Stream: Como Creek

Executive Summary

Water Division: 1
Water District: 6
CDOW#: 13184
CWCB ID: 08/1/A-001

Segment: Headwaters to USFS Boundary
Upper Terminus: HEADWATERS IN THE VICINITY OF
(Latitude: 40º 02’ 22.88”N) (Longitude: 105º 34’ 0.79"W)

Lower Terminus: USFS BOUNDARY AT
(Latitude: 40º 00’ 51.0”N) (Longitude: 105º 30’ 52.89"W)

Watershed: St. Vrain (HUC #: 10190005)
Counties: Boulder
Length: 4.2 miles
USGS Quad(s): Ward
Flow Recommendation: 2.90 cfs (May 1– July 31)
1.10 cfs (August 1 – October 15)
0.45 cfs (October 16 – March 31)
1.10 cfs (April 1 – April 30)

Staff Analysis and Recommendation

Summary

The information contained in this report and the associated instream flow appendices (see CD entitled 2008 Instream Flow Recommendations) forms the basis for staff's 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 5.40.

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

Como Creek is approximately 5.6 miles long. It begins on the east side of Mount Albion at an elevation of approximately 10,500 feet and terminates at the USFS Boundary at an elevation of approximately 8600 feet. Of the 4.2 mile segment addressed by this report, approximately 95% of the segment, or 4.6 miles, is located on public lands. Como Creek is located within Boulder County. The total drainage area of the creek is approximately 4.02 square miles. Como Creek generally flows in a southeasterly direction.

The subject of this report is a segment of the Como Creek beginning at its headwaters and extending downstream to the USFS Boundary. The proposed segment is located north of the town of Nederland. The recommendation for this segment is discussed below.

Instream Flow Recommendation(s)

TU and CDOW are recommending 2.90 cfs, summer, and 0.80 cfs, winter, based on their data collection efforts. This recommendation is based on the physical and biological data collected to date and does not incorporate any water availability constraints.

• 2.90 cubic feet per second recommended is required to maintain the three principal hydraulic criteria of average depth, average velocity and percent wetted perimeter;

• 0.80 cubic feet per second is required to maintain two of the three principal hydraulic criteria.

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

Land Status Review

Upper Terminus	Lower Terminus	Total Length (miles)	Land Ownership	
			% Private	% Public
Headwaters	USFS Boundary	4.2	5%	95%

95% of the public lands are managed by the USFS.

Biological Data

The CDOW and TU, in September 1988, June and July of 2006, collected stream cross section information, natural environment data, and other data needed to quantify the instream flow needs for this reach of Como Creek. Como Creek is classified as a minor stream (between 4 to 9 feet wide) and fishery surveys indicate the stream environment of Como Creek supports Greenback cutthroat trout (*Oncorhynchus clarkii stomias*). Greenback cutthroat trout have been identified by the CDOW and federal agencies as "species of greatest conservation need". CDOW has been involved in developing a Conservation and Management Plan for this species (Greenback Cutthroat Trout Recovery Plan). The intention of this plan is to increase populations and distributions of identified species, thereby assisting in the long-term persistence of each species. The success of this plan could potentially curtail the need for federal listing of these species under the Endangered Species Act (ESA). This species is currently state and federally listed as "Threatened".

Field Survey Data & Biological Flow Quantification

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 a transect, surveying the stream channel geometry, and measuring the stream discharge.

The Board staff relies upon the biological expertise of the cooperating agencies to interpret output from the R2CROSS data collected to develop the initial, biologic instream flow recommendation. This initial recommendation is designed to address the unique biologic requirements of each stream without regard to water availability. Three 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, seven data sets were collected with the results shown in Table 1 below. Table 1 shows who collected the data (Party), the date the data was collected, the measured discharge at the time of the survey (Q), the accuracy range of the predicted flows based on Manning's Equation (240% and 40% of Q), the summer flow recommendation

based on meeting 3 of 3 hydraulic criteria and the winter flow recommendation based upon 2 of 3 hydraulic criteria.

Table 1: Como Creek R2Cross Summary

			Confidence Intervals	Recommended Flows (cfs)	
Party	**Date**	**Q (cfs)**	**250%-40%**	**Summer 3/3**	**Winter 2/3**
DOW	9/10/1988	0.45	1.1 - .02	1.95 (OR)	0.85
DOW	9/10/1988	0.26	0.7 - 0.1	?	0.3
DOW	9/10/1988	0.26	0.7 - 0.1	?	0.2
DOW & TU	6/7/2006	10	25.1 - 4.0	2.2 (OR)	0.9 (OR)
DOW & TU	6/7/2006	9.8	24.5 - 3.9	4.1	2.0 (OR)
TU	7/5/2006	1.35	3.4 - 0.5	1.7	0.6
TU	7/5/2006	1.35	3.4 - 0.5	3.0	2.0

DOW = Division of Wildlife TU = Trout Unlimited OR = Outside of R2X Confidence Rang

The summer flow recommendations, which met 3 of 3 criteria and were within the accuracy range of the R2CROSS model, ranged from 4.1 cfs to 1.7 cfs. Averaging the summer values within range, results in a 2.9 cfs summer recommendation (See Table 1). The winter flow recommendations, which met 2 of 3 criteria and were within the accuracy range of the R2CROSS model, range, ranged from 2.0 cfs to 0.2 cfs. (See Table 1).

Hydrologic Data and Analysis

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. This evaluation was done through a computation that is, in essence, a "water balance". In concept a "water balance" computation can be viewed as an accounting exercise. When done in its most rigorous form, the water balance parses precipitation into all the avenues water pursues after it is deposited as rain, snow, or ice. In other words, given a specified amount of water deposition (input), the balance tries to account for all water depletions (losses) until a selected end point is reached. Water losses include depletions due to evaporation and transpiration, deliveries into ground water storage, temporary surface storage, incorporations into plant and animal tissue and so forth. These losses are individually or collectively subtracted from the input to reveal the net amount of stream runoff as represented by the discharge measured by stream gages. Of course, the measured stream flow need not be the end point of interest; indeed, when looking at issues of water use to extinction stream flow measurements may only describe intermediate steps in the complex accounting process that is a water balance carried out to a net value of zero.

In its analysis, CWCB staff has attempted to use this idea of balancing inputs and losses to determine if water is available for the recommended Instream Flow Appropriation. Of course, this analysis must be a practical exercise rather than a lengthy, and costly, scientific investigation. As a result, staff has simplified the process by lumping some variables and employing certain rational and scientifically supportable assumptions. The process may be described through the following description of the steps used to complete the evaluation for this particular stream.

The first step required in determining water availability is a determination of the hydrologic regime at the Lower Terminus (LT) of the recommended ISF reach. In the best case this means looking at the data from a gage at the LT. Further, this data, in the best case, has been collected for a long period of time (the longer the better) including wet and dry periods. In the case of **Como Creek** no such gage is available at the LT. In fact, there is no gage on Como Creek. It is thus necessary to describe the normal flow regime at the Como Creek LT through a "representative" gage station. The gage station selected for this was SOUTH ST. VRAIN CREEK NEAR WARD, CO (USGS 06722500), a gage with a 25 year period of record (POR) collected between 1925 and 1973. The gage is at an elevation of 9372 ft above mean sea level (amsl) and has a drainage area of 14.4 mi^2. The hydrograph (plot of discharge over time) produced by this gage was used on Como Creek by multiplying the South St. Vrain discharge values by the ratio of Como Creek basin area (4.02 mi^2 above the LT) to South St Vrain Cr. near Ward basin area (14.4 mi^2). No adjustments for losses to diversions were needed in either basin in this case allowing for a direct computation of the hydrograph.

The following hydrograph depicts the mean monthly discharge of Como Creek (proportioned off South St. Vrain Cr. near Ward). Included in the hydrograph are the recommended ISF values. The data used in the creation of this hydrograph are displayed in Table #2.

Fig 1 - Como Creek Average Monthly Discharge (proportioned on S St Vrain Cr near Ward) & ISFs

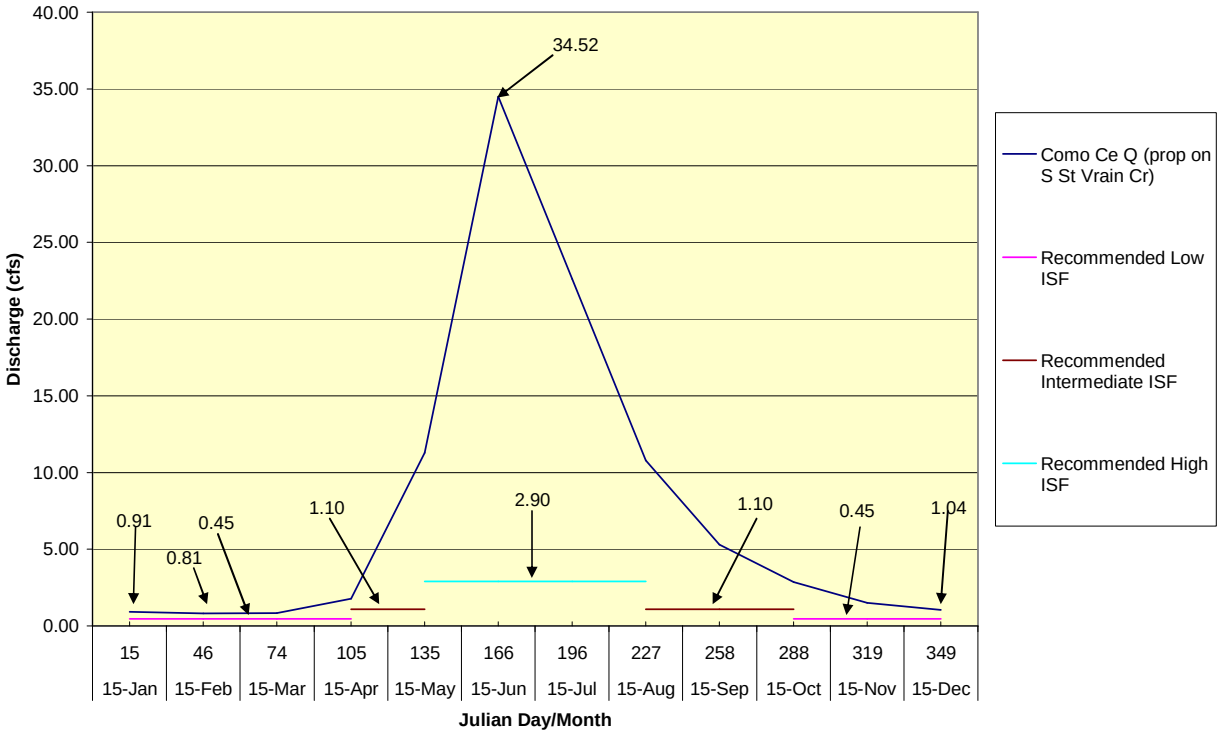


Table 2 – Mean Monthly Discharge and Recommended Instream Flows – Como Cr.

	Julian Day	Como Cr(cfs)	Recom. ISFs(cfs)
15-Jan	15	0.91	0.45
15-Feb	46	0.81	0.45
15-Mar	74	0.83	0.45
31-Mar	90	0.83	0.45
1-Apr	91	1.76	1.10
15-Apr	105	1.76	1.10
30-Apr	120	1.76	1.10
1-May	121	11.27	2.90
15-May	135	11.27	2.90
15-Jun	166	34.52	2.90
15-Jul	196	22.60	2.90
31-Jul	212	22.60	2.90
1-Aug	213	10.77	1.10
15-Aug	227	10.77	1.10
15-Sep	258	5.30	1.10
15-Oct	288	2.86	1.10
16-Oct	289	2.86	0.45
15-Nov	319	1.50	0.45
15-Dec	349	1.04	0.45

Existing Water Right Information

Staff has analyzed the water rights tabulation to identify any potential water availability problems. Records indicate that there are no surface water diversions that are located within this reach of Como Creek. However, CDOW staff did see an abandoned diversion site within the reach and there are existing water rights downstream of the proposed instream flow reach. Based on this analysis staff has determined that water is available for appropriation on Como Creek, from the Headwaters to the USFS Boundary, to preserve the natural environment to a reasonable degree without limiting or foreclosing the exercise of valid existing water rights.

CWCB Staff's Instream Flow Recommendation
Staff recommends the Board form its intent to appropriate on the following stream reach:

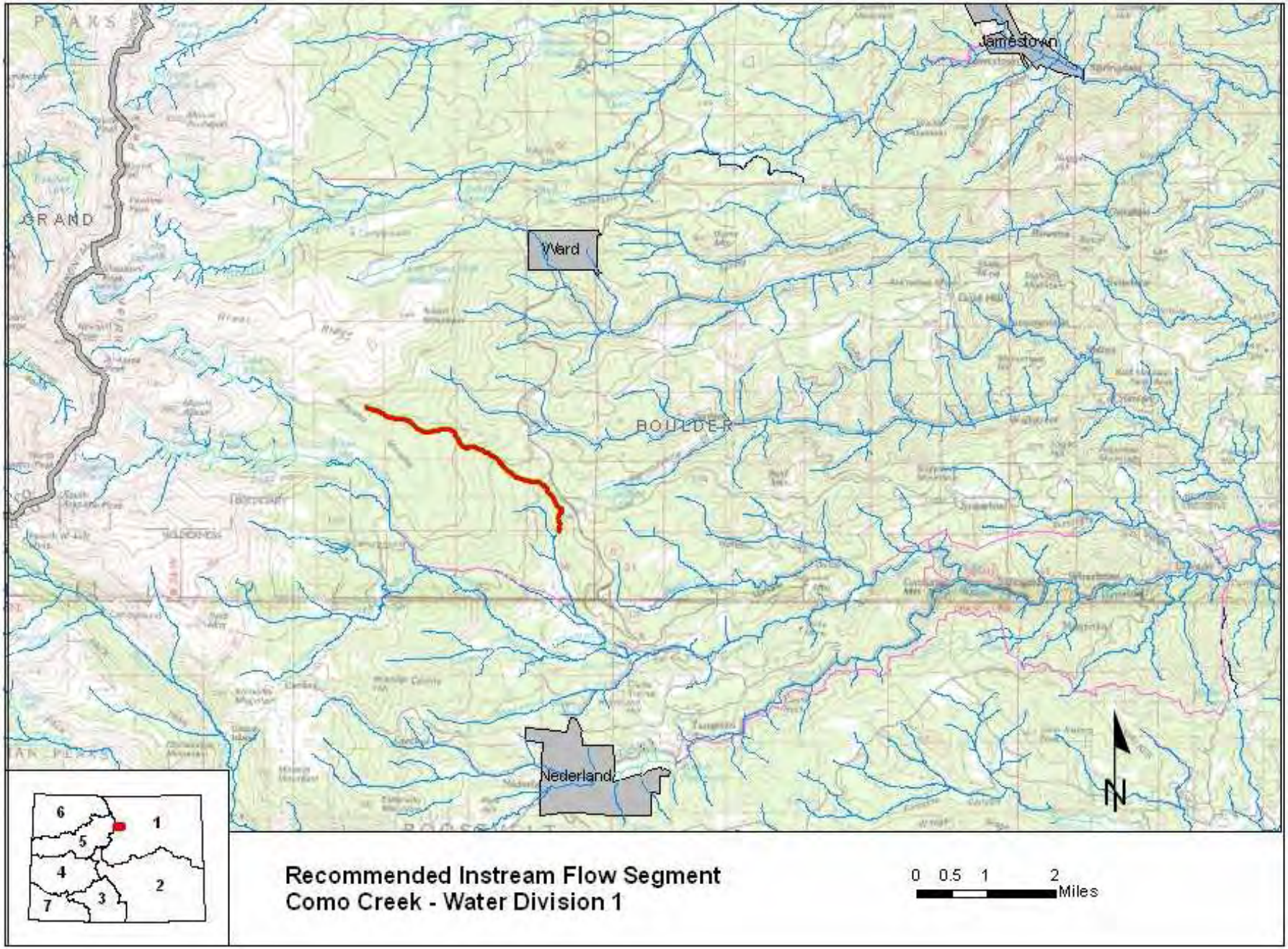
Segment: Headwaters to USFS Boundary

Upper Terminus: HEADWATERS IN THE VICINITY OF
(Latitude: 40º 02' 22.88"N) (Longitude: 105º 34' 0.79"W)
UTM North: 4432316.2 UTM East: 451638.7
S21 T1N R73W 6PM
1190' North of the South Section Line; 1405' West of the East Section Line

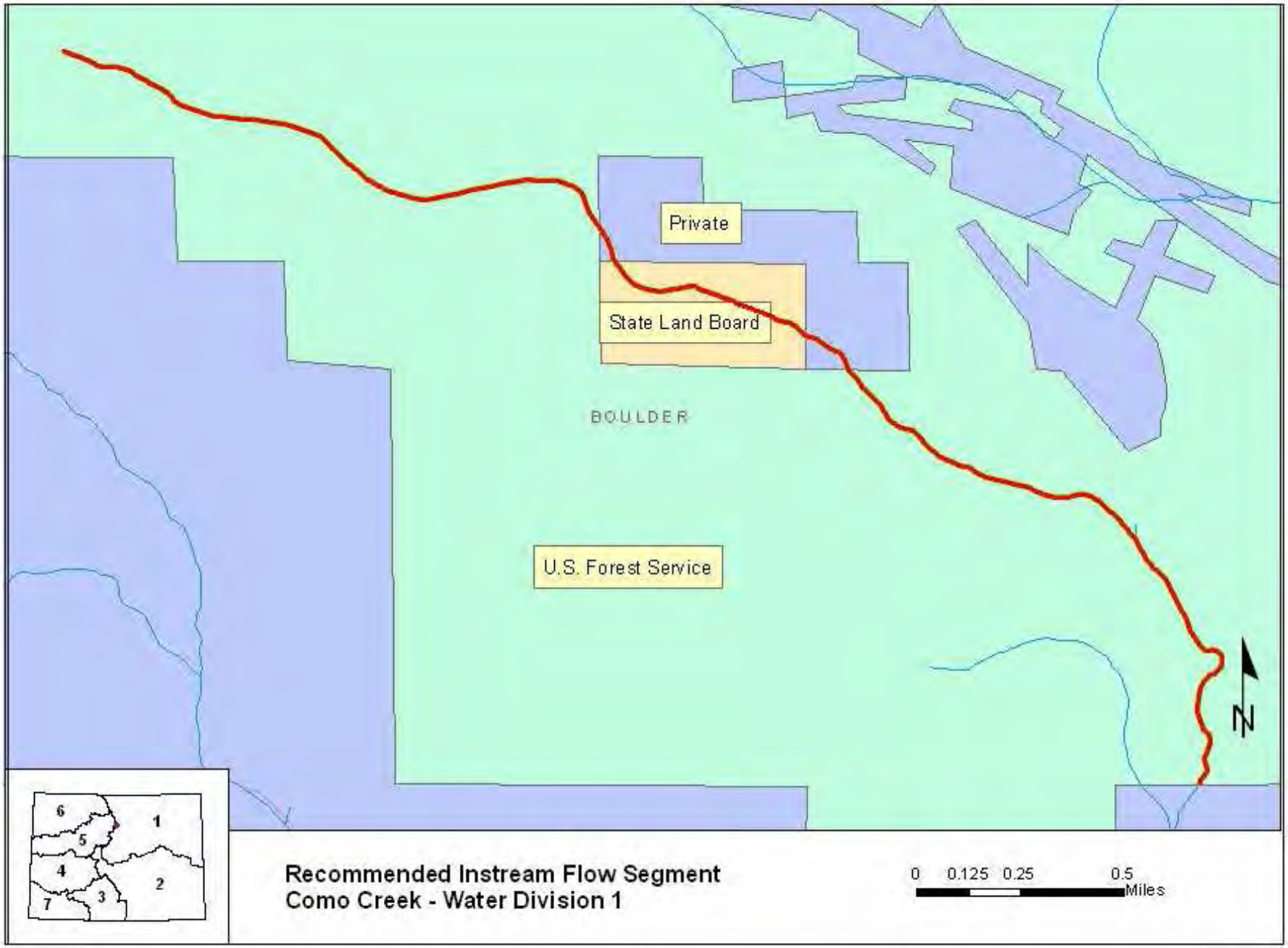
Lower Terminus: USFS BOUNDARY AT
(Latitude: 40º 00' 51.0"N) (Longitude: 105º 30' 52.89"W)
UTM North: 4429456.4 UTM East: 456075.1
S25 T1N R73W 6PM
10' North of the South Section Line; 2475 East of the West Section Line

Watershed: St. Vrain (HUC #: 10190005)
Counties: Boulder
Length: 4.2 miles
USGS Quad(s): Ward
Flow Recommendation 2.90 cfs (May 1– July 31)
1.10 cfs (August 1 – October 15)
0.45 cfs (October 16 – March 31)
1.10 cfs (April 1 – April 30)

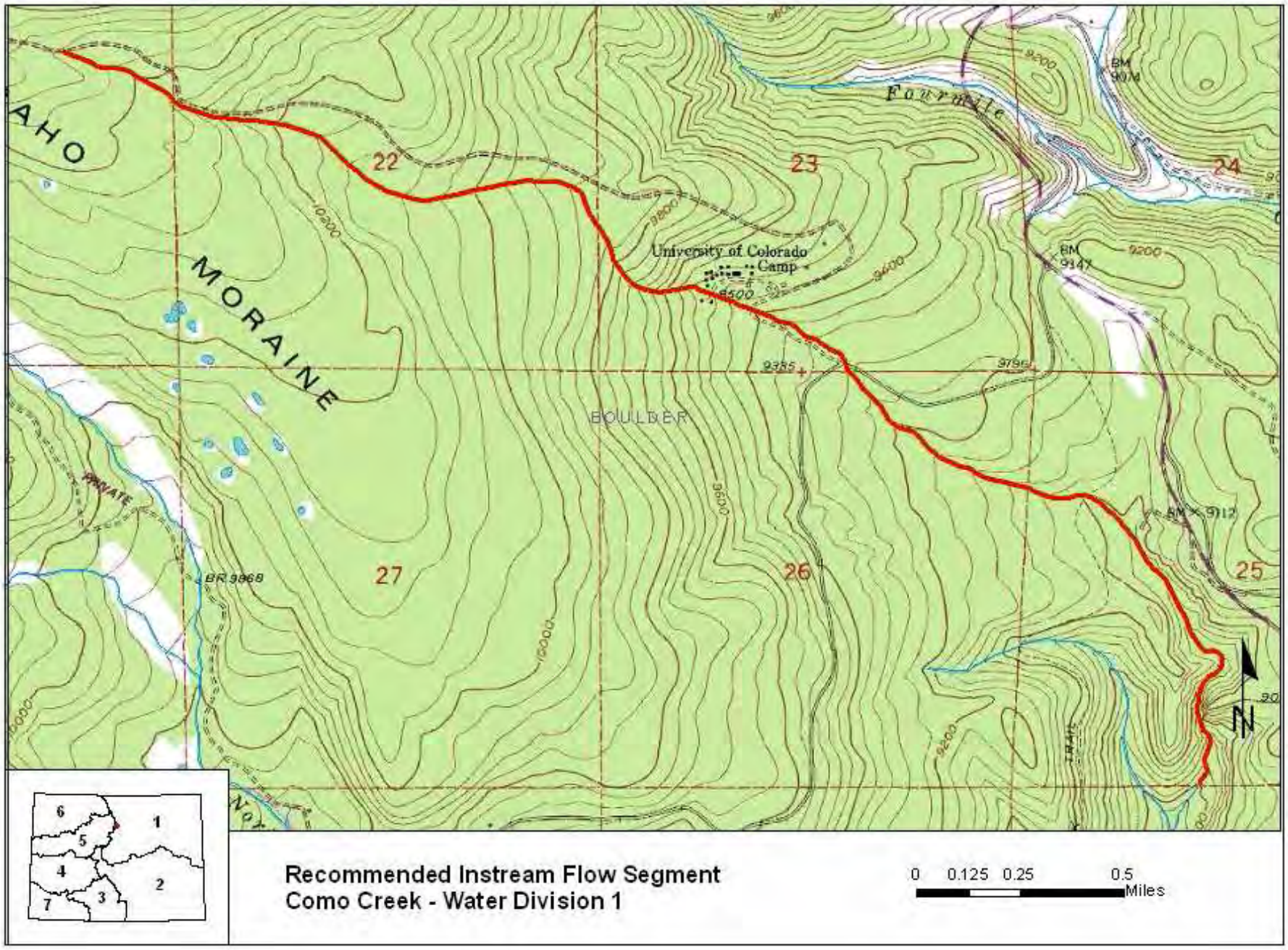
Vicinity Map



Land Use Map


Private
State Land Board
BOULDER
U.S. Forest Service
N
6
1
5
4
2
7
3
Recommended Instream Flow Segment
Como Creek - Water Division 1
0 0.125 0.25 0.5
Miles

Topographic & Water Rights Map



STATE OF COLORADO

Bill Ritter, Jr., Governor
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WILDLIFE
AN EQUAL OPPORTUNITY EMPLOYER

Bruce McCloskey, Director
6060 Broadway
Denver, Colorado 80216
Telephone: (303) 297-1192
wildlife.state.co.us

For Wildlife-
For People

February 20, 2007

Mr. Jeff Baessler and Mr. Todd Doherty
Colorado Water Conservation Board
Stream and Lake Protection Section
1313 Sherman Street, Room 723
Denver, Colorado 80203

Re: Colorado Division of Wildlife Instream Flow Recommendations for Como Creek.

