

Stream: Rock Creek

Executive Summary

Water Division: 1
Water District: 6
CDOW#: 18259
CWCB ID#: 06/01/A-001

Segment:

Upper Terminus: Headwaters at

Latitude: 39d53'32.9"N Longitude: 105d13'53.9"W
UTM North: 4416449.673 UTM East: 480413.417
NW1/4, NE1/4, Sctn9, T2S, R70W
1948 ft, West of the East Section Line, 604 ft, South of the North Section Line

Lower Terminus: Rocky Flats Wildlife Refuge Boundary at:

Latitude: 39d54'53.43"N Longitude: 105d11'39.22"W
UTM North: 4418323.478 UTM East: 483400.262
SE1/4, SW1/4, Sctn30, T1S, R70W
1326 ft, West of the East Section Line, 923 ft, North of the South Section Line

Counties: Boulder

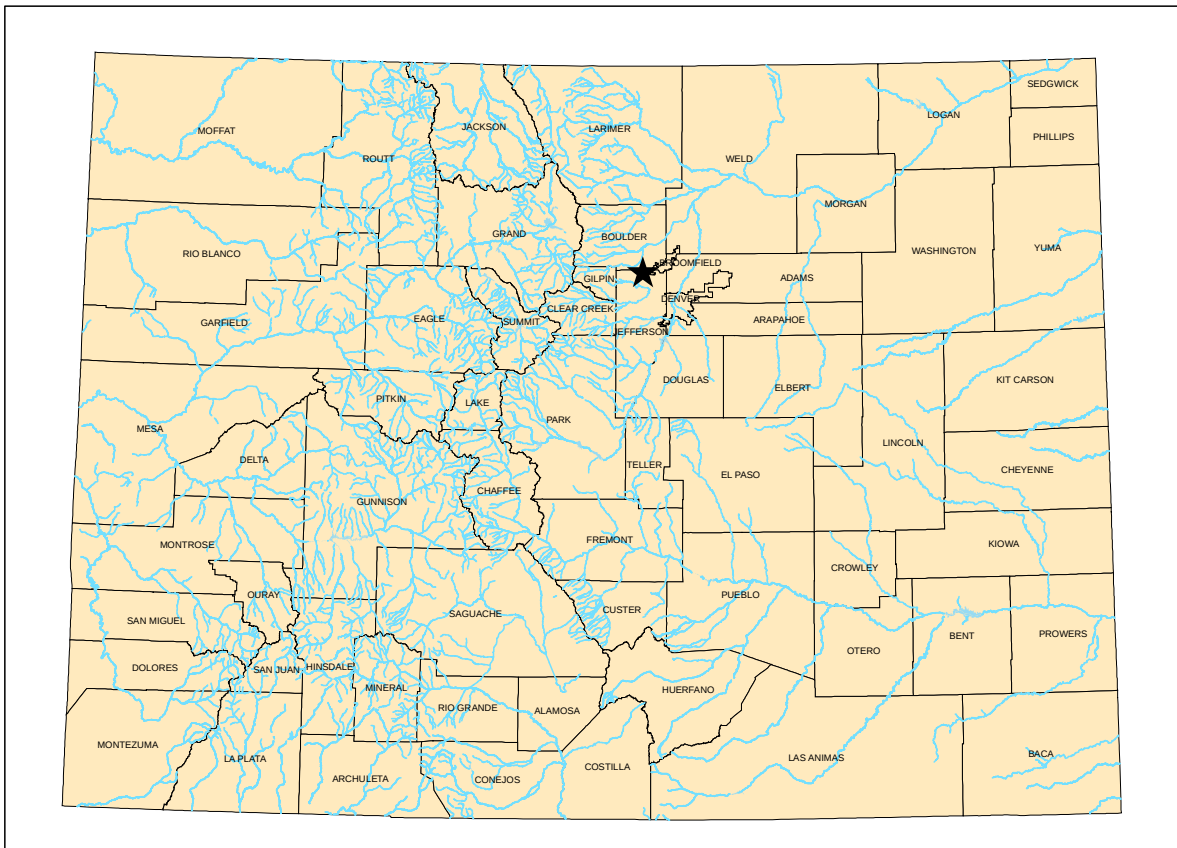
Length: 2.30 miles

USGS Quad(s): Louisville

ISF Appropriation: 0.25 cfs (11/01 - 02/28), 0.70 cfs (03/01 – 05/31),
0.10 cfs (06/01 – 10/31)



Rock Creek



Summary

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 Board. It is staff's opinion that the information contained in this report is sufficient to support the findings required in Rule 5 i.

Colorado's Instream Flow Program 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 CWCB 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 Instream Flow Program, the statute directs the CWCB to request instream flow recommendations from other state and federal agencies. The United States Fish and Wildlife Service (USFWS) and Colorado Division of Wildlife (CDOW) recommended this segment of Rock Creek to the CWCB for inclusion into the Instream Flow Program. Rock Creek is being considered for inclusion into the Instream Flow Program because it has a natural environment that can be preserved to a reasonable degree with an instream flow water right.

The USFWS is forwarding this stream flow recommendation to the CWCB to provide instream flow protection to Rock Creek through the Rocky Flats National Wildlife Refuge (NWR). It was concluded in the Colorado Native Aquatic Species Protection Workshop (1995) that about one-third of the native amphibian species and a little over one-half of the native fish species in Colorado are considered at risk of extinction, or already have been lost. This challenge suggested the need for a proactive effort to assure protection of Colorado aquatic native species, and where possible, an increase in the size and distribution of those species. Approximately 75% of the wildlife species known or likely to occur in Colorado are dependent on riparian areas during all or a portion of their life cycle. This is especially significant when we realize that riparian areas make up less than 1% of the land mass in Colorado (CDOW Wetland Mapping Page 01/27/04). This system has the richest avian species component of any of Colorado's habitats. Many other native species depend on this habitat for a diverse food source, cover habitat and for resting, mating and rearing of young.

Riparian habitat depends on surface flows and groundwater. Dynamic ecological processes are critical to create and maintain riparian habitat. Geomorphologic and hydrological components shape streams, rivers, and floodplains, and create conditions that support unique riparian habitat on the Front Range. Riparian habitat is maintained over time along waterways by a natural flooding regime that periodically scours riparian vegetation, reworks stream channels, floodplains, and benches, and redistributes sediments such that a pattern of appropriate vegetation is present along river and stream edges, and throughout their floodplains. Periodic disturbance of riparian areas sets back succession and promotes dense, low-growing shrubs and lush herbaceous vegetation. Where flows are controlled to preclude a natural pattern and other disturbance is limited, a less favorable mature successional stage of vegetation dominated by cottonwoods or other trees may develop. Human development has produced profound changes in the hydrology of streams flowing east from the Colorado Front Range. Compton and Hugie (1993) concluded that management of water for commercial and residential use tends to channelize and isolate water resources, and has reduced in size and fragmented riparian habitats.

It is important to identify and protect those riparian habitats which are currently undisturbed. Rock Creek originates in Rocky Flats NWR in Boulder County. This area has a rich array of biota. Elk use the drainage as a calving area, and mule deer are frequently seen throughout the drainage. Rock Creek's riparian community supports a population of Preble's Meadow Jumping Mouse which is on the National List of Threatened Species. In 2002, the Colorado Division of Wildlife and the U.S. Fish and Wildlife Service cooperated to reintroduce northern redbelly dace and the common shiner, state listed fish species, into this drainage in Lindsay Ponds. Both species have since become well established. Without careful planning, this unique riparian habitat at Rocky Flats could be affected by disrupting the current hydrology by water use in the upper reaches of Rock Creek.

Currently the Ute Ladies' Tresses Orchid (Federally listed as threatened in 1992) and the Colorado butterfly plant (candidate since 1975 and listed as threatened in October 2000) have not been found in the Rock Creek Drainage within Rocky Flats NWR. Although they require the same habitat as the Preble's Meadow Jumping Mouse, the USFWS and other botanists feel that with better land management practices they could establish in front range riparian habitat of Rock Creek.

The CDOW is forwarding this stream flow recommendation to the CWCB to meet the State of 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” C.R.S. 33-1-101 (1). The CDOW Strategic Plan states “Healthy aquatic environments are essential to maintain healthy and viable fisheries, and critical for self-sustaining populations. The Division desires to protect and enhance the quality and quantity of aquatic habitats.”

Rock Creek is approximately 13.0 miles long. It begins on the east side of Coal Creek Peak at an elevation of approximately 6,130 feet and terminates at the confluence with Coal Creek at an elevation of approximately 5120 feet. Of the 2.30 mile segment addressed by this report, approximately 100% of the segment, or 2.30 miles, is located on public lands, while the remainder of the segment, 0 miles, is located on private lands. Rock Creek is located within Boulder County. The total drainage area of the river is approximately 2.7 square miles. Rock Creek generally flows in an easterly direction.

The subject of this report is a segment of Rock Creek beginning at its headwaters within Rocky Flats NWR and extending downstream to the wildlife boundaries at Colorado State Highway 128. The proposed segment is located south of the Town of Superior. The staff has received two recommendations for this segment, from the USFWS and CDOW. The recommendations for this segment are discussed below.

Instream Flow Recommendation(s)

The CDOW has recommended a flow of 0.7 cfs, year-round, based on their data collection efforts (see Table 1 and Appendix A). The modeling results from this survey effort are within the confidence interval produced by the R2CROSS model.

Land Status Review

Upper Terminus	Lower Terminus	Total Length (miles)	Land Ownership	
			% Private	% Public
Headwaters	Rocky Flats Boundary	2.25	0%	100%

100% of the public lands are owned by the USFWS.

Biological and Field Survey Data

The CDOW has conducted field surveys of the fishery resources on this stream and have found a natural environment that can be preserved. As reported in the letter from CDOW to the CWCB “Rock Creek is classified as a minor stream (between 4 to 9 feet wide) and fishery surveys indicate the stream environment of Rock Creek supports populations of White sucker (*Catostomus commersoni*), Green sunfish (*Lepomis cyanellus*), Central stonerollers (*Camptostoma anomalum*), Creek chub (*Semotilus atromaculatus*), Fathead minnows (*Pimephales promelas*), Common shiner (*Notropis cornutus*) and Northern redbelly dace

(*Phoxinus eos*). The Common shiner (State Threatened) and the Northern redbelly dace (State Endangered) have been identified by the CDOW and others as species of special concern” (See CDOW 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 types that would dry up first should streamflow cease. This type of hydraulic data collection consists of setting up transects, 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 CWCB staff relied 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 instream flow hydraulic parameters, average depth, percent wetted perimeter, and average velocity are used to develop biologic instream flow recommendations. The CDOW has 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 (October 10, 1998), 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)
DOW	6/6/05	0.16	0.4 – 0.1	?	0.4
DOW	6/6/05	0.11	0.3 – 0.0	?	0.2
DOW	6/6/05	0.61	1.5 – 0.2	5.1 ⁽¹⁾	1.5

DOW = Division of Wildlife

(1) Predicted flow outside of the accuracy range of Manning’s Equation. ? = Criteria never met in R2CROSS Staging Table.

Biologic Flow Recommendation

The summer flow recommendation of 5.1 cfs, which met 3 of 3 criteria was outside the accuracy range of the R2CROSS model (See Table 1). The winter flow recommendations, which met 2 of 3 criteria and were within the accuracy range of the R2CROSS model, ranged from 1.5 cfs to 0.2

cfs. Averaging the three winter flow recommendations, within range of the model, results in a flow recommendation of 0.7 cfs (See Table 1).

Hydrologic Data

After receiving the cooperating agency's biologic recommendation, the CWCB staff conducted an 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 stream gage for Rock Creek in Rocky Flats NWR from 1992 to 2004, which has a drainage area of 2.7 square miles (See Gage Summary in Appendix C). The total drainage area of this segment of the Rock Creek is approximately 2.7 square miles. The period of record for this gage was 1992 to 2004, the period of record used by staff in their analysis was 1992 to 2004, or 12 years of record. Table 2 below displays the estimated flow of Rock Creek at the gage.

