33	20.7%
7.34	20.15	23.67	17.5%
7.36	20.15	23.01	14.2%
7.38	20.15	22.37	11.0%
7.40	20.15	21.73	7.8%
7.41	20.15	21.41	6.2%
7.42	20.15	21.09	4.7%
7.43	20.15	20.78	3.1%
7.44	20.15	20.46	1.5%
7.45	20.15	20.15	0.0%
7.46	20.15	19.84	-1.5%
7.47	20.15	19.53	-3.1%
7.48	20.15	19.22	-4.6%
7.49	20.15	18.92	-6.1%
7.50	20.15	18.62	-7.6%
7.52	20.15	18.01	-10.6%
7.54	20.15	17.42	-13.6%
7.56	20.15	16.83	-16.5%
7.58	20.15	16.24	-19.4%
7.60	20.15	15.66	-22.3%
7.62	20.15	15.08	-25.1%
7.64	20.15	14.51	-28.0%
7.66	20.15	13.94	-30.8%
7.68	20.15	13.37	-33.6%
7.70	20.15	12.81	-36.4%

WATERLINE AT ZERO
AREA ERROR = 7.450

STREAM NAME: Cebolla Creek - lower
XS LOCATION: in Mason Family State Wildlife Area
XS NUMBER: 3 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	6.56	45.40	1.19	1.99	54.19	45.70	100.0%	1.19	141.83	2.62
	6.60	44.75	1.17	1.95	52.39	45.05	98.6%	1.16	135.33	2.58
	6.65	43.95	1.14	1.90	50.17	44.24	96.8%	1.13	127.45	2.54
	6.70	43.15	1.11	1.85	47.99	43.43	95.0%	1.11	119.83	2.50
	6.75	42.35	1.08	1.80	45.86	42.62	93.3%	1.08	112.47	2.45
	6.80	41.54	1.05	1.75	43.76	41.81	91.5%	1.05	105.37	2.41
	6.85	40.74	1.02	1.70	41.70	41.00	89.7%	1.02	98.52	2.36
	6.90	39.94	0.99	1.65	39.68	40.19	88.0%	0.99	91.92	2.32
	6.95	39.13	0.96	1.60	37.71	39.38	86.2%	0.96	85.57	2.27
	7.00	38.33	0.93	1.55	35.77	38.57	84.4%	0.93	79.46	2.22
	7.05	37.53	0.90	1.50	33.88	37.77	82.6%	0.90	73.60	2.17
	7.10	36.72	0.87	1.45	32.02	36.96	80.9%	0.87	67.98	2.12
	7.15	35.92	0.84	1.40	30.20	36.15	79.1%	0.84	62.59	2.07
	7.20	35.12	0.81	1.35	28.43	35.34	77.3%	0.80	57.44	2.02
	7.25	34.31	0.78	1.30	26.69	34.53	75.6%	0.77	52.52	1.97
	7.30	33.51	0.75	1.25	25.00	33.72	73.8%	0.74	47.83	1.91
	7.35	32.71	0.71	1.20	23.34	32.91	72.0%	0.71	43.36	1.86
	7.40	31.90	0.68	1.15	21.73	32.10	70.2%	0.68	39.12	1.80
WL	7.45	31.10	0.65	1.10	20.15	31.29	68.5%	0.64	35.10	1.74
	7.50	30.27	0.61	1.05	18.62	30.46	66.6%	0.61	31.32	1.68
	7.55	29.45	0.58	1.00	17.12	29.62	64.8%	0.58	27.75	1.62
	7.60	28.97	0.54	0.95	15.66	29.14	63.8%	0.54	24.19	1.54
	7.65	28.50	0.50	0.90	14.23	28.65	62.7%	0.50	20.83	1.46
	7.70	28.05	0.46	0.85	12.81	28.19	61.7%	0.45	17.69	1.38
	7.75	27.60	0.41	0.80	11.42	27.73	60.7%	0.41	14.77	1.29
	7.80	26.40	0.38	0.75	10.07	26.52	58.0%	0.38	12.33	1.22
	7.85	25.20	0.35	0.70	8.78	25.32	55.4%	0.35	10.12	1.15
	7.90	24.50	0.31	0.65	7.54	24.61	53.8%	0.31	8.00	1.06
	7.95	20.80	0.31	0.60	6.38	20.90	45.7%	0.31	6.76	1.06
	8.00	19.93	0.27	0.55	5.36	20.02	43.8%	0.27	5.20	0.97
	8.05	19.07	0.23	0.50	4.39	19.15	41.9%	0.23	3.84	0.87
	8.10	16.70	0.21	0.45	3.49	16.77	36.7%	0.21	2.87	0.82
	8.15	13.00	0.21	0.40	2.75	13.06	28.6%	0.21	2.27	0.83
	8.20	12.10	0.18	0.35	2.12	12.15	26.6%	0.17	1.55	0.73
	8.25	9.20	0.17	0.30	1.54	9.25	20.2%	0.17	1.09	0.71
	8.30	8.40	0.13	0.25	1.10	8.44	18.5%	0.13	0.66	0.60
	8.35	7.60	0.09	0.20	0.70	7.63	16.7%	0.09	0.33	0.47
	8.40	5.63	0.07	0.15	0.37	5.66	12.4%	0.07	0.14	0.38
	8.45	3.40	0.04	0.10	0.14	3.41	7.5%	0.04	0.04	0.28
	8.50	1.17	0.03	0.05	0.03	1.17	2.6%	0.02	0.01	0.20
	8.55	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Cebolla Creek - lower
XS LOCATION: in Mason Family State Wildlife Area
XS NUMBER: 3

SUMMARY SHEET

MEASURED FLOW (Qm)=	35.10	cfs
CALCULATED FLOW (Qc)=	35.10	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	7.45	ft
CALCULATED WATERLINE (WLc)=	7.45	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	1.10	ft
MAX CALCULATED DEPTH (Dc)=	1.10	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	1.74	ft/sec
MANNING'S N=	0.057	
SLOPE=	0.008	ft/ft
.4 * Qm =	14.0	cfs
2.5 * Qm=	87.8	cfs