Dear Jeff and Todd,

The purpose of this letter and attached report is to formally transmit Trout Unlimited (TU) and the Colorado Division of Wildlife's (CDOW) Instream Flow Recommendations for Como Creek. The CDOW and TU have collected data, including stream cross section information and natural environment data, needed to quantify the instream flow requirements for the reach of Como Creek identified in the report to preserve the natural environment to a reasonable degree. In addition, TU and CDOW staff conducted a preliminary evaluation of the stream hydrology to determine if water is physically available for an instream flow appropriation. Como Creek should be considered for inclusion into the Instream Flow Program (ISFP) because it has a natural environment that can be preserved to a reasonable degree with an instream flow water right.

The State of Colorado's ISFP was created in 1973 when the Colorado 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 Colorado Water Conservation Board (Board) with the exclusive authority to appropriate and acquire instream flow and natural lake level water rights. In order to encourage other entities to participate in the ISFP, the statute directs the Board to request instream flow recommendations from other state and federal agencies. TU and the CDOW are recommending this segment of Como Creek to the Board for inclusion into the ISFP.

TU and the CDOW are forwarding this instream stream flow recommendation to the Board to meet Colorado's policy "that the wildlife and their environment are to be protected, preserved, enhanced, and managed for the use, benefit, and enjoyment of the people of this state and its visitors ... and that, to carry out such program and policy, there shall be a continuous operation of planning, acquisition, and development of wildlife habitats and facilities for wildlife-related opportunities." (See §33-1-101 (1)

C.R.S.). The CDOW Strategic Plan states: "[h]ealthy aquatic environments are essential to maintain healthy and viable fisheries, and critical for self-sustaining populations. The [CDOW] desires to protect and enhance the quality and quantity of aquatic habitats."

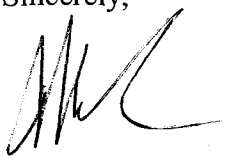
This stream reach is important to TU, the CDOW and Colorado because it supports a naturally reproducing population of Greenback cutthroat trout (*Oncorhynchus clarkii stomias*). Greenback cutthroat trout are currently considered a state and federal "Threatened" species. This species inhabits cold water streams and lakes with adequate stream spawning habitat present in the spring of the year. A Greenback Cutthroat Trout Recovery Plan has been developed by an interagency group of scientists operating under the sponsorship of the U.S. Fish and Wildlife Service. Instream flow maintenance has been identified in the Recovery Plan as an important tool in the recovery of the species. This stream segment was identified at the 2006 instream flow workshop as a possible candidate for instream flow consideration even though it lies outside of the two recommended water divisions (2 & 5). TU and the CDOW believe this recommendation should be considered at this time because:

- The recommendation has broad public support;
- The proposed appropriation will aid in the immediate protection of threatened species;
- The recommended stream is of historical and natural significance;
- The recommendation is part of a water acquisition strategy; and
- The recommendation is part of a collaborative solution to a unique natural resource issue with federal, state and local partners.

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

If you have any questions regarding the attached report or the instream flow recommendations, please contact me at (303)-291-7267.

Sincerely,



Mark Uppendahl
Colorado Division of Wildlife
Instream Flow Program Coordinator

Cc: Grady McNeill, CDOW Resource Support Section Manager – w/o attachments
Jay Skinner, CDOW Water Unit Program Manager – w/o attachments
Greg Gerlich, CDOW Senior Fish Biologist – Northeast Regions – w/o attachments
Harry Crockett, CDOW Aquatic Biologist – w/o attachments
Mark Leslie, CDOW AWM Area 2 – w/o attachments
Claire Solohub, CDOW DWM District 127 – w/o attachments

Appendix - B

Field Data

DATE	Q	25*0.4	3/3	2/3
9/10/88 #1	0.45	1.1-0.2	1.95®	0.85
9/10/88 #2	0.26	0.7-0.1	—	0.30
9/10/88 #3	0.26	0.7-0.1	—	0.20
6/7/06 #2	10.0	25.1-4.0	22®	0.90®
7/5/06 #2	1.35	3.4-0.5	1.7	0.60
6/7/06 #1	9.8	24.5-3.9	4.1	2.0®
7/5/06 #1	1.35	3.4-0.5	3.0	2.0
			2.93	0.80

Nederland 2 NNE 105 33 59.6 40 00 51
Caribou Ranch 105 30 52
Silver Lake NE S21 S SEC line
4429 455
13045607S

FLOW DATA

%	APR	MAY	JUN	JUL	AUG	SEP	OCT	N
25	0.47	6.74	7.17	1.06	0.30	0.25	0.42	0
50	0.21	3.55	4.48	0.57	0.23	0.22	0.31	0
75	0.09	1.41	3.21	0.32	0.13	0.06	0.29	0
Count	44	93	85	62	62	60	31	

4.2 ... le

East of Mount Albion
10,500'
Total 5.6 miles
Area 5.64
Meter 9780
1925 - 1927
1928 - 1931
1954 1973

2.9 (5/1 - 7/31)
0.8 (8/1 - 10/31)
0.45 (11/1 - 3/31)
0.8 (4/1 - 4/30)

$Q = 0.45$

$3/3 = 1.95$

$2/3 = 0.85$

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

LOCATION INFORMATION

STREAM NAME:	COMO CREEK #1
XS LOCATION:	0
XS NUMBER:	1
DATE:	0-Jan-00
OBSERVERS:	SKINNER & WOLFE
1/4 SEC:	0
SECTION:	0
TWP:	0
RANGE:	0
PM:	0
COUNTY:	0
WATERSHED:	0
DIVISION:	0
DOW CODE:	0
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

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

TAPE WT:	0.0106
TENSION:	99999

CHANNEL PROFILE DATA

SLOPE:	0.02044444

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

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

STREAM NAME: COMO CREEK #1
XS LOCATION: 0
XS NUMBER: 1

DATA POINTS= 20

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL
	S	0.00	4.65		
		1.00	5.05		
1	BF	2.00	5.35		
		2.70	6.00		
		3.60	6.15		
	WL	4.60	6.11	0.00	0.00
		4.90	6.20	0.10	0.02
		5.20	6.25	0.10	0.19
		5.50	6.30	0.10	0.30
		5.80	6.30	0.20	0.66
		6.10	6.40	0.30	1.03
		6.40	6.40	0.30	1.10
		6.70	6.40	0.30	0.71
		7.00	6.45	0.30	0.72
		7.30	6.50	0.35	0.75
	WL	7.60	6.12	0.00	0.00
		8.20	6.20		
		8.90	5.75		
1	BF	10.50	5.40		
	TOP PIN	10.51	5.08		

TOTALS ----------

VALUES COMPUTED FROM RAW FIELD DATA

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%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.31	0.10	0.03	0.00	0.1%
0.30	0.10	0.03	0.01	1.3%
0.30	0.10	0.03	0.01	2.0%
0.30	0.20	0.06	0.04	8.7%
0.32	0.30	0.09	0.09	20.4%
0.30	0.30	0.09	0.10	21.8%
0.30	0.30	0.09	0.06	14.1%
0.30	0.30	0.09	0.06	14.3%
0.30	0.35	0.11	0.08	17.3%
0.48		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%
0.00		0.00	0.00	0.0%
3.23	0.35 (Max.)	0.62	0.45	100.0%

Manning's n = 0.0952
Hydraulic Radius= 0.19039433

STREAM NAME: COMO CREEK #1
XS LOCATION: 0
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	0.62	0.70	14.0%
5.87	0.62	2.13	246.0%
5.89	0.62	2.00	226.0%
5.91	0.62	1.88	206.2%
5.93	0.62	1.76	186.6%
5.95	0.62	1.64	167.1%
5.97	0.62	1.52	147.8%
5.99	0.62	1.41	128.7%
6.01	0.62	1.29	109.8%
6.03	0.62	1.18	91.3%
6.05	0.62	1.07	73.2%
6.07	0.62	0.96	55.7%
6.08	0.62	0.90	47.1%
6.09	0.62	0.85	38.6%
6.10	0.62	0.80	30.3%
6.11	0.62	0.75	22.0%
6.12	0.62	0.70	14.0%
6.13	0.62	0.66	6.5%
6.14	0.62	0.61	-0.3%
6.15	0.62	0.58	-6.4%
6.16	0.62	0.54	-11.8%
6.17	0.62	0.51	-16.9%
6.19	0.62	0.45	-26.6%
6.21	0.62	0.40	-35.4%
6.23	0.62	0.35	-43.6%
6.25	0.62	0.30	-51.4%
6.27	0.62	0.25	-58.8%
6.29	0.62	0.21	-65.7%
6.31	0.62	0.17	-71.9%
6.33	0.62	0.14	-77.2%
6.35	0.62	0.11	-82.1%
6.37	0.62	0.08	-86.8%

WATERLINE AT ZERO
AREA ERROR = 6.135

STREAM NAME: COMO CREEK #1
XS LOCATION: 0
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"	5.40	8.45	0.65	1.10	5.46	9.10	100.0%	0.60	8.68	1.59
	5.43	8.25	0.63	1.07	5.18	8.89	97.7%	0.58	8.05	1.56
	5.48	7.97	0.60	1.02	4.77	8.58	94.3%	0.56	7.19	1.51
	5.53	7.69	0.57	0.97	4.38	8.27	90.9%	0.53	6.39	1.46
	5.58	7.40	0.54	0.92	4.00	7.97	87.5%	0.50	5.64	1.41
	5.63	7.12	0.51	0.87	3.64	7.66	84.1%	0.48	4.94	1.36
	5.68	6.84	0.48	0.82	3.29	7.35	80.8%	0.45	4.29	1.31
	5.73	6.56	0.45	0.77	2.95	7.04	77.4%	0.42	3.69	1.25
	5.78	6.38	0.41	0.72	2.63	6.83	75.1%	0.39	3.11	1.18
	5.83	6.25	0.37	0.67	2.32	6.67	73.3%	0.35	2.55	1.10
	5.88	6.11	0.33	0.62	2.01	6.50	71.4%	0.31	2.05	1.02
	5.93	5.98	0.28	0.57	1.70	6.34	69.6%	0.27	1.59	0.93
	5.98	5.85	0.24	0.52	1.41	6.17	67.8%	0.23	1.17	0.83
	6.03	5.55	0.20	0.47	1.12	5.84	64.2%	0.19	0.83	0.74
	6.08	5.17	0.17	0.42	0.85	5.45	59.9%	0.16	0.55	0.65
"WL"	6.13	3.98	0.15	0.37	0.61	4.22	46.4%	0.15	0.38	0.62
	6.18	2.84	0.16	0.32	0.45	3.03	33.3%	0.15	0.28	0.63
	6.23	2.40	0.13	0.27	0.32	2.56	28.1%	0.13	0.18	0.56
	6.28	2.06	0.10	0.22	0.21	2.19	24.1%	0.10	0.10	0.47
	6.33	1.53	0.08	0.17	0.13	1.63	17.9%	0.08	0.05	0.40
	6.38	1.34	0.04	0.12	0.05	1.40	15.4%	0.04	0.01	0.25
	6.43	0.44	0.03	0.07	0.01	0.48	5.3%	0.03	0.00	0.22
	6.48	0.10	0.01	0.02	0.00	0.11	1.2%	0.01	0.00	0.08

3/3 = 1.95 ©

2/3 0.85

STREAM NAME: COMO CREEK #1
XS LOCATION: 0
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	0.45	cfs
CALCULATED FLOW (Qc)=	0.38	cfs
(Qm-Qc)/Qm * 100 =	16.4	%
MEASURED WATERLINE (WLm)=	6.12	ft
CALCULATED WATERLINE (WLc)=	6.13	ft
(WLm-WLc)/WLm * 100 =	-0.3	%
MAX MEASURED DEPTH (Dm)=	0.35	ft
MAX CALCULATED DEPTH (Dc)=	0.37	ft
(Dm-Dc)/Dm * 100	-4.4	%
MEAN VELOCITY=	0.62	ft/sec
MANNING'S N=	0.095	
SLOPE=	0.02044444	ft/ft
.4 * Qm =	0.2	cfs
2.5 * Qm=	1.1	cfs

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

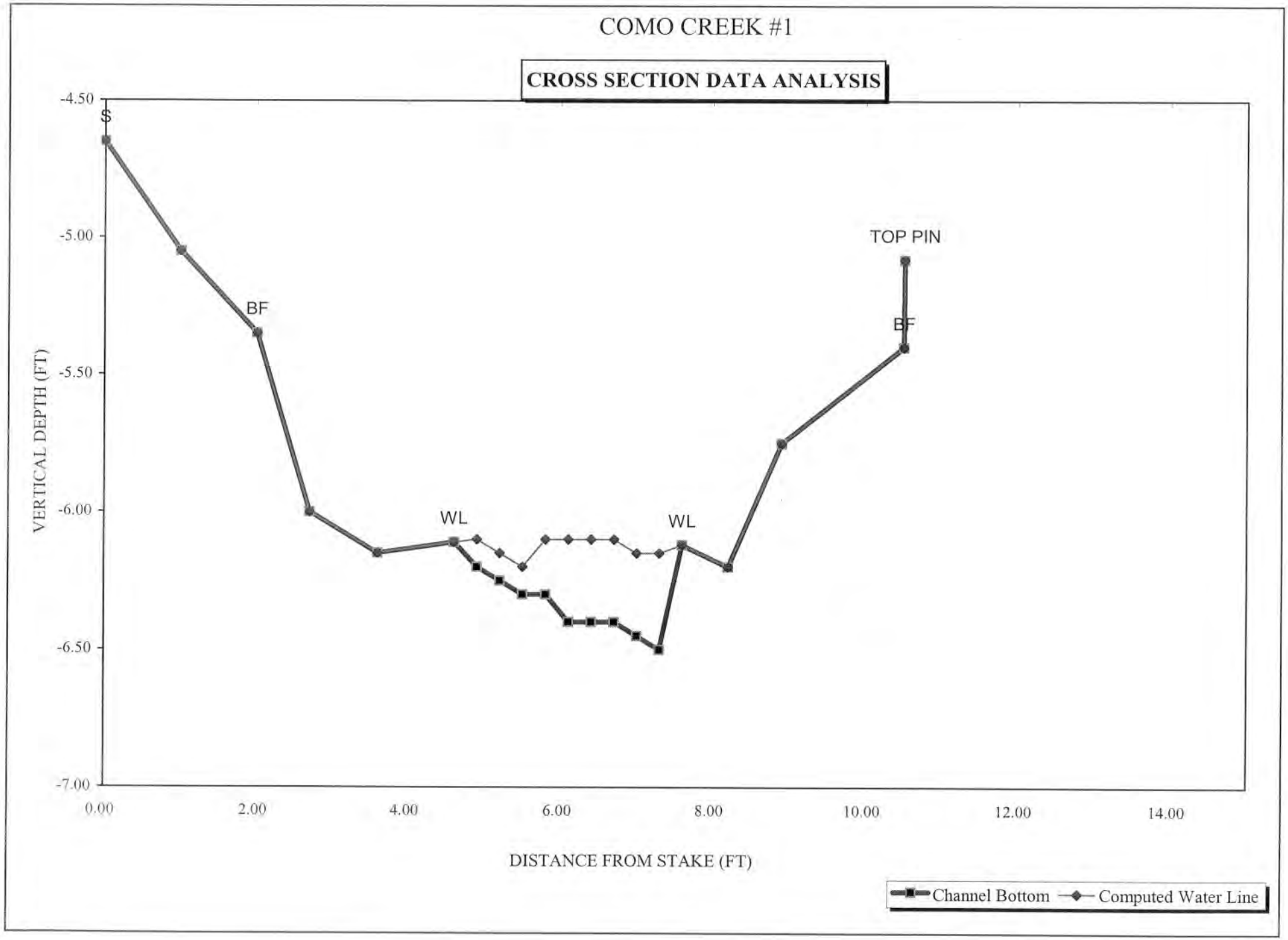
FLOW (CFS)	PERIOD
==========	========
_____	_____
_____	_____
_____	_____
_____	_____

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

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

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

COMO CREEK #1


CROSS SECTION DATA ANALYSIS
-4.50
-5.00
-5.50
-6.00
-6.50
-7.00
VERTICAL DEPTH (FT)
S
BF
WL
WL
TOP PIN
BF
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line

Data Input & Proofing

STREAM NAME: COMO CREEK #1
XS LOCATION:
XS NUMBER: 1
DATE:
OBSERVERS: SKINNER & WOLFE

1/4 SEC:
SECTION:
TWP:
RANGE:
PM:

COUNTY:
WATERSHED:
DIVISION:
DOW CODE:
USGS MAP:
USFS MAP:

Level and Rod Survey

TAPE WT: 0.0106 lbs / ft
TENSION: 99999 lbs

SLOPE: 0.020444444 ft / ft

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

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

Total Data Points = 20

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
	S	0	4.65			0.00	0.00	0.00
		1	5.05			0.00	0.00	0.00
1	BF	2	5.35			0.00	0.00	0.00
		2.7	6			0.00	0.00	0.00
		3.6	6.15			0.00	0.00	0.00
	WL	4.6	6.11	0	0	0.00	0.00	0.00
		4.9	6.2	0.1	0.02	0.03	0.00	6.10
		5.2	6.25	0.1	0.19	0.03	0.01	6.15
		5.5	6.3	0.1	0.3	0.03	0.01	6.20
		5.8	6.3	0.2	0.66	0.06	0.04	6.10
		6.1	6.4	0.3	1.03	0.09	0.09	6.10
		6.4	6.4	0.3	1.1	0.09	0.10	6.10
		6.7	6.4	0.3	0.71	0.09	0.06	6.10
		7	6.45	0.3	0.72	0.09	0.06	6.15
		7.3	6.5	0.35	0.75	0.11	0.08	6.15
	WL	7.6	6.12	0	0	0.00	0.00	0.00
		8.2	6.2			0.00	0.00	0.00
		8.9	5.75			0.00	0.00	0.00
1	BF	10.5	5.4			0.00	0.00	0.00
	TOP PIN	10.51	5.08			0.00	0.00	0.00

Totals	0.62	0.45

STREAM NAME: COMO CREEK #1
XS LOCATION: 0
XS NUMBER: 1

Thorne-Zevenbergen D84 Correction Applied
Estimated D84 = 0.28

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

STAGING TABLE

Velocity based on test of R/D84>1

	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	5.40	8.45	0.65	1.10	5.46	9.10	100.0%	0.60	15.99	2.93
	5.43	8.25	0.63	1.07	5.18	8.89	97.7%	0.58	14.69	2.84
	5.48	7.97	0.60	1.02	4.77	8.58	94.3%	0.56	12.93	2.71
	5.53	7.69	0.57	0.97	4.38	8.27	90.9%	0.53	11.30	2.58
	5.58	7.40	0.54	0.92	4.00	7.97	87.5%	0.50	9.79	2.45
	5.63	7.12	0.51	0.87	3.64	7.66	84.1%	0.48	8.40	2.31
	5.68	6.84	0.48	0.82	3.29	7.35	80.8%	0.45	7.14	2.17
	5.73	6.56	0.45	0.77	2.95	7.04	77.4%	0.42	5.99	2.03
	5.78	6.38	0.41	0.72	2.63	6.83	75.1%	0.39	4.88	1.85
	5.83	6.25	0.37	0.67	2.32	6.67	73.3%	0.35	3.85	1.66
	5.88	6.11	0.33	0.62	2.01	6.50	71.4%	0.31	2.93	1.46
	5.93	5.98	0.28	0.57	1.70	6.34	69.6%	0.27	2.74	1.61
	5.98	5.85	0.24	0.52	1.41	6.17	67.8%	0.23	1.70	1.21
	6.03	5.55	0.20	0.47	1.12	5.84	64.2%	0.19	1.03	0.92
	6.08	5.17	0.17	0.42	0.85	5.45	59.9%	0.16	0.58	0.68
WL	6.13	3.98	0.15	0.37	0.61	4.22	46.4%	0.15	0.38	0.62
	6.18	2.84	0.16	0.32	0.45	3.03	33.3%	0.15	0.29	0.64
	6.23	2.40	0.13	0.27	0.32	2.56	28.1%	0.13	0.16	0.49
	6.28	2.06	0.10	0.22	0.21	2.19	24.1%	0.10	0.07	0.32
	6.33	1.53	0.08	0.17	0.13	1.63	17.9%	0.08	0.03	0.22
	6.38	1.34	0.04	0.12	0.05	1.40	15.4%	0.04	0.01	0.10
	6.43	0.44	0.03	0.07	0.01	0.48	5.3%	0.03	0.00	0.04
	6.48	0.10	0.01	0.02	0.00	0.11	1.2%	0.01	0.00	0.00

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

LOCATION INFORMATION

STREAM NAME:	COMO CREEK #2
XS LOCATION:	0
XS NUMBER:	2
DATE:	0-Jan-00
OBSERVERS:	SKINNER & WOLFE
1/4 SEC:	0
SECTION:	0
TWP:	0
RANGE:	0
PM:	0
COUNTY:	0
WATERSHED:	0
DIVISION:	0
DOW CODE:	0
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

		*** NOTE *** Leave TAPE WT and TENSION at defaults for data collected with a survey level and rod
TAPE WT:	0.0106	
TENSION:	99999	

CHANNEL PROFILE DATA

SLOPE:	0.011875

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

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

STREAM NAME: COMO CREEK #2
XS LOCATION: 0
XS NUMBER: 2

DATA POINTS= 27

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
S	0.00	6.20			0.00		0.00	0.00	0.0%
	1.40	6.95			0.00		0.00	0.00	0.0%
	2.40	7.55			0.00		0.00	0.00	0.0%
1 BF	2.90	7.95			0.00		0.00	0.00	0.0%
	3.40	8.45			0.00		0.00	0.00	0.0%
	4.00	8.75			0.00		0.00	0.00	0.0%
	4.60	9.00			0.00		0.00	0.00	0.0%
	4.80	9.65			0.00		0.00	0.00	0.0%
WL	5.50	9.88	0.00	0.00	0.00		0.00	0.00	0.0%
	5.80	9.95	0.05	0.14	0.31	0.05	0.02	0.00	0.8%
	6.10	10.05	0.10	0.02	0.32	0.10	0.03	0.00	0.2%
	6.40	10.15	0.20	0.22	0.32	0.20	0.06	0.01	5.0%
	6.70	10.20	0.25	0.43	0.30	0.25	0.08	0.03	12.2%
	7.00	10.20	0.25	0.45	0.30	0.25	0.08	0.03	12.8%
	7.30	10.25	0.30	0.50	0.30	0.30	0.09	0.05	17.1%
	7.60	10.25	0.30	0.60	0.30	0.30	0.09	0.05	20.5%
	7.90	10.30	0.40	0.57	0.30	0.40	0.12	0.07	25.9%
	8.20	10.20	0.25	0.11	0.32	0.25	0.08	0.01	3.1%
	8.50	10.15	0.20	0.09	0.30	0.20	0.06	0.01	2.0%
WL	8.80	10.10	0.15	0.03	0.30	0.15	0.02	0.00	0.3%
	8.81	9.90	0.00	0.00	0.20		0.00	0.00	0.0%
	9.00	8.95			0.00		0.00	0.00	0.0%
1 BF	9.40	8.90			0.00		0.00	0.00	0.0%
	9.90	8.60			0.00		0.00	0.00	0.0%
	11.30	8.40			0.00		0.00	0.00	0.0%
BASE	18.80	8.70			0.00		0.00	0.00	0.0%
TOP PIN	18.81	8.36			0.00		0.00	0.00	0.0%
TOTALS					3.58	0.4 (Max.)	0.71	0.26	100.0%

Manning's n = 0.1495
Hydraulic Radius= 0.199360915

STREAM NAME: COMO CREEK #2
XS LOCATION: 0
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	0.71	0.87	22.2%
9.64	0.71	1.79	151.4%
9.66	0.71	1.71	140.0%
9.68	0.71	1.63	128.8%
9.70	0.71	1.55	117.8%
9.72	0.71	1.48	106.9%
9.74	0.71	1.40	96.3%
9.76	0.71	1.33	85.8%
9.78	0.71	1.25	75.5%
9.80	0.71	1.18	65.4%
9.82	0.71	1.11	55.5%
9.84	0.71	1.04	45.7%
9.85	0.71	1.01	40.9%
9.86	0.71	0.97	36.2%
9.87	0.71	0.94	31.4%
9.88	0.71	0.90	26.8%
9.89	0.71	0.87	22.2%
9.90	0.71	0.84	17.6%
9.91	0.71	0.81	13.1%
9.92	0.71	0.78	8.7%
9.93	0.71	0.74	4.3%
9.94	0.71	0.71	0.0%
9.96	0.71	0.65	-8.4%
9.98	0.71	0.59	-16.7%
10.00	0.71	0.54	-24.8%
10.02	0.71	0.48	-32.7%
10.04	0.71	0.42	-40.4%
10.06	0.71	0.37	-48.0%
10.08	0.71	0.32	-55.4%
10.10	0.71	0.27	-62.7%
10.12	0.71	0.22	-69.6%
10.14	0.71	0.17	-76.0%