Table 2: Estimated Stream Flow in Rock Creek:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
cfs	0.21	0.25	1.02	2.31	1.10	0.18	0.04	0.11	0.04	0.13	0.28	0.23

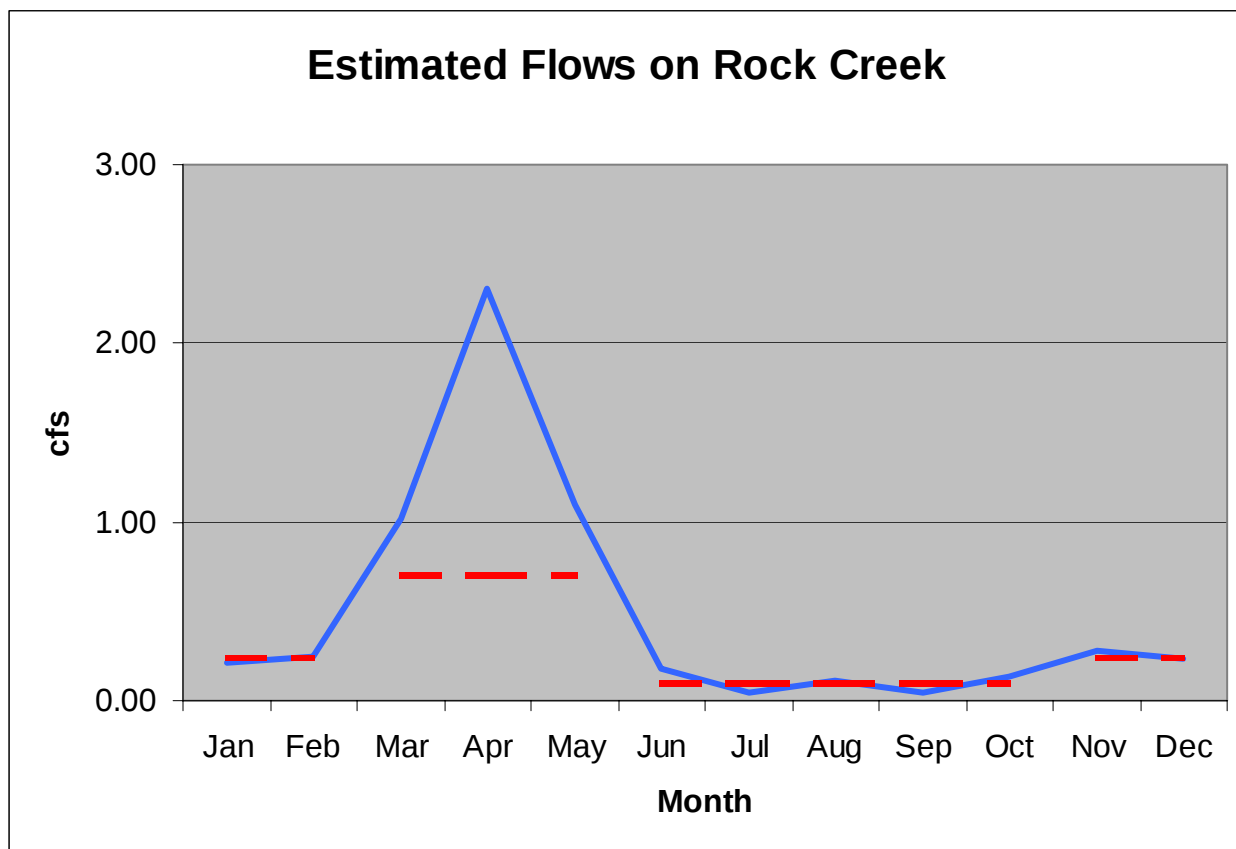
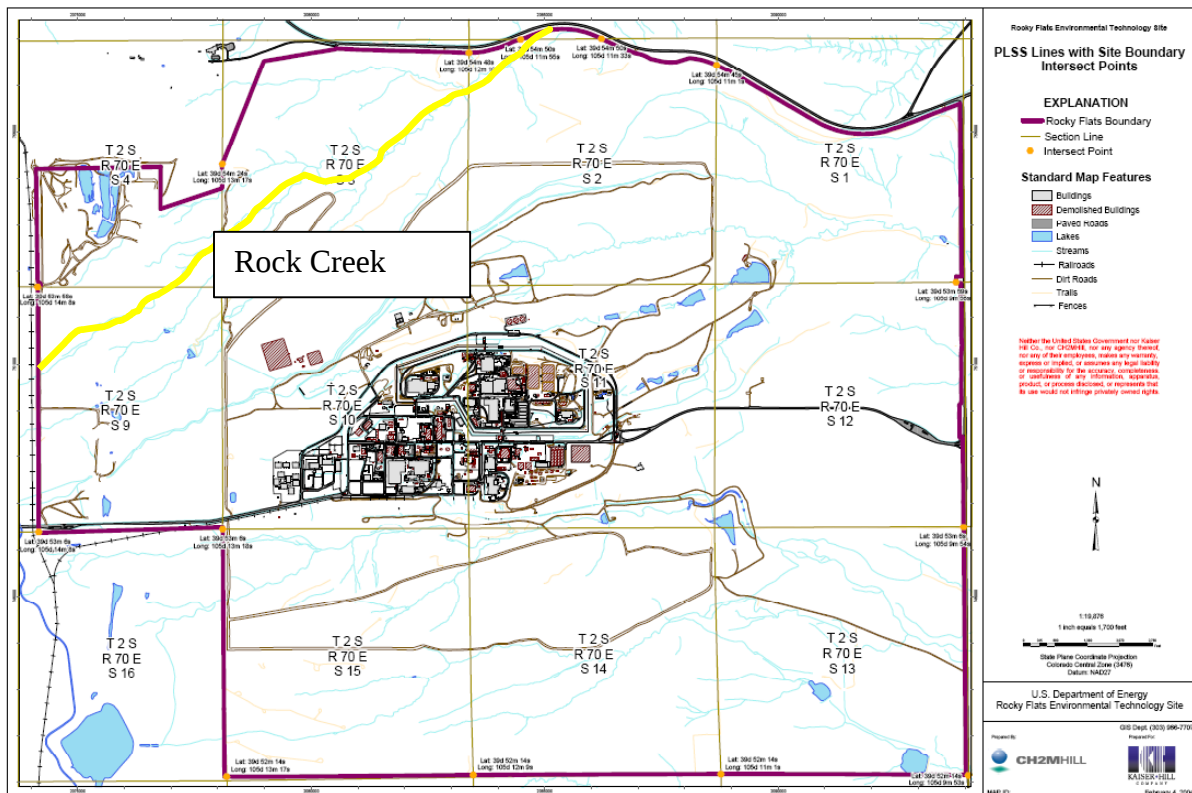


Table 2 shows that the year round flow recommendation of 0.70 cfs is available on average from March 1st through May 31st. Based on water availability, the winter recommendation of 0.70 cfs

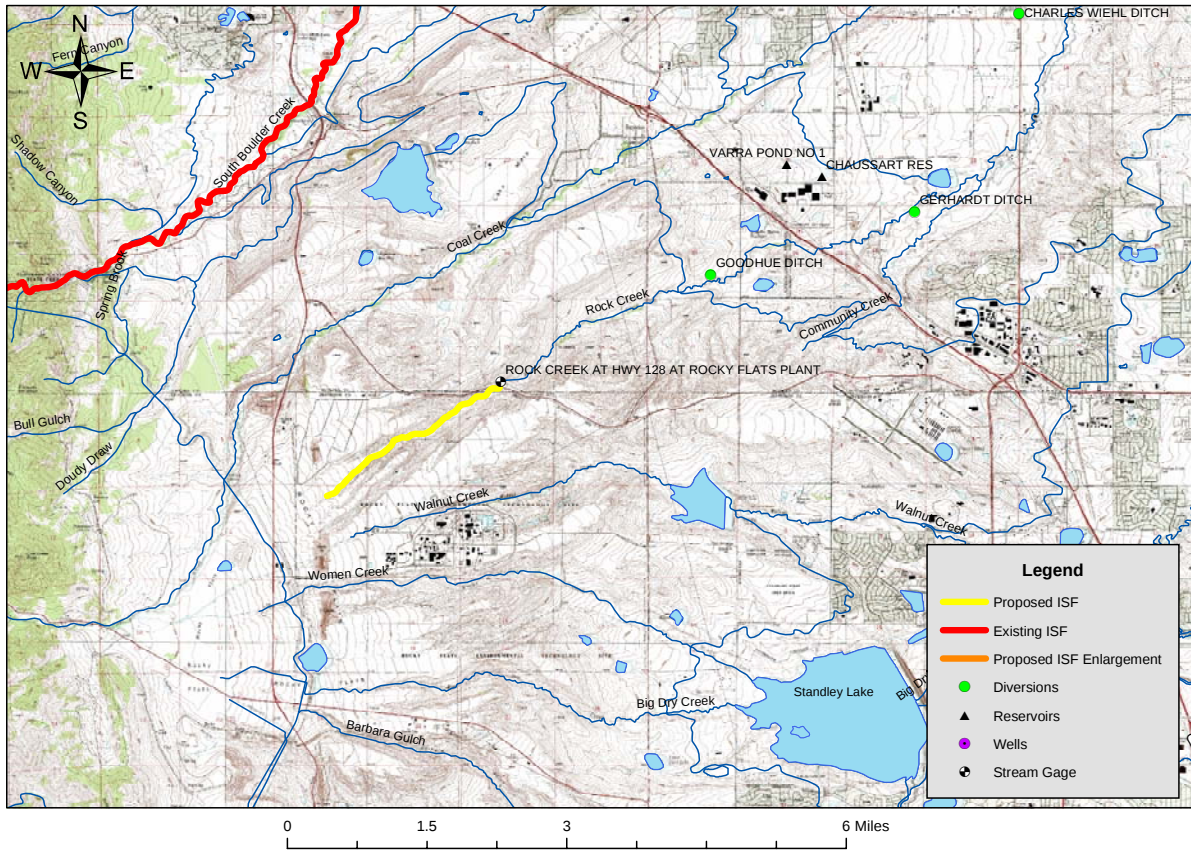
was not available and was further reduced to 0.25 cfs from November 1st through February 28th. The winter flow recommendation was further reduced to 0.10 cfs from June 1st through October 31st based on water availability.

Existing Water Right Information

Staff has analyzed the water rights tabulation and consulted with the Division Engineer's Office (DEO) to identify any potential water availability problems. Records indicate that there are no surface water diversions located within this reach of Rock Creek. Upstream of this segment, several decreed and undeclared water uses have been identified that may have a hydrologic connection to Rock Creek. Staff has met with the landowner located upstream of this segment and is currently working to document his uses in order to recognize these uses as senior to the proposed instream flow water right. According to the DEO, there is usually sufficient water available within this stream reach to satisfy the recommended instream flow amount. Based on this analysis, staff has determined that water is available for appropriation on Rock Creek, from the headwaters to Rocky Flats NWR Boundary (Highway 128), to preserve the natural environment to a reasonable degree without limiting or foreclosing the exercise of valid existing water rights.



Rock Creek



CWCB Staff's Instream Flow Recommendation

Based on the CDOW recommendation, staff recommends the Board form its intent to appropriate on the following stream reach:

Stream Name: Rock Creek

Segment:

Upper Terminus: Headwaters at

Latitude: 39d53'32.9"N Longitude: 105d13'53.9"W

UTM North: 4416449.673 UTM East: 480413.417

NW1/4, NE1/4, Sctn9, T2S, R70W

1948 ft, West of the East Section Line, 604 ft, South of the North Section Line

Lower Terminus: Rocky Flats Wildlife Refuge Boundary at:

Latitude: 39d54'53.43"N Longitude: 105d11'39.22"W

UTM North: 4418323.478 UTM East: 483400.262

SE1/4, SW1/4, Sctn30, T1S, R70W

1326 ft, West of the East Section Line, 923 ft, North of the South Section Line

Counties: Boulder

Length: 2.30 miles

USGS Quad(s): Louisville

ISF Appropriation: 0.25 cfs (11/01 - 02/28), 0.70 cfs (03/01 – 05/31),
 0.10 cfs (06/01 – 10/31)

APPENDIX – A
ISF Recommendation

BA WTR
WR CO
Mail Stop 60189

Mr. Dan Merriman
Colorado Water Conservation Board
Stream and Lake Protection Team
1313 Sherman Street, Room 723
Denver, Colorado 80203

Re: U.S. Fish and Wildlife Service Instream Flow Recommendations for Rock Creek

Dear Mr. Merriman:

The U.S. Fish and Wildlife Service (USFWS) is writing this letter to formally communicate its instream flow recommendation for Rock Creek, located within Rocky Flats National Wildlife Refuge (NWR), in Water Division 1.

Location and Land Status: Rock Creek flows through the Rocky Flats NWR which is located within Boulder County. The total drainage area of the creek is approximately 2.7 square miles, and it generally flows in an easterly direction. One hundred percent of the stream length which is recommended for instream flow protection is public land owned by the United States.