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

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

RATIONALE FOR RECOMMENDATION:
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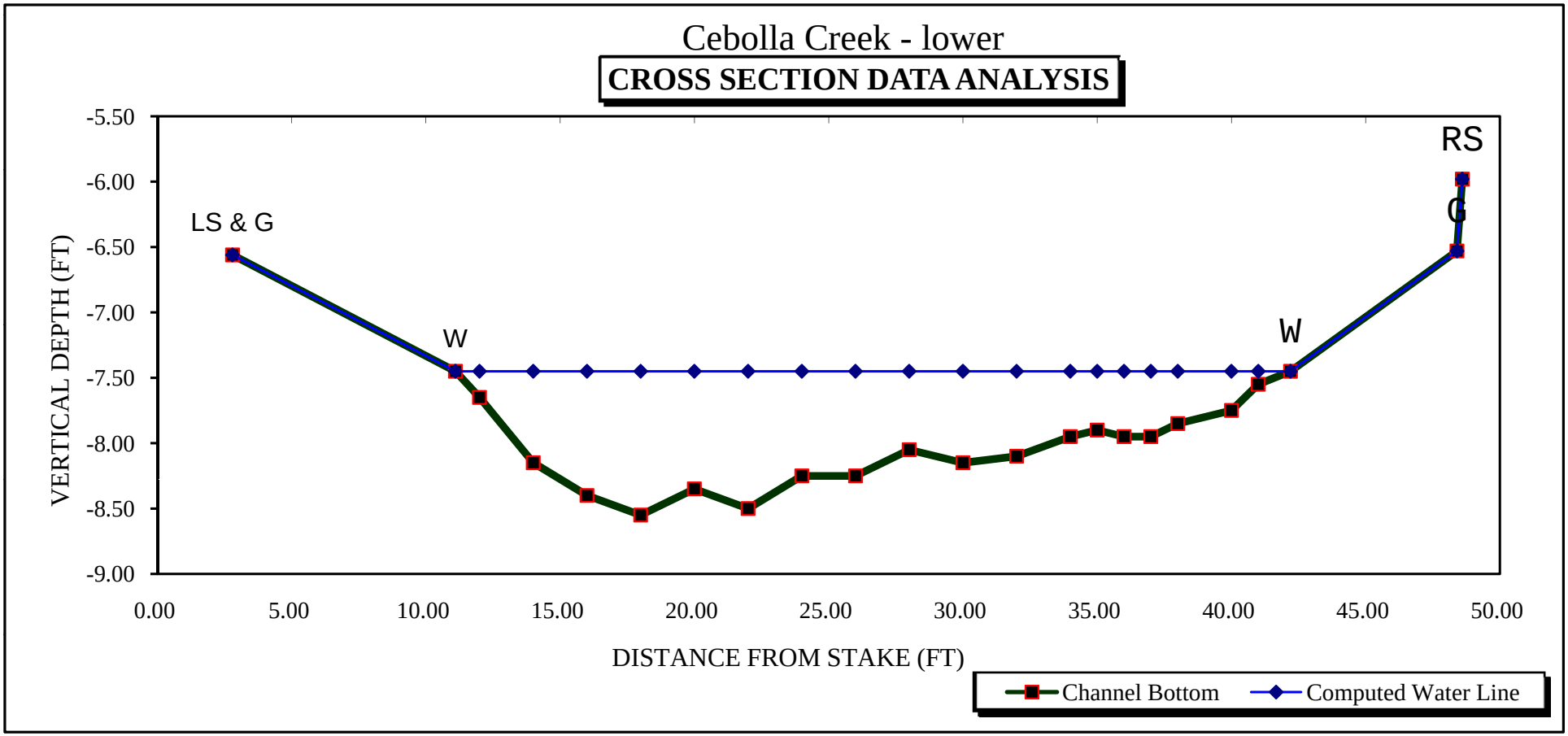
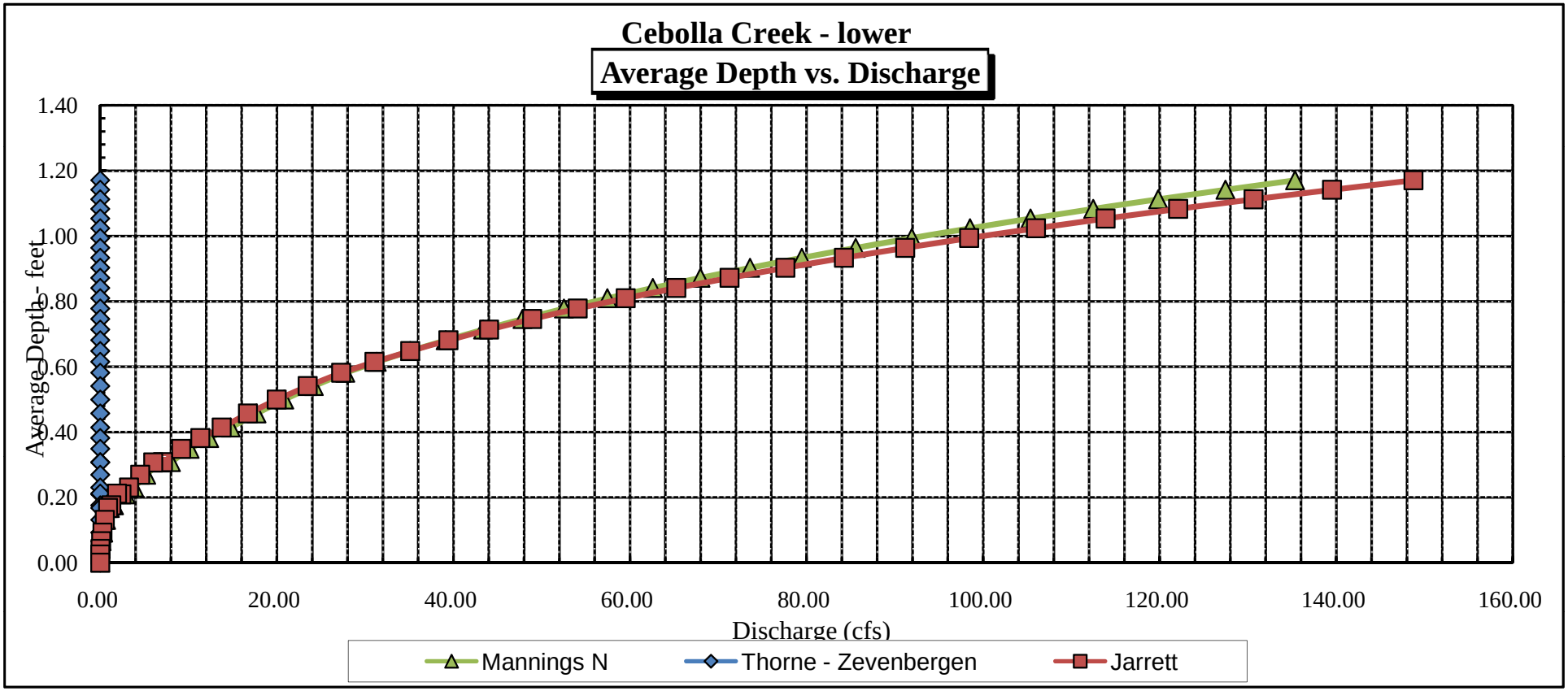
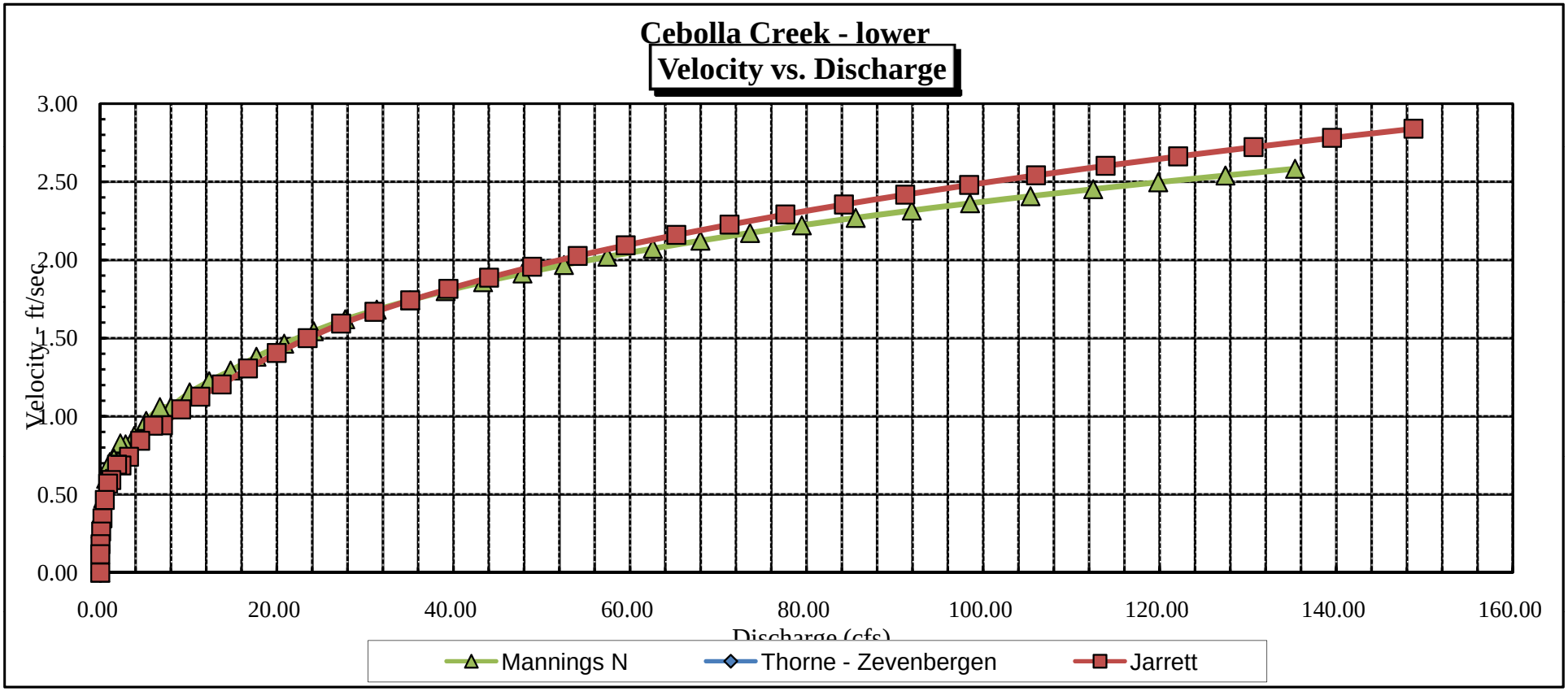
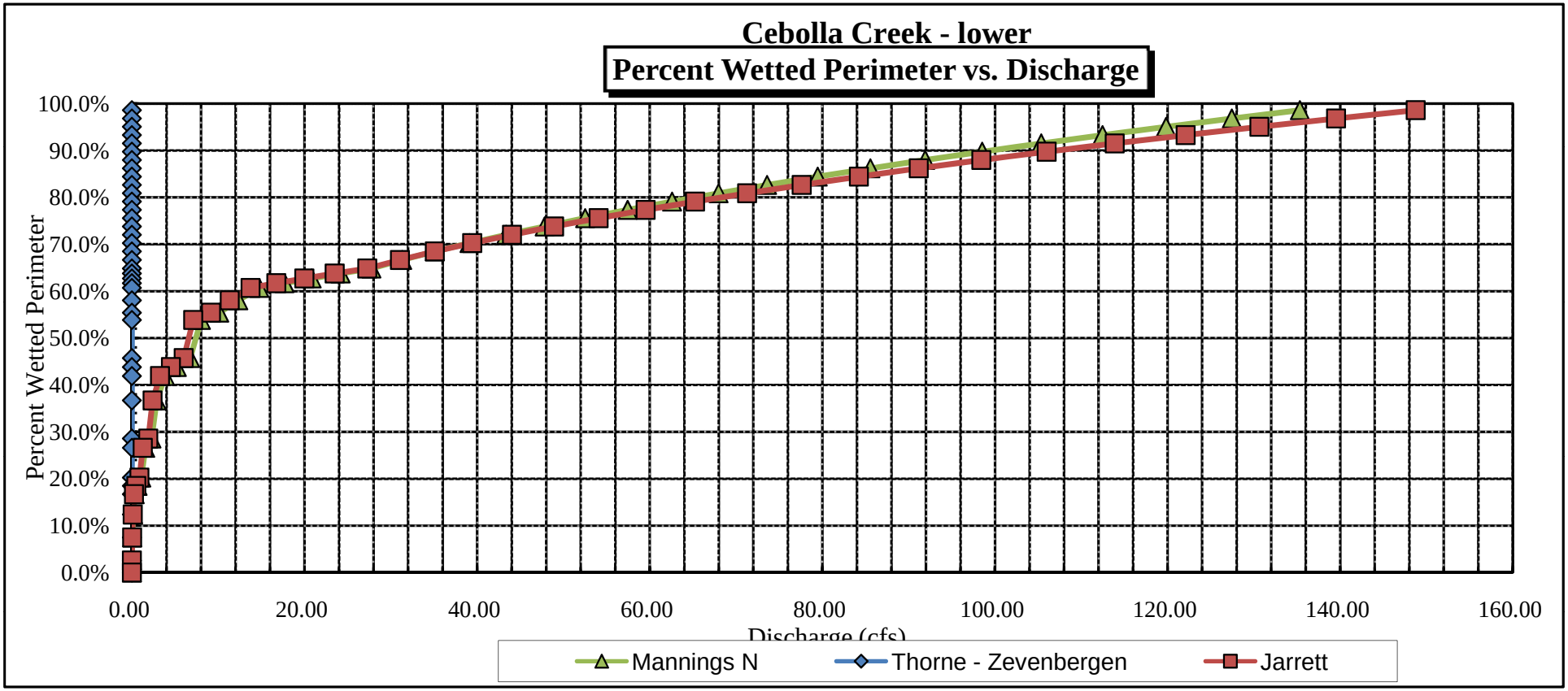
RECOMMENDATION BY: ……………………...………...……............................... AGENCY...……………………….......……...…...……...... DATE:......…...…......……………