WATERLINE AT ZERO
AREA ERROR = 9.940

STREAM NAME: COMO CREEK #2
XS LOCATION: 0
XS NUMBER: 2

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	8.90	5.04	0.98	1.40	4.96	6.63	100.0%	0.75	4.43	0.89
	8.94	4.62	1.03	1.36	4.77	6.20	93.6%	0.77	4.33	0.91
	8.99	4.42	1.03	1.31	4.54	5.95	89.8%	0.76	4.11	0.90
	9.04	4.37	0.99	1.26	4.32	5.83	88.0%	0.74	3.84	0.89
	9.09	4.34	0.94	1.21	4.11	5.73	86.4%	0.72	3.56	0.87
	9.14	4.32	0.90	1.16	3.89	5.62	84.9%	0.69	3.29	0.85
	9.19	4.29	0.86	1.11	3.67	5.52	83.3%	0.67	3.03	0.83
	9.24	4.27	0.81	1.06	3.46	5.42	81.7%	0.64	2.78	0.80
	9.29	4.24	0.77	1.01	3.25	5.31	80.2%	0.61	2.53	0.78
	9.34	4.22	0.72	0.96	3.04	5.21	78.6%	0.58	2.29	0.76
	9.39	4.19	0.67	0.91	2.82	5.11	77.1%	0.55	2.06	0.73
	9.44	4.17	0.63	0.86	2.62	5.00	75.5%	0.52	1.84	0.70
	9.49	4.14	0.58	0.81	2.41	4.90	73.9%	0.49	1.62	0.67
	9.54	4.12	0.53	0.76	2.20	4.80	72.4%	0.46	1.42	0.64
	9.59	4.09	0.49	0.71	2.00	4.69	70.8%	0.43	1.22	0.61
	9.64	4.07	0.44	0.66	1.79	4.59	69.3%	0.39	1.04	0.58
	9.69	3.93	0.41	0.61	1.59	4.40	66.4%	0.36	0.88	0.55
	9.74	3.77	0.37	0.56	1.40	4.19	63.2%	0.33	0.73	0.52
	9.79	3.61	0.34	0.51	1.22	3.98	60.0%	0.31	0.60	0.49
	9.84	3.44	0.30	0.46	1.04	3.77	56.8%	0.28	0.48	0.46
	9.89	3.27	0.27	0.41	0.87	3.54	53.5%	0.25	0.37	0.43
WL	9.94	3.05	0.23	0.36	0.71	3.27	49.4%	0.22	0.28	0.39
	9.99	2.89	0.20	0.31	0.57	3.05	46.1%	0.19	0.20	0.35
	10.04	2.73	0.16	0.26	0.42	2.84	42.9%	0.15	0.13	0.30
	10.09	2.58	0.11	0.21	0.29	2.64	39.8%	0.11	0.07	0.25
	10.14	2.19	0.08	0.16	0.17	2.22	33.6%	0.08	0.03	0.20
	10.19	1.62	0.05	0.11	0.08	1.65	24.8%	0.05	0.01	0.14
	10.24	0.84	0.02	0.06	0.02	0.85	12.9%	0.02	0.00	0.09
	10.29	0.09	0.00	0.01	0.00	0.09	1.4%	0.00	0.00	0.03

STREAM NAME: COMO CREEK #2
XS LOCATION: 0
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	0.26	cfs
CALCULATED FLOW (Qc)=	0.28	cfs
(Qm-Qc)/Qm * 100 =	-6.1	%
MEASURED WATERLINE (WLm)=	9.89	ft
CALCULATED WATERLINE (WLc)=	9.94	ft
(WLm-WLc)/WLm * 100 =	-0.5	%
MAX MEASURED DEPTH (Dm)=	0.40	ft
MAX CALCULATED DEPTH (Dc)=	0.36	ft
(Dm-Dc)/Dm * 100	10.0	%
MEAN VELOCITY=	0.39	ft/sec
MANNING'S N=	0.149	
SLOPE=	0.011875	ft/ft
.4 * Qm =	0.1	cfs
2.5 * Qm=	0.7	cfs

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

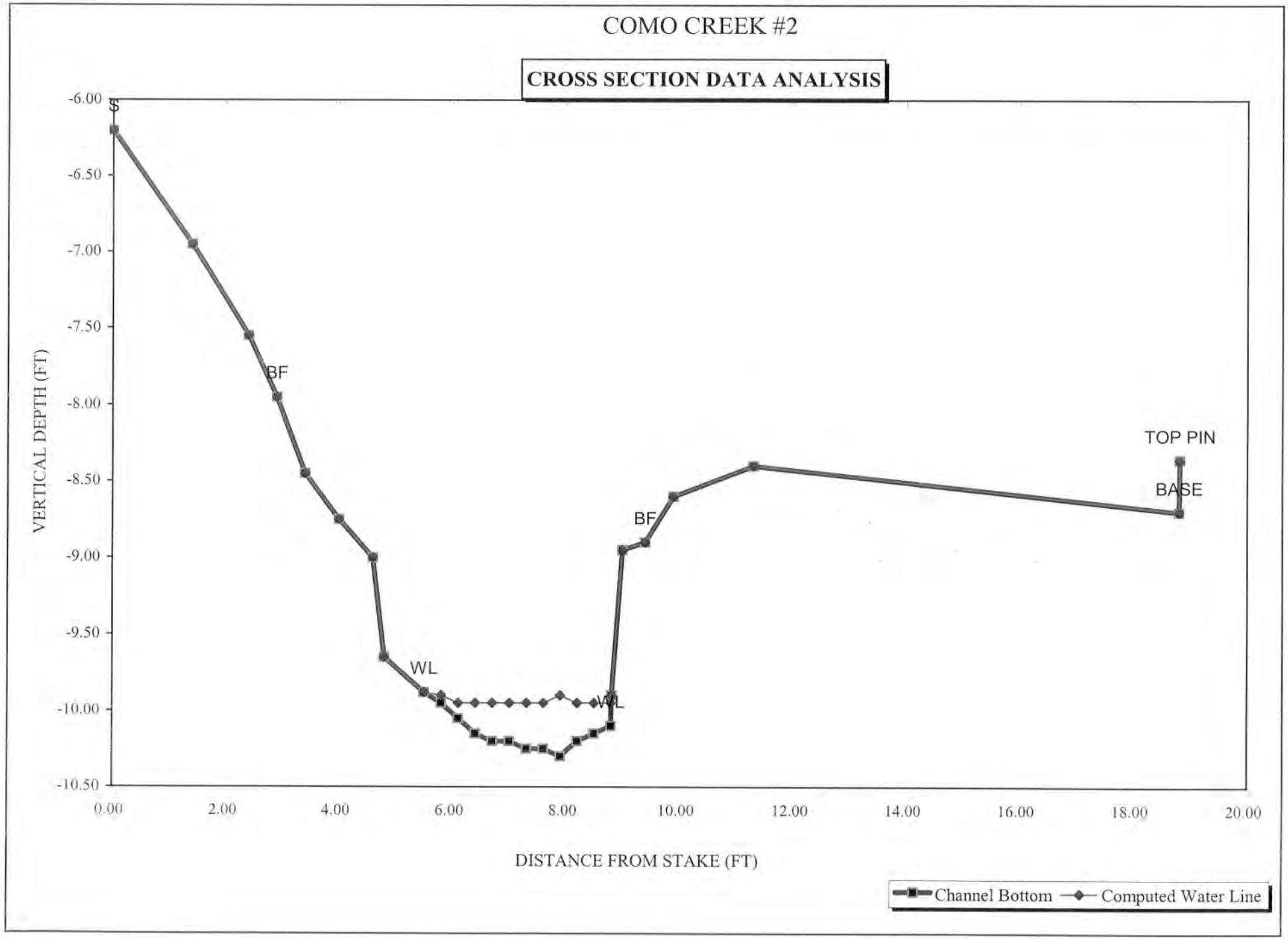
FLOW (CFS)	PERIOD
==========	========
_____	_____
_____	_____
_____	_____
_____	_____

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

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

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

COMO CREEK #2


CROSS SECTION DATA ANALYSIS
-6.00
-6.50
-7.00
-7.50
-8.00
-8.50
-9.00
-9.50
-10.00
-10.50
VERTICAL DEPTH (FT)
BF
WL
WL
BF
TOP PIN
BASE
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line

Data Input & Proofing

STREAM NAME: COMO CREEK #2
XS LOCATION:
XS NUMBER: 2
DATE:
OBSERVERS: SKINNER & WOLFE

1/4 SEC:
SECTION:
TWP:
RANGE:
PM:

COUNTY:
WATERSHED:
DIVISION:
DOW CODE:
USGS MAP:
USFS MAP:

Level and Rod Survey

TAPE WT: 0.0106 lbs / ft
TENSION: 99999 lbs

SLOPE: 0.011875 ft / ft

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

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

Total Data Points = 27

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
	S	0	6.2			0.00	0.00	0.00
		1.4	6.95			0.00	0.00	0.00
		2.4	7.55			0.00	0.00	0.00
1	BF	2.9	7.95			0.00	0.00	0.00
		3.4	8.45			0.00	0.00	0.00
		4	8.75			0.00	0.00	0.00
		4.6	9			0.00	0.00	0.00
		4.8	9.65			0.00	0.00	0.00
	WL	5.5	9.88	0	0	0.00	0.00	0.00
		5.8	9.95	0.05	0.14	0.02	0.00	9.90
		6.1	10.05	0.1	0.02	0.03	0.00	9.95
		6.4	10.15	0.2	0.22	0.06	0.01	9.95
		6.7	10.2	0.25	0.43	0.08	0.03	9.95
		7	10.2	0.25	0.45	0.08	0.03	9.95
		7.3	10.25	0.3	0.5	0.09	0.05	9.95
		7.6	10.25	0.3	0.6	0.09	0.05	9.95
		7.9	10.3	0.4	0.57	0.12	0.07	9.90
		8.2	10.2	0.25	0.11	0.08	0.01	9.95
		8.5	10.15	0.2	0.09	0.06	0.01	9.95
	WL	8.8	10.1	0.15	0.03	0.02	0.00	9.95
		8.81	9.9	0	0	0.00	0.00	0.00
		9	8.95			0.00	0.00	0.00
1	BF	9.4	8.9			0.00	0.00	0.00
		9.9	8.6			0.00	0.00	0.00
		11.3	8.4			0.00	0.00	0.00
	BASE	18.8	8.7			0.00	0.00	0.00
	TOP PIN	18.81	8.36			0.00	0.00	0.00

Totals	0.71	0.26

STREAM NAME: COMO CREEK #2
XS LOCATION: 0
XS NUMBER: 2

Thorne-Zevenbergen D84 Correction Applied
Estimated D84 = 0.66

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

STAGING TABLE

Velocity based on test of R/D84>1

	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	8.90	5.04	0.98	1.40	4.96	6.63	100.0%	0.75	10.31	2.08
	8.94	4.62	1.03	1.36	4.77	6.20	93.6%	0.77	10.11	2.12
	8.99	4.42	1.03	1.31	4.54	5.95	89.8%	0.76	9.49	2.09
	9.04	4.37	0.99	1.26	4.32	5.83	88.0%	0.74	8.71	2.01
	9.09	4.34	0.94	1.21	4.11	5.73	86.4%	0.72	7.93	1.93
	9.14	4.32	0.90	1.16	3.89	5.62	84.9%	0.69	7.18	1.85
	9.19	4.29	0.86	1.11	3.67	5.52	83.3%	0.67	6.45	1.76
	9.24	4.27	0.81	1.06	3.46	5.42	81.7%	0.64	11.48	3.32
	9.29	4.24	0.77	1.01	3.25	5.31	80.2%	0.61	9.67	2.98
	9.34	4.22	0.72	0.96	3.04	5.21	78.6%	0.58	8.07	2.66
	9.39	4.19	0.67	0.91	2.82	5.11	77.1%	0.55	6.65	2.35
	9.44	4.17	0.63	0.86	2.62	5.00	75.5%	0.52	5.42	2.07
	9.49	4.14	0.58	0.81	2.41	4.90	73.9%	0.49	4.34	1.80
	9.54	4.12	0.53	0.76	2.20	4.80	72.4%	0.46	3.43	1.56
	9.59	4.09	0.49	0.71	2.00	4.69	70.8%	0.43	2.65	1.33
	9.64	4.07	0.44	0.66	1.79	4.59	69.3%	0.39	2.00	1.12
	9.69	3.93	0.41	0.61	1.59	4.40	66.4%	0.36	1.54	0.96
	9.74	3.77	0.37	0.56	1.40	4.19	63.2%	0.33	1.16	0.83
	9.79	3.61	0.34	0.51	1.22	3.98	60.0%	0.31	0.86	0.70
	9.84	3.44	0.30	0.46	1.04	3.77	56.8%	0.28	0.61	0.59
	9.89	3.27	0.27	0.41	0.87	3.54	53.5%	0.25	0.42	0.48
WL	9.94	3.05	0.23	0.36	0.71	3.27	49.4%	0.22	0.28	0.39
	9.99	2.89	0.20	0.31	0.57	3.05	46.1%	0.19	0.17	0.30
	10.04	2.73	0.16	0.26	0.42	2.84	42.9%	0.15	0.09	0.22
	10.09	2.58	0.11	0.21	0.29	2.64	39.8%	0.11	0.05	0.16
	10.14	2.19	0.08	0.16	0.17	2.22	33.6%	0.08	0.02	0.10
	10.19	1.62	0.05	0.11	0.08	1.65	24.8%	0.05	0.00	0.06
	10.24	0.84	0.02	0.06	0.02	0.85	12.9%	0.02	0.00	0.02
	10.29	0.09	0.00	0.01	0.00	0.09	1.4%	0.00	0.00	0.00

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

LOCATION INFORMATION

STREAM NAME:	COMO CREEK #3
XS LOCATION:	0
XS NUMBER:	3
DATE:	0-Jan-00
OBSERVERS:	SKINNER & WOLFE
1/4 SEC:	0
SECTION:	0
TWP:	0
RANGE:	0
PM:	0
COUNTY:	0
WATERSHED:	0
DIVISION:	0
DOW CODE:	0
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

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

TAPE WT:	0.0106
TENSION:	99999

CHANNEL PROFILE DATA

SLOPE:	0.02344828

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

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

STREAM NAME: COMO CREEK #3
XS LOCATION: 0
XS NUMBER: 3

DATA POINTS= 24

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL
	Top Pin	0.00	4.76		
	Base	0.01	5.00		
		6.00	5.45		
		6.60	5.95		
		7.00	6.35		
1	BF	7.50	6.45		
	W	8.00	7.77	0.00	0.00
		8.30	7.90	0.20	0.16
		8.60	8.15	0.40	0.17
		8.90	8.25	0.20	0.38
		9.20	8.05	0.20	0.37
		9.50	8.10	0.30	0.70
		9.80	8.25	0.30	0.90
		10.10	8.05	0.20	0.50
		10.40	7.95	0.10	0.08
		10.70	8.05	0.20	0.07
		11.00	8.01	0.30	0.05
		11.30	8.05	0.20	0.03
		11.50	8.05	0.20	0.04
	W	11.51	7.82	0.00	0.00
		11.80	7.35		
		12.30	7.00		
1	BF	12.90	6.40		
	S	15.00	5.65		

TOTALS ----------

VALUES COMPUTED FROM RAW FIELD DATA

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%
0.00		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%
0.33	0.20	0.06	0.01	3.7%
0.39	0.40	0.12	0.02	7.8%
0.32	0.20	0.06	0.02	8.7%
0.36	0.20	0.06	0.02	8.5%
0.30	0.30	0.09	0.06	24.0%
0.34	0.30	0.09	0.08	30.9%
0.36	0.20	0.06	0.03	11.4%
0.32	0.10	0.03	0.00	0.9%
0.32	0.20	0.06	0.00	1.6%
0.30	0.30	0.09	0.00	1.7%
0.30	0.20	0.05	0.00	0.6%
0.20	0.20	0.02	0.00	0.3%
0.23		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%
0.00		0.00	0.00	0.0%
4.06	0.4 (Max.)	0.79	0.26	100.0%

Manning's n = 0.2304
Hydraulic Radius= 0.194715498

STREAM NAME: COMO CREEK #3
XS LOCATION: 0
XS NUMBER: 3

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	0.79	0.93	17.7%
7.55	0.79	1.84	132.7%
7.57	0.79	1.77	123.2%
7.59	0.79	1.69	113.7%
7.61	0.79	1.62	104.3%
7.63	0.79	1.54	95.0%
7.65	0.79	1.47	85.7%
7.67	0.79	1.40	76.4%
7.69	0.79	1.32	67.3%
7.71	0.79	1.25	58.1%
7.73	0.79	1.18	49.0%
7.75	0.79	1.11	40.0%
7.76	0.79	1.07	35.5%
7.77	0.79	1.04	31.0%
7.78	0.79	1.00	26.5%
7.79	0.79	0.97	22.1%
7.80	0.79	0.93	17.7%
7.81	0.79	0.90	13.3%
7.82	0.79	0.86	9.0%
7.83	0.79	0.83	4.7%
7.84	0.79	0.79	0.4%
7.85	0.79	0.76	-3.8%
7.87	0.79	0.69	-12.2%
7.89	0.79	0.63	-20.4%
7.91	0.79	0.56	-28.6%
7.93	0.79	0.50	-36.6%
7.95	0.79	0.44	-44.6%
7.97	0.79	0.38	-52.5%
7.99	0.79	0.32	-60.0%
8.01	0.79	0.26	-67.1%
8.03	0.79	0.21	-73.6%
8.05	0.79	0.17	-79.1%

WATERLINE AT ZERO
AREA ERROR = 7.836

STREAM NAME: COMO CREEK #3
XS LOCATION: 0
XS NUMBER: 3

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	6.45	5.35	1.28	1.80	6.82	7.41	100.0%	0.92	6.38	0.93
	6.84	4.82	1.01	1.41	4.86	6.46	87.1%	0.75	3.97	0.82
	6.89	4.75	0.97	1.36	4.62	6.33	85.4%	0.73	3.70	0.80
	6.94	4.68	0.94	1.31	4.39	6.21	83.7%	0.71	3.44	0.78
	6.99	4.61	0.90	1.26	4.15	6.08	82.0%	0.68	3.18	0.77
	7.04	4.53	0.87	1.21	3.93	5.95	80.2%	0.66	2.94	0.75
	7.09	4.44	0.83	1.16	3.70	5.81	78.3%	0.64	2.71	0.73
	7.14	4.35	0.80	1.11	3.48	5.67	76.4%	0.61	2.49	0.71
	7.19	4.26	0.77	1.06	3.27	5.53	74.5%	0.59	2.27	0.70
	7.24	4.17	0.73	1.01	3.06	5.38	72.6%	0.57	2.07	0.68
	7.29	4.07	0.70	0.96	2.85	5.24	70.7%	0.54	1.88	0.66
	7.34	3.98	0.66	0.91	2.65	5.10	68.8%	0.52	1.69	0.64
	7.39	3.92	0.62	0.86	2.45	4.98	67.2%	0.49	1.51	0.62
	7.44	3.87	0.58	0.81	2.26	4.87	65.7%	0.46	1.33	0.59
	7.49	3.82	0.54	0.76	2.06	4.76	64.2%	0.43	1.17	0.57
	7.54	3.77	0.50	0.71	1.87	4.65	62.7%	0.40	1.01	0.54
	7.59	3.72	0.45	0.66	1.69	4.53	61.2%	0.37	0.86	0.51
	7.64	3.67	0.41	0.61	1.50	4.42	59.6%	0.34	0.72	0.48
	7.69	3.62	0.36	0.56	1.32	4.31	58.1%	0.31	0.59	0.45
	7.74	3.57	0.32	0.51	1.14	4.20	56.6%	0.27	0.47	0.41
	7.79	3.49	0.28	0.46	0.96	4.06	54.8%	0.24	0.36	0.38
WL	7.84	3.36	0.24	0.41	0.79	3.88	52.3%	0.20	0.27	0.34
	7.89	3.24	0.19	0.36	0.63	3.70	50.0%	0.17	0.19	0.30
	7.94	3.16	0.15	0.31	0.47	3.56	48.1%	0.13	0.12	0.25
	7.99	2.88	0.11	0.26	0.31	3.21	43.3%	0.10	0.07	0.21
	8.04	2.13	0.09	0.21	0.18	2.37	32.0%	0.08	0.03	0.18
	8.09	1.25	0.08	0.16	0.10	1.43	19.3%	0.07	0.02	0.17
	8.14	0.89	0.06	0.11	0.05	1.00	13.5%	0.05	0.01	0.14
	8.19	0.51	0.03	0.06	0.02	0.58	7.8%	0.03	0.00	0.09
	8.24	0.11	0.01	0.01	0.00	0.13	1.7%	0.01	0.00	0.03

STREAM NAME: COMO CREEK #3
XS LOCATION: 0
XS NUMBER: 3

SUMMARY SHEET

MEASURED FLOW (Qm)=	0.26	cfs
CALCULATED FLOW (Qc)=	0.27	cfs
(Qm-Qc)/Qm * 100 =	-3.1	%
MEASURED WATERLINE (WLm)=	7.80	ft
CALCULATED WATERLINE (WLc)=	7.84	ft
(WLm-WLc)/WLm * 100 =	-0.5	%
MAX MEASURED DEPTH (Dm)=	0.40	ft
MAX CALCULATED DEPTH (Dc)=	0.41	ft
(Dm-Dc)/Dm * 100	-3.5	%
MEAN VELOCITY=	0.34	ft/sec
MANNING'S N=	0.230	
SLOPE=	0.02344828	ft/ft
.4 * Qm =	0.1	cfs
2.5 * Qm=	0.7	cfs

RECOMMENDED INSTREAM FLOW:

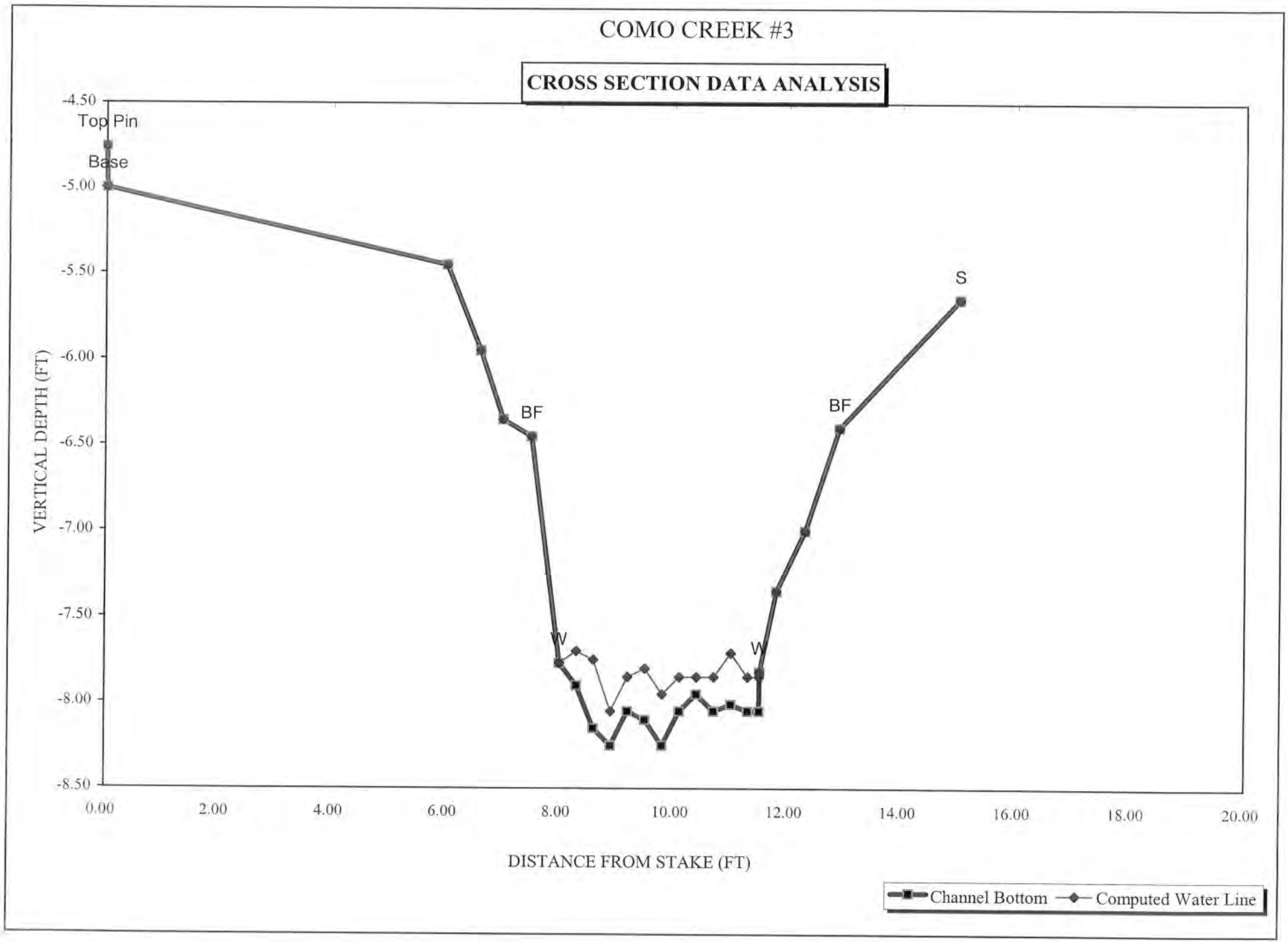
FLOW (CFS)	PERIOD

RATIONALE FOR RECOMMENDATION:

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

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

COMO CREEK #3


CROSS SECTION DATA ANALYSIS
-4.50
Top Pin
Base
-5.00
-5.50
-6.00
-6.50
-7.00
-7.50
-8.00
-8.50
VERTICAL DEPTH (FT)
BF
BF
S
W
W
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
DISTANCE FROM STAKE (FT)
Channel Bottom
Computed Water Line

Data Input & Proofing

STREAM NAME: COMO CREEK #3
XS LOCATION:
XS NUMBER: 3
DATE:
OBSERVERS: SKINNER & WOLFE

1/4 SEC:
SECTION:
TWP:
RANGE:
PM:

COUNTY:
WATERSHED:
DIVISION:
DOW CODE:
USGS MAP:
USFS MAP:

Level and Rod Survey

TAPE WT: 0.0106 lbs / ft
TENSION: 99999 lbs

SLOPE: 0.023448276 ft / ft

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

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

Total Data Points = 24

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
	Top Pin	0	4.76			0.00	0.00	0.00
	Base	0.01	5			0.00	0.00	0.00
		6	5.45			0.00	0.00	0.00
		6.6	5.95			0.00	0.00	0.00
		7	6.35			0.00	0.00	0.00
1	BF	7.5	6.45			0.00	0.00	0.00
	W	8	7.77	0	0	0.00	0.00	0.00
		8.3	7.9	0.2	0.16	0.06	0.01	7.70
		8.6	8.15	0.4	0.17	0.12	0.02	7.75
		8.9	8.25	0.2	0.38	0.06	0.02	8.05
		9.2	8.05	0.2	0.37	0.06	0.02	7.85
		9.5	8.1	0.3	0.7	0.09	0.06	7.80
		9.8	8.25	0.3	0.9	0.09	0.08	7.95
		10.1	8.05	0.2	0.5	0.06	0.03	7.85
		10.4	7.95	0.1	0.08	0.03	0.00	7.85
		10.7	8.05	0.2	0.07	0.06	0.00	7.85
		11	8.01	0.3	0.05	0.09	0.00	7.71
		11.3	8.05	0.2	0.03	0.05	0.00	7.85
		11.5	8.05	0.2	0.04	0.02	0.00	7.85
	W	11.51	7.82	0	0	0.00	0.00	0.00
		11.8	7.35			0.00	0.00	0.00
		12.3	7			0.00	0.00	0.00
1	BF	12.9	6.4			0.00	0.00	0.00
	S	15	5.65			0.00	0.00	0.00

Totals	0.79	0.26

STREAM NAME: COMO CREEK #3
XS LOCATION: 0
XS NUMBER: 3

Thorne-Zevenbergen D84 Correction Applied
Estimated D84 = 0.79

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

STAGING TABLE

Velocity based on test of R/D84>1

	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	6.45	5.35	1.28	1.80	6.82	7.41	100.0%	0.92	19.39	2.84
	6.84	4.82	1.01	1.41	4.86	6.46	87.1%	0.75	20.99	4.32
	6.89	4.75	0.97	1.36	4.62	6.33	85.4%	0.73	18.55	4.01
	6.94	4.68	0.94	1.31	4.39	6.21	83.7%	0.71	16.31	3.72
	6.99	4.61	0.90	1.26	4.15	6.08	82.0%	0.68	14.27	3.43
	7.04	4.53	0.87	1.21	3.93	5.95	80.2%	0.66	12.48	3.18
	7.09	4.44	0.83	1.16	3.70	5.81	78.3%	0.64	10.88	2.94
	7.14	4.35	0.80	1.11	3.48	5.67	76.4%	0.61	9.43	2.71
	7.19	4.26	0.77	1.06	3.27	5.53	74.5%	0.59	8.13	2.49
	7.24	4.17	0.73	1.01	3.06	5.38	72.6%	0.57	6.95	2.27
	7.29	4.07	0.70	0.96	2.85	5.24	70.7%	0.54	5.90	2.07
	7.34	3.98	0.66	0.91	2.65	5.10	68.8%	0.52	4.96	1.87
	7.39	3.92	0.62	0.86	2.45	4.98	67.2%	0.49	4.09	1.67
	7.44	3.87	0.58	0.81	2.26	4.87	65.7%	0.46	3.31	1.47
	7.49	3.82	0.54	0.76	2.06	4.76	64.2%	0.43	2.64	1.28
	7.54	3.77	0.50	0.71	1.87	4.65	62.7%	0.40	2.07	1.11
	7.59	3.72	0.45	0.66	1.69	4.53	61.2%	0.37	1.59	0.94
	7.64	3.67	0.41	0.61	1.50	4.42	59.6%	0.34	1.20	0.80
	7.69	3.62	0.36	0.56	1.32	4.31	58.1%	0.31	0.87	0.66
	7.74	3.57	0.32	0.51	1.14	4.20	56.6%	0.27	0.61	0.54
	7.79	3.49	0.28	0.46	0.96	4.06	54.8%	0.24	0.42	0.43
WL	7.84	3.36	0.24	0.41	0.79	3.88	52.3%	0.20	0.27	0.34
	7.89	3.24	0.19	0.36	0.63	3.70	50.0%	0.17	0.16	0.26
	7.94	3.16	0.15	0.31	0.47	3.56	48.1%	0.13	0.09	0.19
	7.99	2.88	0.11	0.26	0.31	3.21	43.3%	0.10	0.04	0.14
	8.04	2.13	0.09	0.21	0.18	2.37	32.0%	0.08	0.02	0.10
	8.09	1.25	0.08	0.16	0.10	1.43	19.3%	0.07	0.01	0.06
	8.14	0.89	0.06	0.11	0.05	1.00	13.5%	0.05	0.00	0.03
	8.19	0.51	0.03	0.06	0.02	0.58	7.8%	0.03	0.00	0.01
	8.24	0.11	0.01	0.01	0.00	0.13	1.7%	0.01	0.00	0.00

Q = 1.35
3/3 = 1.7
2/3 = 0.6

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

LOCATION INFORMATION

STREAM NAME:	Como Creek Wp #24
XS LOCATION:	Up Stream of flum about 50'
XS NUMBER:	2
DATE:	5-Jul-06
OBSERVERS:	Todd
1/4 SEC:	SW
SECTION:	23
TWP:	1N
RANGE:	73W
PM:	6
COUNTY:	Boulder
WATERSHED:	Boulder
DIVISION:	1
DOW CODE:	0
USGS MAP:	WARD
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:	0.0585

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

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

STREAM NAME: Como Creek Wp #24
XS LOCATION: Up Stream of flum about 50'
XS NUMBER: 2

DATA POINTS= 30

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL
	Top S	0.00	3.69		
		0.00	4.09		
		0.40	3.94		
1	GL	1.40	4.17		
		2.00	4.95		
		2.40	5.05		
	WL	3.05	5.43	0.00	0.00
		3.30	5.73	0.30	0.57
		3.60	5.78	0.35	2.15
		3.90	5.68	0.25	2.42
		4.20	5.58	0.15	2.21
		4.50	5.58	0.15	1.87
		4.80	5.63	0.20	0.64
		5.10	5.63	0.20	0.94
		5.40	5.53	0.10	0.44
		5.70	5.58	0.15	1.48
		6.00	5.58	0.15	1.08
		6.30	5.43	0.00	0.00
		6.60	5.43	0.00	0.00
		6.90	5.63	0.20	2.21
		7.20	5.71	0.28	1.80
		7.50	5.63	0.20	2.33
		7.80	5.63	0.20	0.99
		8.10	5.63	0.20	0.22
	WL	8.35	5.40	0.00	0.00
		8.80	5.17		
1	GL	10.40	4.50		
		13.00	4.35		
	Bottom Stake	16.00	4.21		
	Top Stake	16.00	3.65		

TOTALS ----------

VALUES COMPUTED FROM RAW FIELD DATA

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%
0.00		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%
0.39	0.30	0.08	0.05	3.5%
0.30	0.35	0.11	0.23	16.7%
0.32	0.25	0.08	0.18	13.4%
0.32	0.15	0.05	0.10	7.3%
0.30	0.15	0.05	0.08	6.2%
0.30	0.20	0.06	0.04	2.8%
0.30	0.20	0.06	0.06	4.2%
0.32	0.10	0.03	0.01	1.0%
0.30	0.15	0.05	0.07	4.9%
0.30	0.15	0.05	0.05	3.6%
0.34		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.36	0.20	0.06	0.13	9.8%
0.31	0.28	0.08	0.15	11.0%
0.31	0.20	0.06	0.14	10.3%
0.30	0.20	0.06	0.06	4.4%
0.30	0.20	0.06	0.01	0.9%
0.34		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%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
5.41	0.35 (Max.)	0.91	1.35	100.0%

Manning's n = 0.0737
Hydraulic Radius= 0.168339359

STREAM NAME: Como Creek Wp #24
XS LOCATION: Up Stream of flum about 50'
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	0.91	0.91	-0.4%
5.18	0.91	2.33	156.3%
5.20	0.91	2.21	142.8%
5.22	0.91	2.09	129.5%
5.24	0.91	1.97	116.4%
5.26	0.91	1.85	103.4%
5.28	0.91	1.73	90.6%
5.30	0.91	1.62	78.0%
5.32	0.91	1.51	65.5%
5.34	0.91	1.39	53.2%
5.36	0.91	1.28	41.0%
5.38	0.91	1.17	29.0%
5.39	0.91	1.12	23.0%
5.40	0.91	1.07	17.1%
5.41	0.91	1.01	11.3%
5.42	0.91	0.96	5.4%
5.43	0.91	0.91	-0.4%
5.44	0.91	0.86	-5.8%
5.45	0.91	0.81	-11.2%
5.46	0.91	0.76	-16.5%
5.47	0.91	0.71	-21.7%
5.48	0.91	0.67	-26.9%
5.50	0.91	0.57	-37.1%
5.52	0.91	0.48	-47.1%
5.54	0.91	0.39	-56.8%
5.56	0.91	0.31	-65.8%
5.58	0.91	0.23	-74.3%
5.60	0.91	0.17	-80.8%
5.62	0.91	0.12	-86.6%
5.64	0.91	0.08	-90.8%
5.66	0.91	0.06	-93.4%
5.68	0.91	0.04	-95.5%

WATERLINE AT ZERO
AREA ERROR = 5.429

STREAM NAME: Como Creek Wp #24
XS LOCATION: Up Stream of flum about 50'
XS NUMBER: 2

Constant Manning's n

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

STAGING TABLE

	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	4.50	8.75	0.86	1.28	7.48	9.68	100.0%	0.77	30.76	4.11
	4.53	8.65	0.84	1.25	7.23	9.57	98.8%	0.76	29.25	4.05
	4.58	8.50	0.80	1.20	6.80	9.37	96.8%	0.73	26.78	3.94
	4.63	8.34	0.76	1.15	6.38	9.18	94.9%	0.69	24.41	3.83
	4.68	8.18	0.73	1.10	5.97	8.99	92.9%	0.66	22.14	3.71
	4.73	8.02	0.69	1.05	5.56	8.80	90.9%	0.63	19.98	3.59
	4.78	7.86	0.66	1.00	5.16	8.60	88.9%	0.60	17.92	3.47
	4.83	7.71	0.62	0.95	4.77	8.41	86.9%	0.57	15.97	3.34
	4.88	7.55	0.58	0.90	4.39	8.22	84.9%	0.53	14.11	3.21
	4.93	7.39	0.54	0.85	4.02	8.03	82.9%	0.50	12.36	3.08
	4.98	7.14	0.51	0.80	3.65	7.75	80.1%	0.47	10.80	2.96
	5.03	6.82	0.48	0.75	3.31	7.41	76.6%	0.45	9.41	2.85
	5.08	6.57	0.45	0.70	2.97	7.14	73.8%	0.42	8.08	2.72
	5.13	6.36	0.42	0.65	2.65	6.91	71.4%	0.38	6.82	2.57
	5.18	6.16	0.38	0.60	2.34	6.69	69.1%	0.35	5.65	2.42
	5.23	5.98	0.34	0.55	2.03	6.48	66.9%	0.31	4.58	2.25
	5.28	5.79	0.30	0.50	1.74	6.27	64.8%	0.28	3.61	2.07
	5.33	5.61	0.26	0.45	1.45	6.06	62.6%	0.24	2.74	1.88
	5.38	5.43	0.22	0.40	1.18	5.85	60.5%	0.20	1.97	1.67
WL	5.43	4.97	0.18	0.35	0.91	5.37	55.4%	0.17	1.36	1.49
	5.48	4.70	0.14	0.30	0.67	5.02	51.9%	0.13	0.85	1.27
	5.53	4.43	0.10	0.25	0.44	4.69	48.5%	0.09	0.44	1.01
	5.58	3.11	0.08	0.20	0.24	3.29	34.0%	0.07	0.20	0.84
	5.63	1.44	0.07	0.15	0.10	1.53	15.9%	0.06	0.08	0.79
	5.68	0.85	0.05	0.10	0.04	0.90	9.3%	0.05	0.03	0.63
	5.73	0.46	0.03	0.05	0.01	0.47	4.8%	0.02	0.00	0.41
	5.78	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

3/3 = 1.7
2/3 = .67

STREAM NAME: Como Creek Wp #24
XS LOCATION: Up Stream of flum about 50'
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	1.35	cfs
CALCULATED FLOW (Qc)=	1.36	cfs
(Qm-Qc)/Qm * 100 =	-0.5	%
MEASURED WATERLINE (WLm)=	5.43	ft
CALCULATED WATERLINE (WLc)=	5.43	ft
(WLm-WLc)/WLm * 100 =	0.0	%
MAX MEASURED DEPTH (Dm)=	0.35	ft
MAX CALCULATED DEPTH (Dc)=	0.35	ft
(Dm-Dc)/Dm * 100	-0.2	%
MEAN VELOCITY=	1.49	ft/sec
MANNING'S N=	0.074	
SLOPE=	0.0585	ft/ft
.4 * Qm =	0.5	cfs
2.5 * Qm=	3.4	cfs

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

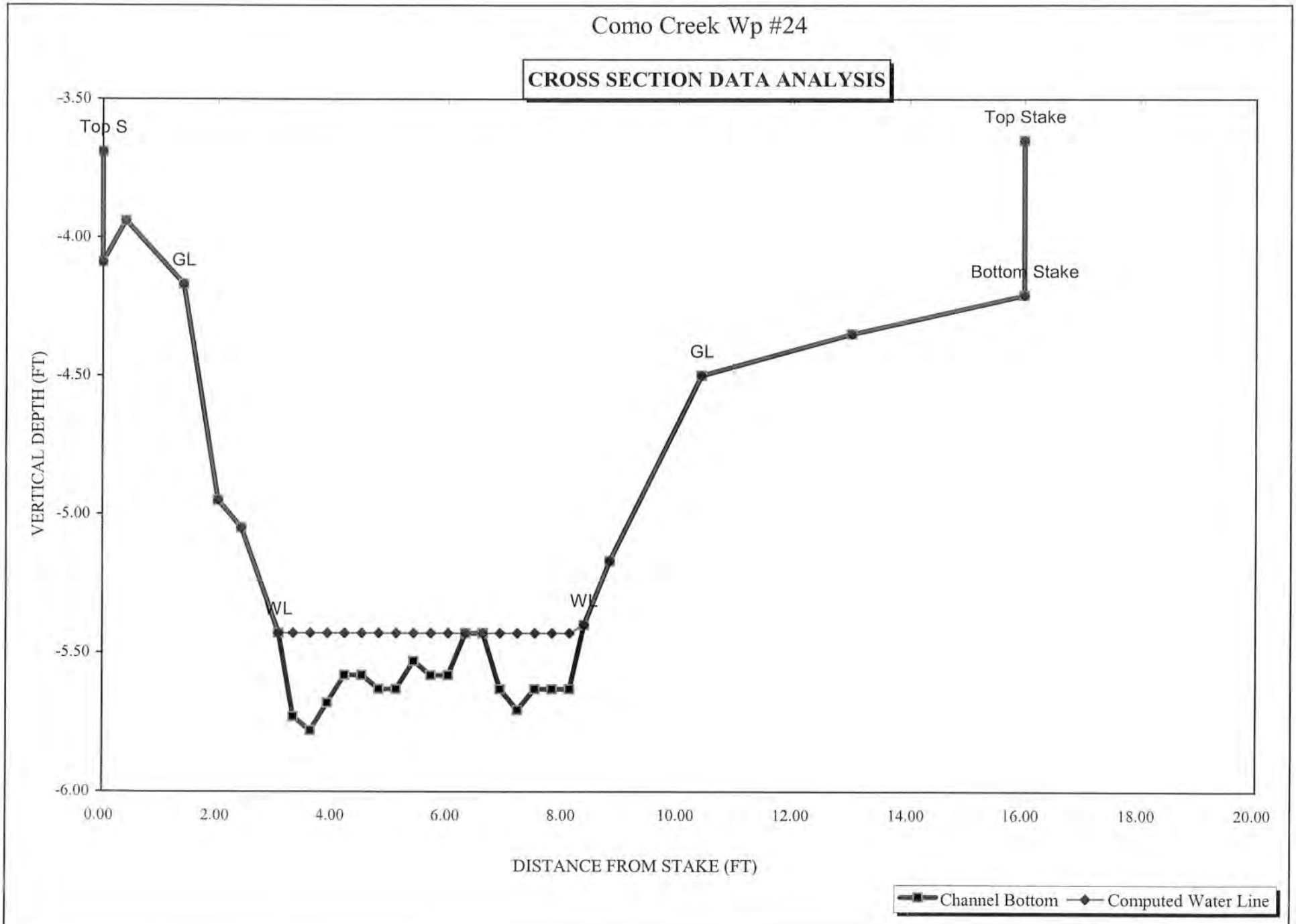
FLOW (CFS)	PERIOD
==========	========
_____	_____
_____	_____
_____	_____
_____	_____

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

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

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

Como Creek Wp #24



Data Input & Proofing

STREAM NAME:	Como Creek Wp #24
XS LOCATION:	Up Stream of flum about 50'
XS NUMBER:	2
DATE:	7/5/2006
OBSERVERS:	Todd
1/4 SEC:	SW
SECTION:	23
TWP:	1N
RANGE:	73W
PM:	6
COUNTY:	Boulder
WATERSHED:	Boulder
DIVISION:	1
DOW CODE:	
USGS MAP:	WARD
USFS MAP:	
TAPE WT:	Level and Rod Survey 0.0106 lbs / ft
TENSION:	99999 lbs
SLOPE:	0.0585 ft / ft

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

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

Total Data Points = 30

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
	Top S	0.00	3.69			0.00	0.00	0.00
		0.00	4.09			0.00	0.00	0.00
		0.40	3.94			0.00	0.00	0.00
1	GL	1.40	4.17			0.00	0.00	0.00
		2.00	4.95			0.00	0.00	0.00
		2.40	5.05			0.00	0.00	0.00
	WL	3.05	5.43	0.00	0.00	0.00	0.00	0.00
		3.30	5.73	0.30	0.57	0.08	0.05	5.43
		3.60	5.78	0.35	2.15	0.11	0.23	5.43
		3.90	5.68	0.25	2.42	0.08	0.18	5.43
		4.20	5.58	0.15	2.21	0.05	0.10	5.43
		4.50	5.58	0.15	1.87	0.05	0.08	5.43
		4.80	5.63	0.20	0.64	0.06	0.04	5.43
		5.10	5.63	0.20	0.94	0.06	0.06	5.43
		5.40	5.53	0.10	0.44	0.03	0.01	5.43
		5.70	5.58	0.15	1.48	0.05	0.07	5.43
		6.00	5.58	0.15	1.08	0.05	0.05	5.43
		6.30	5.43	0.00	0.00	0.00	0.00	0.00
		6.60	5.43	0.00	0.00	0.00	0.00	0.00
		6.90	5.63	0.20	2.21	0.06	0.13	5.43
		7.20	5.71	0.28	1.80	0.08	0.15	5.43
		7.50	5.63	0.20	2.33	0.06	0.14	5.43
		7.80	5.63	0.20	0.99	0.06	0.06	5.43
		8.10	5.63	0.20	0.22	0.06	0.01	5.43
	WL	8.35	5.40	0.00	0.00	0.00	0.00	0.00
		8.80	5.17			0.00	0.00	0.00
1	GL	10.40	4.50			0.00	0.00	0.00
		13.00	4.35			0.00	0.00	0.00
	Bottom Stake	16.00	4.21			0.00	0.00	0.00
					Totals	0.91	1.35	

UPPER

Distance from top of north pin to water's edge:	3.05	LB
Elevation change from N pin to water:	1.74	
Distance from top of south pin to water's edge:	7.65	RB
Elevation change from S pin to water:	1.75	

Flow				
	4	0		
	4.3	0.3	0.57	0.0513
	4.6	0.35	2.15	0.22575
	4.9	0.25	2.42	0.1815
	5.2	0.15	2.21	0.09945
	5.5	0.15	1.87	0.08415
	5.8	0.2	0.64	0.0384
	6.1	0.2	0.94	0.0564
	6.4	0.1	0.44	0.0132
	6.7	0.15	1.48	0.0666
	7	0.15	1.08	0.0486
	7.3	0	0	0
	7.6	0	0	0
	7.9	0.2	2.21	0.1326
	8.2	0.275	1.8	0.1485
	8.5	0.2	2.33	0.1398
	8.8	0.2	0.99	0.0594
	9.1	0.2	0.22	0.0132
	9.4	0		
				1.35885

STREAM NAME: Como Creek Wp #24
XS LOCATION: Up Stream of flum about 50'
XS NUMBER: 2

Thorne-Zevenbergen D84 Correction Applied
Estimated D84 = 0.28

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

STAGING TABLE

Velocity based on test of R/D84>1

	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	4.50	8.75	0.86	1.28	7.48	9.68	100.0%	0.77	52.88	7.07
	4.53	8.65	0.84	1.25	7.23	9.57	98.8%	0.76	49.99	6.92
	4.58	8.50	0.80	1.20	6.80	9.37	96.8%	0.73	45.26	6.66
	4.63	8.34	0.76	1.15	6.38	9.18	94.9%	0.69	40.77	6.39
	4.68	8.18	0.73	1.10	5.97	8.99	92.9%	0.66	36.51	6.12
	4.73	8.02	0.69	1.05	5.56	8.80	90.9%	0.63	32.49	5.84
	4.78	7.86	0.66	1.00	5.16	8.60	88.9%	0.60	28.69	5.56
	4.83	7.71	0.62	0.95	4.77	8.41	86.9%	0.57	25.13	5.26
	4.88	7.55	0.58	0.90	4.39	8.22	84.9%	0.53	21.79	4.96
	4.93	7.39	0.54	0.85	4.02	8.03	82.9%	0.50	18.69	4.65
	4.98	7.14	0.51	0.80	3.65	7.75	80.1%	0.47	15.98	4.37
	5.03	6.82	0.48	0.75	3.31	7.41	76.6%	0.45	13.61	4.12
	5.08	6.57	0.45	0.70	2.97	7.14	73.8%	0.42	11.36	3.82
	5.13	6.36	0.42	0.65	2.65	6.91	71.4%	0.38	9.27	3.50
	5.18	6.16	0.38	0.60	2.34	6.69	69.1%	0.35	7.38	3.16
	5.23	5.98	0.34	0.55	2.03	6.48	66.9%	0.31	5.69	2.80
	5.28	5.79	0.30	0.50	1.74	6.27	64.8%	0.28	4.22	2.43
	5.33	5.61	0.26	0.45	1.45	6.06	62.6%	0.24	3.77	2.59
	5.38	5.43	0.22	0.40	1.18	5.85	60.5%	0.20	2.28	1.94
WL	5.43	4.97	0.18	0.35	0.91	5.37	55.4%	0.17	1.36	1.49
	5.48	4.70	0.14	0.30	0.67	5.02	51.9%	0.13	0.71	1.06
	5.53	4.43	0.10	0.25	0.44	4.69	48.5%	0.09	0.30	0.69
	5.58	3.11	0.08	0.20	0.24	3.29	34.0%	0.07	0.11	0.49
	5.63	1.44	0.07	0.15	0.10	1.53	15.9%	0.06	0.03	0.34
	5.68	0.85	0.05	0.10	0.04	0.90	9.3%	0.05	0.01	0.19
	5.73	0.46	0.03	0.05	0.01	0.47	4.8%	0.02	0.00	0.07
	5.78	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

Q = 10.04
3/3 = 2.2 (L)
2/3 = 0.9 (R)

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

LOCATION INFORMATION

STREAM NAME:	Como Creek Wp #24
XS LOCATION:	Up Stream of flum about 50'
XS NUMBER:	2
DATE:	7-Jun-06
OBSERVERS:	Uppendahl and Todd
1/4 SEC:	SW
SECTION:	23
TWP:	1N
RANGE:	73W
PM:	6
COUNTY:	Boulder
WATERSHED:	Boulder
DIVISION:	1
DOW CODE:	0
USGS MAP:	WARD
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:	0.0585

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

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

STREAM NAME: Como Creek Wp #24
XS LOCATION: Up Stream of flum about 50'
XS NUMBER: 2