Biological Summary: Rock Creek is classified as a minor stream (between 4 to 9 feet wide) which supports a lush undisturbed riparian habitat. Approximately 75% of the wildlife species known or likely to occur in Colorado are dependent on riparian areas during all or a portion of their life cycle. This is especially significant when we realize that riparian areas make up less than 1% of the land mass in Colorado (CDOW Wetland Mapping Page 01/27/04). This system has the richest avian species component of any of Colorado's habitats. Many other native species depend on this habitat for a diverse food source, cover habitat and for resting, mating and rearing of young. Front Range riparian areas support a rich variety of biota including threatened species such as the Preble's Meadow Jumping Mouse and recently reintroduced northern redbelly dace and the common shiner, state listed fish species.

R2CROSS Analysis: USFWS's data analysis, coordinated with the Colorado Division of Wildlife's R2CROSS Analysis, indicates that the following flows are needed to protect the fishery and natural environment to a reasonable degree.

The year round flow recommendation of 0.70 cfs is available on average from March 1st through May 31st. Based on water availability, the winter recommendation of 0.70 cfs was not available and was further reduced to 0.25 cfs from November 1st through February 28th. The winter flow recommendation was further reduced to 0.10 cfs from June 1st through October 31st based on water availability.

The USFWS requests that the Colorado Water Conservation Board recognize that this recommendation is based upon the minimum flows necessary to support a fishery and the uncommon Front Range riparian habitat found within the Refuge.

If you have any questions regarding our instream flow recommendations, please contact Jana Mohrman at 303-236-4486.

Sincerely,

Cheryl C. Williss
Chief, Division of Water Resources

bcc: WTR rf
Refuges (CO, KS, NE)
Rocky Flats NWR

WTR:JMohrman:cc:01/05/2006
I:\Jana\1Refuges\Co\Rocky Flats\ Official Request for instreamflow.wpd

APPENDIX – B
Field Data

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

LOCATION INFORMATION

STREAM NAME Rock Creek - RCL
XS LOCATION ~ 50' u/s of flume (lat 39 54' 53" long 105 11' 44 1")
XS NUMBER RCL

DATE 6-Jun-05
OBSERVERS Uppendahl, Doherty, Dilger, Mohrman

1/4 SEC SW
SECTION 35
TWP 1 S
RANGE 70 W
PM 6

COUNTY BOULDER
WATERSHED BOULDER CREEK
DIVISION 1
DOW CODE 0

USGS MAP LOUISVILLE
USFS MAP 0

SUPPLEMENTAL DATA

*** NOTE ***

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

TAPE WT 0.0106
TENSION 99999

CHANNEL PROFILE DATA

SLOPE 0.0365

INPUT DATA CHECKED BY DATE
ASSIGNED TO DATE

STREAM NAME Rock Creek - RCL
 XS LOCATION ~ 50' W/s of Home (lat 39 54' 53" long 105 11' 44 1")
 XS NUMBER RCL

DATA POINTS= 18

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL
1 S/G	0.00	4.40		
	0.70	5.10		
W	2.40	5.61	0.00	0.00
	2.80	5.75	0.15	0.09
	3.20	5.75	0.15	0.27
	3.60	5.85	0.25	0.37
R	4.00	5.85	0.25	0.67
	4.40	5.85	0.30	0.67
	4.80	5.95	0.35	0.85
	5.20	5.95	0.35	1.05
	5.60	5.90	0.30	0.51
	6.00	5.90	0.30	0.33
	6.40	5.85	0.25	0.26
	6.80	5.75	0.15	0.11
W	6.90	5.60	0.00	0.00
	9.00	5.10		
1 G	12.00	4.45		
S	13.40	3.95		

WETTED PERIM	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.42	0.15	0.06	0.01	0.9%
0.40	0.15	0.06	0.02	2.7%
0.41	0.25	0.10	0.04	6.1%
0.40	0.25	0.10	0.07	11.1%
0.40	0.30	0.12	0.08	13.3%
0.41	0.35	0.14	0.12	19.7%
0.40	0.35	0.14	0.15	24.4%
0.40	0.30	0.12	0.06	10.2%
0.40	0.30	0.12	0.04	6.0%
0.40	0.25	0.10	0.03	4.3%
0.41	0.15	0.04	0.00	0.7%
0.18		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%

TOTALS

4.65 0.35 1.10 0.50 100.0%
 (Max)

Manning's n = 0.1974
 Hydraulic Radius = 0.236162318

STREAM NAME Rock Creek - RCL
 XS LOCATION ~ 50' u/s of flume (lat 39 54' 53" long 105 11' 44 1")
 XS NUMBER RCL

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	1.10	1.06	-3.7%
5.36	1.10	2.42	120.2%
5.38	1.10	2.29	108.7%
5.40	1.10	2.17	97.5%
5.42	1.10	2.05	86.5%
5.44	1.10	1.93	75.9%
5.46	1.10	1.82	65.5%
5.48	1.10	1.71	55.4%
5.50	1.10	1.60	45.5%
5.52	1.10	1.49	36.0%
5.54	1.10	1.39	26.7%
5.56	1.10	1.29	17.7%
5.57	1.10	1.24	13.3%
5.58	1.10	1.20	8.9%
5.59	1.10	1.15	4.6%
5.60	1.10	1.10	0.4%
5.61	1.10	1.06	-3.7%
5.62	1.10	1.01	-7.8%
5.63	1.10	0.97	-11.8%
5.64	1.10	0.92	-15.9%
5.65	1.10	0.88	-19.9%
5.66	1.10	0.84	-23.8%
5.68	1.10	0.75	-31.7%
5.70	1.10	0.67	-39.4%
5.72	1.10	0.58	-47.0%
5.74	1.10	0.50	-54.4%
5.76	1.10	0.42	-61.5%
5.78	1.10	0.35	-67.9%
5.80	1.10	0.29	-73.9%
5.82	1.10	0.22	-79.7%
5.84	1.10	0.16	-85.2%
5.86	1.10	0.11	-90.0%

WATERLINE AT ZERO
 AREA ERROR = 5.596

STREAM NAME Rork Creek - RCL
 XS LOCATION ~ 50' ups of flume (lat 33 54' 53" long 105 11' 44 1")
 XS NUMBER RCL

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 RADIIUS (FT)	FLOW (CFS)	AVG VELOCITY (FT/SEC)
GL	4.45	11.95	0.91	1.50	10.87	12.57	100.0%	0.66	14.12	1.31
	4.60	11.13	0.83	1.35	9.18	11.67	92.9%	0.79	11.25	1.23
	4.65	10.85	0.80	1.30	8.63	11.37	96.4%	0.76	10.34	1.20
	4.70	10.57	0.77	1.25	8.10	11.06	88.0%	0.73	9.46	1.17
	4.75	10.29	0.74	1.20	7.58	10.75	85.5%	0.70	8.63	1.14
	4.80	10.01	0.71	1.15	7.07	10.45	83.1%	0.68	7.84	1.11
	4.85	9.73	0.68	1.10	6.58	10.14	80.7%	0.65	7.09	1.08
	4.90	9.45	0.65	1.05	6.10	9.83	78.2%	0.62	6.38	1.05
	4.95	9.16	0.61	1.00	5.63	9.53	75.8%	0.59	5.70	1.01
	5.00	8.88	0.58	0.95	5.18	9.22	73.3%	0.56	5.07	0.96
	5.05	8.60	0.55	0.90	4.74	8.91	70.9%	0.53	4.48	0.94
	5.10	8.32	0.52	0.85	4.32	8.60	68.5%	0.50	3.92	0.91
	5.15	7.95	0.48	0.80	3.91	8.22	65.4%	0.48	3.43	0.88
	5.20	7.58	0.47	0.75	3.53	7.83	62.3%	0.45	2.98	0.84
	5.25	7.20	0.44	0.70	3.16	7.44	59.2%	0.42	2.56	0.81
	5.30	6.82	0.41	0.65	2.81	7.05	56.1%	0.40	2.18	0.78
	5.35	6.45	0.38	0.60	2.47	6.66	53.0%	0.37	1.84	0.74
	5.40	6.07	0.36	0.55	2.16	6.27	49.9%	0.34	1.53	0.71
	5.45	5.69	0.33	0.50	1.87	5.88	46.8%	0.32	1.25	0.67
	5.50	5.32	0.30	0.45	1.59	5.49	43.7%	0.29	1.00	0.63
	5.55	4.94	0.27	0.40	1.34	5.10	40.6%	0.26	0.79	0.59
WL	5.60	4.56	0.24	0.35	1.10	4.71	37.5%	0.23	0.60	0.54
	5.65	4.37	0.20	0.30	0.87	4.48	35.7%	0.20	0.47	0.48
	5.70	4.19	0.16	0.25	0.66	4.27	34.0%	0.15	0.27	0.41
	5.75	4.01	0.11	0.20	0.46	4.06	32.3%	0.11	0.15	0.33
	5.80	3.23	0.09	0.15	0.28	3.26	26.0%	0.09	0.09	0.28
	5.85	2.83	0.05	0.10	0.13	2.85	27.7%	0.05	0.02	0.18
	5.90	1.45	0.03	0.05	0.04	1.46	11.6%	0.03	0.01	0.13
	5.95	0.45	0.00	0.00	0.00	0.45	3.6%	0.00	0.00	0.03

3.13 = 5.5
 4.0 = 1.5
 1.1 = 0.4

STREAM NAME	Ruck Creek - RCI
XS LOCATION	~ 50'is of flume (lat 39 54' 53" long 105 11' 44" 1")
XS NUMBER	RCI

SUMMARY SHEET

MEASURED FLOW (Qm)=	0.60 cfs
CALCULATED FLOW (Qc)=	0.60 cfs
(Qm-Qc)/Qm * 100 =	0.0 %
MEASURED WATERLINE (WLM)=	5.61 ft
CALCULATED WATERLINE (WLC)=	5.60 ft
(WLM-WLC)/WLM * 100 =	0.2 %
MAX MEASURED DEPTH (Dm)=	0.35 ft
MAX CALCULATED DEPTH (Dc)=	0.35 ft
(Dm-Dc)/Dm * 100 =	-0.1 %
MEAN VELOCITY=	0.54 ft/sec
MANNING'S N=	0.147
SLOPE=	0.0365 ft/ft
4 * Qm =	0.2 cfs
2.5 * Qm=	1.5 cfs

RECOMMENDED INSTREAM FLOW
=====J=====

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

RATIONALS FOR RECOMMENDATION

The following table shows the results of the regression analysis for the dependent variable "Number of publications" (Y) against the independent variables "Gender" (X1) and "Age" (X2). The model is represented by the equation: $Y = 0.0001X_1 + 0.0002X_2 + 0.0003$. The adjusted R-squared value is 0.0001.

Variable	Coefficient	Standard Error	t-Statistic	p-Value
Gender (X1)	0.0001	0.0001	1.0000	0.3173
Age (X2)	0.0002	0.0001	2.0000	0.0476
Constant	0.0003	0.0001	3.0000	0.0044

The regression analysis indicates that the model is not statistically significant, as the adjusted R-squared value is very low (0.0001). The p-value for the Gender variable is 0.3173, which is greater than the significance level of 0.05, suggesting that Gender is not a significant predictor of the number of publications. The p-value for the Age variable is 0.0476, which is less than the significance level of 0.05, suggesting that Age is a significant predictor of the number of publications. The p-value for the constant term is 0.0044, which is less than the significance level of 0.05, suggesting that the constant term is significant.