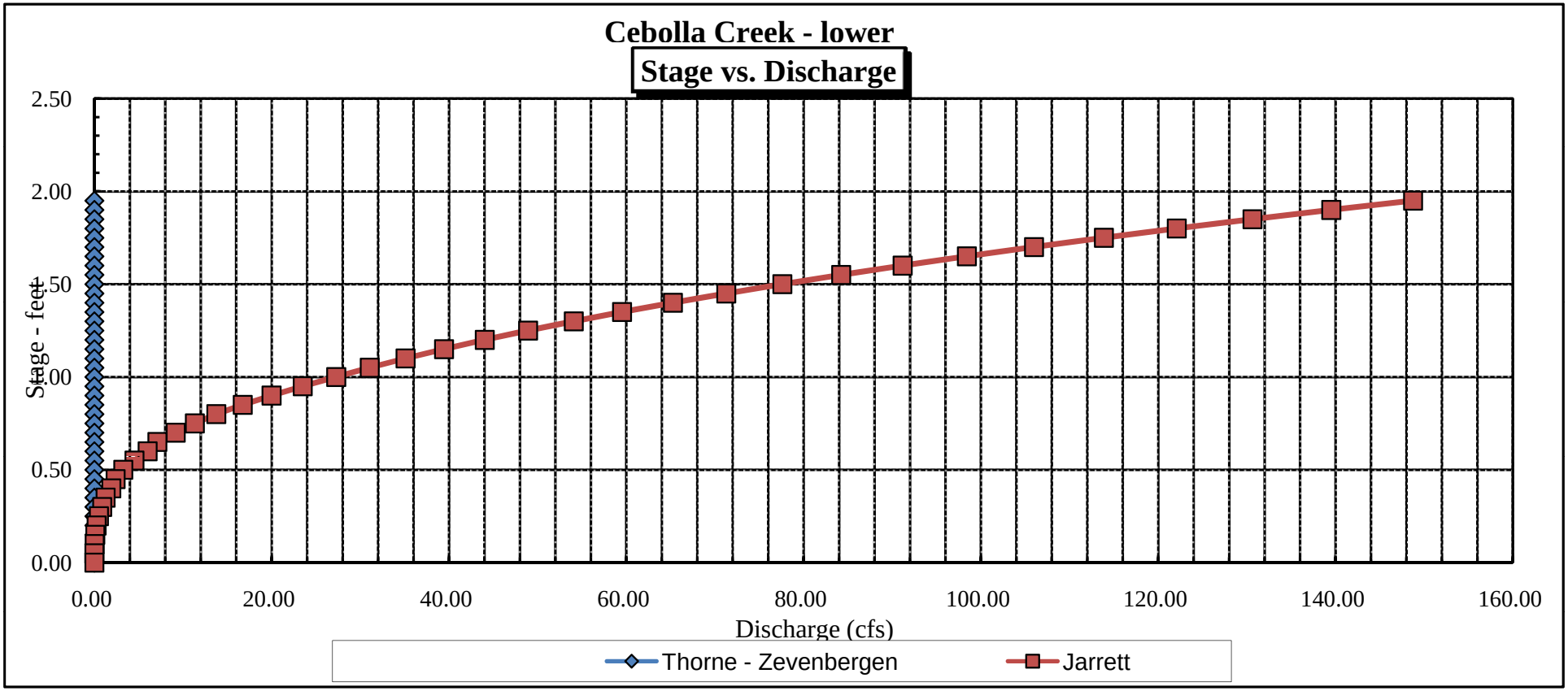
CWCB REVIEW BY: ..……………………………....………………………………………………………...…............. DATE:.................…………….....…


Cebolla Creek - lower
CROSS SECTION DATA ANALYSIS
-5.50
-6.00
-6.50
-7.00
-7.50
-8.00
-8.50
-9.00
VERTICAL DEPTH (FT)
LS & G
W
W
RS
G
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
50.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Cebolla Creek - lower
Average Depth vs. Discharge
Average Depth - feet
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


Cebolla Creek - lower
Velocity vs. Discharge
Velocity - ft/sec
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


Cebolla Creek - lower
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


Cebolla Creek - lower
Stage vs. Discharge
Stage - feet
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)
Thorne - Zevenbergen
Jarrett

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

LOCATION INFORMATION

STREAM NAME:	Cebolla Creek - lower
XS LOCATION:	1/4 mile upstream from BLM campground
XS NUMBER:	1
DATE:	8-Oct-08
OBSERVERS:	R. Smith, A. Hayes
1/4 SEC:	SW
SECTION:	1
TWP:	45N
RANGE:	2W
PM:	N.M.
COUNTY:	Hinsdale
WATERSHED:	Gunnison
DIVISION:	4
DOW CODE:	38895
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:	0.014

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

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

STREAM NAME: Cebolla Creek - lower
XS LOCATION: 1/4 mile upstream from BLM campground
XS NUMBER: 1

DATA POINTS= 31

VALUES COMPUTED FROM RAW FIELD DATA

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
	RS	2.00	2.30			0.00		0.00	0.00	0.0%
1	G	8.30	5.20			0.00		0.00	0.00	0.0%
	W	11.50	5.80			0.00		0.00	0.00	0.0%
		13.00	5.90	0.10	1.30	1.50	0.10	0.18	0.23	0.6%
		15.00	6.70	0.85	1.91	2.15	0.85	1.70	3.25	8.2%
		17.00	6.50	0.70	2.18	2.01	0.70	1.40	3.05	7.7%
		19.00	6.40	0.60	2.44	2.00	0.60	1.20	2.93	7.4%
		21.00	6.40	0.60	2.11	2.00	0.60	1.20	2.53	6.4%
		23.00	6.50	0.80	1.77	2.00	0.80	1.60	2.83	7.1%
		25.00	6.30	0.50	1.43	2.01	0.50	1.00	1.43	3.6%
		27.00	6.30	0.50	0.91	2.00	0.50	1.00	0.91	2.3%
		29.00	6.50	0.70	2.16	2.01	0.70	1.40	3.02	7.6%
		31.00	6.10	0.30	1.96	2.04	0.30	0.60	1.18	3.0%
		33.00	6.05	0.25	1.09	2.00	0.25	0.50	0.55	1.4%
		35.00	6.20	0.40	2.58	2.01	0.40	0.60	1.55	3.9%
		36.00	6.50	0.70	1.79	1.04	0.70	0.70	1.25	3.1%
		37.00	6.25	0.45	3.11	1.03	0.45	0.45	1.40	3.5%
		38.00	6.45	0.65	1.09	1.02	0.65	0.65	0.71	1.8%
		39.00	6.50	0.70	2.67	1.00	0.70	0.70	1.87	4.7%
		40.00	6.65	0.85	3.03	1.01	0.85	0.85	2.58	6.5%
		41.00	6.80	1.00	2.62	1.01	1.00	1.00	2.62	6.6%
		42.00	6.70	0.90	3.38	1.00	0.90	0.90	3.04	7.6%
		43.00	6.85	1.05	1.59	1.01	1.05	1.05	1.67	4.2%
		44.00	6.70	0.90	0.27	1.01	0.90	1.35	0.36	0.9%
		46.00	6.40	0.60	0.18	2.02	0.60	1.20	0.22	0.5%
		48.00	6.00	0.20	0.70	2.04	0.20	0.40	0.28	0.7%
		50.00	6.20	0.40	0.44	2.01	0.40	0.80	0.35	0.9%
		52.00	5.90	0.10	0.00	2.02	0.10	0.21	0.00	0.0%
	W	54.10	5.80			2.10		0.00	0.00	0.0%
1	G	56.00	5.22			0.00		0.00	0.00	0.0%
	LS	56.50	3.74			0.00		0.00	0.00	0.0%
	TOTALS ----------					43.08	1.05 (Max.)	22.63	39.80	100.0%

Manning's n = 0.0651
Hydraulic Radius= 0.52529594

STREAM NAME: Cebolla Creek - lower
XS LOCATION: 1/4 mile upstream from BLM campground
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	22.63	22.53	-0.4%
5.55	22.63	33.45	47.8%
5.57	22.63	32.56	43.9%
5.59	22.63	31.67	39.9%
5.61	22.63	30.78	36.0%
5.63	22.63	29.90	32.1%
5.65	22.63	29.02	28.2%
5.67	22.63	28.14	24.4%
5.69	22.63	27.27	20.5%
5.71	22.63	26.40	16.7%
5.73	22.63	25.53	12.8%
5.75	22.63	24.67	9.0%
5.76	22.63	24.24	7.1%
5.77	22.63	23.81	5.2%
5.78	22.63	23.38	3.3%
5.79	22.63	22.96	1.4%
5.80	22.63	22.53	-0.4%
5.81	22.63	22.11	-2.3%
5.82	22.63	21.69	-4.2%
5.83	22.63	21.27	-6.0%
5.84	22.63	20.86	-7.8%
5.85	22.63	20.45	-9.7%
5.87	22.63	19.64	-13.2%
5.89	22.63	18.84	-16.7%
5.91	22.63	18.06	-20.2%
5.93	22.63	17.28	-23.6%
5.95	22.63	16.51	-27.0%
5.97	22.63	15.74	-30.4%
5.99	22.63	14.98	-33.8%
6.01	22.63	14.22	-37.2%
6.03	22.63	13.46	-40.5%
6.05	22.63	12.72	-43.8%

WATERLINE AT ZERO
AREA ERROR = 5.798

STREAM NAME: Cebolla Creek - lower
XS LOCATION: 1/4 mile upstream from BLM campground
XS NUMBER: 1 Constant Manning's n