DATA POINTS= 26

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL
	Top S	0.00	3.69		
		0.00	4.09		
		0.40	3.94		
I	GL	1.40	4.17		
	WL	2.00	4.95	0.00	0.00
		2.40	5.05	0.10	0.00
		2.80	5.75	0.70	3.39
		3.20	5.75	0.70	3.31
		3.60	5.65	0.65	3.80
		4.00	5.65	0.60	3.60
		4.40	5.62	0.60	4.03
		4.80	5.65	0.55	3.29
		5.20	5.55	0.45	2.74
		5.60	5.51	0.40	2.58
		6.00	5.37	0.25	3.48
		6.40	5.72	0.55	3.78
		6.80	5.73	0.55	3.35
		7.20	5.73	0.55	1.88
		7.60	5.63	0.50	2.48
		8.00	5.51	0.50	3.40
		8.40	5.49	0.25	2.07
	WL	8.80	5.17	0.00	0.00
1	GL	10.40	4.50		
		13.00	4.35		
	Bottom Stake	16.00	4.21		
	Top Stake	16.00	3.65		

TOTALS ----------

VALUES COMPUTED FROM RAW FIELD DATA

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%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.41	0.10	0.04	0.00	0.0%
0.81	0.70	0.28	0.95	9.5%
0.40	0.70	0.28	0.93	9.2%
0.41	0.65	0.26	0.99	9.8%
0.40	0.60	0.24	0.86	8.6%
0.40	0.60	0.24	0.97	9.6%
0.40	0.55	0.22	0.72	7.2%
0.41	0.45	0.18	0.49	4.9%
0.40	0.40	0.16	0.41	4.1%
0.42	0.25	0.10	0.35	3.5%
0.53	0.55	0.22	0.83	8.3%
0.40	0.55	0.22	0.74	7.3%
0.40	0.55	0.22	0.41	4.1%
0.41	0.50	0.20	0.50	4.9%
0.42	0.50	0.20	0.68	6.8%
0.40	0.25	0.10	0.21	2.1%
0.51		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%
0.00		0.00	0.00	0.0%
7.55	0.7 (Max.)	3.16	10.04	100.0%

Manning's n = 0.0633
Hydraulic Radius= 0.418792855

STREAM NAME: Como Creek Wp #24
XS LOCATION: Up Stream of flum about 50'
XS NUMBER: 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	3.16	3.40	7.5%
4.81	3.16	5.22	65.3%
4.83	3.16	5.07	60.4%
4.85	3.16	4.91	55.5%
4.87	3.16	4.76	50.7%
4.89	3.16	4.61	45.9%
4.91	3.16	4.46	41.2%
4.93	3.16	4.31	36.5%
4.95	3.16	4.17	31.8%
4.97	3.16	4.02	27.2%
4.99	3.16	3.88	22.7%
5.01	3.16	3.74	18.3%
5.02	3.16	3.67	16.1%
5.03	3.16	3.60	13.9%
5.04	3.16	3.53	11.8%
5.05	3.16	3.47	9.7%
5.06	3.16	3.40	7.5%
5.07	3.16	3.33	5.4%
5.08	3.16	3.27	3.4%
5.09	3.16	3.20	1.3%
5.10	3.16	3.13	-0.8%
5.11	3.16	3.07	-2.9%
5.13	3.16	2.94	-7.0%
5.15	3.16	2.81	-11.0%
5.17	3.16	2.68	-15.1%
5.19	3.16	2.56	-19.1%
5.21	3.16	2.43	-23.0%
5.23	3.16	2.31	-27.0%
5.25	3.16	2.18	-30.9%
5.27	3.16	2.06	-34.8%
5.29	3.16	1.94	-38.7%
5.31	3.16	1.82	-42.5%

WATERLINE AT ZERO
AREA ERROR = 5.096

STREAM NAME: Como Creek Wp #24
XS LOCATION: Up Stream of flum about 50'
XS NUMBER: 2

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"	4.50	8.75	0.89	1.25	7.78	9.85	100.0%	0.79	37.75	4.85
	4.55	8.60	0.86	1.20	7.38	9.67	98.2%	0.76	34.99	4.74
	4.60	8.44	0.82	1.15	6.96	9.48	96.2%	0.73	32.12	4.62
	4.65	8.28	0.79	1.10	6.54	9.29	94.3%	0.70	29.36	4.49
	4.70	8.13	0.75	1.05	6.13	9.09	92.3%	0.67	26.73	4.36
	4.75	7.97	0.72	1.00	5.72	8.90	90.4%	0.64	24.21	4.23
	4.80	7.81	0.68	0.95	5.33	8.71	88.4%	0.61	21.81	4.09
	4.85	7.65	0.65	0.90	4.94	8.52	86.5%	0.58	19.53	3.95
	4.90	7.50	0.61	0.85	4.57	8.32	84.5%	0.55	17.36	3.80
	4.95	7.34	0.57	0.80	4.19	8.13	82.6%	0.52	15.31	3.65
	5.00	7.03	0.55	0.75	3.83	7.81	79.3%	0.49	13.55	3.53
	5.05	6.71	0.52	0.70	3.49	7.47	75.9%	0.47	11.93	3.42
"WL"	5.10	6.55	0.48	0.65	3.16	7.27	73.8%	0.43	10.29	3.26
	5.15	6.40	0.44	0.60	2.84	7.08	71.9%	0.40	8.74	3.08
	5.20	6.28	0.40	0.55	2.52	6.92	70.3%	0.36	7.29	2.89
	5.25	6.19	0.36	0.50	2.21	6.79	68.9%	0.33	5.93	2.68
	5.30	6.10	0.31	0.45	1.90	6.65	67.5%	0.29	4.68	2.46
	5.35	6.01	0.27	0.40	1.60	6.51	66.1%	0.25	3.55	2.22
	5.40	5.82	0.22	0.35	1.30	6.25	63.5%	0.21	2.59	1.99
	5.45	5.52	0.18	0.30	1.02	5.89	59.8%	0.17	1.79	1.76
	5.50	5.12	0.15	0.25	0.75	5.41	54.9%	0.14	1.14	1.52
	5.55	4.23	0.12	0.20	0.52	4.47	45.4%	0.12	0.70	1.35
	5.60	3.76	0.08	0.15	0.32	3.93	39.9%	0.08	0.34	1.06
	5.65	2.60	0.06	0.10	0.15	2.71	27.5%	0.06	0.12	0.83
	5.70	1.61	0.03	0.05	0.06	1.66	16.9%	0.03	0.03	0.59
	5.75	0.42	0.00	0.00	0.00	0.42	4.3%	0.00	0.00	0.14

3/3 = 2.19
2/3 = 0.91
1/3 = 0.29

STREAM NAME: Como Creek Wp #24
XS LOCATION: Up Stream of flum about 50'
XS NUMBER: 2

SUMMARY SHEET

MEASURED FLOW (Qm)=	10.04	cfs
CALCULATED FLOW (Qc)=	10.29	cfs
(Qm-Qc)/Qm * 100 =	-2.5	%
MEASURED WATERLINE (WLm)=	5.06	ft
CALCULATED WATERLINE (WLc)=	5.10	ft
(WLm-WLc)/WLm * 100 =	-0.7	%
MAX MEASURED DEPTH (Dm)=	0.70	ft
MAX CALCULATED DEPTH (Dc)=	0.65	ft
(Dm-Dc)/Dm * 100	6.6	%
MEAN VELOCITY=	3.26	ft/sec
MANNING'S N=	0.063	
SLOPE=	0.0585	ft/ft
.4 * Qm =	4.0	cfs
2.5 * Qm=	25.1	cfs

RECOMMENDED INSTREAM FLOW:

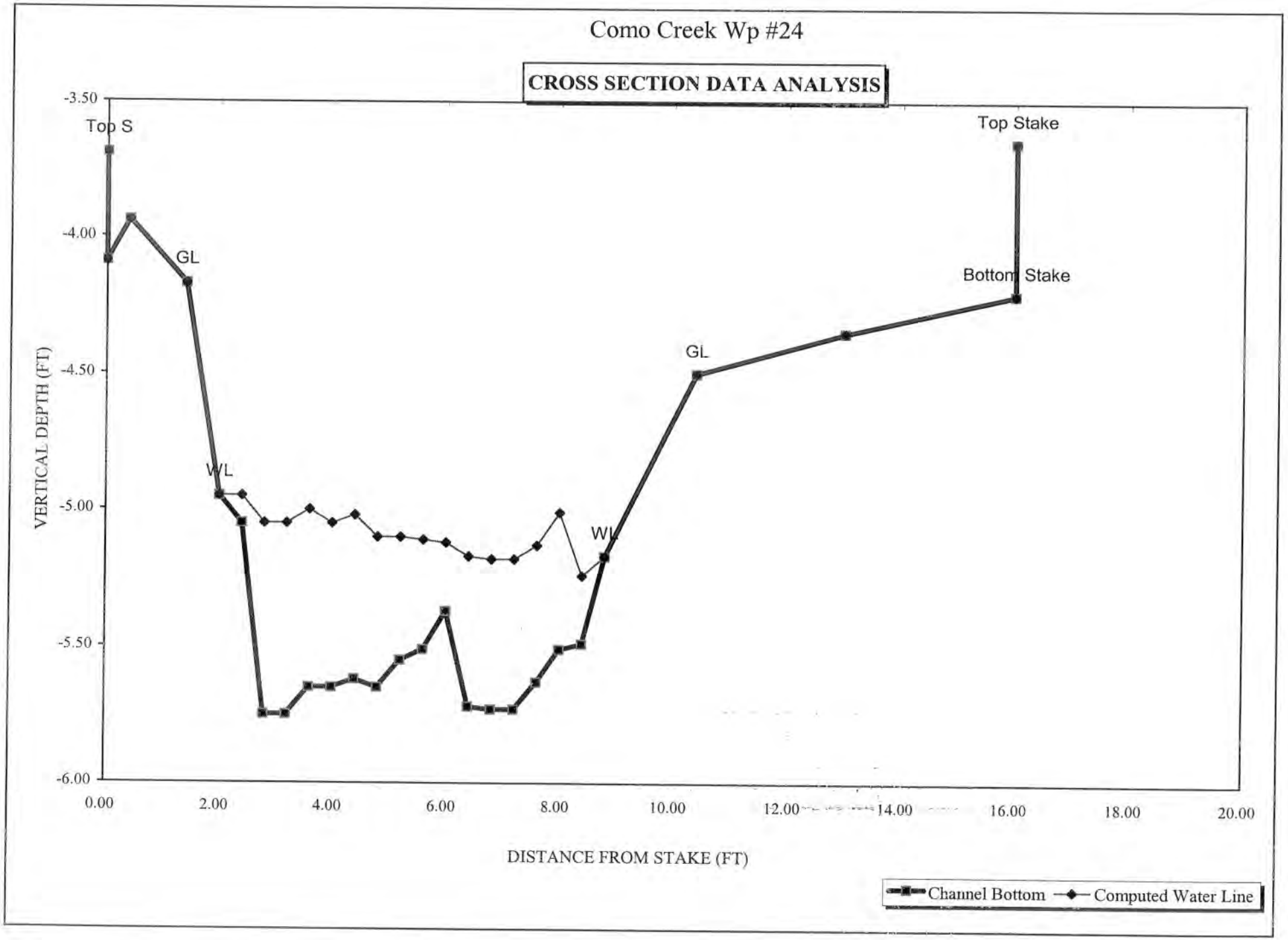
FLOW (CFS)	PERIOD

RATIONALE FOR RECOMMENDATION:

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

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

Como Creek Wp #24



Data Input & Proofing

STREAM NAME:	Como Creek Wp #24
XS LOCATION:	Up Stream of flum about 50'
XS NUMBER:	2
DATE:	6/7/2006
OBSERVERS:	Uppendahl and Todd
1/4 SEC:	SW
SECTION:	23
TWP:	1N
RANGE:	73W
PM:	6
COUNTY:	Boulder
WATERSHED:	Boulder
DIVISION:	1
DOW CODE:	
USGS MAP:	WARD
USFS MAP:	
	Level and Rod Survey
TAPE WT:	0.0106 lbs / ft
TENSION:	99999 lbs
SLOPE:	0.0585 ft / ft

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

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

Total Data Points = 26

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
	Top S	0.00	3.69			0.00	0.00	0.00
		0.00	4.09			0.00	0.00	0.00
		0.40	3.94			0.00	0.00	0.00
1	GL	1.40	4.17			0.00	0.00	0.00
	WL	2.00	4.95	0.00	0.00	0.00	0.00	0.00
		2.40	5.05	0.10	0.00	0.04	0.00	4.95
		2.80	5.75	0.70	3.39	0.28	0.95	5.05
		3.20	5.75	0.70	3.31	0.28	0.93	5.05
		3.60	5.65	0.65	3.80	0.26	0.99	5.00
		4.00	5.65	0.60	3.60	0.24	0.86	5.05
		4.40	5.62	0.60	4.03	0.24	0.97	5.02
		4.80	5.65	0.55	3.29	0.22	0.72	5.10
		5.20	5.55	0.45	2.74	0.18	0.49	5.10
		5.60	5.51	0.40	2.58	0.16	0.41	5.11
		6.00	5.37	0.25	3.48	0.10	0.35	5.12
		6.40	5.72	0.55	3.78	0.22	0.83	5.17
		6.80	5.73	0.55	3.35	0.22	0.74	5.18
		7.20	5.73	0.55	1.88	0.22	0.41	5.18
		7.60	5.63	0.50	2.48	0.20	0.50	5.13
		8.00	5.51	0.50	3.40	0.20	0.68	5.01
		8.40	5.49	0.25	2.07	0.10	0.21	5.24
	WL	8.80	5.17	0.00	0.00	0.00	0.00	0.00
1	GL	10.40	4.50			0.00	0.00	0.00
		13.00	4.35			0.00	0.00	0.00
	Bottom Stake	16.00	4.21			0.00	0.00	0.00
	Top Stake	16.00	3.65			0.00	0.00	0.00

Totals	3.16	10.04

COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: COMO CREEK WP# 24						CROSS-SECTION NO.: #2
CROSS-SECTION LOCATION: u/s of Flume ≈ 50'						
40 01 48.2 105 31 59.9						
DATE: 6/7/06	OBSERVERS: Uppendahl + Todd					
LEGAL DESCRIPTION	¼ SECTION: SW	SECTION: 23	TOWNSHIP: 1 N/S	RANGE: 73 E/W	PM: 6	
COUNTY: Boulder	WATERSHED: Boulder	WATER DIVISION: 1	DOW WATER CODE:			
MAP(S): USGS: WARD	USFS:					

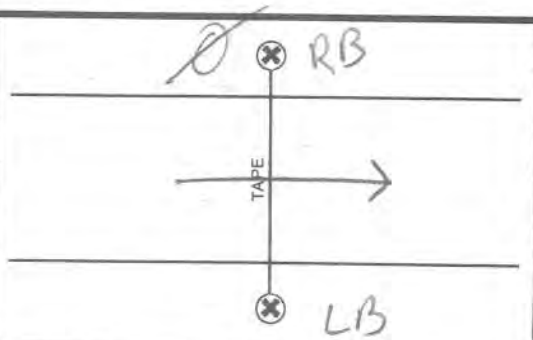
SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES/NO	METER TYPE: FLO-MATE			
METER NUMBER:	DATE RATED:	CALIB/SPIN: ____ sec	TAPE WEIGHT: ____ lbs/foot	TAPE TENSION: ____ lbs
CHANNEL BED MATERIAL SIZE RANGE:		PHOTOGRAPHS TAKEN: YES/NO	NUMBER OF PHOTOGRAPHS: 3	

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
Tape @ Stake LB	0.0	
Tape @ Stake RB	0.0	
1 WS @ Tape LB/RB	0.0	4.95 / 5.17
2 WS Upstream	5.9	4.77
3 WS Downstream	5.9	5.46
SLOPE	0.69 / 11.8 = 0.0585	

SKETCH



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

AQUATIC SAMPLING SUMMARY

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

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

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

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

COMMENTS

FLUME DEPTH ≈ 0.6' Flume width 3.0'

Flume High water mark ≈ 0.95

Q = Cha^n = 12 * .6^1.57 = 5.94

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Como Creek	CROSS-SECTION NO.: 2	DATE: 6/7/06	SHEET 1 OF 1
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) (LEFT / RIGHT)	Gage Reading: ____ ft	TIME: 13:00

Features (Stake (S), Grassline (G), Waterline (W), Rock (R))	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
Top S	~~0~~		3.69								
	~~0~~		4.09								
	.4		3.94								
BL	1.4		4.17								
WL	2.0	.2	~~4.95~~	~~0~~				~~0~~			
	2.4	.4	5.05	.10				~~0~~			
	2.8	↑	5.75	.70				3.39			.949
	3.2		5.75	.70				3.31			.927
	3.6		5.65	.65				3.80			.988
	4.0		5.65	.60				3.60			.864
	4.4		5.67	.60				4.03			.967
	4.8		5.65	.55				3.29			.717
	5.2		5.55	.45				2.74			.493
	5.6		5.51	.40				2.58			.413
	6.0		5.37	.25				3.48			.348
	6.4		5.72	.55				3.78			.832
	6.8		5.73	.55				3.35			.737
	7.2		5.73	.55				1.88			.414
	7.6		5.63	.50				2.48			.496
	8.0	↓	5.51	.50				3.40			.680
	8.4	.4	5.49	.25				2.07			.207
WL	8.8	.2	5.17	~~0~~				~~0~~			~~0~~
BL	10.4		4.50								
	13.0		4.35								
Bot S	16.0		4.21								
Top S	16.0		3.65								
TOTALS:											10.03

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

STREAM NAME: Como Creek Wp #24
XS LOCATION: Up Stream of flum about 50'
XS NUMBER: 2

Thorne-Zevenbergen D84 Correction Applied
Estimated D84 = 0.38

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

STAGING TABLE

Velocity based on test of R/D84>1

	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	4.50	8.75	0.89	1.25	7.78	9.85	100.0%	0.79	49.07	6.31
	4.55	8.60	0.86	1.20	7.38	9.67	98.2%	0.76	44.95	6.09
	4.60	8.44	0.82	1.15	6.96	9.48	96.2%	0.73	40.68	5.85
	4.65	8.28	0.79	1.10	6.54	9.29	94.3%	0.70	36.64	5.60
	4.70	8.13	0.75	1.05	6.13	9.09	92.3%	0.67	32.80	5.35
	4.75	7.97	0.72	1.00	5.72	8.90	90.4%	0.64	29.18	5.10
	4.80	7.81	0.68	0.95	5.33	8.71	88.4%	0.61	25.78	4.84
	4.85	7.65	0.65	0.90	4.94	8.52	86.5%	0.58	22.58	4.57
	4.90	7.50	0.61	0.85	4.57	8.32	84.5%	0.55	19.59	4.29
	4.95	7.34	0.57	0.80	4.19	8.13	82.6%	0.52	16.81	4.01
	5.00	7.03	0.55	0.75	3.83	7.81	79.3%	0.49	14.49	3.78
	5.05	6.71	0.52	0.70	3.49	7.47	75.9%	0.47	12.40	3.55
WL	5.10	6.55	0.48	0.65	3.16	7.27	73.8%	0.43	10.29	3.26
	5.15	6.40	0.44	0.60	2.84	7.08	71.9%	0.40	8.35	2.94
	5.20	6.28	0.40	0.55	2.52	6.92	70.3%	0.36	9.86	3.91
	5.25	6.19	0.36	0.50	2.21	6.79	68.9%	0.33	7.00	3.17
	5.30	6.10	0.31	0.45	1.90	6.65	67.5%	0.29	4.78	2.52
	5.35	6.01	0.27	0.40	1.60	6.51	66.1%	0.25	3.11	1.95
	5.40	5.82	0.22	0.35	1.30	6.25	63.5%	0.21	1.96	1.51
	5.45	5.52	0.18	0.30	1.02	5.89	59.8%	0.17	1.18	1.16
	5.50	5.12	0.15	0.25	0.75	5.41	54.9%	0.14	0.65	0.87
	5.55	4.23	0.12	0.20	0.52	4.47	45.4%	0.12	0.35	0.68
	5.60	3.76	0.08	0.15	0.32	3.93	39.9%	0.08	0.15	0.46
	5.65	2.60	0.06	0.10	0.15	2.71	27.5%	0.06	0.04	0.29
	5.70	1.61	0.03	0.05	0.06	1.66	16.9%	0.03	0.01	0.16
	5.75	0.42	0.00	0.00	0.00	0.42	4.3%	0.00	0.00	0.05

Como Creek #2

Above Flume

Q = 9.78
3/3 = 4.1
2/3 = 2.0 ②

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

LOCATION INFORMATION

STREAM NAME:	Como Creek WP #023
XS LOCATION:	CU Research Station Low site below flume
XS NUMBER:	1
DATE:	7-Jun-06
OBSERVERS:	Uppendahl and Todd
1/4 SEC:	SW
SECTION:	23
TWP:	1 N
RANGE:	73 W
PM:	6
COUNTY:	Boulder
WATERSHED:	Boulder Creek
DIVISION:	1
DOW CODE:	0
USGS MAP:	WARD
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:	0.0629

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

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

STREAM NAME: Como Creek WP #023
XS LOCATION: CU Research Station Low site below flume
XS NUMBER: 1

DATA POINTS= 34

	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
	Top	0.00	6.32			0.00		0.00	0.00	0.0%
	Bottom	0.00	6.94			0.00		0.00	0.00	0.0%
		0.40	7.00			0.00		0.00	0.00	0.0%
1	G.L.	1.00	7.32			0.00		0.00	0.00	0.0%
		2.00	7.65			0.00		0.00	0.00	0.0%
		3.00	7.71			0.00		0.00	0.00	0.0%
	R	4.00	7.60			0.00		0.00	0.00	0.0%
	WL	4.60	8.26	0.00	0.00	0.00		0.00	0.00	0.0%
		5.00	8.52	0.35	0.39	0.48	0.35	0.14	0.05	0.6%
		5.40	8.62	0.50	0.43	0.41	0.50	0.20	0.09	0.9%
		5.80	8.67	0.40	0.79	0.40	0.40	0.16	0.13	1.3%
		6.20	8.72	0.60	3.55	0.40	0.60	0.24	0.85	8.7%
		6.60	8.46	0.45	5.05	0.48	0.45	0.18	0.91	9.3%
		7.00	8.46	0.35	6.79	0.40	0.35	0.14	0.95	9.7%
		7.40	8.50	0.45	5.17	0.40	0.45	0.18	0.93	9.5%
		7.80	8.51	0.50	3.86	0.40	0.50	0.20	0.77	7.9%
		8.20	8.75	0.75	1.80	0.47	0.75	0.30	0.54	5.5%
		8.60	8.88	0.90	4.47	0.42	0.90	0.36	1.61	16.4%
		9.00	8.73	0.70	1.64	0.43	0.70	0.28	0.46	4.7%
		9.40	8.62	0.50	2.24	0.41	0.50	0.20	0.45	4.6%
		9.80	8.60	0.50	3.70	0.40	0.50	0.20	0.74	7.6%
		10.20	8.50	0.50	3.54	0.41	0.50	0.20	0.71	7.2%
		10.60	8.40	0.35	3.50	0.41	0.35	0.14	0.49	5.0%
		11.00	8.32	0.30	0.83	0.41	0.30	0.12	0.10	1.0%
		11.40	8.23	0.20	0.11	0.41	0.20	0.08	0.01	0.1%
		11.80	8.23	0.20	0.00	0.40	0.20	0.08	0.00	0.0%
		12.20	8.19	0.15	0.00	0.40	0.15	0.06	0.00	0.0%
		12.60	8.26	0.25		0.41	0.25	0.10	0.00	0.0%
	WL	13.00	8.05	0.00		0.45		0.00	0.00	0.0%
1	GL	14.00	6.99			0.00		0.00	0.00	0.0%
		15.00	6.12			0.00		0.00	0.00	0.0%
		16.00	5.79			0.00		0.00	0.00	0.0%
	Stake	17.50	5.60			0.00		0.00	0.00	0.0%
	Top	17.50	5.22			0.00		0.00	0.00	0.0%
	TOTALS ----------					8.81	0.9 (Max.)	3.56	9.78	100.0%

VALUES COMPUTED FROM RAW FIELD DATA

Manning's n = 0.0741
Hydraulic Radius= 0.404232349

STREAM NAME: Como Creek WP #023
XS LOCATION: CU Research Station Low site below flume
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	3.56	2.84	-20.1%
7.91	3.56	5.00	40.3%
7.93	3.56	4.82	35.3%
7.95	3.56	4.64	30.4%
7.97	3.56	4.47	25.5%
7.99	3.56	4.29	20.6%
8.01	3.56	4.12	15.7%
8.03	3.56	3.95	10.8%
8.05	3.56	3.77	6.0%
8.07	3.56	3.60	1.2%
8.09	3.56	3.43	-3.6%
8.11	3.56	3.26	-8.4%
8.12	3.56	3.18	-10.7%
8.13	3.56	3.09	-13.1%
8.14	3.56	3.01	-15.4%
8.15	3.56	2.93	-17.8%
8.16	3.56	2.84	-20.1%
8.17	3.56	2.76	-22.5%
8.18	3.56	2.68	-24.8%
8.19	3.56	2.60	-27.1%
8.20	3.56	2.51	-29.4%
8.21	3.56	2.43	-31.6%
8.23	3.56	2.28	-36.0%
8.25	3.56	2.14	-40.0%
8.27	3.56	2.00	-43.7%
8.29	3.56	1.87	-47.4%
8.31	3.56	1.74	-51.1%
8.33	3.56	1.62	-54.6%
8.35	3.56	1.49	-58.1%
8.37	3.56	1.37	-61.5%
8.39	3.56	1.25	-64.9%
8.41	3.56	1.13	-68.1%