RECOMMENDATION BY	AGENCY	DATE
CWCB REVIEW BY		DATE

Data Input & Proofing

GL=1 FEATURE

Data Input & Proofing		GL=1 FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
STREAM NAME Rock Creek - RCL		1	0.00	4.40			0.00	0.00	0.00
XS LOCATION ~ 50' u/s of flume (lat 39 54' 53" long 105 11' 44 1")			0.70	5.10			0.00	0.00	0.00
XS NUMBER RCL		W	2.40	5.61	0.00	0.00	0.00	0.00	0.00
DATE 6/6/2005			2.80	5.75	0.15	0.09	0.06	0.01	5.60
OBSERVERS Uppendahl, Doherty, Dilger, Mohrman			3.20	5.75	0.15	0.27	0.06	0.02	5.60
			3.60	5.85	0.25	0.37	0.10	0.04	5.60
1/4 SEC SW		R	4.00	5.85	0.25	0.67	0.10	0.07	5.60
SECTION 35			4.40	5.85	0.30	0.67	0.12	0.08	5.55
TWP 1 S			4.80	5.95	0.35	0.85	0.14	0.12	5.60
RANGE 70 W			5.20	5.95	0.35	1.05	0.14	0.15	5.60
PM 6			5.60	5.90	0.30	0.51	0.12	0.06	5.60
			6.00	5.90	0.30	0.33	0.12	0.04	5.60
COUNTY BOULDER			6.40	5.85	0.25	0.26	0.10	0.03	5.60
WATERSHED BOULDER CREEK			6.80	5.75	0.15	0.11	0.04	0.00	5.60
DIVISION 1		W	6.90	5.60	0.00	0.00	0.00	0.00	0.00
DOW CODE			9.00	5.10			0.00	0.00	0.00
USGS MAP LOUISVILLE		1	G	12.00	4.45		0.00	0.00	0.00
USFS MAP		S	13.40	3.95			0.00	0.00	0.00
TAPE WT 0.0166		Love and Root Survey							
TENSION 99999									
SLOPE				0.0365		ft / ft			

CHECKED BY

DATE

ASSIGNED TO

DATE

Totals| 1.10| 0.60|



COLORADO WATER
CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS



LOCATION INFORMATION

STREAM NAME Rock Creek CROSS-SECTION NO RCL
CROSS-SECTION LOCATION ≈ 50' U/S of Flume on Rock Creek
lat 39° 54' 53" long 105° 11' 44.1" ≈ 5725'
DATE 6/10/04 OBSERVERS Upendahl / Eschert / Elger / Mohrman
LEGAL DESCRIPTION SECTION SW SECTION 3S TOWNSHIP 1 N RANGE 70 E PM 6
COUNTY Boulder WATERSHED Boulder CK WATER DIVISION 1 DOW WATER CODE
MAP(S) USGS Louisville USFS

SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION YES/NO METER TYPE Flo-Mate
METER NUMBER DATE RATED CALIB/SPIN sec TAPE WEIGHT lbs/ft TAPE TENSION lbs
CHANNEL BED MATERIAL SIZE RANGE PHOTOGRAPHS TAKEN YES/NO NUMBER OF PHOTOGRAPHS

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	HUD READING (ft)	S K E T C H	LEGEND	
⊗ Tape & Stake LB	00				
⊗ Tape & Stake RB	00				
① WS & Tape LB/RB	00				
② WS Upstream	10'	5.22			
③ WS Downstream	10'	5.95			

SLOPE | .73 / 20 = .0365

AQUATIC SAMPLING SUMMARY

STREAM ELECTROFISHED YES/NO YES 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)

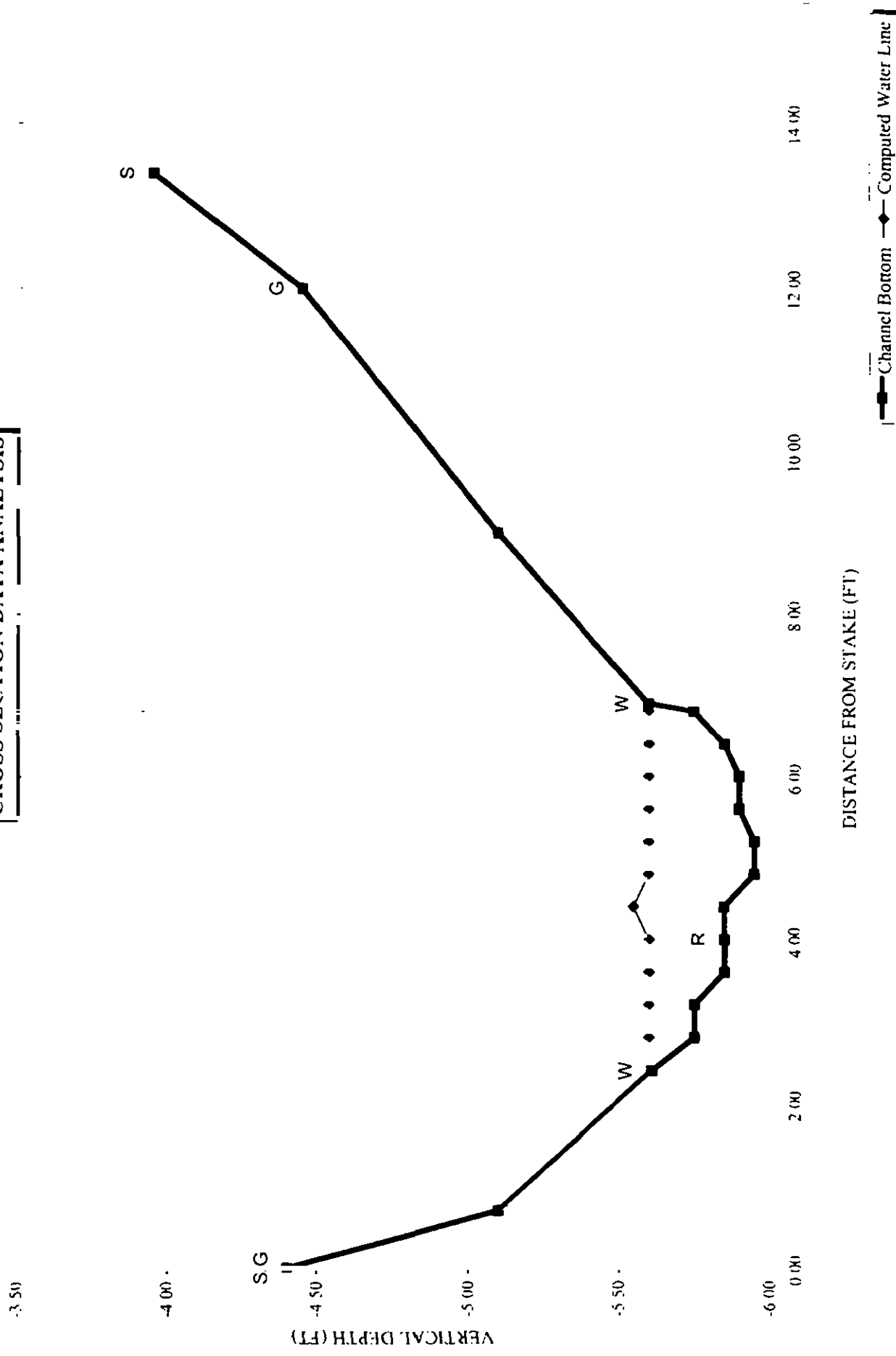
SPECIES (FILL IN)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	>15	TOTAL

AQUATIC INSECTS IN STREAM SECTION BY COMMON OR SCIENTIFIC ORDER NAME

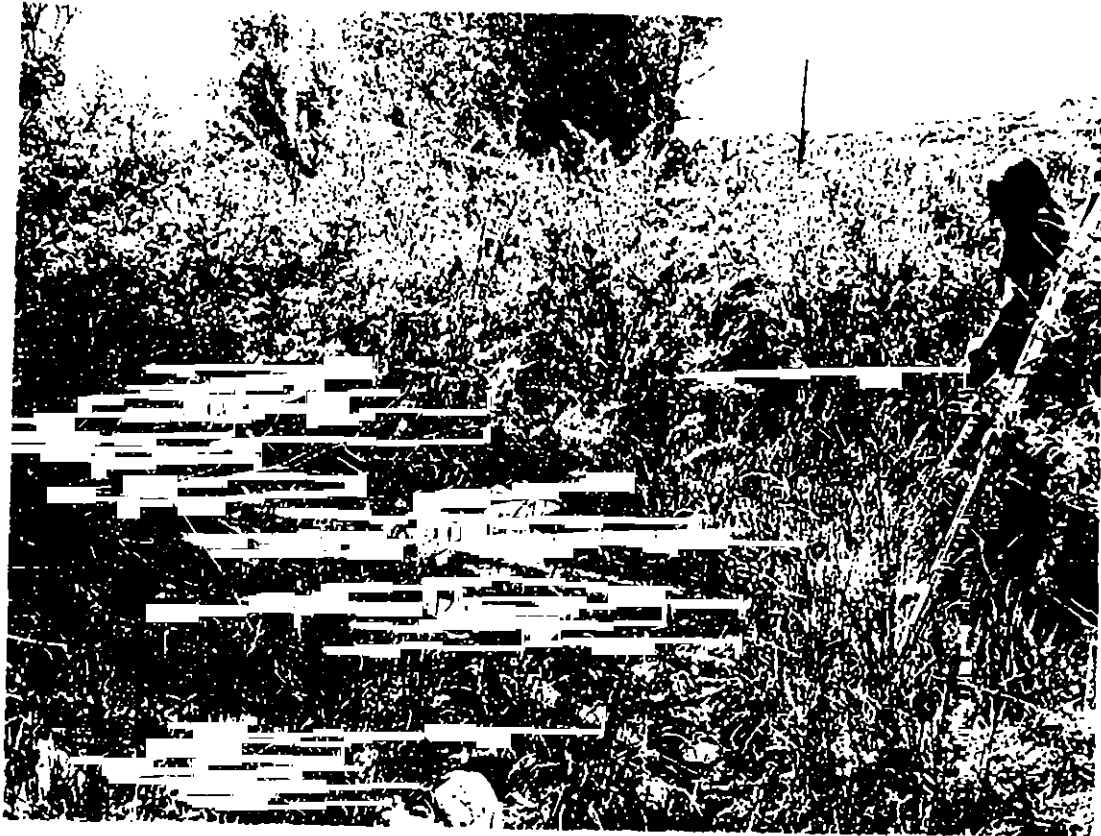
COMMENTS

Rock Creek - RCL

CROSS SECTION DATA ANALYSIS



Rock Creek – X-Section = RCL = 06/06/05



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

LOCATION INFORMATION

STREAM NAME Rock Creek (RCM)
XS LOCATION ~ 600' d/s of confl w/Rock Ck Trn (lat 39 54' 31 1" long 105 12' 25 6")
XS NUMBER RCM

DATE 6-Jun-05
OBSERVERS Uppendahl, Doherty, Dilger, Mohrman

1/4 SEC NE
SECTION 3
TWP 2 S
RANGE 70 W
PM 6

COUNTY BOULDER
WATERSHED BOULDER CREEK
DIVISION 1
DOW CODE 0

USGS MAP LOUISVILLE
USFS MAP 0

SUPPLEMENTAL DATA

*** NOTE ***

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

TAPE WT 0 0106
TENSION 99999

CHANNEL PROFILE DATA

SLOPE 0 0075

INPUT DATA CHECKED BY DATE

ASSIGNED TO DATE

Rock Creek (RCM)
~ 600' d/s of confluence w/ Rock Ck Trib (lat 39 54' 31 1" long 105 12' 25 6")
RCM

15

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
S	0 00	7 05			0 00		0 00	0 00	0 0%
1 G	0 90	7 10			0 00		0 00	0 00	0 0%
W	1 60	7 65	0 00	0 00	0 00		0 00	0 00	0 0%
	1 90	7 75	0 10	0 18	0 32	0 10	0 03	0 01	4 9%
	2 20	7 80	0 15	0 32	0 30	0 15	0 05	0 01	13 1%
	2 50	7 85	0 20	0 32	0 30	0 20	0 06	0 02	17 4%
	2 80	7 80	0 15	0 32	0 30	0 15	0 05	0 01	13 1%
	3 10	7 80	0 15	0 26	0 30	0 15	0 05	0 01	10 6%
	3 40	7 90	0 25	0 30	0 32	0 25	0 08	0 02	20 4%
	3 70	7 85	0 25	0 30	0 30	0 25	0 08	0 02	20 4%
W	4 00	7 65	0 00	0 00	0 36		0 00	0 00	0 0%
	4 60	7 35			0 00		0 00	0 00	0 0%
1 G	5 60	7 25			0 00		0 00	0 00	0 0%
	6 60	6 50			0 00		0 00	0 00	0 0%
S	7 30	6 45			0 00		0 00	0 00	0 0%

TOTALS -----

2.51	0.25	0.38	0.11	100.0%
(Max)				

Manning's n = 0.1234
Hydraulic Radius = 0.149428397

STREAM NAME Rock Creek (RCM)
 XS LOCATION ~ 600' d/s of confl w/Rock Ck Trib (lat 39 54' 31 1" long 105 12' 25 6")
 XS NUMBER RCM