STAGING TABLE
GL = lowest Grassline elevation corrected for sag
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	5.22	47.59	1.02	1.63	48.69	48.21	100.0%	1.01	132.39	2.72
	5.25	47.36	1.00	1.60	47.37	47.97	99.5%	0.99	126.92	2.68
	5.30	46.92	0.96	1.55	45.02	47.53	98.6%	0.95	117.29	2.61
	5.35	46.49	0.92	1.50	42.68	47.08	97.7%	0.91	108.00	2.53
	5.40	46.06	0.88	1.45	40.37	46.64	96.7%	0.87	99.04	2.45
	5.45	45.63	0.83	1.40	38.07	46.20	95.8%	0.82	90.42	2.37
	5.50	45.20	0.79	1.35	35.80	45.76	94.9%	0.78	82.13	2.29
	5.55	44.77	0.75	1.30	33.55	45.31	94.0%	0.74	74.19	2.21
	5.60	44.34	0.71	1.25	31.33	44.87	93.1%	0.70	66.60	2.13
	5.65	43.91	0.66	1.20	29.12	44.43	92.1%	0.66	59.36	2.04
	5.70	43.48	0.62	1.15	26.93	43.99	91.2%	0.61	52.47	1.95
	5.75	43.05	0.58	1.10	24.77	43.54	90.3%	0.57	45.95	1.85
WL	5.80	42.62	0.53	1.05	22.63	43.10	89.4%	0.53	39.79	1.76
	5.85	40.88	0.50	1.00	20.54	41.36	85.8%	0.50	34.80	1.69
	5.90	39.08	0.47	0.95	18.54	39.56	82.0%	0.47	30.22	1.63
	5.95	38.56	0.43	0.90	16.60	39.03	80.9%	0.43	25.37	1.53
	6.00	38.10	0.39	0.85	14.69	38.55	80.0%	0.38	20.85	1.42
	6.05	36.93	0.35	0.80	12.81	37.36	77.5%	0.34	16.95	1.32
	6.10	33.18	0.33	0.75	11.05	33.59	69.7%	0.33	14.23	1.29
	6.15	30.97	0.31	0.70	9.45	31.35	65.0%	0.30	11.48	1.21
	6.20	28.85	0.28	0.65	7.96	29.20	60.6%	0.27	9.03	1.14
	6.25	28.00	0.23	0.60	6.54	28.32	58.7%	0.23	6.64	1.02
	6.30	26.77	0.19	0.55	5.17	27.06	56.1%	0.19	4.63	0.90
	6.35	22.58	0.18	0.50	3.98	22.82	47.3%	0.17	3.35	0.84
	6.40	20.34	0.14	0.45	2.90	20.54	42.6%	0.14	2.13	0.73
	6.45	14.11	0.15	0.40	2.08	14.27	29.6%	0.15	1.56	0.75
	6.50	9.07	0.17	0.35	1.50	9.19	19.1%	0.16	1.22	0.81
	6.55	7.60	0.14	0.30	1.09	7.70	16.0%	0.14	0.80	0.73
	6.60	6.31	0.12	0.25	0.74	6.39	13.2%	0.12	0.48	0.64
	6.65	5.02	0.09	0.20	0.46	5.07	10.5%	0.09	0.25	0.55
	6.70	3.73	0.06	0.15	0.24	3.76	7.8%	0.06	0.10	0.43
	6.75	2.24	0.04	0.10	0.09	2.26	4.7%	0.04	0.03	0.32
	6.80	0.74	0.02	0.05	0.02	0.75	1.5%	0.02	0.00	0.23
	6.85	0.03	0.00	0.00	0.00	0.03	0.1%	0.00	0.00	0.03

STREAM NAME: Cebolla Creek - lower
XS LOCATION: 1/4 mile upstream from BLM campground
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	39.80	cfs
CALCULATED FLOW (Qc)=	39.79	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	5.80	ft
CALCULATED WATERLINE (WLc)=	5.80	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	1.05	ft
MAX CALCULATED DEPTH (Dc)=	1.05	ft
(Dm-Dc)/Dm * 100	-0.2	%
MEAN VELOCITY=	1.76	ft/sec
MANNING'S N=	0.065	
SLOPE=	0.014	ft/ft
.4 * Qm =	15.9	cfs
2.5 * Qm=	99.5	cfs

RECOMMENDED INSTREAM FLOW:
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FLOW (CFS)	PERIOD
===========	========
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________