WATERLINE AT ZERO
AREA ERROR = 8.070

STREAM NAME: Como Creek WP #023
XS LOCATION: CU Research Station Low site below flume
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	7.32	12.69	0.89	1.56	11.32	13.76	100.0%	0.82	49.95	4.41
	7.37	12.49	0.86	1.51	10.69	13.54	98.3%	0.79	45.93	4.30
	7.42	12.29	0.82	1.46	10.07	13.31	96.7%	0.76	42.05	4.18
	7.47	12.09	0.78	1.41	9.46	13.08	95.0%	0.72	38.34	4.05
	7.52	11.89	0.75	1.36	8.86	12.85	93.4%	0.69	34.78	3.92
	7.57	11.70	0.71	1.31	8.27	12.62	91.7%	0.66	31.38	3.79
	7.62	11.30	0.68	1.26	7.70	12.19	88.5%	0.63	28.47	3.70
	7.67	10.33	0.69	1.21	7.15	11.16	81.1%	0.64	26.71	3.74
	7.72	9.20	0.72	1.16	6.67	9.99	72.6%	0.67	25.59	3.84
	7.77	9.11	0.68	1.11	6.21	9.85	71.6%	0.63	22.94	3.69
	7.82	9.02	0.64	1.06	5.76	9.72	70.6%	0.59	20.41	3.55
	7.87	8.92	0.59	1.01	5.31	9.58	69.6%	0.55	18.00	3.39
	7.92	8.83	0.55	0.96	4.86	9.45	68.6%	0.51	15.71	3.23
	7.97	8.74	0.51	0.91	4.42	9.31	67.6%	0.48	13.55	3.06
	8.02	8.65	0.46	0.86	3.99	9.17	66.6%	0.43	11.51	2.89
WL	8.07	8.53	0.42	0.81	3.56	9.02	65.5%	0.39	9.63	2.70
	8.12	8.39	0.37	0.76	3.14	8.85	64.3%	0.35	7.90	2.52
	8.17	8.25	0.33	0.71	2.72	8.67	63.0%	0.31	6.31	2.32
	8.22	7.64	0.30	0.66	2.32	8.02	58.3%	0.29	5.09	2.20
	8.27	6.61	0.30	0.61	1.97	6.95	50.5%	0.28	4.28	4.07 2.17
	8.32	6.31	0.26	0.56	1.65	6.63	48.2%	0.25	3.27	1.99
	8.37	5.98	0.22	0.51	1.34	6.28	45.6%	0.21	2.41	2.04 1.80
	8.42	5.67	0.18	0.46	1.05	5.95	43.3%	0.18	1.66	1.58
	8.47	4.88	0.16	0.41	0.78	5.14	37.3%	0.15	1.11	1.43
	8.52	3.81	0.15	0.36	0.56	4.03	29.3%	0.14	0.75	1.35
	8.57	3.25	0.12	0.31	0.38	3.43	24.9%	0.11	0.44	1.16
	8.62	2.37	0.10	0.26	0.24	2.51	18.2%	0.09	0.25	1.04
	8.67	1.63	0.08	0.21	0.14	1.73	12.5%	0.08	0.13	.21 0.92
	8.72	0.89	0.08	0.16	0.07	0.94	6.9%	0.08	0.07	0.91
	8.77	0.63	0.06	0.11	0.03	0.67	4.9%	0.05	0.02	0.70
	8.82	0.35	0.03	0.06	0.01	0.37	2.7%	0.03	0.00	0.47
	8.87	0.06	0.01	0.01	0.00	0.06	0.4%	0.00	0.00	0.14

1.0

avg. depth: .22 - .18 = .04 .22 - .20 = .02

2.41 - 1.66 = .75 CFS

.75/.04 = 18.75 × .02 = 0.375

2.41 - 0.375 = 2.04

% WP: 50.5 - 48.2 = 2.3 50.5 - 50.0 = 0.5

4.28 - 3.27 = .99

.99/23 = 0.43 × .45 = 0.215

4.28 - 0.215 = 4.065

avg. velocity:

1.04 - .92 = .12 1.04 - 1.0 = .04

.25 - .13 = .12 = FS

.12/.12 = 1 × .04 = .04

.25 - .04 = .21

STREAM NAME: Como Creek WP #023
XS LOCATION: CU Research Station Low site below flume
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	9.78	cfs
CALCULATED FLOW (Qc)=	9.63	cfs
(Qm-Qc)/Qm * 100 =	1.6	%
MEASURED WATERLINE (WLm)=	8.16	ft
CALCULATED WATERLINE (WLc)=	8.07	ft
(WLm-WLc)/WLm * 100 =	1.0	%
MAX MEASURED DEPTH (Dm)=	0.90	ft
MAX CALCULATED DEPTH (Dc)=	0.81	ft
(Dm-Dc)/Dm * 100	10.0	%
MEAN VELOCITY=	2.70	ft/sec
MANNING'S N=	0.074	
SLOPE=	0.0629	ft/ft
.4 * Qm =	3.9	cfs
2.5 * Qm=	24.5	cfs

RECOMMENDED INSTREAM FLOW:

FLOW (CFS)	PERIOD

RATIONALE FOR RECOMMENDATION:

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

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

Data Input & Proofing

STREAM NAME: Como Creek WP #023
XS LOCATION: CU Research Station Low site below flume
XS NUMBER: 1
DATE: 6/7/2006
OBSERVERS: Uppendahl and Todd

1/4 SEC: SW
SECTION: 23
TWP: 1 N
RANGE: 73 W
PM: 6

COUNTY: Boulder
WATERSHED: Boulder Creek
DIVISION: 1
DOW CODE:
USGS MAP: WARD
USFS MAP:

Level and Rod Survey

TAPE WT: 0.0106 lbs / ft
TENSION: 99999 lbs

SLOPE: 0.0629 ft / ft

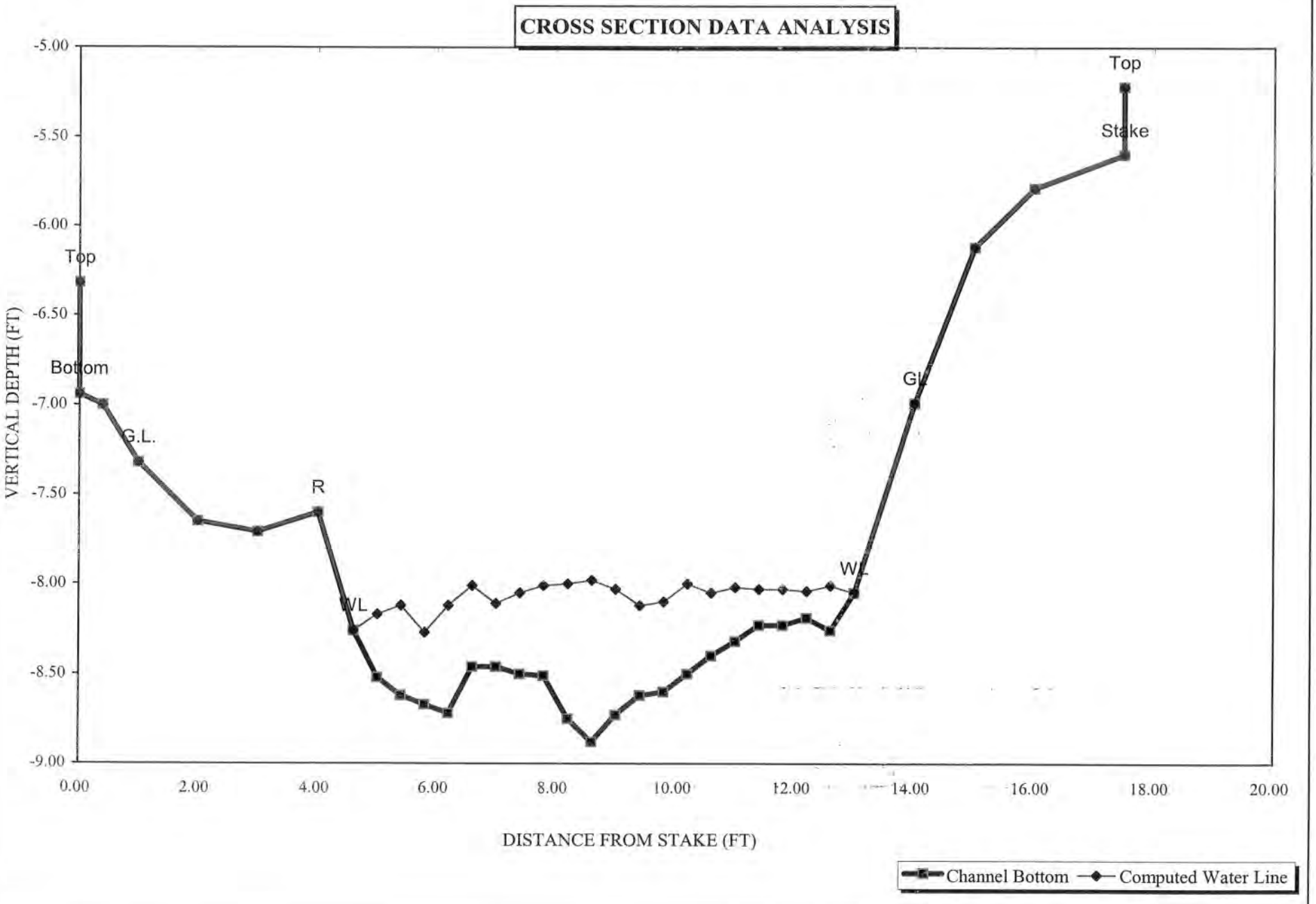
CHECKED BY:.....DATE.....

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

Total Data Points = 34

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
	Top	0	6.32			0.00	0.00	0.00
	Bottom	0	6.94			0.00	0.00	0.00
		0.4	7.00			0.00	0.00	0.00
1	G.L.	1	7.32			0.00	0.00	0.00
		2	7.65			0.00	0.00	0.00
		3	7.71			0.00	0.00	0.00
	R	4	7.60			0.00	0.00	0.00
	WL	4.6	8.26	0.00	0.00	0.00	0.00	0.00
		5	8.52	0.35	0.39	0.14	0.05	8.17
		5.4	8.62	0.50	0.43	0.20	0.09	8.12
		5.8	8.67	0.40	0.79	0.16	0.13	8.27
		6.2	8.72	0.60	3.55	0.24	0.85	8.12
		6.6	8.46	0.45	5.05	0.18	0.91	8.01
		7	8.46	0.35	6.79	0.14	0.95	8.11
		7.4	8.50	0.45	5.17	0.18	0.93	8.05
		7.8	8.51	0.50	3.86	0.20	0.77	8.01
		8.2	8.75	0.75	1.80	0.30	0.54	8.00
		8.6	8.88	0.90	4.47	0.36	1.61	7.98
		9	8.73	0.70	1.64	0.28	0.46	8.03
		9.4	8.62	0.50	2.24	0.20	0.45	8.12
		9.8	8.60	0.50	3.70	0.20	0.74	8.10
		10.2	8.50	0.50	3.54	0.20	0.71	8.00
		10.6	8.40	0.35	3.50	0.14	0.49	8.05
		11	8.32	0.30	0.83	0.12	0.10	8.02
		11.4	8.23	0.20	0.11	0.08	0.01	8.03
		11.8	8.23	0.20	0.00	0.08	0.00	8.03
		12.2	8.19	0.15	0.00	0.06	0.00	8.04
		12.6	8.26	0.25		0.10	0.00	8.01
	WL	13	8.05	0.00		0.00	0.00	0.00
1	GL	14	6.99			0.00	0.00	0.00
		15	6.12			0.00	0.00	0.00
		16	5.79			0.00	0.00	0.00
	Stake	17.5	5.60			0.00	0.00	0.00
	Top	17.5	5.22			0.00	0.00	0.00
					Totals	3.56	9.78	

Como Creek WP #023



COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Como Creek WP # 023					CROSS-SECTION NO.: 1
CROSS-SECTION LOCATION: CU Research station Low site Below Flume. 40° 01' 47.2" 105° 31' 56.6"					
DATE: 6/7/06	OBSERVERS: Uppendahl & Todd				
LEGAL DESCRIPTION	¼ SECTION: SW	SECTION: 23	TOWNSHIP: 1 (N)/S	RANGE: 73 E/(W)	PM: 6
COUNTY: Boulder	WATERSHED: Boulder CE	WATER DIVISION: 1	DOW WATER CODE:		
MAP(S): USGS: WARD	USFS:				

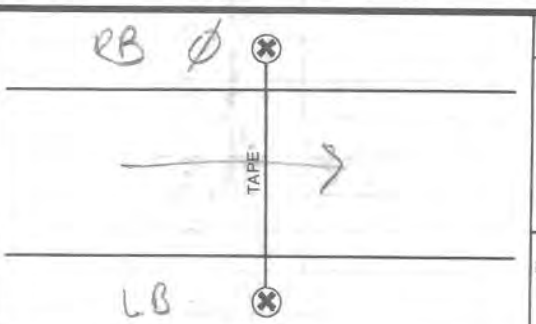
SUPPLEMENTAL DATA

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

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	
⊗ Tape @ Stake RB	0.0	
① WS @ Tape LB/RB	0.0	8.26 8.05
② WS Upstream	6.6	7.53
③ WS Downstream	6.6'	8.36
SLOPE	0.83 / 13.2 = 0.0629	

SKETCH



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

AQUATIC SAMPLING SUMMARY

STREAM ELECTROFISHED: YES/NO	DISTANCE ELECTROFISHED: _____ft	FISH CAUGHT: YES/NO	WATER CHEMISTRY SAMPLED: YES/NO

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

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

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

COMMENTS

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: COMO CREEK | CROSS-SECTION NO.: 1 | DATE: 6/7/06 | SHEET 1 OF 1

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) (LEFT / RIGHT) | Gage Reading: ____ ft | TIME: 11.40

Features (Stake (S), Grassline (G), Waterline (W), Rock (R))	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
TOP	Ø		6.32								
Bottom	Ø		6.94								
	0.4		7.00								
B.F	1.0		7.32								
	2.0		7.65								
	3.0		7.71					DAW	TU	TU	
R	4.0		7.60								
WL	4.6	.2	8.26	Ø				Ø	Ø	Ø	
	5.0	.4	8.52	.35				0.39	Ø	.Ø	.055
	5.4	.4	8.62	.50				0.43	.28	.039	.086
	5.8	↑	8.67	.40				0.79	Ø		.126
	6.2		8.72	.60				3.55	3.08	.739	.852
	6.6		8.46	.45				5.05	5.08		.909
	7.0		8.46	.35				6.79	5.09		.951
	7.4		8.50	.45				5.17	3.40		.931
	7.8		8.51	.50				3.86	2.74		.772
	8.2		8.75	.75				1.80	2.04		0.540
	8.6		8.88	.90				4.47	4.06		1.609
	9.0		8.73	.70				1.64	.71		.459
	9.4		8.62	.50				2.24	.53		.448
	9.8		8.60	.50				3.70	2.99		.740
	10.2		8.50	.50				3.54	4.65		.708
	10.6		8.40	.35				3.50	2.21		.490
	11.0		8.32	.30				0.83	.67		.099
	11.4		8.23	.20				0.11			.004
	11.8	↓	8.23	.20				0.20			.008
	12.2		8.19	.15				Ø			Ø
	12.6	.4	8.26	.25				Ø	TU		Ø
WL	13.0	.2	8.Ø5	Ø							
BL	14.0		6.99								
	15.0		6.12								
	16.0		9.79								
Stake	17.5		5.60								
TOP	17.5		5.22								
TOTALS:											9.8

End of Measurement | Time: 12.05 | Gage Reading: ____ ft | CALCULATIONS PERFORMED BY: | CALCULATIONS CHECKED BY:

STREAM NAME: Como Creek WP #023
XS LOCATION: CU Research Station Low site below flume
XS NUMBER: 1

Thorne-Zevenbergen D84 Correction Applied
Estimated D84 = 0.57

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

STAGING TABLE

Velocity based on test of R/D84>1

	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	7.32	12.69	0.89	1.56	11.32	13.76	100.0%	0.82	62.02	5.48
	7.37	12.49	0.86	1.51	10.69	13.54	98.3%	0.79	56.14	5.25
	7.42	12.29	0.82	1.46	10.07	13.31	96.7%	0.76	50.54	5.02
	7.47	12.09	0.78	1.41	9.46	13.08	95.0%	0.72	45.23	4.78
	7.52	11.89	0.75	1.36	8.86	12.85	93.4%	0.69	40.22	4.54
	7.57	11.70	0.71	1.31	8.27	12.62	91.7%	0.66	35.49	4.29
	7.62	11.30	0.68	1.26	7.70	12.19	88.5%	0.63	31.59	4.11
	7.67	10.33	0.69	1.21	7.15	11.16	81.1%	0.64	29.50	4.13
	7.72	9.20	0.72	1.16	6.67	9.99	72.6%	0.67	28.37	4.25
	7.77	9.11	0.68	1.11	6.21	9.85	71.6%	0.63	24.75	3.99
	7.82	9.02	0.64	1.06	5.76	9.72	70.6%	0.59	21.35	3.71
	7.87	8.92	0.59	1.01	5.31	9.58	69.6%	0.55	26.55	5.00
	7.92	8.83	0.55	0.96	4.86	9.45	68.6%	0.51	21.15	4.35
	7.97	8.74	0.51	0.91	4.42	9.31	67.6%	0.48	16.58	3.75
	8.02	8.65	0.46	0.86	3.99	9.17	66.6%	0.43	12.76	3.20
WL	8.07	8.53	0.42	0.81	3.56	9.02	65.5%	0.39	9.63	2.70
	8.12	8.39	0.37	0.76	3.14	8.85	64.3%	0.35	7.12	2.27
	8.17	8.25	0.33	0.71	2.72	8.67	63.0%	0.31	5.11	1.88
	8.22	7.64	0.30	0.66	2.32	8.02	58.3%	0.29	3.85	1.66
	8.27	6.61	0.30	0.61	1.97	6.95	50.5%	0.28	3.18	1.62
	8.32	6.31	0.26	0.56	1.65	6.63	48.2%	0.25	2.19	1.33
	8.37	5.98	0.22	0.51	1.34	6.28	45.6%	0.21	1.43	1.07
	8.42	5.67	0.18	0.46	1.05	5.95	43.3%	0.18	0.88	0.84
	8.47	4.88	0.16	0.41	0.78	5.14	37.3%	0.15	0.52	0.67
	8.52	3.81	0.15	0.36	0.56	4.03	29.3%	0.14	0.32	0.57
	8.57	3.25	0.12	0.31	0.38	3.43	24.9%	0.11	0.16	0.42
	8.62	2.37	0.10	0.26	0.24	2.51	18.2%	0.09	0.07	0.31
	8.67	1.63	0.08	0.21	0.14	1.73	12.5%	0.08	0.03	0.21
	8.72	0.89	0.08	0.16	0.07	0.94	6.9%	0.08	0.01	0.15
	8.77	0.63	0.06	0.11	0.03	0.67	4.9%	0.05	0.00	0.07
	8.82	0.35	0.03	0.06	0.01	0.37	2.7%	0.03	0.00	0.02
	8.87	0.06	0.01	0.01	0.00	0.06	0.4%	0.00	0.00	0.00

Como Creek #1

Below flume

Q = 1.35 cfs
3/3 = 3.0
2/3 = 20

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

LOCATION INFORMATION

STREAM NAME:	Como Creek WP #023
XS LOCATION:	CU Research Station Low site below flume
XS NUMBER:	1
DATE:	5-Jul-06
OBSERVERS:	Todd
1/4 SEC:	SW
SECTION:	23
TWP:	1 N
RANGE:	73 W
PM:	6
COUNTY:	Boulder
WATERSHED:	Boulder Creek
DIVISION:	1
DOW CODE:	0
USGS MAP:	WARD
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:	0.0629

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

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

STREAM NAME: Como Creek WP #023
XS LOCATION: CU Research Station Low site below flume
XS NUMBER: 1

DATA POINTS= 38

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL
Top	0.00	6.32		
Bottom	0.00	6.94		
	0.40	7.00		
1 G.L.	1.00	7.32		
	2.00	7.65		
	3.00	7.71		
R	4.00	7.60		
	4.60	8.26		
wl	5.00	8.49	0.00	0.00
	5.30	8.69	0.20	0.00
	5.60	8.79	0.30	0.18
	5.90	8.79	0.30	0.02
	6.20	8.79	0.30	1.56
	6.50	8.89	0.40	0.90
	6.80	8.69	0.20	2.41
	7.10	8.64	0.15	2.26
	7.40	8.74	0.25	1.05
	7.70	8.69	0.20	0.99
	8.00	8.74	0.25	0.95
	8.30	8.99	0.50	0.38
	8.60	8.89	0.40	1.40
	8.90	9.04	0.55	2.10
	9.20	8.89	0.40	0.01
	9.50	8.79	0.30	0.20
	9.80	8.74	0.25	0.35
	10.10	8.69	0.20	0.11
wl	10.50	8.40	0.00	0.00
	11.00	8.32		
	11.40	8.23		
	11.80	8.23		
	12.20	8.19		
	12.60	8.26		
	13.00	8.05		
1 GL	14.00	6.99		
	15.00	6.12		
	16.00	5.79		
Stake	17.50	5.60		
Top	17.50	5.22		

VALUES COMPUTED FROM RAW FIELD DATA

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%
0.00		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%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.36	0.20	0.06	0.00	0.0%
0.32	0.30	0.09	0.02	1.2%
0.30	0.30	0.09	0.00	0.1%
0.30	0.30	0.09	0.14	10.4%
0.32	0.40	0.12	0.11	8.0%
0.36	0.20	0.06	0.14	10.7%
0.30	0.15	0.05	0.10	7.6%
0.32	0.25	0.08	0.08	5.8%
0.30	0.20	0.06	0.06	4.4%
0.30	0.25	0.08	0.07	5.3%
0.39	0.50	0.15	0.06	4.2%
0.32	0.40	0.12	0.17	12.5%
0.34	0.55	0.17	0.35	25.7%
0.34	0.40	0.12	0.00	0.1%
0.32	0.30	0.09	0.02	1.3%
0.30	0.25	0.08	0.03	1.9%
0.30	0.20	0.07	0.01	0.6%
0.49		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%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%
0.00		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%
0.00		0.00	0.00	0.0%
0.00		0.00	0.00	0.0%

TOTALS				
5.98	0.55 (Max.)	1.56	1.35	100.0%

Manning's n = 0.1753
Hydraulic Radius= 0.260105763

STREAM NAME: Como Creek WP #023
XS LOCATION: CU Research Station Low site below flume
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	1.56	1.79	15.0%
8.20	1.56	3.38	117.6%
8.22	1.56	3.23	107.4%
8.24	1.56	3.08	97.9%
8.26	1.56	2.94	89.0%
8.28	1.56	2.81	80.5%
8.30	1.56	2.68	72.1%
8.32	1.56	2.55	63.9%
8.34	1.56	2.42	55.9%
8.36	1.56	2.30	48.0%
8.38	1.56	2.18	40.4%
8.40	1.56	2.07	33.0%
8.41	1.56	2.01	29.3%
8.42	1.56	1.95	25.7%
8.43	1.56	1.90	22.1%
8.44	1.56	1.84	18.5%
8.45	1.56	1.79	15.0%
8.46	1.56	1.73	11.4%
8.47	1.56	1.68	7.9%
8.48	1.56	1.62	4.4%
8.49	1.56	1.57	0.9%
8.50	1.56	1.52	-2.5%
8.52	1.56	1.41	-9.4%
8.54	1.56	1.30	-16.2%
8.56	1.56	1.20	-22.9%
8.58	1.56	1.10	-29.5%
8.60	1.56	0.99	-36.1%
8.62	1.56	0.89	-42.6%
8.64	1.56	0.79	-49.0%
8.66	1.56	0.70	-55.3%
8.68	1.56	0.60	-61.2%
8.70	1.56	0.51	-66.9%

WATERLINE AT ZERO
AREA ERROR = 8.488

STREAM NAME: Como Creek WP #023
XS LOCATION: CU Research Station Low site below flume
XS NUMBER: 1