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	0.38	0.36	-4.0%
7.40	0.38	1.06	183.3%
7.42	0.38	1.00	166.3%
7.44	0.38	0.94	149.6%
7.46	0.38	0.88	133.4%
7.48	0.38	0.82	117.4%
7.50	0.38	0.76	101.8%
7.52	0.38	0.70	86.6%
7.54	0.38	0.64	71.7%
7.56	0.38	0.59	57.1%
7.58	0.38	0.54	42.9%
7.60	0.38	0.48	29.1%
7.61	0.38	0.46	22.3%
7.62	0.38	0.43	15.6%
7.63	0.38	0.41	9.0%
7.64	0.38	0.38	2.4%
7.65	0.38	0.36	-4.0%
7.66	0.38	0.34	-10.3%
7.67	0.38	0.31	-16.6%
7.68	0.38	0.29	-22.7%
7.69	0.38	0.27	-28.6%
7.70	0.38	0.25	-34.5%
7.72	0.38	0.20	-45.9%
7.74	0.38	0.16	-56.7%
7.76	0.38	0.12	-67.1%
7.78	0.38	0.09	-76.7%
7.80	0.38	0.05	-85.5%
7.82	0.38	0.03	-91.4%
7.84	0.38	0.02	-95.6%
7.86	0.38	0.01	-98.1%
7.88	0.38	0.00	-99.5%
7.90	0.38	0.00	-100.0%

WATERLINE AT ZERO
 AREA ERROR = 7.644

STREAM NAME Rock Creek (RCM)
 XS LOCATION ~ 600' d/s of confluence w/ Rock Ck Tno (lat 39 54' 31" 1" long 105 12' 25 6")
 XS NUMBER RCM

Constant Manning's n

GL = lowest Grassline elevation corrected for sag

STAGING TABLE

WL = Waterline corrected for variations in field measured water surface elevations and sag

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG DEPTH (FT)	MAX DEPTH (FT)	AREA (SQ FT)	WETTED PERIM (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG VELOCITY (FT/SEC)
GL	7 25	4 51	0 36	0 65	1 62	4 83	100 0%	0 34	0 82	0 50
	7 29	4 02	0 36	0 61	1 44	4 32	89 4%	0 33	0 72	0 50
	7 34	3 45	0 36	0 56	1 25	3 74	77 4%	0 33	0 63	0 50
	7 39	3 24	0 33	0 51	1 08	3 50	72 4%	0 31	0 52	0 48
	7 44	3 07	0 30	0 46	0 92	3 30	68 4%	0 28	0 41	0 45
	7 49	2 91	0 27	0 41	0 77	3 11	64 4%	0 25	0 32	0 41
	7 54	2 75	0 23	0 38	0 63	2 92	60 4%	0 22	0 24	0 38
	7 59	2 58	0 19	0 31	0 50	2 73	56 4%	0 18	0 17	0 34
WL	7 64	2 42	0 15	0 26	0 37	2 53	52 4%	0 15	0 11	0 29
	7 69	2 20	0 12	0 21	0 26	2 29	47 4%	0 11	0 06	0 24
	7 74	1 98	0 08	0 15	0 15	2 04	42 3%	0 08	0 03	0 19
	7 79	1 62	0 04	0 11	0 06	1 67	34 5%	0 04	0 01	0 12
	7 84	0 55	0 03	0 06	0 01	0 57	11 8%	0 03	0 00	0 09
	7 89	0 06	0 00	0 01	0 00	0 06	1 2%	0 00	0 00	0 02

Rock Creek (RCM)
~ 600' d/s of confl w/Rock Ck Trib (lat 39 54' 31 1" long 105 12' 25 6")
RCM

SUMMARY SHEET

MEASURED FLOW (Qm)=	0.11 cfs
CALCULATED FLOW (Qc)=	0.11 cfs
(Qm-Qc)/Qm * 100 =	0.6 %
MEASURED WATERLINE (Wlm)=	7.65 ft
CALCULATED WATERLINE (Wlc)=	7.64 ft
(Wlm-Wlc)/Wlm * 100 =	0.1 %
MAX MEASURED DEPTH (Dm)=	0.25 ft
MAX CALCULATED DEPTH (Dc)=	0.26 ft
(Dm-Dc)/Dm * 100	-2.5 %
MEAN VELOCITY=	0.29 ft/sec
MANNING'S N=	0.123
SLOPE=	0.0075 ft/ft
4 * Qm =	0.0 cfs
2.5 * Qm=	0.3 cfs

RECOMMENDED INSTREAM FLOW

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

RATIONALE FOR RECOMMENDATION

=====

[illegible]

RECOMMENDATION BY

AGENCY

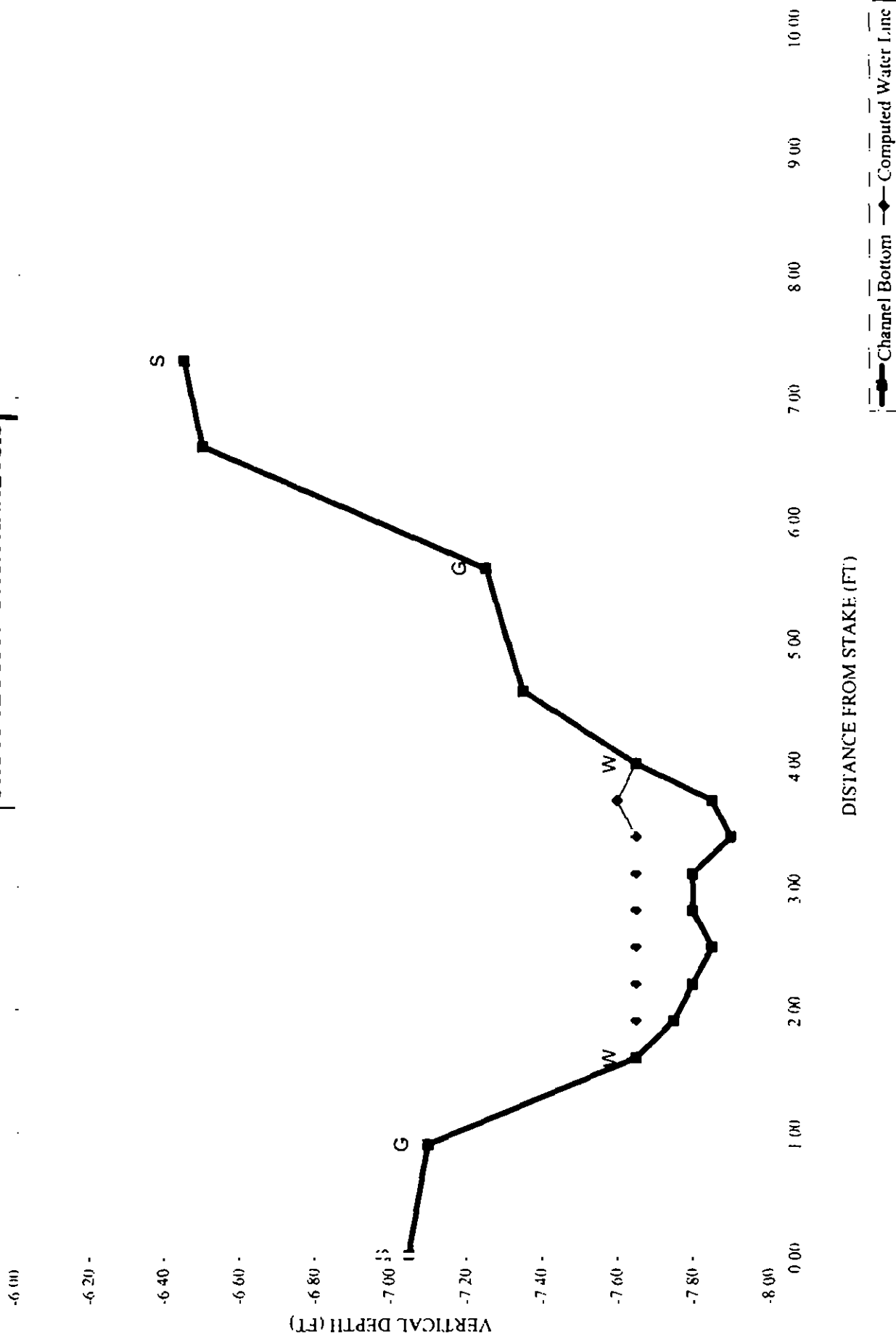
DATE _____

CWCB REVIEW BY

DATE _____

Rock Creek (RCM)

CROSS SECTION DATA ANALYSIS



Totals	0.38	0.11
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FIELD DATA FOR INSTREAM FLOW DETERMINATIONS



COLORADO WATER
CONSERVATION BOARD

LOCATION INFORMATION

STREAM NAME Rock Creek CROSS-SECTION NO ECM
CROSS SECTION LOCATION 600' d/s of Confl w/unnamed Tr. b.
Lat 39°54'31.1" long 105°12'25.6" ≈ 5825'
DATE 6/6/03 OBSERVERS dependent/Cheney/Barber/Adelman
LEGAL DESCRIPTION 1/4 SECTION N1/4 SECTION 3 TOWNSHIP 2 N(S) RANGE 70 E(W) 6
COUNTY Boulder WATERSHED Boulder CK WATER DIVISION 1 COW WATER CODE
MAP(S) USGS Louisville USFS

SUPPLEMENTAL DATA

SAG TAPE SECTION SAML AS DISCHARGE SECTION (YLS) NO METER TYPE Flo-Mate
METER NUMBER DATE RATED CALIB. SPIN SEC TAPE WEIGHT IBS/100' TAPE TENSION IBS
CHANNEL BED MATERIAL SIZE RANGE PHOTOGRAPHS TAKEN YES/NO NUMBER OF PHOTOGRAPHS 3

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	HOOD READING (ft)	LEGEND
① Tape to Stake LB	0.0		Stake (X)
② Tape to Stake HB	0.0		Station (1)
③ WS to Tape LB/RB	0.0		Photo (1)
④ WS Upstream	10'	7.7	Direction of Flow
⑤ WS Downstream	10'	7.65	
SLOPE	$.15/20 = .0075$		

Sketch: 7.65 / 7.65

AQUATIC SAMPLING SUMMARY

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

LENGTH-FREQUENCY DISTRIBUTION BY ONE-INCH SIZE GROUPS (1 0-1 9, 2 0-2 9 ETC)

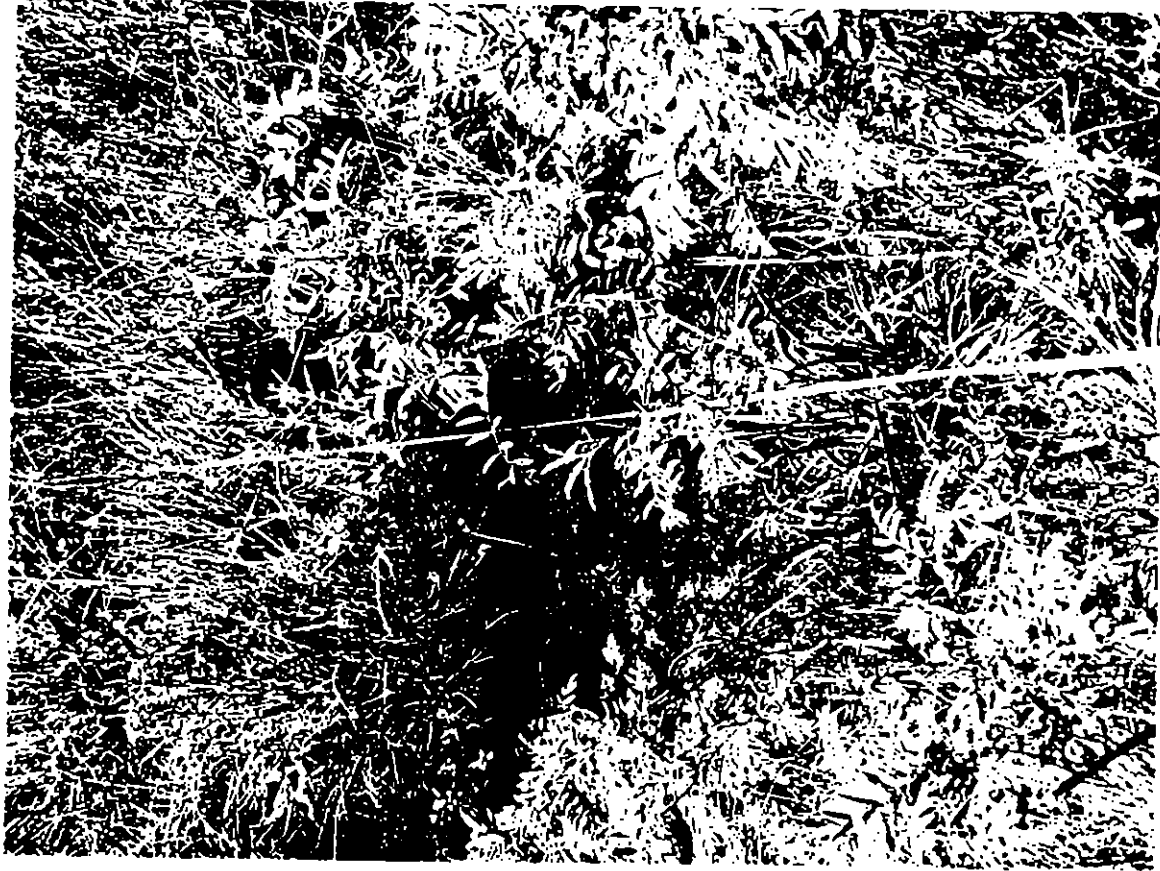
SPECIES (FILL IN)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	>15	TOTAL