RATIONALE FOR RECOMMENDATION:
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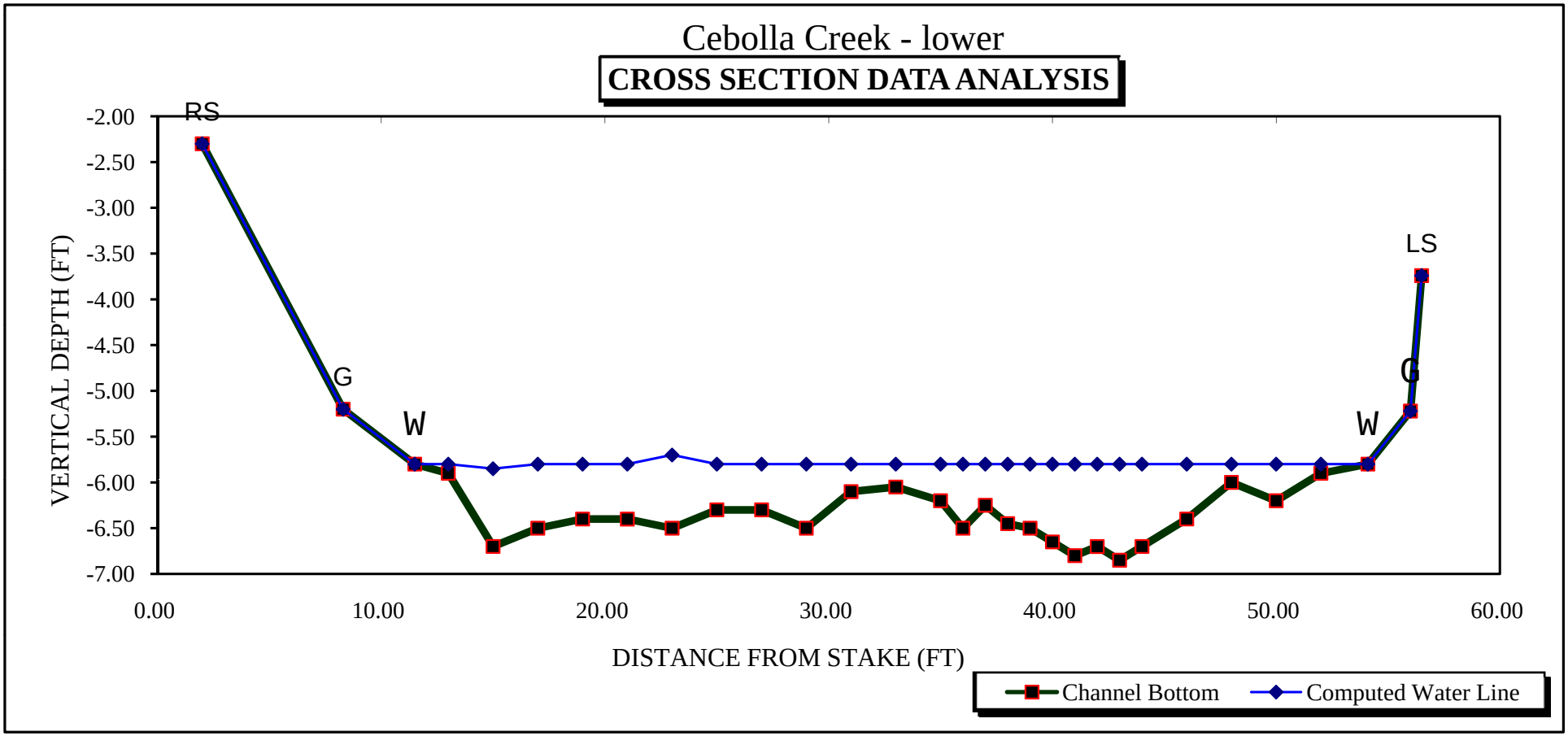
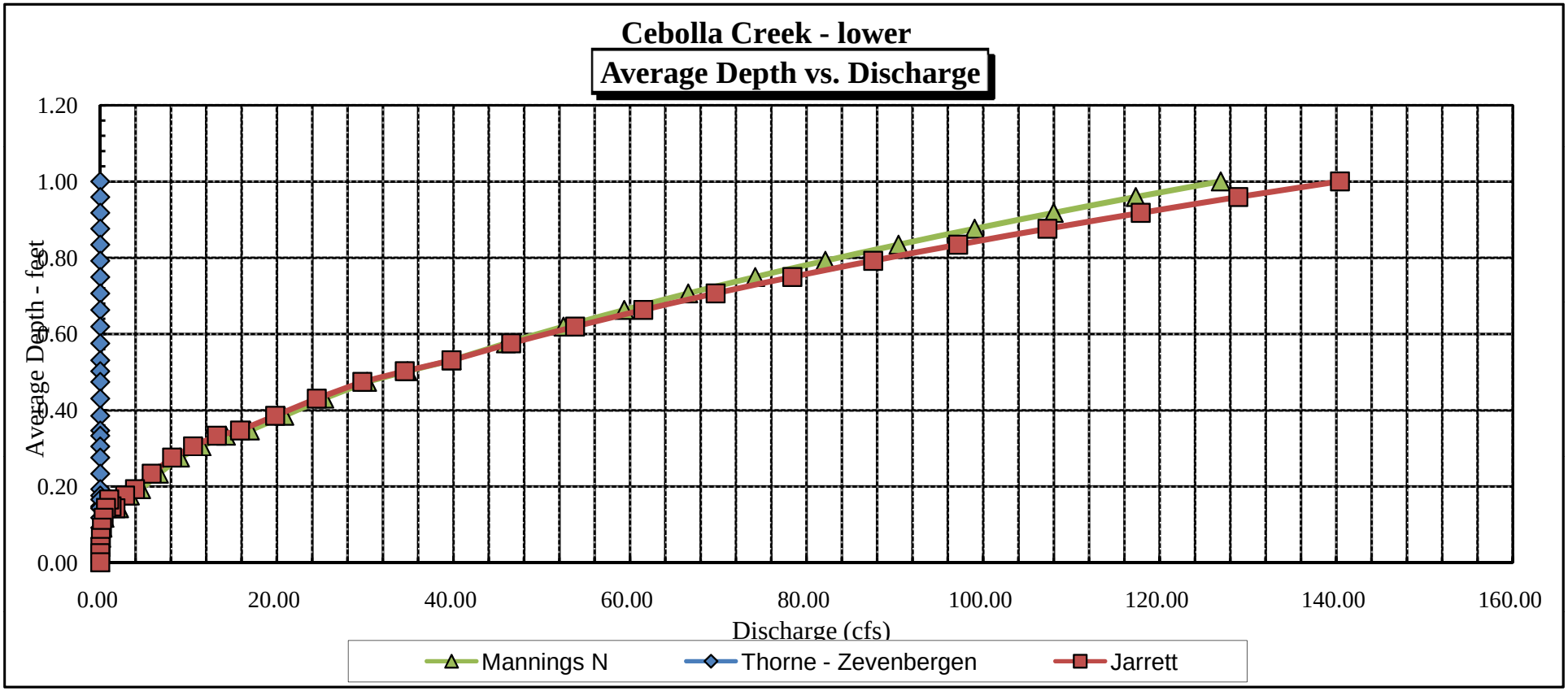
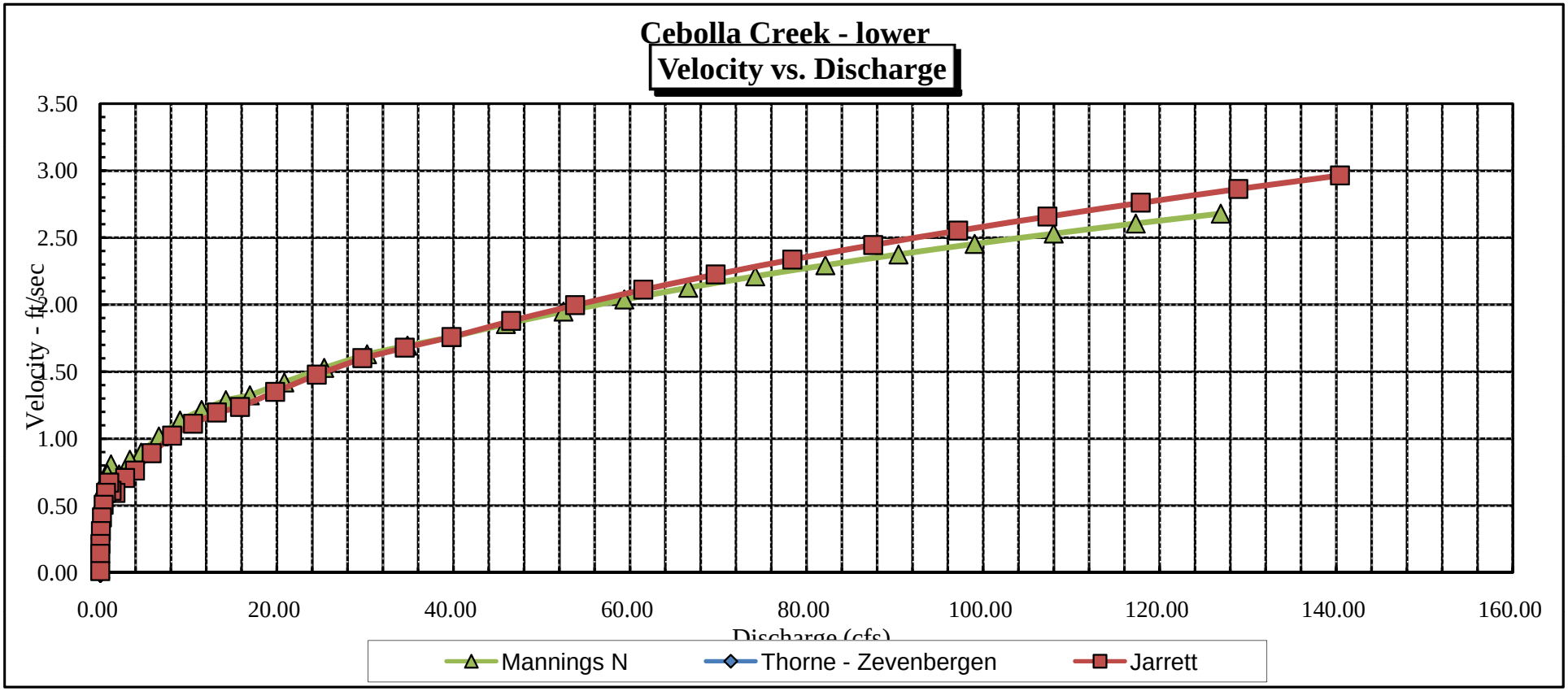
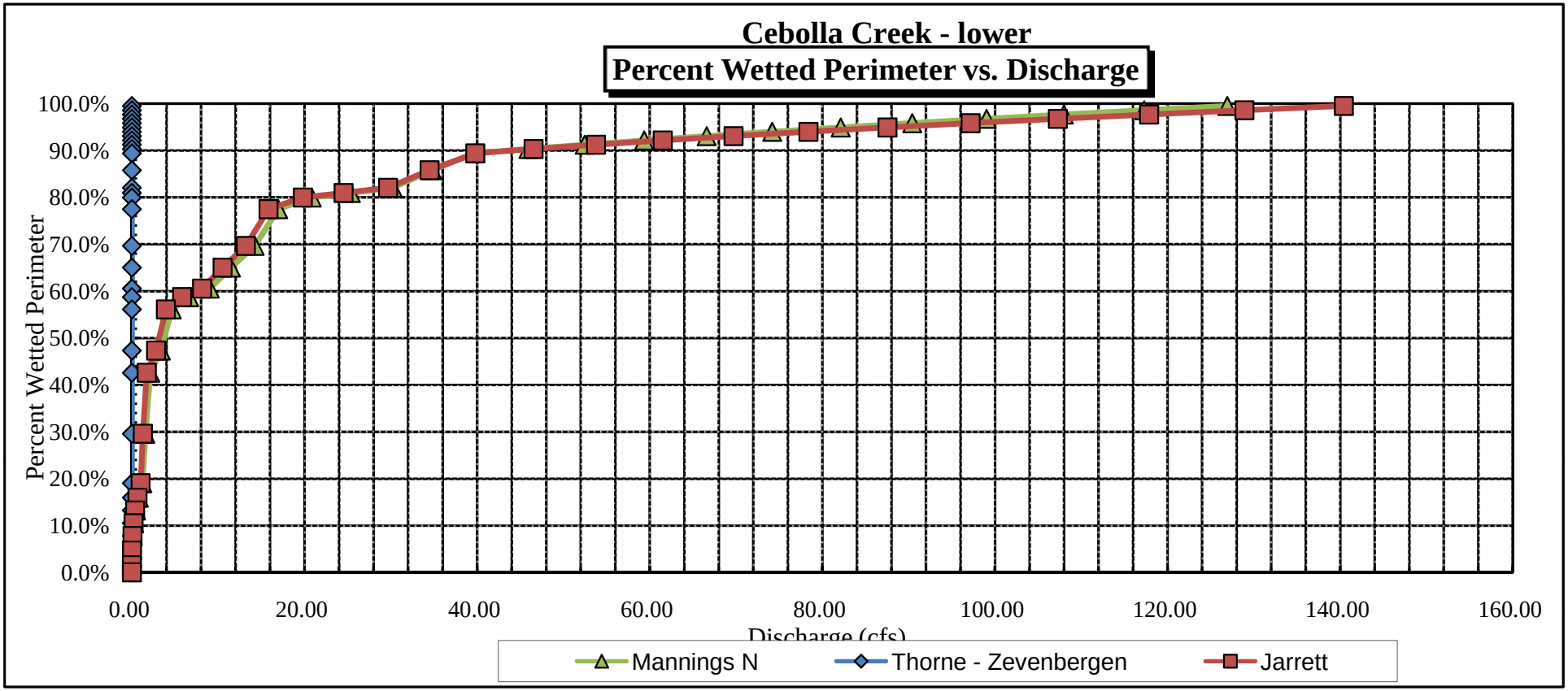
RECOMMENDATION BY: …………………...………..……............................... AGENCY...………………………......……....…....……...... DATE:.......…....…......……………

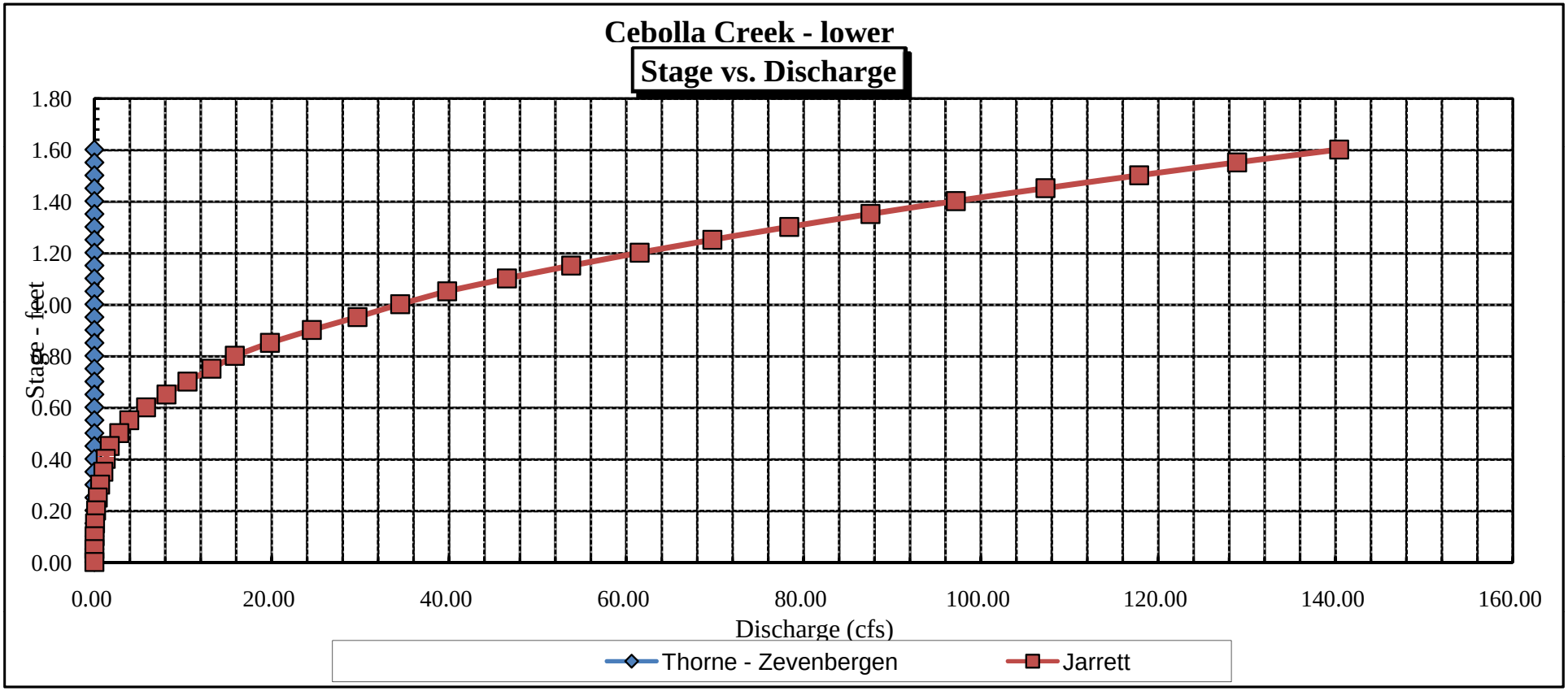
CWCB REVIEW BY: ..………………………….....……………………………………………………...…............. DATE:..................….……………...…