Constant Manning's n

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

STAGING TABLE

	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	7.32	12.69	0.96	1.72	12.19	13.97	100.0%	0.87	23.66	1.94
	7.49	12.02	0.84	1.55	10.12	13.21	94.5%	0.77	18.00	1.78
	7.54	11.82	0.81	1.50	9.52	12.98	92.9%	0.73	16.46	1.73
	7.59	11.62	0.77	1.45	8.94	12.75	91.3%	0.70	14.98	1.68
	7.64	11.05	0.76	1.40	8.37	12.13	86.8%	0.69	13.88	1.66
	7.69	9.84	0.80	1.35	7.84	10.86	77.8%	0.72	13.41	1.71
	7.74	9.17	0.80	1.30	7.37	10.15	72.7%	0.73	12.66	1.72
	7.79	9.08	0.76	1.25	6.92	10.01	71.7%	0.69	11.49	1.66
	7.84	8.98	0.72	1.20	6.47	9.88	70.7%	0.65	10.36	1.60
	7.89	8.89	0.68	1.15	6.02	9.74	69.7%	0.62	9.28	1.54
	7.94	8.80	0.63	1.10	5.58	9.61	68.7%	0.58	8.25	1.48
	7.99	8.71	0.59	1.05	5.14	9.47	67.8%	0.54	7.27	1.41
	8.04	8.61	0.55	1.00	4.71	9.33	66.8%	0.50	6.34	1.35
	8.09	8.48	0.50	0.95	4.28	9.17	65.6%	0.47	5.47	1.28
	8.14	8.34	0.46	0.90	3.86	8.99	64.4%	0.43	4.66	1.21
	8.19	8.20	0.42	0.85	3.44	8.82	63.1%	0.39	3.91	1.14
	8.24	6.96	0.44	0.80	3.06	7.53	53.9%	0.41	3.56	1.17
	8.29	6.50	0.42	0.75	2.72	7.04	50.4%	0.39	3.07	1.13
	8.34	6.15	0.39	0.70	2.41	6.68	47.8%	0.36	2.59	1.08
	8.39	5.75	0.37	0.65	2.11	6.26	44.8%	0.34	2.17	1.03
	8.44	5.54	0.33	0.60	1.83	6.02	43.1%	0.30	1.76	0.96
WL	8.49	5.38	0.29	0.55	1.55	5.83	41.8%	0.27	1.37	0.88
	8.54	5.24	0.25	0.50	1.29	5.66	40.5%	0.23	1.02	0.79
	8.59	5.09	0.20	0.45	1.03	5.48	39.2%	0.19	0.72	0.70
	8.64	4.95	0.16	0.40	0.78	5.31	38.0%	0.15	0.46	0.59
	8.69	4.38	0.12	0.35	0.55	4.69	33.6%	0.12	0.28	0.51
	8.74	3.13	0.11	0.30	0.36	3.40	24.4%	0.11	0.17	0.47
	8.79	2.52	0.09	0.25	0.22	2.74	19.6%	0.08	0.09	0.39
	8.84	1.48	0.09	0.20	0.13	1.65	11.8%	0.08	0.05	0.39
	8.89	1.04	0.07	0.15	0.07	1.17	8.3%	0.06	0.02	0.32
	8.94	0.63	0.04	0.10	0.03	0.70	5.0%	0.04	0.01	0.24
	8.99	0.22	0.03	0.05	0.01	0.24	1.8%	0.02	0.00	0.17
	9.04	0.01	0.00	0.00	0.00	0.01	0.1%	0.00	0.00	0.02

3/3 = 3.0

2/3 = 2.0

STREAM NAME: Como Creek WP #023
XS LOCATION: CU Research Station Low site below flume
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	1.35	cfs
CALCULATED FLOW (Qc)=	1.37	cfs
(Qm-Qc)/Qm * 100 =	-1.6	%
MEASURED WATERLINE (WLm)=	8.45	ft
CALCULATED WATERLINE (WLc)=	8.49	ft
(WLm-WLc)/WLm * 100 =	-0.5	%
MAX MEASURED DEPTH (Dm)=	0.55	ft
MAX CALCULATED DEPTH (Dc)=	0.55	ft
(Dm-Dc)/Dm * 100	-0.4	%
MEAN VELOCITY=	0.88	ft/sec
MANNING'S N=	0.175	
SLOPE=	0.0629	ft/ft
.4 * Qm =	0.5	cfs
2.5 * Qm=	3.4	cfs

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

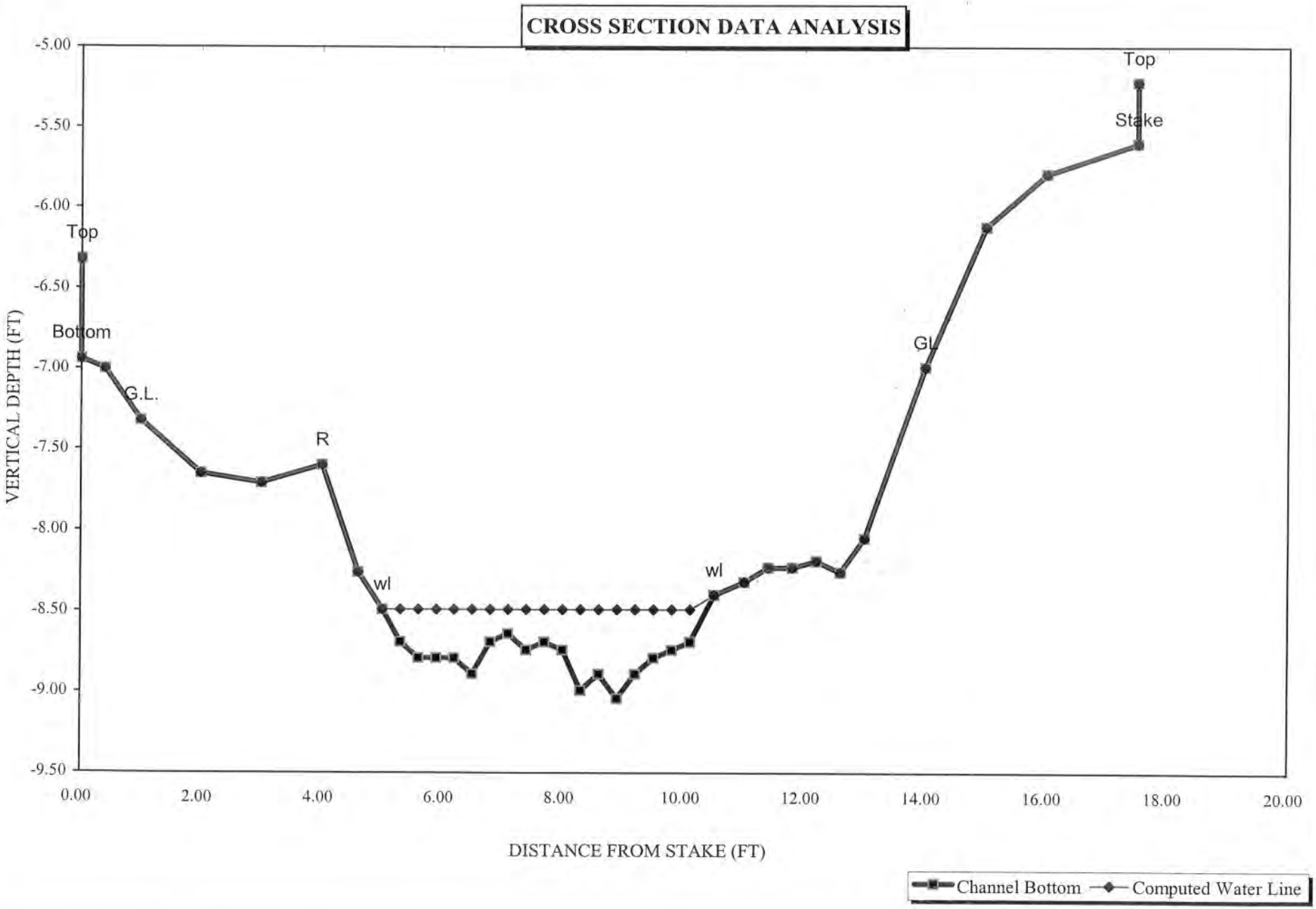
FLOW (CFS)	PERIOD
==========	========

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

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

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

Como Creek WP #023



Data Input & Proofing

STREAM NAME: Como Creek WP #023
XS LOCATION: CU Research Station Low site below flume
XS NUMBER: 1
DATE: 7/5/2006
OBSERVERS: Todd

1/4 SEC: SW
SECTION: 23
TWP: 1 N
RANGE: 73 W
PM: 6

COUNTY: Boulder
WATERSHED: Boulder Creek
DIVISION: 1
DOW CODE:
USGS MAP: WARD
USFS MAP:

Level and Rod Survey

TAPE WT: 0.0106 lbs / ft
TENSION: 99999 lbs

SLOPE: 0.0629 ft / ft

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

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

Total Data Points = 38

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
	Top	0	6.32			0.00	0.00	0.00
	Bottom	0	6.94			0.00	0.00	0.00
		0.4	7.00			0.00	0.00	0.00
1	G.L.	1	7.32			0.00	0.00	0.00
		2	7.65			0.00	0.00	0.00
		3	7.71			0.00	0.00	0.00
	R	4	7.60			0.00	0.00	0.00
		4.6	8.26			0.00	0.00	0.00
	wl	5	8.49	0.00	0.00	0.00	0.00	0.00
		5.3	8.69	0.20	0.00	0.06	0.00	8.49
		5.6	8.79	0.30	0.18	0.09	0.02	8.49
		5.9	8.79	0.30	0.02	0.09	0.00	8.49
		6.2	8.79	0.30	1.56	0.09	0.14	8.49
		6.5	8.89	0.40	0.90	0.12	0.11	8.49
		6.8	8.69	0.20	2.41	0.06	0.14	8.49
		7.1	8.64	0.15	2.26	0.05	0.10	8.49
		7.4	8.74	0.25	1.05	0.08	0.08	8.49
		7.7	8.69	0.20	0.99	0.06	0.06	8.49
		8	8.74	0.25	0.95	0.08	0.07	8.49
		8.3	8.99	0.50	0.38	0.15	0.06	8.49
		8.6	8.89	0.40	1.40	0.12	0.17	8.49
		8.9	9.04	0.55	2.10	0.17	0.35	8.49
		9.20	8.89	0.40	0.01	0.12	0.00	8.49
		9.50	8.79	0.30	0.20	0.09	0.02	8.49
		9.80	8.74	0.25	0.35	0.08	0.03	8.49
		10.10	8.69	0.20	0.11	0.07	0.01	8.49
	wl	10.50	8.40	0.00	0.00	0.00	0.00	0.00
		11	8.32			0.00	0.00	0.00
		11.4	8.23			0.00	0.00	0.00
		11.8	8.23			0.00	0.00	0.00
		12.2	8.19			0.00	0.00	0.00
		12.6	8.26			0.00	0.00	0.00
		13	8.05			0.00	0.00	0.00
1	GL	14	6.99			0.00	0.00	0.00
		15	6.12			0.00	0.00	0.00
		16	5.79			0.00	0.00	0.00
	Stake	17.5	5.60			0.00	0.00	0.00
	Top	17.5	5.22			0.00	0.00	0.00
					Totals	1.56	1.35	

Lower

Distance from top of north pin to water's edge:	5
Elevation change from N pin to water:	2.17
Distance from top of south pin to water's edge:	7.05
Elevation change from S pin to water:	3.18

			Flow
6			
6.3	0.2	0	0
6.6	0.3	0.18	0.0162
6.9	0.3	0.02	0.0018
7.2	0.3	1.56	0.1404
7.5	0.4	0.9	0.108
7.8	0.2	2.41	0.1446
8.1	0.15	2.26	0.1017
8.4	0.25	1.05	0.07875
8.7	0.2	0.99	0.0594
9	0.25	0.95	0.07125
9.3	0.5	0.38	0.057
9.6	0.4	1.4	0.168
9.9	0.55	2.1	0.3465
10.2	0.4	0.004	0.00048
10.5	0.3	0.2	0.018
10.8	0.25	0.35	0.02625
11.1	0.2	0.11	0.0077
11.5			
			1.34603

STREAM NAME: Como Creek WP #023
XS LOCATION: CU Research Station Low site below flume
XS NUMBER: 1

Thorne-Zevenbergen D84 Correction Applied
Estimated D84 = 0.90

STAGING TABLE

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

Velocity based on test of R/D84>1

	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"	7.32	12.69	0.96	1.72	12.19	13.97	100.0%	0.87	79.02	6.48
	7.49	12.02	0.84	1.55	10.12	13.21	94.5%	0.77	51.36	5.08
	7.54	11.82	0.81	1.50	9.52	12.98	92.9%	0.73	44.62	4.69
	7.59	11.62	0.77	1.45	8.94	12.75	91.3%	0.70	38.52	4.31
	7.64	11.05	0.76	1.40	8.37	12.13	86.8%	0.69	35.35	4.23
	7.69	9.84	0.80	1.35	7.84	10.86	77.8%	0.72	36.97	4.72
	7.74	9.17	0.80	1.30	7.37	10.15	72.7%	0.73	35.72	4.84
	7.79	9.08	0.76	1.25	6.92	10.01	71.7%	0.69	30.35	4.39
	7.84	8.98	0.72	1.20	6.47	9.88	70.7%	0.65	25.58	3.96
	7.89	8.89	0.68	1.15	6.02	9.74	69.7%	0.62	21.35	3.55
	7.94	8.80	0.63	1.10	5.58	9.61	68.7%	0.58	17.64	3.16
	7.99	8.71	0.59	1.05	5.14	9.47	67.8%	0.54	14.40	2.80
	8.04	8.61	0.55	1.00	4.71	9.33	66.8%	0.50	11.60	2.47
	8.09	8.48	0.50	0.95	4.28	9.17	65.6%	0.47	9.26	2.16
	8.14	8.34	0.46	0.90	3.86	8.99	64.4%	0.43	7.28	1.89
	8.19	8.20	0.42	0.85	3.44	8.82	63.1%	0.39	5.61	1.63
	8.24	6.96	0.44	0.80	3.06	7.53	53.9%	0.41	5.25	1.72
	8.29	6.50	0.42	0.75	2.72	7.04	50.4%	0.39	4.31	1.58
	8.34	6.15	0.39	0.70	2.41	6.68	47.8%	0.36	3.38	1.40
	8.39	5.75	0.37	0.65	2.11	6.26	44.8%	0.34	2.65	1.25
	8.44	5.54	0.33	0.60	1.83	6.02	43.1%	0.30	1.95	1.07
"WL"	8.49	5.38	0.29	0.55	1.55	5.83	41.8%	0.27	1.37	0.88
	8.54	5.24	0.25	0.50	1.29	5.66	40.5%	0.23	0.92	0.71
	8.59	5.09	0.20	0.45	1.03	5.48	39.2%	0.19	0.58	0.56
	8.64	4.95	0.16	0.40	0.78	5.31	38.0%	0.15	0.34	0.43
	8.69	4.38	0.12	0.35	0.55	4.69	33.6%	0.12	0.18	0.34
	8.74	3.13	0.11	0.30	0.36	3.40	24.4%	0.11	0.09	0.25
	8.79	2.52	0.09	0.25	0.22	2.74	19.6%	0.08	0.04	0.18
	8.84	1.48	0.09	0.20	0.13	1.65	11.8%	0.08	0.02	0.12
	8.89	1.04	0.07	0.15	0.07	1.17	8.3%	0.06	0.00	0.07
	8.94	0.63	0.04	0.10	0.03	0.70	5.0%	0.04	0.00	0.03
	8.99	0.22	0.03	0.05	0.01	0.24	1.8%	0.02	0.00	0.01
	9.04	0.01	0.00	0.00	0.00	0.01	0.1%	0.00	0.00	0.00

STREAM NAME: Como Creek WP #023
XS LOCATION: CU Research Station Low site below flume
XS NUMBER: 1

Thorne-Zevenbergen D84 Correction Applied
Estimated D84 = 0.90

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

Velocity based on test of R/D84>1

	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	7.32	12.69	0.96	1.72	12.19	13.97	100.0%	0.87	79.02	6.48
	7.49	12.02	0.84	1.55	10.12	13.21	94.5%	0.77	51.36	5.08
	7.54	11.82	0.81	1.50	9.52	12.98	92.9%	0.73	44.62	4.69
	7.59	11.62	0.77	1.45	8.94	12.75	91.3%	0.70	38.52	4.31
	7.64	11.05	0.76	1.40	8.37	12.13	86.8%	0.69	35.35	4.23
	7.69	9.84	0.80	1.35	7.84	10.86	77.8%	0.72	36.97	4.72
	7.74	9.17	0.80	1.30	7.37	10.15	72.7%	0.73	35.72	4.84
	7.79	9.08	0.76	1.25	6.92	10.01	71.7%	0.69	30.35	4.39
	7.84	8.98	0.72	1.20	6.47	9.88	70.7%	0.65	25.58	3.96
	7.89	8.89	0.68	1.15	6.02	9.74	69.7%	0.62	21.35	3.55
	7.94	8.80	0.63	1.10	5.58	9.61	68.7%	0.58	17.64	3.16
	7.99	8.71	0.59	1.05	5.14	9.47	67.8%	0.54	14.40	2.80
	8.04	8.61	0.55	1.00	4.71	9.33	66.8%	0.50	11.60	2.47
	8.09	8.48	0.50	0.95	4.28	9.17	65.6%	0.47	9.26	2.16
	8.14	8.34	0.46	0.90	3.86	8.99	64.4%	0.43	7.28	1.89
	8.19	8.20	0.42	0.85	3.44	8.82	63.1%	0.39	5.61	1.63
	8.24	6.96	0.44	0.80	3.06	7.53	53.9%	0.41	5.25	1.72
	8.29	6.50	0.42	0.75	2.72	7.04	50.4%	0.39	4.31	1.58
	8.34	6.15	0.39	0.70	2.41	6.68	47.8%	0.36	3.38	1.40
	8.39	5.75	0.37	0.65	2.11	6.26	44.8%	0.34	2.65	1.25
	8.44	5.54	0.33	0.60	1.83	6.02	43.1%	0.30	1.95	1.07
WL	8.49	5.38	0.29	0.55	1.55	5.83	41.8%	0.27	1.37	0.88
	8.54	5.24	0.25	0.50	1.29	5.66	40.5%	0.23	0.92	0.71
	8.59	5.09	0.20	0.45	1.03	5.48	39.2%	0.19	0.58	0.56
	8.64	4.95	0.16	0.40	0.78	5.31	38.0%	0.15	0.34	0.43
	8.69	4.38	0.12	0.35	0.55	4.69	33.6%	0.12	0.18	0.34
	8.74	3.13	0.11	0.30	0.36	3.40	24.4%	0.11	0.09	0.25
	8.79	2.52	0.09	0.25	0.22	2.74	19.6%	0.08	0.04	0.18
	8.84	1.48	0.09	0.20	0.13	1.65	11.8%	0.08	0.02	0.12
	8.89	1.04	0.07	0.15	0.07	1.17	8.3%	0.06	0.00	0.07
	8.94	0.63	0.04	0.10	0.03	0.70	5.0%	0.04	0.00	0.03
	8.99	0.22	0.03	0.05	0.01	0.24	1.8%	0.02	0.00	0.01
	9.04	0.01	0.00	0.00	0.00	0.01	0.1%	0.00	0.00	0.00

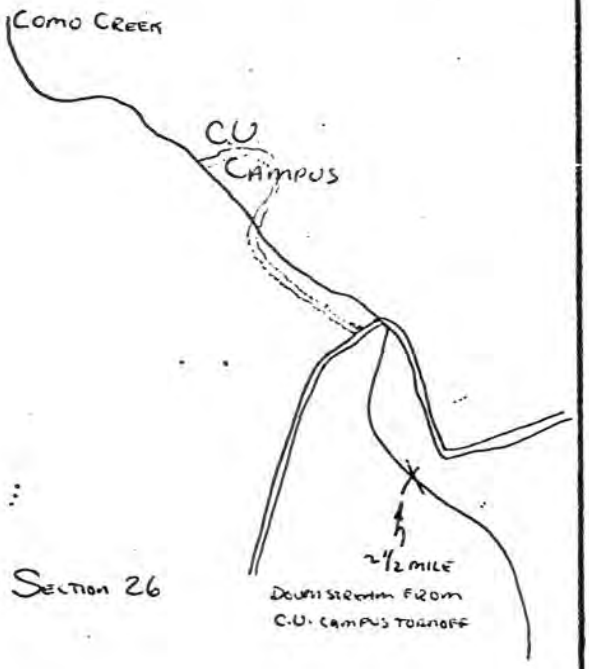
COLORADO STREAM SURVEY
(1975 Revision)

UT: T. 1 N R. 73W S. 21
LT: T. 1 S R. 72W S. 6
Length: 6.1

urveyed by: JERRY WHITTAKER

	CODE	
ode No. 13184	1	Region NORTHEAST CE
ate 8/14/75	2	Beaver dams
ection No. 1	3	Number (count or estimate) None
tream Name Como Creek	4	Estimated acreage
Primary Drainage North Boulder Creek	5	Physical stream damage (% of section affected)
Major Drainage SP 41	6	Bank degredation
ower terminus FISHERY		Channelization
Location: ½ mile downstream from the C.U. campus turnoff.	7	Dredging
		Mine tailing encroachment
		Road encroachment
		Accessibility (miles)
T. 1 N	8	Surfaced
R. 73W	9	Non-surfaced car 1
S. 26	10	4-wheel
Width 6'	11	Established trail
Elevation 9300'	12	No established trail
Flow (c.f.s.)	13	Boat only
pH 7.0	14	No access
phth 17.1	15	Land Status and mileage
MO	16	USFS 1 (closed due to Greenback Fishery)
EDTA	17	BLM
Conductivity 17	18	Municipal
" if stream profile obtained	19	Div. of Wild.
ower terminus	XXX	Private, no public access
Location: The upper end of the University of Colorado campus to ¼ 100 yards upstream.	20	Private, open to public
		State Land Board
		County
T. 1 N	21	Mixed small tracts, open
R. 73W	22	Mixed small tracts, closed
S. 23	23	Stocking
Width 6'	24	Miles creel size
Elevation 9500'	25	Miles fingerling
Flow	26	Miles fry
pH	27	Miles not stocked 1
phth	28	Aquatic Vegetation
MO	29	Filamentous algae (x one)
EDTA	30	Absent
Conductivity	31	Rare
X if stream profile obtained	32	Common
ection Summary	XXX	Abundant
Meander factor Actual mileage	33	Watercress
Length in Miles 1	34	X if present
Width in feet 6'	35	Stream Size classification (x one)
Acreage 0.72	36	Large river ≥ 100'
Observed flow Normal	37	River 60-99'
X if inundated by reservoir	38	Large stream 36-59'
Mileage unsectioned	39	Medium 20-35'
ounties where section is located	XXX	Small 10-19'
unty Boulder	40	Minor 4-9' X
Miles 1	41	Very small stream < 4'
County	42	Gradient (computer-use elevation & miles)
Miles	43	Percent per mile
County	44	
Miles	45	

Fishery Value (X one)	XXXX
None	88
Poor	89
Below average	90
Average	91
Above average	92
Excellent X	93
Fishery Value - limiting factors	XXXX
	94
	95
	96
FISH SAMPLING	XXXX
Lower or only station	XXXX
Elevation	97
Describe or map station location	98



Sampling method Electrofishing	99
Length - feet 150	100
Sampling adequate X	101
Sampling inadequate	102
X if scales collected	103
Estimated % of fish biomass	XXXX
Rough fish	104
Game Fish 100%	105
Estimated % of rough fish biomass	XXXX
Bullheads	106
Carp	107
Cottids	108
Dace	109
Minnows	110
Suckers	111
Sunfish	112

Upper Station	
Elevation	
Describe or map station location	

The upper end of the C.U. campus to 100 yards upstream.

Sampling method Electrofishing	
Length - feet 300	
Sampling adequate X	
Sampling inadequate	
X if scales collected	
Estimated % of fish biomass	
Rough fish	
Game fish	
Estimated % of rough fish biomass	
Bullheads	
Carp	
Cottids	
Dace	
Minnows	
Suckers	
Sunfish	
Combined stations	
Estimated % of fish biomass	
Rough fish	
Game Fish	
Estimate % of rough fish biomass	
Bullheads	
Carp	
Cottids	
Dace	
Minnows	
Suckers	
Sunfish	
No. of game fish ≥ 6.0" per mile	

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

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	>15	Total
						LOWER STATION										
Rainbow																
Brown																
Brook																
Native		4	2	2	6	5	2	1							106	22
Whitefish																
Total																22
						UPPER STATION										
Rainbow																
Brown																
Brook																
Native																
Whitefish																
Total																
						COMBINED STATIONS										
Rainbow																
Brown																
Brook																
Native		4	2	2	6	5	2	1							106	22
Whitefish																
Total																22

POPULATION ESTIMATE

A	B	C	D	D C		Code
Marked Fish	Fish Captured	Marked Recovery	A X B	Population Extimate	No. $\geq$ 6.0 (For Station)	139
					Weight $\geq$ 6.0 (For Station)	140

	Code
Resident game fish size rating	141
Resident game fish density rating	142
Recommended flow from profile	143

Comments and Recommendations

THE UPPER STATION PRODUCED NO FISH TO OUR ELECTROFISHING EFFORTS. HOWEVER, THE HABITAT LOOKS GOOD FOR GREENBACK NATIVES (i.e. DEEP POOLS, GOOD COVER). THE WATER IN THE LOWER STATION WAS NOT AS DEEP, BUT THE COVER WAS MUCH BETTER. ALSO, THE GRADIENT WAS NOT AS STEEP SO THE WATER WAS NOT MOVING AS FAST.

IT HAS BEEN SUGGESTED THAT COMO CREEK BE ~~USED~~ AGAIN USED AS A ~~FUTURE~~ SOURCE FOR FUTURE GREENBACK PLANTS. IT SHOULD FIRST BE INVESTIGATED AS TO WHETHER THIS POPULATION CAN WITHSTAND THE PRESSURE OF FISH BEING TAKEN OUT ON A STEADY BASIS.