AQUATIC INSECTS IN STREAM SECTION BY COMMON OR SCIENTIFIC ORDER NAME

COMMENTS

Rock Creek

X-Section = RCM = 06/06/05



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

LOCATION INFORMATION

STREAM NAME Rock Creek (RCU)
XS LOCATION ~ 200' d/s of confl w/Rock Ck Trib (lat 39 54' 28 2" long 105 12' 30 7")
XS NUMBER RCU

DATE 6-Jun-05
OBSERVERS Uppendahl, Doherty, Dilger, Mohrman

1/4 SEC NE
SECTION 3
TWP 2 S
RANGE 70 W
PM 6

COUNTY BOULDER
WATERSHED BOULDER CREEK
DIVISION 1
DOW CODE 0

USGS MAP LOUISVILLE
USFS MAP 0

SUPPLEMENTAL DATA

*** NOTE ***

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

TAPE WT 0 0106
TENSION 99999

CHANNEL PROFILE DATA

SLOPE 0 033

INPUT DATA CHECKED BY DATE

ASSIGNED TO DATE

STREAM NAME Rock Creek (RCU)
 XS LOCATION ~ 200' d/s of confl w/Rock Ck Trib (lat 39 54' 28 2" long 105 12' 30 7")
 XS NUMBER RCU

DATA POINTS=

21

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
S	0 00	5 70			0 00		0 00	0 00	0 0%
1 G	1 00	5 85			0 00		0 00	0 00	0 0%
	2 00	6 40			0 00		0 00	0 00	0 0%
	3 00	6 05			0 00		0 00	0 00	0 0%
	4 10	6 25			0 00		0 00	0 00	0 0%
W	4 20	6 42	0 00	0 00	0 00		0 00	0 00	0 0%
	4 50	6 45	0 05	0 00	0 30	0 05	0 02	0 00	0 0%
	4 80	6 45	0 05	0 00	0 30	0 05	0 02	0 00	0 0%
	5 10	6 60	0 10	0 10	0 34	0 10	0 03	0 00	1 9%
	5 40	6 65	0 20	0 11	0 30	0 20	0 06	0 01	4 2%
	5 70	6 60	0 20	0 34	0 30	0 20	0 06	0 02	12 9%
	6 00	6 55	0 15	0 32	0 30	0 15	0 05	0 01	9 1%
	6 30	6 70	0 30	0 81	0 34	0 30	0 09	0 07	46 2%
	6 60	6 70	0 30	0 45	0 30	0 30	0 09	0 04	25 7%
	6 90	6 60	0 20	0 00	0 32	0 20	0 06	0 00	0 0%
	7 20	6 45	0 05	0 00	0 34	0 05	0 02	0 00	0 0%
	7 50	6 45	0 05	0 00	0 30	0 05	0 02	0 00	0 0%
	7 80	6 45	0 00	0 00	0 30		0 00	0 00	0 0%
W	8 20	6 40			0 00		0 00	0 00	0 0%
1 G	8 60	5 35			0 00		0 00	0 00	0 0%
S	9 00	5 25			0 00		0 00	0 00	0 0%

TOTALS -----

3 74

0 3

0 50

0 16

100 0%

(Max)

Manning's n =

0 2200

Hydraulic Radius=

0 132481562

STREAM NAME Rock Creek (RCU)
 XS LOCATION ~ 200' d/s of confl w/Rock Ck Tnb (lat 39 54' 28.2" long 105 12' 30.7")
 XS NUMBER RCU

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	0.50	0.43	-13.8%
6.19	0.50	1.56	216.0%
6.21	0.50	1.46	194.0%
6.23	0.50	1.35	172.9%
6.25	0.50	1.25	152.6%
6.27	0.50	1.15	133.1%
6.29	0.50	1.06	114.0%
6.31	0.50	0.97	95.4%
6.33	0.50	0.88	77.2%
6.35	0.50	0.79	59.6%
6.37	0.50	0.70	42.3%
6.39	0.50	0.62	25.5%
6.40	0.50	0.58	17.3%
6.41	0.50	0.54	9.2%
6.42	0.50	0.50	1.3%
6.43	0.50	0.46	-6.4%
6.44	0.50	0.43	-13.8%
6.45	0.50	0.39	-20.9%
6.46	0.50	0.36	-26.7%
6.47	0.50	0.34	-31.4%
6.48	0.50	0.32	-36.1%
6.49	0.50	0.29	-40.7%
6.51	0.50	0.25	-49.7%
6.53	0.50	0.21	-58.3%
6.55	0.50	0.17	-66.7%
6.57	0.50	0.13	-74.5%
6.59	0.50	0.09	-81.3%
6.61	0.50	0.06	-87.2%
6.63	0.50	0.04	-91.9%
6.65	0.50	0.02	-95.1%
6.67	0.50	0.01	-97.3%
6.69	0.50	0.01	-99.0%

WATERLINE AT ZERO
 AREA ERROR = 6.417

STREAM NAME Rock Creek (RCU)
 XS LOCATION ~ 200' d/s of confl w/Rock Cr Trib (lat 39 54' 28 2" long 105 12' 30 7")
 XS NUMBER RCU

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	5.85	7.41	0.52	0.85	3.85	8.24	100.0%	0.47	2.84	0.74
	5.87	7.37	0.51	0.83	3.72	8.19	99.4%	0.45	2.70	0.73
	5.92	7.26	0.46	0.78	3.36	8.03	97.5%	0.42	2.30	0.69
	5.97	7.15	0.42	0.73	3.00	7.88	95.5%	0.38	1.93	0.64
	6.02	7.04	0.38	0.68	2.64	7.72	93.6%	0.34	1.59	0.60
	6.07	6.79	0.34	0.63	2.29	7.42	90.0%	0.31	1.29	0.56
	6.12	6.27	0.31	0.58	1.97	6.83	82.9%	0.29	1.05	0.54
	6.17	5.74	0.29	0.53	1.67	6.24	75.7%	0.27	0.85	0.51
	6.22	5.21	0.27	0.48	1.39	5.65	68.6%	0.25	0.67	0.48
	6.27	4.76	0.24	0.43	1.15	5.14	62.4%	0.22	0.52	0.45
	6.32	4.48	0.20	0.38	0.91	4.77	57.9%	0.19	0.37	0.41
	6.37	4.20	0.17	0.33	0.70	4.41	53.5%	0.16	0.25	0.36
WL	6.42	3.87	0.13	0.28	0.49	4.01	48.6%	0.12	0.15	0.30
	6.47	2.33	0.14	0.23	0.34	2.46	29.8%	0.14	0.11	0.33
	6.52	2.13	0.10	0.18	0.22	2.24	27.1%	0.10	0.06	0.26
	6.57	1.80	0.07	0.13	0.12	1.87	22.7%	0.07	0.02	0.20
	6.62	1.12	0.04	0.08	0.05	1.15	14.0%	0.04	0.01	0.15
	6.67	0.47	0.03	0.03	0.01	0.48	5.8%	0.03	0.00	0.11

Rock Creek (RCU)
~ 200' d/s of confl w/ Rock Ck Trib (lat 39 54' 28 2" long 105 12' 30 7")
RCU

SUMMARY SHEET

MEASURED FLOW (Qm)=	0 16 cfs
CALCULATED FLOW (Qc)=	0 15 cfs
(Qm-Qc)/Qm * 100 =	4 6 %
MEASURED WATERLINE (WLm)=	6 44 ft
CALCULATED WATERLINE (WLC)=	6 42 ft
(WLm-WLC)/WLm * 100 =	0 3 %
MAX MEASURED DEPTH (Dm)=	0 30 ft
MAX CALCULATED DEPTH (Dc)=	0 28 ft
(Dm-Dc)/Dm * 100	5 6 %
MEAN VELOCITY=	0 30 ft/sec
MANNING'S N=	0 220
SLOPE=	0 033 ft/ft
4 * Qm =	0 1 cfs
2 5 * Qm=	0 4 cfs

RECOMMENDED INSTREAM FLOW
=====[illegible]

RATIONALE FOR RECOMMENDATION
=====

[illegible]

RECOMMENDATION BY

AGENCY

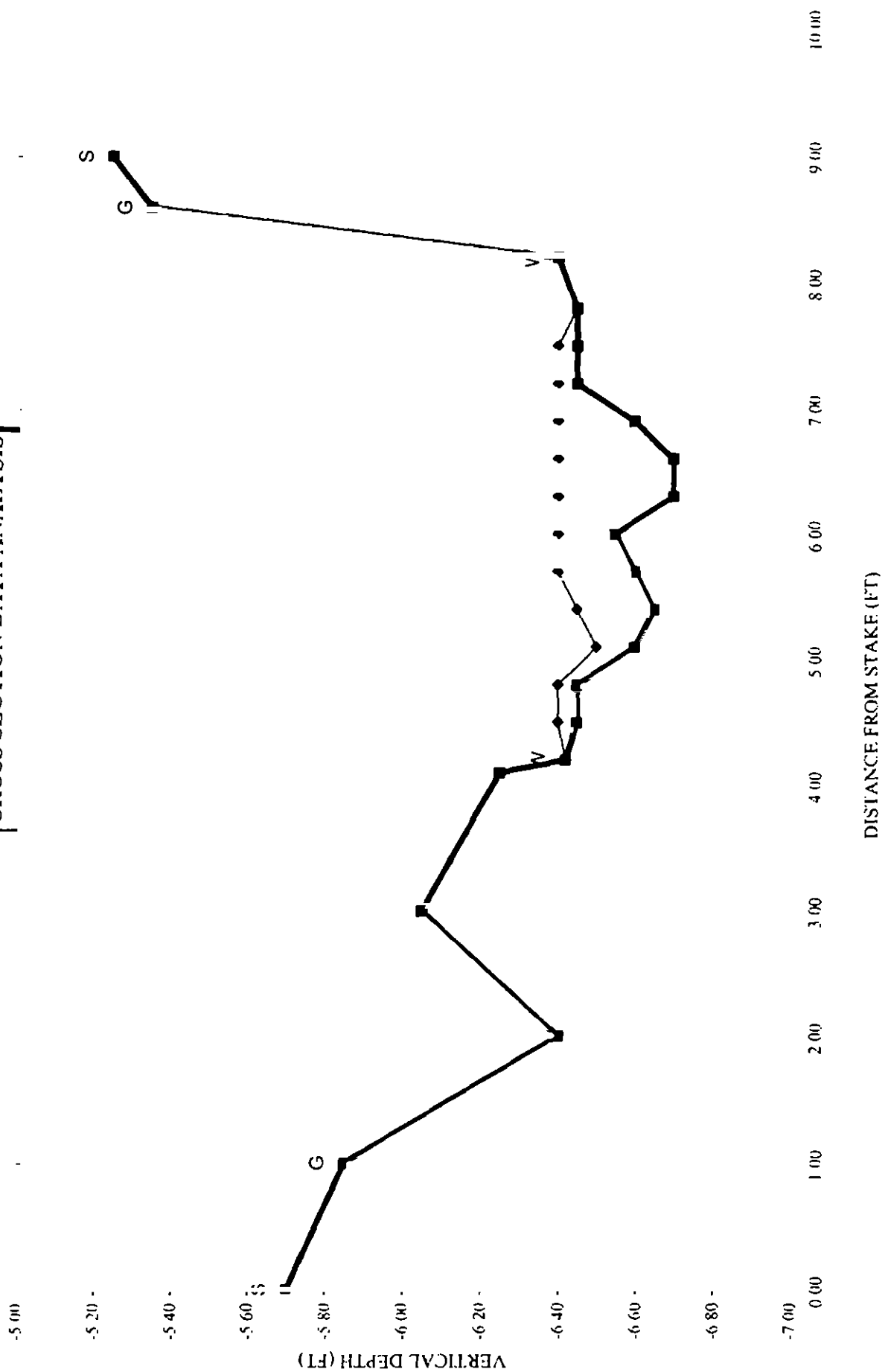
DATE _____

CWCB REVIEW BY

DATE _____

Rock Creek (RCU)