Cebolla Creek - lower
CROSS SECTION DATA ANALYSIS
RS
G
W
W
G
LS
-2.00
-2.50
-3.00
-3.50
-4.00
-4.50
-5.00
-5.50
-6.00
-6.50
-7.00
VERTICAL DEPTH (FT)
0.00
10.00
20.00
30.00
40.00
50.00
60.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Cebolla Creek - lower
Average Depth vs. Discharge
Average Depth - feet
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


Cebolla Creek - lower
Velocity vs. Discharge
Velocity - ft/sec
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


Cebolla Creek - lower
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


Cebolla Creek - lower
Stage vs. Discharge
Stage - 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)
Thorne - Zevenbergen
Jarrett

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

LOCATION INFORMATION

STREAM NAME:	Cebolla Creek - lower
XS LOCATION:	0.5 mile upstream from BLM campground
XS NUMBER:	2
DATE:	8-Oct-08
OBSERVERS:	R. Smith, A. Hayes
1/4 SEC:	SW
SECTION:	1
TWP:	45N
RANGE:	2W
PM:	N.M.
COUNTY:	Hinsdale
WATERSHED:	Gunnison
DIVISION:	4
DOW CODE:	38895
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:	0.008

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

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

STREAM NAME: Cebolla Creek - lower
XS LOCATION: 0.5 mile upstream from BLM campground
XS NUMBER: 2

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
LS	2.00	3.00			0.00		0.00	0.00	0.0%
	3.40	3.55			0.00		0.00	0.00	0.0%
1 G	3.80	4.36			0.00		0.00	0.00	0.0%
W	4.00	5.35			0.00		0.00	0.00	0.0%
	5.00	5.70	0.35	1.49	1.06	0.35	0.53	0.78	1.9%
	7.00	6.05	0.70	1.59	2.03	0.70	1.40	2.23	5.3%
	9.00	6.35	1.00	1.34	2.02	1.00	2.00	2.68	6.4%
	11.00	5.85	0.50	2.20	2.06	0.50	1.00	2.20	5.3%
	13.00	6.25	0.90	1.97	2.04	0.90	1.80	3.55	8.5%
	15.00	6.15	0.80	1.90	2.00	0.80	1.60	3.04	7.3%
	17.00	6.35	1.00	1.85	2.01	1.00	2.00	3.70	8.8%
	19.00	6.25	0.90	1.82	2.00	0.90	1.80	3.28	7.8%
	21.00	6.30	0.95	1.62	2.00	0.95	1.90	3.08	7.4%
	23.00	6.05	0.70	1.77	2.02	0.70	1.40	2.48	5.9%
	25.00	5.85	0.50	1.88	2.01	0.50	1.00	1.88	4.5%
	27.00	6.05	0.70	1.59	2.01	0.70	1.40	2.23	5.3%
	29.00	5.95	0.60	1.95	2.00	0.60	1.20	2.34	5.6%
	31.00	5.85	0.50	1.89	2.00	0.50	1.00	1.89	4.5%
	33.00	5.70	0.35	1.74	2.01	0.35	0.70	1.22	2.9%
	35.00	5.55	0.20	2.03	2.01	0.20	0.40	0.81	1.9%
	37.00	5.55	0.20	0.97	2.00	0.20	0.40	0.39	0.9%
	39.00	5.55	0.20	1.67	2.00	0.20	0.40	0.67	1.6%
	41.00	5.55	0.20	1.31	2.00	0.20	0.40	0.52	1.3%
	43.00	5.80	0.45	1.05	2.02	0.45	0.90	0.95	2.3%
	45.00	5.95	0.60	1.51	2.01	0.60	1.20	1.81	4.3%
	47.00	6.00	0.65	0.11	2.00	0.65	1.24	0.14	0.3%
W	48.80	5.35			1.91		0.00	0.00	0.0%
1 G	49.50	4.36			0.00		0.00	0.00	0.0%
	49.70	4.52			0.00		0.00	0.00	0.0%
RS	51.90	3.82			0.00		0.00	0.00	0.0%
TOTALS ----------					45.22	1 (Max.)	25.66	41.85	100.0%

Manning's n = 0.0559
Hydraulic Radius= 0.56749414

STREAM NAME: Cebolla Creek - lower
XS LOCATION: 0.5 mile upstream from BLM campground
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	25.66	25.66	0.0%
5.10	25.66	36.89	43.8%
5.12	25.66	35.99	40.3%
5.14	25.66	35.09	36.7%
5.16	25.66	34.19	33.2%
5.18	25.66	33.29	29.7%
5.20	25.66	32.39	26.2%
5.22	25.66	31.49	22.7%
5.24	25.66	30.59	19.2%
5.26	25.66	29.70	15.7%
5.28	25.66	28.80	12.2%
5.30	25.66	27.90	8.7%
5.31	25.66	27.45	7.0%
5.32	25.66	27.01	5.2%
5.33	25.66	26.56	3.5%
5.34	25.66	26.11	1.7%
5.35	25.66	25.66	0.0%
5.36	25.66	25.21	-1.7%
5.37	25.66	24.77	-3.5%
5.38	25.66	24.32	-5.2%
5.39	25.66	23.87	-7.0%
5.40	25.66	23.43	-8.7%
5.42	25.66	22.54	-12.2%
5.44	25.66	21.65	-15.6%
5.46	25.66	20.77	-19.1%
5.48	25.66	19.88	-22.5%
5.50	25.66	19.00	-25.9%
5.52	25.66	18.13	-29.4%
5.54	25.66	17.25	-32.8%
5.56	25.66	16.44	-35.9%
5.58	25.66	15.70	-38.8%
5.60	25.66	14.96	-41.7%

WATERLINE AT ZERO
AREA ERROR = 5.350

STREAM NAME: Cebolla Creek - lower
XS LOCATION: 0.5 mile upstream from BLM campground
XS NUMBER: 2 Constant Manning's n

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

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	4.36	46.40	1.52	1.99	70.51	48.22	100.0%	1.46	216.13	3.07
	4.40	46.19	1.49	1.95	68.66	47.94	99.4%	1.43	207.57	3.02
	4.45	45.93	1.44	1.90	66.36	47.58	98.7%	1.39	197.08	2.97
	4.50	45.66	1.40	1.85	64.07	47.22	97.9%	1.36	186.81	2.92
	4.55	45.53	1.36	1.80	61.79	47.01	97.5%	1.31	176.40	2.85
	4.60	45.48	1.31	1.75	59.52	46.90	97.3%	1.27	165.97	2.79
	4.65	45.44	1.26	1.70	57.24	46.79	97.0%	1.22	155.79	2.72
	4.70	45.39	1.21	1.65	54.97	46.68	96.8%	1.18	145.86	2.65
	4.75	45.35	1.16	1.60	52.70	46.56	96.6%	1.13	136.18	2.58
	4.80	45.30	1.11	1.55	50.44	46.45	96.3%	1.09	126.77	2.51
	4.85	45.25	1.06	1.50	48.17	46.34	96.1%	1.04	117.62	2.44
	4.90	45.21	1.02	1.45	45.91	46.23	95.9%	0.99	108.74	2.37
	4.95	45.16	0.97	1.40	43.65	46.11	95.6%	0.95	100.13	2.29
	5.00	45.12	0.92	1.35	41.40	46.00	95.4%	0.90	91.80	2.22
	5.05	45.07	0.87	1.30	39.14	45.89	95.2%	0.85	83.75	2.14
	5.10	45.03	0.82	1.25	36.89	45.78	94.9%	0.81	76.00	2.06
	5.15	44.98	0.77	1.20	34.64	45.67	94.7%	0.76	68.54	1.98
	5.20	44.94	0.72	1.15	32.39	45.55	94.5%	0.71	61.39	1.90
	5.25	44.89	0.67	1.10	30.14	45.44	94.2%	0.66	54.55	1.81
	5.30	44.85	0.62	1.05	27.90	45.33	94.0%	0.62	48.03	1.72
WL	5.35	44.80	0.57	1.00	25.66	45.22	93.8%	0.57	41.85	1.63
	5.40	44.52	0.53	0.95	23.43	44.92	93.1%	0.52	36.11	1.54
	5.45	44.24	0.48	0.90	21.21	44.62	92.5%	0.48	30.73	1.45
	5.50	43.96	0.43	0.85	19.00	44.32	91.9%	0.43	25.71	1.35
	5.55	37.67	0.45	0.80	16.81	38.02	78.8%	0.44	23.22	1.38
	5.60	36.33	0.41	0.75	14.96	36.65	76.0%	0.41	19.59	1.31
	5.65	34.98	0.38	0.70	13.18	35.28	73.2%	0.37	16.26	1.23
	5.70	33.63	0.34	0.65	11.46	33.91	70.3%	0.34	13.24	1.15
	5.75	32.14	0.31	0.60	9.82	32.40	67.2%	0.30	10.54	1.07
	5.80	30.65	0.27	0.55	8.25	30.89	64.1%	0.27	8.14	0.99
	5.85	28.89	0.23	0.50	6.76	29.12	60.4%	0.23	6.08	0.90
	5.90	25.35	0.21	0.45	5.41	25.55	53.0%	0.21	4.57	0.84
	5.95	21.81	0.19	0.40	4.23	21.97	45.6%	0.19	3.35	0.79
	6.00	16.94	0.19	0.35	3.26	17.07	35.4%	0.19	2.57	0.79
	6.05	14.20	0.17	0.30	2.48	14.31	29.7%	0.17	1.83	0.74
	6.10	13.02	0.14	0.25	1.80	13.11	27.2%	0.14	1.14	0.63
	6.15	11.83	0.10	0.20	1.18	11.91	24.7%	0.10	0.60	0.51
	6.20	9.15	0.07	0.15	0.65	9.20	19.1%	0.07	0.27	0.41
	6.25	6.47	0.04	0.10	0.26	6.50	13.5%	0.04	0.07	0.28
	6.30	2.03	0.03	0.05	0.05	2.05	4.2%	0.02	0.01	0.20
	6.35	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Cebolla Creek - lower
XS LOCATION: 0.5 mile upstream from BLM campground
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	41.85	cfs
CALCULATED FLOW (Qc)=	41.85	cfs
(Qm-Qc)/Qm * 100 =	0.0	%
MEASURED WATERLINE (WLm)=	5.35	ft
CALCULATED WATERLINE (WLc)=	5.35	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	1.00	ft
MAX CALCULATED DEPTH (Dc)=	1.00	ft
(Dm-Dc)/Dm * 100	0.0	%
MEAN VELOCITY=	1.63	ft/sec
MANNING'S N=	0.056	
SLOPE=	0.008	ft/ft
.4 * Qm =	16.7	cfs
2.5 * Qm=	104.6	cfs

RECOMMENDED INSTREAM FLOW:
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FLOW (CFS)	PERIOD
===========	========
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________

RATIONALE FOR RECOMMENDATION:
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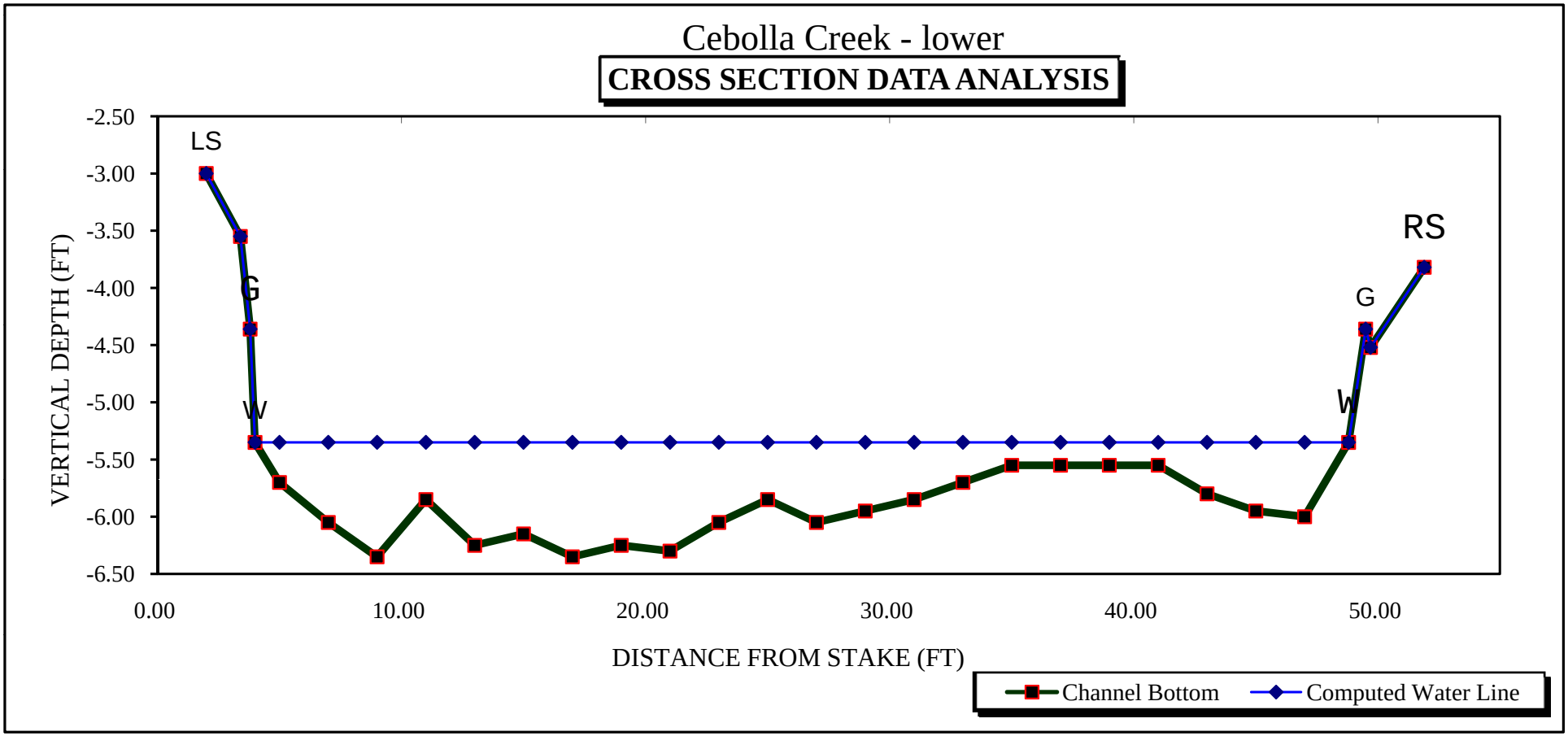
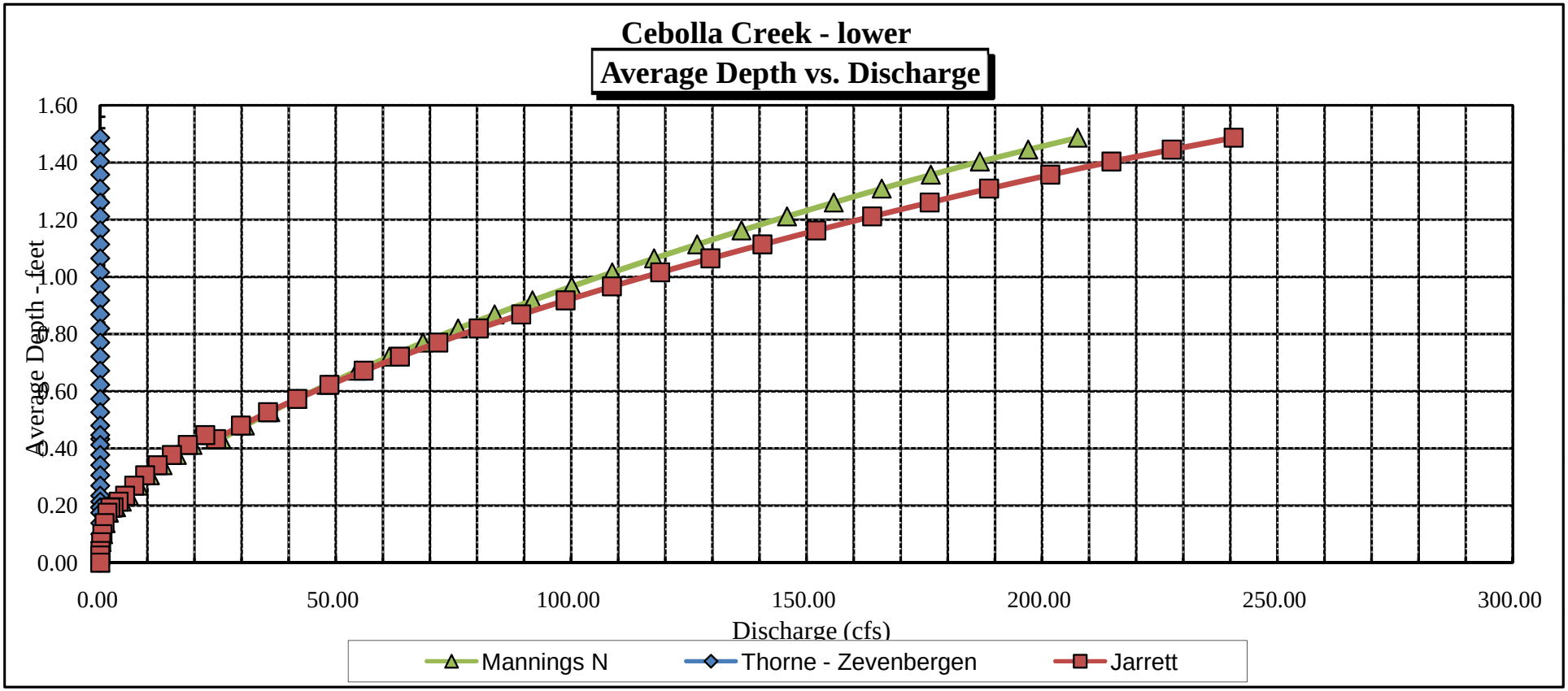
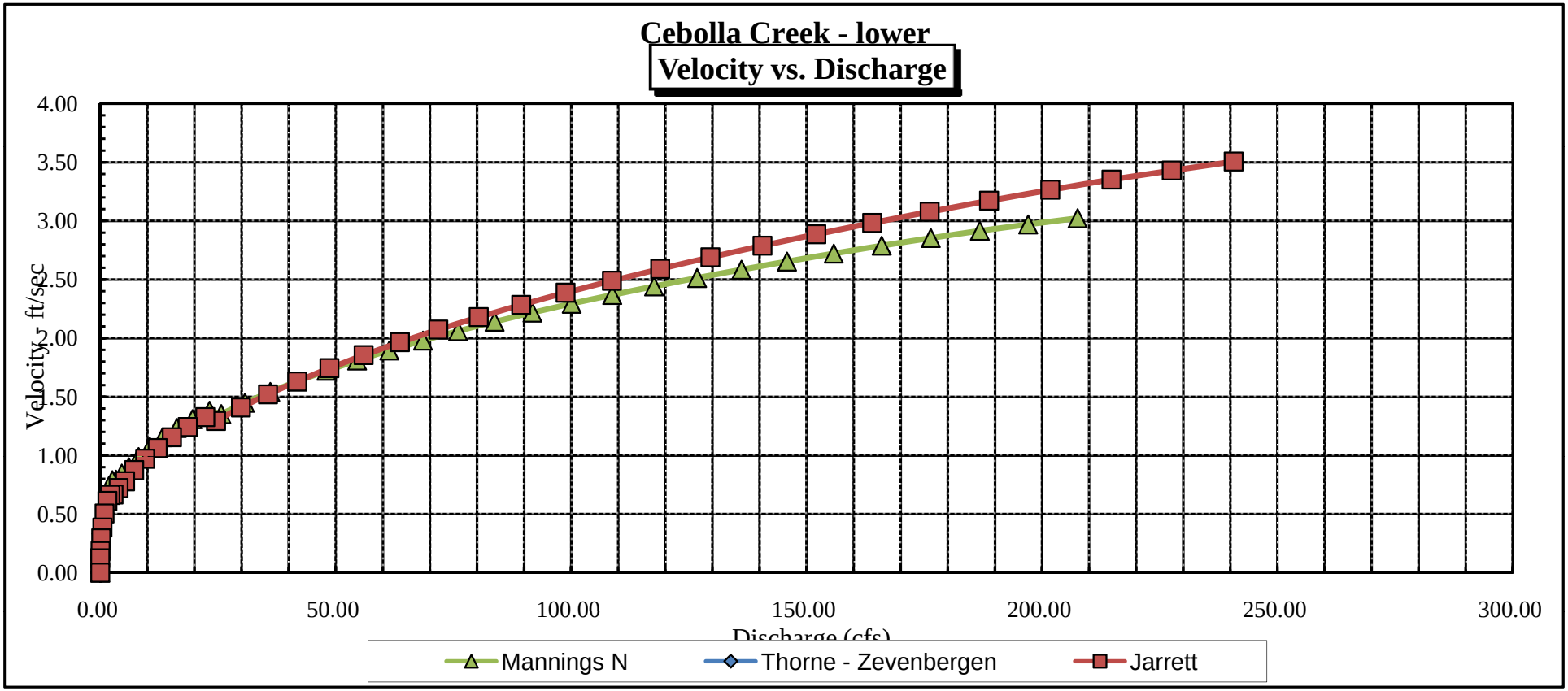
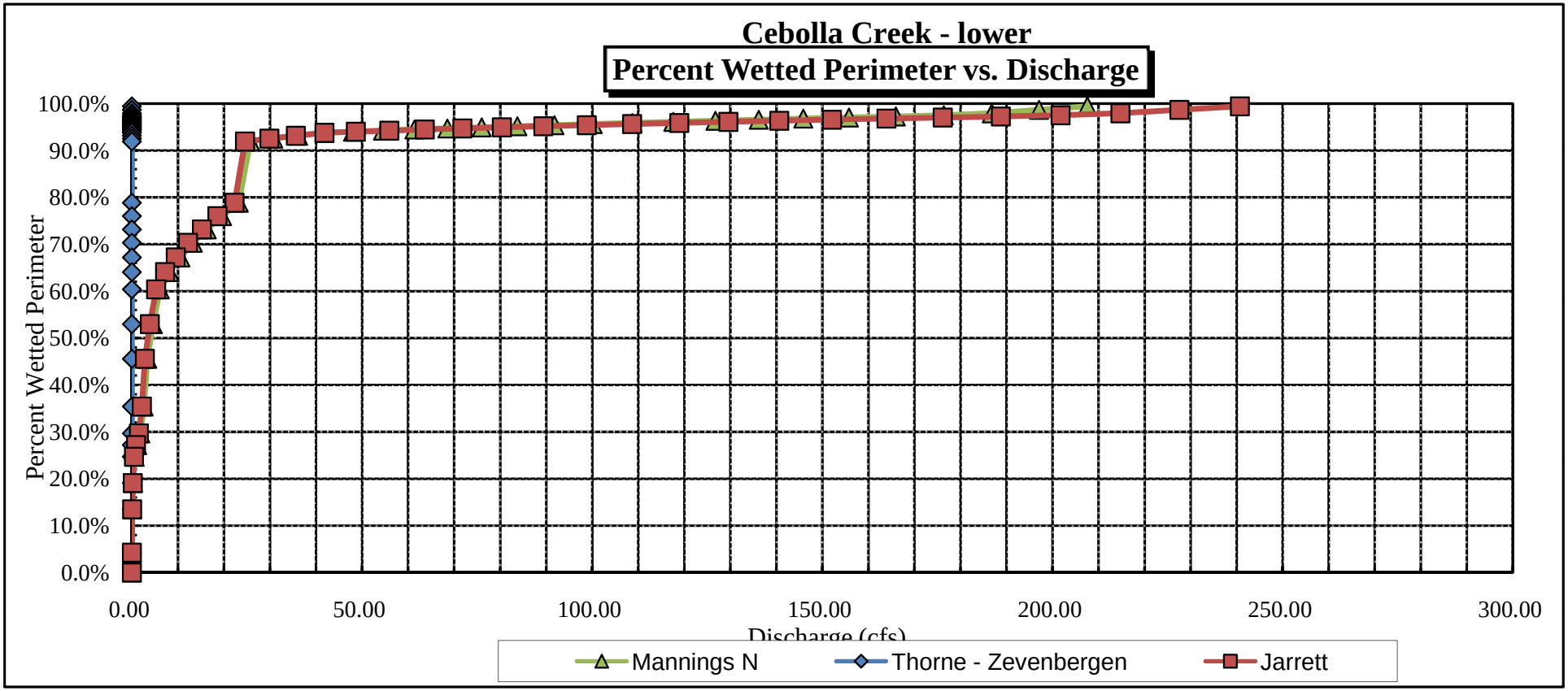
RECOMMENDATION BY: …………………...………..……............................... AGENCY..……………………......……....…....……...... DATE:.......…...…......……………