CROSS SECTION DATA ANALYSIS



Channel Bottom Computed Water Line

Data Input & Proofing			GL=1 FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
						Total Data Points = 21				
STREAM NAME	Rock Creek (RCU)		S	0 00	5 70			0 00	0 00	0 00
XS LOCATION	~ 200' d/s of confl w/Rock Ck Trn (lat 39 54' 28 2"	1	G	1 00	5 85			0 00	0 00	0 00
XS NUMBER	RCU			2 00	6 40			0 00	0 00	0 00
DATE	6/6/2005			3 00	6 05			0 00	0 00	0 00
OBSERVERS	Uppendahl, Doherty, Dilger, Mohman			4 10	6 25			0 00	0 00	0 00
			W	4 20	6 42	0 00	0 00	0 00	0 00	0 00
1/4 SEC	NE			4 50	6 45	0 05	0 00	0 02	0 00	6 40
SECTION	3			4 80	6 45	0 05	0 00	0 02	0 00	6 40
TWP	2 S			5 10	6 60	0 10	0 10	0 03	0 00	6 50
RANGE	70 W			5 40	6 65	0 20	0 11	0 06	0 01	6 45
PM	6			5 70	6 60	0 20	0 34	0 06	0 02	6 40
				6 00	6 55	0 15	0 32	0 05	0 01	6 40
COUNTY	BOULDER			6 30	6 70	0 30	0 81	0 09	0 07	6 40
WATERSHED	BOULDER CREEK			6 60	6 70	0 30	0 45	0 09	0 04	6 40
DIVISION	1			6 90	6 60	0 20	0 00	0 06	0 00	6 40
DOW CODE				7 20	6 45	0 05	0 00	0 02	0 00	6 40
USGS MAP	LOUISVILLE			7 50	6 45	0 05	0 00	0 02	0 00	6 40
USFS MAP				7 80	6 45	0 00	0 00	0 00	0 00	0 00
			W	8 20	6 40			0 00	0 00	0 00
TAPE WT	0 0106	Level and Rod Survey	G	8 60	5 35			0 00	0 00	0 00
TENSION	99999	lbs	S	9 00	5 25			0 00	0 00	0 00
SLOPE		0 033 ft / ft								

CHECKED BY DATE

ASSIGNED TO DATE

| Totals| 0 50| 0 16|



FIELD DATA FOR INSTREAM FLOW DETERMINATIONS



COLORADO WATER
CONSERVATION BOARD

LOCATION INFORMATION

STREAM NAME Rock Creek d/s T-12 #1 Rock-CK-WB-060605 CROSS-SECTION NO RCU
 CROSS SECTION LOCATION 200' d/s of T-12 #1
39° 51' 28.2" N 105° 12' 30.7" W 2 S. 940'
 DATE 6/1/05 OBSERVERS Uppendahl / Mohrman
 LEGAL DESCRIPTION SECTION NE SECTION 3 TOWNSHIP 2 N(S) RANGE 70 E(W) PM 6
 COUNTY Boulder WATERSHED Boulder CK WATER DIVISION 1 DOW WATER CODE
 MAP(S) USGS Louisville USFS

SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION ☒ YES ☐ NO METER TYPE Flow-Mate
 METER NUMBER _____ DATE RATED _____ CALIB/SPIN _____ SEC _____ TAPE WEIGHT _____ LBS 100' 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)	LEGEND
☒ Tape to Stake LB	0.0		Stake ☒
☒ Tape to Stake RB	0.0		Station ☐
☐ WS w Tape LB/RB	0.0	<u>6.42 / 6.40</u>	Photo ☐
☐ WS Upstream	<u>10'</u>	<u>6.05</u>	Direction of Flow ☐
☐ WS Downstream	<u>10'</u>	<u>6.71</u>	
SLOPE <u>.66/20</u>	<u>=</u>	<u>.0330</u>	

Sketch:

AQUATIC SAMPLING SUMMARY

STREAM ELECTROFISHED YES ☒ NO ☐ DISTANCE ELECTROFISHED _____' 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

AKA: TICK CRICK

Rock Creek – X-Section = RCU = 06/06/05



Rocky Flats Sensitive Ecosystems

The plant communities of greatest ecological significance on Site are the xeric tallgrass prairie, the Great Plains riparian community, the tall upland shrubland community and associated peripheral shrublands, and wetlands.

Xeric Tallgrass Prairie – The tallgrass prairie region stretches from the Canadian border to Oklahoma and Texas along the eastern edge of the Great Plains. However, in a narrow band paralleling the Front Range, climatic, geologic, and hydrologic conditions exist that allow the tallgrass prairie to survive, separated by hundreds of miles from the rest of the tallgrass prairie. The tallgrass prairie at the Site is distinguished by such species as: big bluestem, little bluestem, rice grass, prairie dropseed, and switchgrass. Referred to as xeric tallgrass prairie because the climate here is much drier than that of the eastern Great Plains.

Great Plains riparian community - mapped at the Site as riparian (stream channel) woodland and shrubland, is found along streams at the Site. Cottonwood trees and willows predominate in this community. This community provides important habitat for many of the bird and mammal species found here, including the Preble's meadow jumping mouse. This community provides the majority of the nesting habitat for many protected, rare, and sensitive birds, including most birds-of-prey.

Tall Upland Shrublands – The tall upland shrubland is a series of hillside shrubland patches dominated by chokecherry, hawthorn, and American plum. They provide important cover, forage, and breeding habitat for many birds and mammal species at the Site. The tall upland shrubland community is located primarily in the Rock Creek drainage with smaller portions found in the Walnut Creek and Woman Creek drainages. The communities are typically found on hillsides located just below the ridge tops and above large seeps that emerge on the hillsides.

Wetlands – The entire Site was surveyed by the Army Corps in 1993 with a final report and wetland map produced in December 1994. The map and report are the current baseline for the jurisdictional wetland inventory for the Site and the survey is valid until August 1, 2000. The Site wetlands study identified 1099 wetlands, with a combined surface area of 191.03 acres. Approximately 35% of the wetland acreage is located on hill slopes supported by seeps and springs. The largest slope wetlands occur in the Rock Creek and Woman Creek drainages. The remaining 65% is located along stream channels and around ponds, supported by surface water flows.

Preble's Habitat – The Preble's meadow jumping mouse is listed as a threatened species under the Endangered Species Act. The primary habitat for the mouse includes riparian plant communities, the Site's unique tall upland shrubland, and peripheral wetland areas. The US Fish and Wildlife Service have designated all three Site drainages along with Smart Ditch as Preble's mouse Protection Areas.

Sensitive visual environment There are local initiatives along the Front Range of Colorado to preserve pristine mountain backdrop from development. Open space purchases surround approximately two thirds of the Rocky Flats. Combined with the protected open space, these undeveloped plant communities make the Site ecosystems even more valuable to biota.

IMPORTANT ECOLOGICAL RESOURCES AT ROCKY FLATS

Rare and imperiled vegetation communities:

- *Xeric Tallgrass Prairie*
- *Great Plains Mixed Grass Prairie*
- *Tall Upland Shrubland (Seep shrublands)*
- *Great Plains Riparian (Plains Cottonwood Riparian Woodlands)*
- *Wetlands*

Important riparian and wetlands areas:

- *Antelope Springs*
- *Rock Creek*
- *Woman Creek*

Special concern and sensitive species:

- *See 1998 Search List*

Species of regulatory concern - e.g., threatened and endangered species -

- *Preble's meadow jumping mouse*
- *Bald eagle*
- *Peregrine Falcon*

Clean headwaters streams for diverse aquatic communities

- *Fish,*
- *Arthropods,*
- *Mollusks,*
- *Aquatic plants*

High biodiversity:

- *45 Mammals*
- *192 Birds*
- *8 Reptiles*
- *7 Amphibians*
- *576 Plants*

Instream Flow Recommendation Questionnaire

1. Contact Information

a. Recommending agency, entity or individual

United States Fish and Wildlife Service

b. Contact person

Amy Thornburg

c. Mailing address, phone number and email address

Rocky Mountain Arsenal National Wildlife Refuge Complex
Building 121
Commerce City, CO 80022
(303) 966-5777
amy_thornburg@fws.gov

2. Please provide a general description of the stream reach or natural lake of concern to the best of your knowledge:

a. Name of stream or natural lake

Rock Creek

b. County

Jefferson County

c. Water division and water district

Water Division 1, District 6

d. Major drainage basin

South Platte Basin, South Boulder Creek, Coal Creek

e. Upper terminus (i.e. headwaters, confluence, etc.)

Western boundary of Rocky Flats

f. Lower terminus

State Highway 128 and Rock Creek on the northern boundary of Rocky Flats

g. Approximate segment length in miles

The main branch is approximately four miles in length.

h. Name of USGS quad maps (Please attach copies)

i. Any photos available?

3. Please provide a brief description of the natural environment to be preserved or improved, and the basis for the recommendation.

The Colorado Division of Wildlife has worked with the Service to introduce northern redbelly dace and the common shiner, both state listed species, into Lindsay Pond located in Rock Creek. A portion of the Rock Creek drainage is protected habitat for the Preble's meadow jumping mouse, a federally listed species. Songbirds, mule deer and elk frequently use the area as well.

The numerous seeps in the Rock Creek drainage allow diverse upland shrub and wetland communities to flourish.

Please refer to the copy of the 2001 Rock Creek Preserve Plan provided for additional details.

4. Please provide any additional information that should be considered by CWCB staff when reviewing this recommendation (i.e. federal cooperation, community support, unique characteristics, resource threats, etc.)

In addition to some of the unique attributes of interest to the Service mentioned above, consideration should be given to the past interest expressed by Boulder County and the City of Lafayette in maintaining instream flows.

The headwaters of Rock Creek lie in an area that is permitted for future gravel mining and possible further development of the privately owned strip land west of Rocky Flats and adjacent to Highway 93.

5. Please provide a brief description of fieldwork that has been completed (i.e. biologic or hydrologic data, quantification studies). If work has been performed, please include the name of the individual, agency, or consulting firm that performed the work.

The United States Department of Energy has collected water flow and quality data.

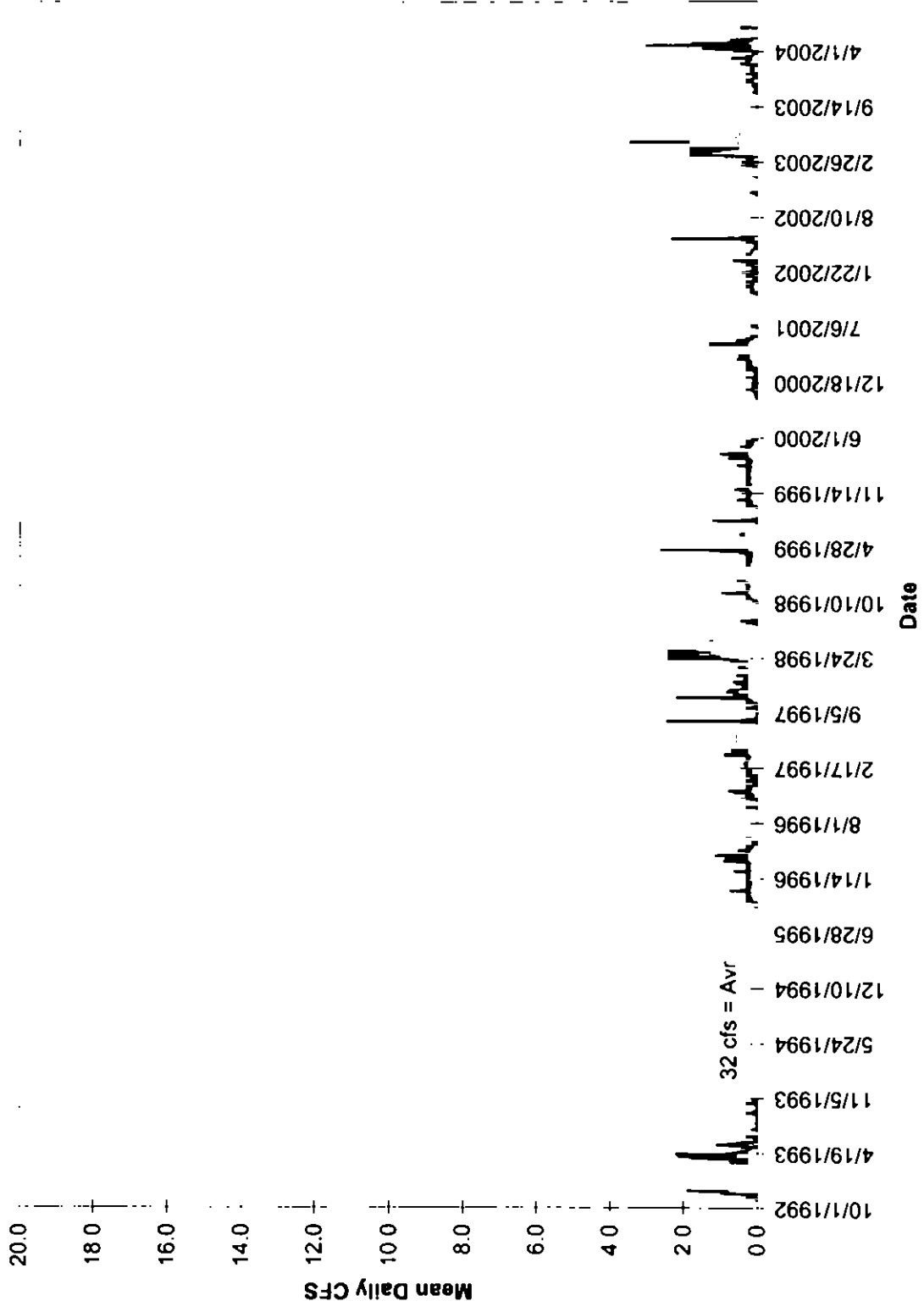
Biological monitoring has been conducted by Aquatics Associates.