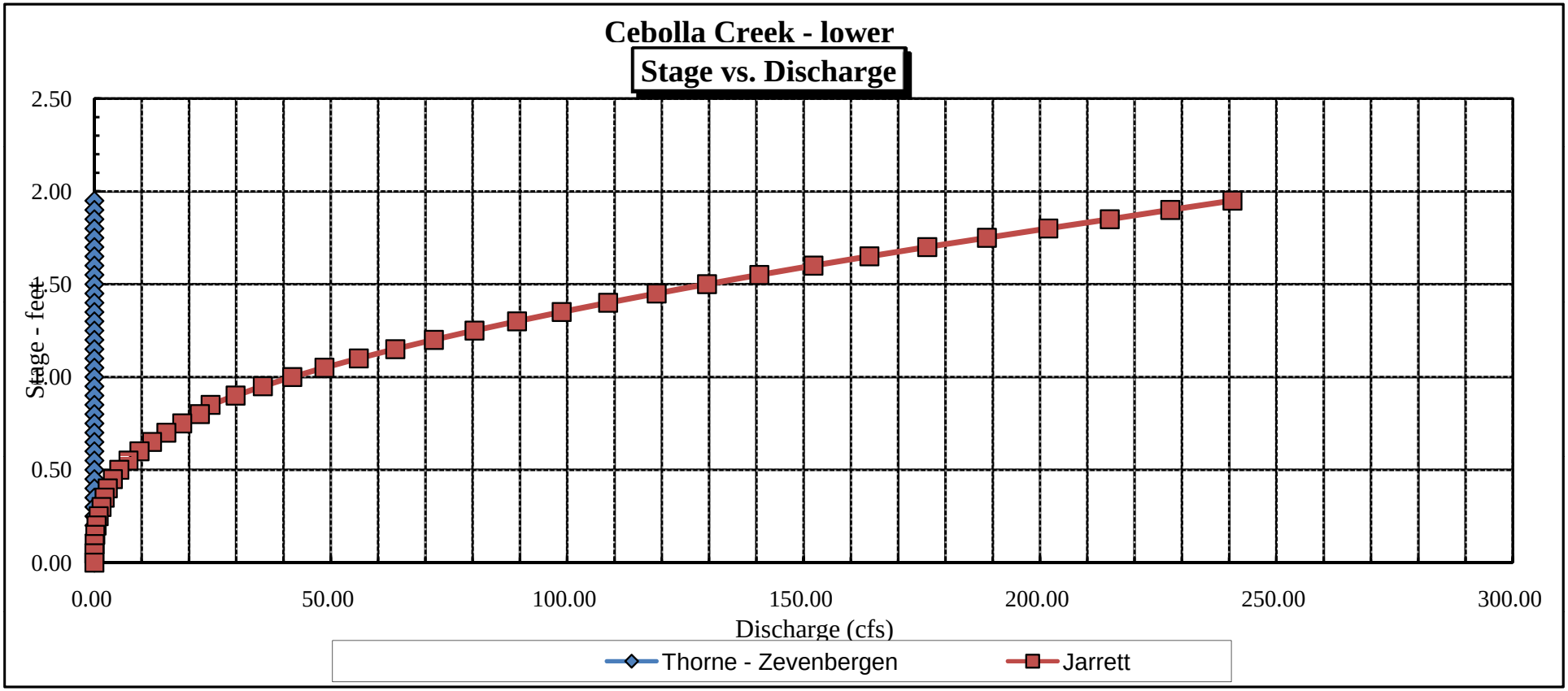
CWCB REVIEW BY: ..…………………………....…………………………………………………...…............. DATE:.................…………….....


Cebolla Creek - lower
CROSS SECTION DATA ANALYSIS
-2.50
-3.00
-3.50
-4.00
-4.50
-5.00
-5.50
-6.00
-6.50
VERTICAL DEPTH (FT)
LS
G
W
G
W
RS
0.00
10.00
20.00
30.00
40.00
50.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line


Cebolla Creek - lower
Average Depth vs. Discharge
Average Depth - feet
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
50.00
100.00
150.00
200.00
250.00
300.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Cebolla Creek - lower
Velocity vs. Discharge
Velocity - ft/sec
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.00
50.00
100.00
150.00
200.00
250.00
300.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Cebolla Creek - lower
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
50.00
100.00
150.00
200.00
250.00
300.00
Discharge (cfs)
Mannings N
Thorne - Zevenbergen
Jarrett


Cebolla Creek - lower
Stage vs. Discharge
Stage - feet
2.50
2.00
1.50
1.00
0.50
0.00
0.00
50.00
100.00
150.00
200.00
250.00
300.00
Discharge (cfs)
Thorne - Zevenbergen
Jarrett