Rocky Mountain Remediation Services, Environmental Restoration Group conducted a seep analysis study in 1995, and provided a Seep and Spring Analysis in Support of the Accelerated Site Action Project for Site Closure report in 1996.

Please refer to copies of these reports for more detailed information.

APPENDIX – C
Water Availability Analysis

Hydrograph for Rock Creek at GS04: Water 1993 to Present



Rock Cr. at GS04 Discharge Summary: Water Years 1993-Present

Cubic Feet Per Second: CFS; Gallons Per Minute: GPM
Cubic Feet: CF; Million Gallons: MGals

Month	Average Mean Daily Flow Rate		Minimum Mean Daily Flow Rate		Maximum Mean Daily Flow Rate	
	CFS	GPM	CFS	GPM	CFS	GPM
January	0.20	87.7	0.000	0.0	0.5	243
February	0.24	105.6	0.043	19.3	0.6	274
March	0.58	261.5	0.052	23.2	15.3	6886
April	1.36	611.1	0.048	21.5	16.5	7409
May	0.70	314.0	0.000	0.0	18.5	8312
June	0.10	45.8	0.000	0.0	0.9	426
July	0.00	2.1	0.000	0.0	0.3	131
August	0.04	19.5	0.000	0.0	2.4	1087
September	0.01	5.9	0.000	0.0	0.3	141
October	0.07	32.3	0.000	0.0	2.2	978
November	0.22	98.9	0.000	0.0	1.0	457
December	0.20	90.2	0.000	0.0	1.9	845
Annual	0.31	139.3	0.000	0.0	18.5	8312

Monthly Climatic Data for RALSTON RESERVOIR for years 1978 - 1999
 Station - 56816 Latitude - 3949 Longitude - 10514 Elevation - 5900

Total monthly precipitation.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1978	M	M	M	M	552	150	61	43	43	181	60	103	
1979	68	39	209	183	461	331	42	325	34	126	231	134	21.83
1980	61	54	184	304	494	54	206	85	106	24	68	14	16.54
1981	8	57	277	122	411	44	174	120	48	127	40	96	15.24
1982	28	28	78	40	466	152	214	322	267	118	31	180	19.24
1983	6	15	546	194	527	394	217	150	51	27	332	73	25.32
1984	18	136I	180	303	63	202	184	227	85	379	0	23	18.00
1985	61	105	95	186	209	179	154	15	170	34	211	68	14.87
1986	M	99	76	353	293	266	133	105	70	219	171	92	
1987	92	168	182	187	401	517	57	215	60	129	124	180	23.12
1988	47	80	162	89	320	144	121	111	132	18	40	141	14.05
1989	115	92	55	153	202	293	186	221	270	56	57	116	18.16
1990	46	43	472	199	196	22	272	191	302	66	122	18	19.49
1991	80	12	35	219	393	336	282	249	99	76	299	2	20.82
1992	69	0I	552	27	114	190	113	348	8	66	171	53	17.11
1993	14	50	212	187	138	181	85	61	210	154	140	33	14.65
1994	47	80	156	335	94	114	60	214	52	64	151	26	13.93
1995	46	96	120	485	654	384	70	52	185	23	87	9	22.11
1996	95	19I	154	123	505	146	88	46	375	53	84	33	17.21
1997	52	130	33I	431	110	291	180	322	143I	265	117I	92	21.66
1998	85	14	286	413	268I	151I	216I	184I	116I	160	M	88I	
1999	60I	25I	50	566	384	250	347	487	223	105I	55	87	26.39
Ave	0.55	0.64	1.96	2.43	3.30	2.18	1.57	1.86	1.39	1.12	1.23	0.76	18.93
Max	1.15	1.68	5.52	5.66	6.54	5.17	3.47	4.87	3.75	3.79	3.32	1.80	26.39
Year	1989	1987	1992	1999	1995	1987	1999	1999	1996	1984	1983	1987+	1999
Min	0.06	0.00	0.33	0.27	0.63	0.22	0.42	0.15	0.08	0.18	0.00	0.02	13.93
Year	1983	1992	1997	1992	1984	1990	1979	1985	1992	1988	1984	1991	1994
Count	20	21	21	21	22	22	22	22	22	22	21	22	19

Average of MEAN CFS		Water Year											
MONTH		1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
1					0 268709677	0 203744901	0 400185344	0 285994814	0 225260662	0 07524267	0 114643191	0 026766296	0 119411856
2					0 251034483	0 269709952	0 374752831	0 250442179	0 232313838	0 195321149	0 155878556	0 131059176	0 224530357
3	0 5046				0 410967742	0 300670252	1 208154091	0 195543107	0 308176866	0 274245014	0 298818598	2 095935227	0 182635089
4	0 809583333				0 358	1 997492528	4 37685316	2 116368854	0 392590165	0 672206308	0 101641083	2 091282541	0 698238004
5	0 341416129				0 531612903	0 650092795	1 193956053	1 492418281	0 144865899	1 290877938	0 24264943	0 816447182	0 292378588
6	0 02759				0 109	0 146602573	0 340137505	0 189634002	0 003640127	0 030247895	0 01542862	0 122852867	0 033332933
7	0 012764516				0	0	0 02344737	0 000779596	0	0 00547329	0	0 000151373	
8	0 01326129				0	0 196827704	0 064990637	0 116012434	0	0	0	0	
9	0 036146667				0 020333333	0 039475984	0	0 022717602	0	0	0	0	
10	0 003782759	0 026459364			0 093225806	0 036031256	0 310841427	0 072298356	0 228214852	0 006935175	9 933303E-06	0	0
11	0 352910345				0 225666667	0 22510724	0 552265983	0 342996353	0 231272465	0 082114418	0 099959935	0 041092157	0 054468289
12	1 159166667				0 209677419	0 19663115	0 4568811	0 29460386	0 246851599	0 068706225	0 117809961	0 006562959	0 116551054

APPENDIX – D

Diversion Records

WD ID#	Water Right Name	Strut Type #	Name	Stream	Cy	Q-O-Q	Sec	TS	Rng	PM	Coors	Use	Decreed Amount	J Adj Type	Acquit Date	WATER R	PREV ADJ DATE	ASSESS DATE	ADMIN NUMBER	Prior Number	Court Case	Seate P	Alley COMMI	Monday, Jan
6	549 CHARLES WIEHL DITCH	1	41 ROCK CREEK		7	SW	SW	SW	11	1 S	69 W	S 1	2 5000 C S		03/13/1907	03/13/1907	04/10/1905	06/01/1981	0	2018811475		CA4842	1	0 397
6	747 GOODHUE DITCH	1	41 ROCK CREEK		7	SE	SE	30	1 S	69 W	S 1	19 8500 C S	19 8500 C S		06/21/1926	03/13/1907	03/13/1907	05/01/1875	0	20880 09252		CA6672	1	0 493
6	564 COMMUNITY DITCH	1	41 ROCK CREEK		7	SE	SE	30	1 S	69 W	S 0	227 0000 C S,AP	227 0000 C S,AP		06/21/1926	03/13/1907	03/13/1907	08/26/1903	0	20890 19595		CA6672	86	0604212 543 AL?
6	564 COMMUNITY DITCH	1	41 ROCK CREEK		7	SE	SE	30	1 S	69 W	S 1	0 4200 C S,TF,AP	0 4200 C S,TF,AP		06/21/1926	03/13/1907	03/13/1907	08/26/1903	0	20890 19595		92CW0075	90 A	0600564 LOU,SV
6	564 COMMUNITY DITCH	1	41 ROCK CREEK		7	SE	SE	30	1 S	69 W	S 12	0 4200 C S,TF,AP	0 4200 C S,TF,AP		06/21/1926	03/13/1907	03/13/1907	08/26/1903	0	20890 19595		92CW0075	91 A	0600564 LOU,SV
6	564 COMMUNITY DITCH	1	41 ROCK CREEK		7	SE	SE	30	1 S	69 W	S 0	57 0800 C S,AP,AB	57 0800 C S,AP,AB		06/21/1926	03/13/1907	03/13/1907	08/26/1903	0	20890 19595		92CW0075	116 A	0600564 ABAN L
6	862 GERHARDT DITCH	1	41 ROCK CREEK		7	NE	NE	NE	28	1 S	69 W	S 1	4 5000 C S		12/31/1972	12/31/1972	12/31/1971	08/18/1951	0	44559 37119		W4512	1	0
6	3925 CHAUSSART RES	3	41 ROCK CREEK		7	SE	NE	SE	20	1 S	69 W	S 12	36 2400 A S		12/31/1979	12/31/1979	12/31/1978	06/01/1892	0	47116 15493		79CW0154	1	0 CONDIL
6	5934 VARRA POND NO 1	3	41 ROCK CREEK		7	NW	NW	SE	20	1 S	69 W	S 15	15 0000 A S		12/31/1982	12/31/1982	12/31/1981	06/30/1950	0	48212 36705		82CW0423	1	0

1 SOURCE TO S.B.D.R OR FOR STORAGE IN MARSHAL RES

2 TILLE CHING USE 03/31/1995

3 TILLE CHING USE 03/31/1995

4 OUISVILLE CHING USE 03/31/1995

5 ON MUN SOURCE IS ROCK CREEK

Structure Name: GOODHUE DITCH

Water District: 6

ID Number: 747

Source ROCK CREEK
Location Q160 Q40 Q10 Section Township Range PM
SE 30 1 S 69 W S

Acres Irrigated 0
CIU U

Distance from section lines From N/S line From E/W line
UTM Coordinates (NAD 83) Northing (UTM y) 4420266 3 Easting (UTM x) 487039 7 Spotted from PLSS quarters
Latitude/Longitude (decimal degrees) 39.9324 -105 1517

Measuring Device/Recorder

Contact GOODHUE DITCH & RES CO(SEC) Phone (303) 666-6180
Address JOHN MAYHOFFER Cell Phone
E-mail

Water Rights Summary	Total Decreed Rate(s)	Abs	19 8500	Cond	0 0000	AP/EX	0 0000
	Total Decreed Volume(s)	Abs	0 0000	Cond	0 0000	AP/EX	0 0000

Water Rights -- Transactions

Seq. #	Case Number	Adjudication Date	Appropriation Date	Admin Number	O #	Priority Number	Decreed Amount	Adj Type	Uses	Comments
1	CA6672	6/21/1926	5/1/1875	20890 09252	0		19 85 C S		1	493

Rock Creek

X-Section = RCM = 06/06/05



Rock Creek Tributary

X-Section = RCT = 06/06/05



Rock Creek – X-Section = RCL = 06/06/05



Rock Creek – X-Section = RCU = 06/06/05