APPENDIX 1

FISHERY VALUE LIMITING FACTOR LIST

Fishery value would be higher except for the following 3 or less most important limiting factors: (X up to three limiting factors)

A Natural factors (physical)

1 Intermittent stream
2 Blow out stream
3 Flash flood area
4 Highly erosive drainage
X 5 Steep gradient
6 No spawning areas
X 7 Poor pools and cover
8 Pool area excessive
9 Riffle area excessive
10 Poor fishability
11 Remoteness
12 Streamside access limited (canyon walls, etc.)
13 Poor aesthetically
14 High temperature
15 Low temperature

B Natural factors (biological)

1 Rough fish
2 Small trout
X 3 Few trout
4 Lack of reproduction
5 Unsuited game fish
6 Riparian vegetation inadequate
7 Dense riparian vegetation-poor fishability
8 Excessive reproduction

C Artificial factors

1 Water diversion-irrigation
2 Water diversion-domestic
3 Water diversion-power
4 Water diversion-other
5 Flow fluctuation-power
6 Flow fluctuation-irrigation
7 Flow fluctuation-domestic
8 Return irrigation flows
9 Land abuse-roads
10 Land abuse-housing
11 Land abuse-logging
12 Land abuse-livestock
13 Land abuse-other
14 Stream encroachment-roads
15 Stream encroachment-mine tailings
16 Mine dredging
17 Channelization-road related
18 Channelization-ice control
19 Channelization-land reclamation
20 Streamside deciduous plant spraying

D Recreational conflict

1 Wading or swimming
2 Boats or tubes
3 Recreational streamside overuse

E Pollution

1 Excessive siltation
2 Mining
3 Commercial-chemical
4 Commercial-organic
5 Domestic
6 Stock (feed lots)

MAJOR DRAINAGES

31 A - Arkansas
32 C - Colorado
33 D - Dolores
34 G - Gunnison
35 GR - Green
36 L - Larimer
37 NP - North Platte
38 REP- Republican
39 RG - Rio Grande
40 SJ - San Juan
41 SP - South Platte
W - White
Y - Yampa

SAMPLING METHODS

X 50 Electrofishing
51 Seining
52 Gill netting
53 Toxicants
54 Hook and Line
55 Prima cord or dynamite
56 Other or combination

Electrofishing Record

Stream Como Creek Date 8/14/75

Section or Location

Length of Stream electrofished

Estimated efficiency ______ Good ______ Fair ______ Poor

Type of water Conductivity = 17 Velocity & Volume

Crew [illegible]

Rolf N[illegible]

Dick Moore

Tim Robertson & Dean McBride

FISH COLLECTED

Species	Length	Weight	Scale Sample No.	Mortality Species	Mortality Length	Mortality Weight
G.B. Native	8.4	4.5				
	5.6	1.0				
	7.5	3.5				
	6.1	2.5				
	4.6	2.0				
	7.5	3.5				
	2.4	–				
	2.3	–				
	6.0	–				
	4.2	–				
	5.2	–				
	6.1	–				
	5.2	–				
	5.9	–				
	6.9	–				
	7.1	–				

ALSO SAW: 2 FISH ~ 2"
2 FISH ~ 3"-4"
1 FISH ~ 5"
1 FISH ~ 6"

AVERAGE LENGTHS & WEIGHTS OF SPECIES

NUMBER = 22 FISH
AVE. LENGTH = 5.1 INCHES
AVE. WIDTH = 2.8 OUNCES

NO FISH TAKEN ABOVE CU CAMPUS. NATURAL REPRODUCTION EVIDENT.

'72-'73 FISHERIES INVENTORY / 1041 RELATED DATA

Stream Code 1 3 1 8 4

'72-'73 Inventory S - _ _ _ _ _

Stream Name Como Creek

Percent Open to Public —, ('72 Inventory)

1041 Form

Quality of Water	8,
Pool-riffle Ratio	5,
Temperature of Water	7,
Clarity of Water	8,
Fish Food Supply	5,
Condition of Fish	5,
Legal Access	10,
Physical Access*	—,
Aesthetic Value	7,
Meanders Value	6,
Improvement Potential	4,

'72 Inventory

Stocking Status	—,	(regularly, occasionally, rarely or never)
Population Status	—,	(normal, over-populated, under-populated)

☐ MINIMUM STREAM FLOW DATA

SB-97 Computer run Step A

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

"Filed on" Blue book

Decreed Flow	_____,
Initial Month	_____,
Initial Day	_____,
Initial Year	_____*

STREAM SURVEY
Field Form

13184

Stream Name: Como Creek Sec. No.: _____

Personnel: Redlinger + Robertson Date: July 30, 1986

Time: 9:45 am Temp: Air 70° Water 48°

Gradient: _____ Location: 1/4 mile down from

G - Grass W - Water C.V. Research Center

Cross Section

0.0					

Discharge

Dist.	Depth	Clicks	Dist.	Depth	Clicks

Width: _____ pH: 7.1

pHTH: _____ MO: 20 ppm

Hardness: 17 ppm Conductivity: 30

Algae: _____ Watercress: _____

Beaver: _____

Comments: _____

W.C. Weiler, 22 February 1980

ELECTRO-FISHING RECORD

Stream: Como Creek Date: _____

Station #1: 1/4 mile down stream from C.U. Research Station

Distance: 50' Width: 3' Acreage: 0.004

Station #2: _____

Distance: _____ Width: _____ Acreage: _____

Station #3: _____

Distance: _____ Width: _____ Acreage: _____

Equipment Used: _____

Personnel: Reddinger + Robertson

SIZE LENGTH IN INCHES

Sta.	Species	0-9	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18+	Tot.	Avg.
1	Greenback native					3		1	2	1											7	

Comments: Very Heavily overgrown

Greenback Native 284g Total = 156.4 lbs/Acre netted

W.C. Weiler, 20 February 1980

COLORADO DIVISION OF WILDLIFE

FISH POPULATION SAMPLING SUMMARY

ATER Como Creek COUNTY Boulder DATE July 30, 1986

TATION(S)* 1 SAMPLE METHOD electrofishing EFFORT: 50' NETS; HOURS

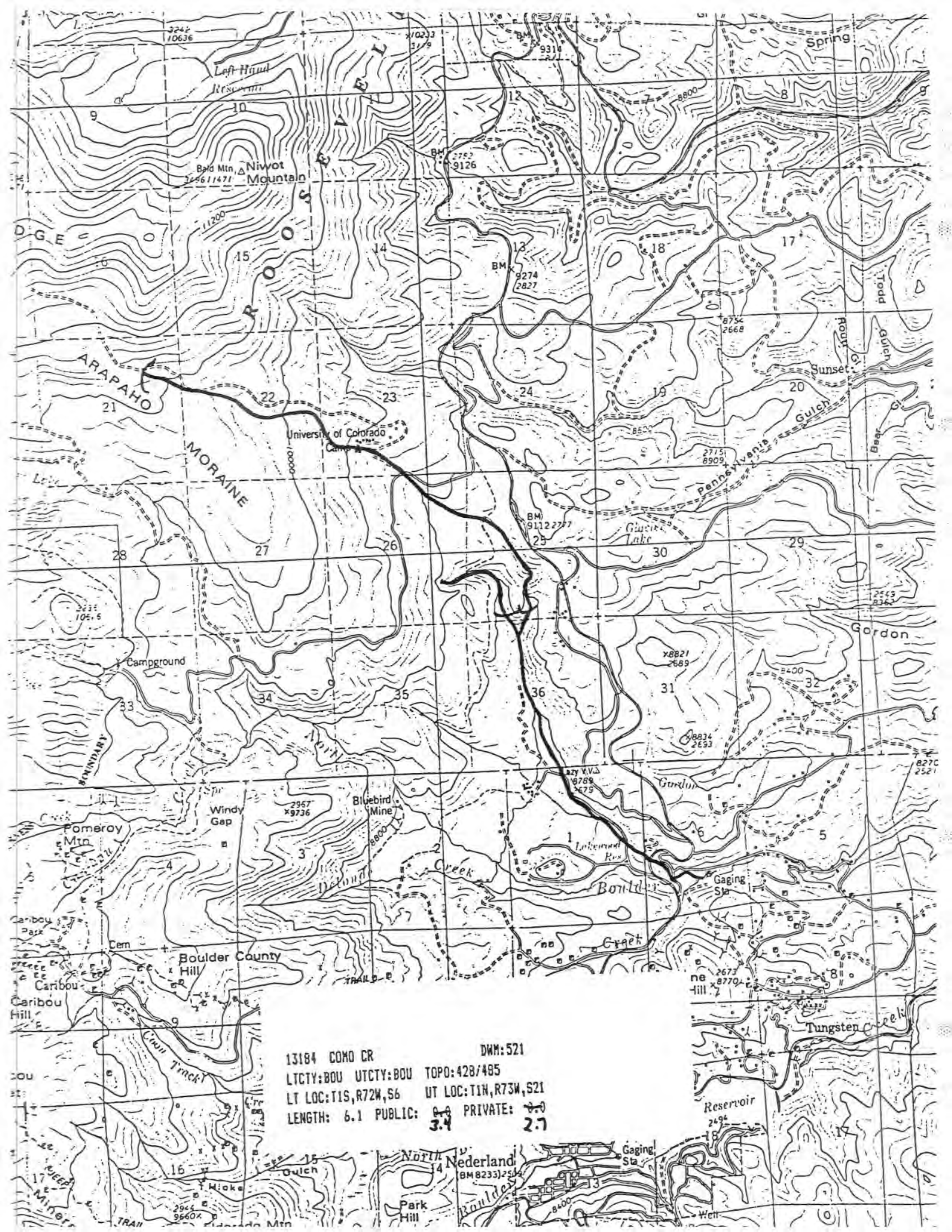
PECIES	TOTAL NUMBER	MEAN LENGTH (mm)	LENGTH RANGE (mm)	MEAN WEIGHT (gm)	WEIGHT RANGE (gm)	% TOTAL CATCH no.	% TOTAL CATCH wt.	CATCH PER HOUR	ADDITIONAL INFORMATION
reenback -	7	152.6	108-203	40.6	15-80	100%	100%		

note: if more than one station, data represents all stations combined.

FISH POPULATION SAMPLING SUMMARY

LENGTH FREQUENCY DISTRIBUTION
(Millimeters)

SPECIES	0 | 75	76 | 100	101 | 125	126 | 150	151 | 175	176 | 200	201 | 225	226 | 250	251 | 275	276 | 300	301 | 325	326 | 350	351 | 375	376 | 400	401 | 425	426 | 450	451 | 475	476 | 500	501 | 525	526 | 550	551 | 600	601 | UP
Greenback -			3		1	2	1															



13184 COMO CR DWM:521

LTCTY:BOU UTCTY:BOU TOPO:428/485

LT LOC:T1S,R72W,S6 UT LOC:T1N,R73W,S21

LENGTH: 6.1 PUBLIC: ~~0.0~~ 3.4 PRIVATE: ~~0.0~~ 2.7

Como Creek 13184

WATERWORKS

STREAM IMPROVEMENTS TO AID COLORADO'S GREENBACK CUTTHROAT

A Colorado native was in need of a little help. The native in need was the Colorado greenback cutthroat trout *(Salmo clarki stomias).* Through the efforts of a successful stream improvement project last July by the Boulder Flycasters Chapter of Trout Unlimited, the U.S. Forest Service and the Colorado Division of Wildlife, the greenbacks of Como Creek received the strong helping hand they needed. The habitat improvements on the creek will assist the species on their amazing route to recovery.

Como Creek is located just east of the Continental Divide about 18 miles west of Boulder, Colorado. What makes the creek special is that it is one of only three remaining historic sites of the rare greenback cutthroat trout (see About Trout by Robert J. Behnke, ***Trout,*** winter 1985). Only a little more than a century ago the greenbacks were the native trout of the Eastern Slope of Colorado. Unfortunately, the greenback's inability to coexist with other trout species doomed the greenbacks to near extinction. As rainbows, browns and brookies were introduced into Colorado's streams and lakes, the native greenbacks were eventually squeezed out. By the 1940s the species was believed extinct.

Amazingly, in 1969, a researcher at the University of Colorado's Alpine Research Center discovered what he believed to be greenbacks in Como Creek — a tiny, high-altitude stream that flows through the center's property. He called renowned trout expert Robert J. Behnke in Fort Collins, Colorado, and, sure enough, Behnke confirmed that the Como Creek trout were indeed pure greenbacks. Since then, after extensive search, two more pure populations of the rare greenbacks have been discovered in Colorado. These three populations, all located in small headwater streams naturally protected by barrier falls, are the only remaining historic greenback populations. The total number of fish in the three streams is less that 3,000, with Como Creek holding the majority of greenbacks.

Volunteers transport a check dam log to Como Creek.

Over the past seven years, under the guidelines of the Greenback Cutthroat Trout Recovery Plan, a team of fisheries biologists from the U.S. Fish and Wildlife Service, the National Park Service, the U.S. Forest Service and the Colorado Division of Wildlife have united in an effort to re-introduce the greenbacks into high-mountain streams and lakes throughout the species' original range of habitation.

On June 16, 1985, board members of the Boulder Flycasters met with Bob Stuber, fishery biologist for the U.S. Forest Service out of Fort Collins, Colorado, and Bill Weiler, fisheries biologist for the Central Region of the Colorado Division of Wildlife. The purpose of the gathering was to plan a stream improvement project for Como Creek. Even though the creek is closed to fishing in order to protect its rare greenback population, the Boulder Flycasters enthusiastically agreed to participate in such a unique project. The chapter members were excited about being able to contribute to the comeback of this rare species of trout.

The Flycasters mailed hundreds of fliers asking would-be volunteers to "Give a day back to the trout." The fliers looked like an FBI wanted poster, and in large, bold letters read, "Wanted. Wild, Native Trout." Below that, in smaller type, the sign said, ". . . And a few volunteers to help them." This was followed by information about the project and the greenbacks. As an added incentive, anyone who volunteered to work for a day had their name entered into an exclusive raffle. The prize was a graphite fly rod, and only those who worked on the Como Creek project or another project that summer were eligible. The project was set for July 27.

Five weeks after the planning meeting, on a beautiful, warm and sunny Saturday morning, over 20 people from the Boulder Flycasters and the U.S. Forest Service convened at Como Creek. The objective was to install a series of five log check dams in the creek. The check dams would increase trout habitat by creating self-scouring plungepools. These new pools would dramatically improve habitat and cover for the greenbacks. Stuber's computer projections revealed that the improve-

Como Cr
13184

1950
ENVIRONMENTAL ASSESSMENT REPORT

Como Creek Greenback Cutthroat Trout Restoration Project
Roosevelt National Forest
Boulder County, Colorado

Lead Agency: USDA-Forest Service
301 South Howes
Ft. Collins, CO 80522

Cooperating Agencies: Colorado Division of Wildlife
6060 Broadway
Denver, CO 80216

Responsible Official: Gray F. Reynolds, Forest Supervisor
Arapaho and Roosevelt National Forest

For Further Information Contact: James C. Cruse
Range & Wildlife Staff Officer
Arapaho and Roosevelt National Forest
301 South Howes
Ft. Collins, CO 80522
(303-482-5155)

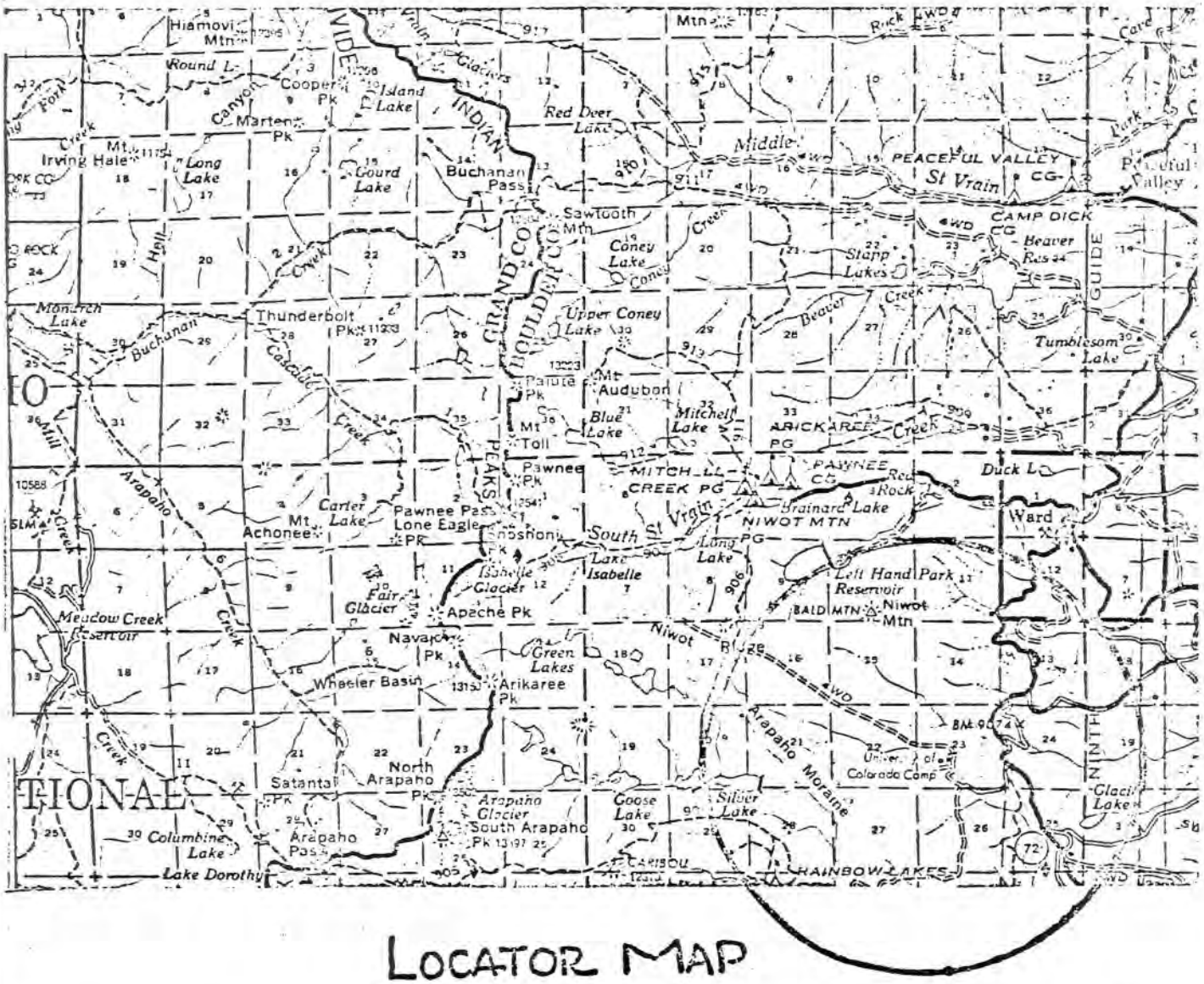
Abstract: This...includes

Comments regarding this report should be sent to the Forest Supervisor of the Arapaho and Roosevelt National Forest by _____.

Abstract: This Environmental Assessment Report describes two alternatives: (1) habitat rehabilitation of Como Creek to permanently close all roads that are now temporarily closed due to adverse impacts, maintain continued closure of Como Creek to fishing and implementation of habitat improvement work to restore Como Creek to natural conditions, and (2) the no action alternative. The Forest Service preferred alternative is identified. The reasoning for determining why an environmental statement will not be prepared is included.

TABLE OF CONTENTS

ROOSEVELT NATIONAL FOREST
COLORADO



LOCATOR MAP

LEGEND

- National Forest Boundary
- Adjacent National Forest Boundary
- State Boundary Line
- County Boundary Line
- Reservation Boundary
- Wilderness Boundary
- Interstate Highway (25)
- U.S. Highway (87)
- State Highway (14)
- Forest Route (448)
- Paved Road
- Forest Supervisors Headquarters
- District Ranger Station
- Forest Service Station
- Recreation Site
- Recreation Site other than Forest Service
- Ski Area
- Observation Site
- Point of Interest
- House, Cabin or other Building
- Water Well
- Mine, Quarry or Gravel Pit

I. INTRODUCTION

A. Proposed Activity

The proposed activity on Como Creek involves (1) permanent closure of all the roads that have been temporarily closed due to adverse impacts to Como Creek, (2) continued closure of Como Creek to fishing, and (3) habitat improvement work which includes removal of litter in Como Creek.

The habitat improvement work would consist of reseeding all banks that have eroded due to livestock grazing or vehicle use. (The banks are too small for any type of bank cribbing work.) In areas where pools are few, log dams will be placed at strategic positions to enhance trout production. Log dams have been described by W. Harry Everhart et al. (Principles of Fishery Science 1975. Comstock Publ., Ithaca, N.Y.). A few trees will be cut down locally to provide material for the dams. Construction of these log dams is simple and takes little time to complete. Habitat improvement structures such as log dams have been known to increase mean annual biomass and mean annual numbers of trout in the long run (R. Hunt. 1976. A long-term evaluation of trout habitat development and its relation to improving management-related research. Trans. Amer. Fish. Soc. 105(3): 361-364).

The proposed activity is a cooperative project with fisheries biologists from the Colorado Division of Wildlife implementing the habitat improvement work.

B. Nature of the Decision

The decision to be made is one of how best to carry out the greenback cutthroat trout recovery program and are the impacts to Como Creek adversely affecting the greenback trout population.

C. Background

In 1969 the only population ideally conforming to the diagnostic characters of the threatened greenback cutthroat trout was found in a tiny stream locally called Como Creek, tributary to North Boulder Creek in Roosevelt National Forest (see map). On May 18, 1978, the greenback cutthroat trout was declassified from endangered to threatened. Most of the new greenback trout populations that have been established have come from Como Creek.

A habitat assessment and population estimate of Como Creek was conducted by Colorado Division of Wildlife personnel during May, 1978. The main objective of this reconnaissance effort was analysis of the lower two miles of Como Creek from the University of Colorado research station downstream to the barrier falls at the Caribou Ranch property line. The results of this survey are divided into sections corresponding to the areas samples (see map).

Section I: Numerous campsites were found with trash evident along the stream and throughout the campsites. Electrofishing efforts produced 225 cutthroat trout with largest only seven inches. The downstream portion of this section contains optimum trout habitat. This section is composed mainly of an Aspen-Conifer forest.

Section II: The evidence of heavy fishing pressure and environmental perturbations was substantial. Only 75 cutthroat trout were electrofished from this section and they were substantially smaller than those sampled in the other sections. Fishing tackle was found along the stream and fishermen were seen during the survey. A picnic table and several campsites were observed in this section. Trash (bedsprings, bottles, etc.) were found in the stream. Erosion of the stream banks and surrounding area due to livestock grazing and numerous jeep trail crossings was evident throughout this section. The vegetative type is mainly Aspen and grass meadows.

Section III: Livestock grazing and litter was apparent in the upper portion of this section. Electrofishing efforts produced 175 cutthroat trout, with larger fish (8") being more abundant than the other sections. Most of this section of stream flows through a dense coniferous forest.

II. ENVIRONMENTAL SETTING

A. Location

The portion of Como Creek occupied by greenback cutthroat trout is located on the Boulder District of the Roosevelt National Forest, with the exception of a few hundred yards on the Arctic and Alpine Research Institute of the University of Colorado. Como Creek is a tributary of North Boulder Creek, Boulder County, Colorado.

B. Ecological Setting

Como Creek is a perennial stream with an average discharge of 2.5 cfs. The average depth is approximately 0.5 feet and average width is 3 feet. The section of Como Creek under consideration is 2 miles in length, beginning at the property line of the Arctic and Alpine Research Station (9,800 ft.), extending downstream to the Caribou Ranch property line (8,600 ft.), at which point the stream enters a series of natural waterfall barriers. The flora and fauna of this 2 mile section of stream is characteristic of a subalpine and upper montain forest zone. The vegetative type is blue spruce, lodgepole and ponderosa pine, with areas of aspen stands and grassy meadows. The dominant riparian vegetation consists of willow, bog-birch and various grasses. The common terrestrial animals are elk, deer, snowshoe hare, yellow-bellied marmot, pine squirrel, golden-mantled ground squirrel, robin, magpie, gray jay, and the dipper. The common aquatic organisms are greenback cutthroat trout (a

federal and state threatened species), mayflies, stoneflies, caddisflies, and various species of dipterans.

C. Social and Economic Setting

Recreation use is moderate. Access to Como Creek is via highway 72 and various vehicle trails coming off of this highway. Vehicle access to the stream (off of highway 72) has been temporarily halted by road closures. Human uses of the area are hunting, illegal fishing, camping and "jeeping."

Archeological or historical surveys are not needed in regard to this proposal because the proposed action will only affect aquatic organisms.

There will be no change in economics of the local communities of Ward or Nederland from this proposed action.

III. EVALUATION CRITERIA

The only objective involved in this proposal is to improve and expand management programs to enhance a threatened fish population by protection of habitat and increasing the abundance of greenback cutthroat trout.

The evaluation criteria used in the alternative section will be based on the alternative which:

-Best satisfies the management objective.
-Best maximizes favorable effects and minimizes adverse effects.
-Best maintains or enhances long-term productivity.

The source of the criteria have been developed by an interdisciplinary team and used in environmental analysis on this forest for several years.

IV. ALTERNATIVES CONSIDERED

The Greenback Cutthroat Trout Recovery Plan was prepared to delineate reasonable actions which would restore this threatened trout to a healthy, self-sustaining population over much of its natural range and restore the species to a non-threatened status by the year 2000. This plan and the 1979 Program of Work are the sources used in formulating the alternatives.

Two alternatives which were considered are as follows:

A. No action.
B. Permanent closure of all the roads that have been temporarily closed due to adverse impacts on Como Creek, continued closure of Como Creek to fishing and implementation of habitat improvement work to restore Como Creek back to natural conditions.

V. EFFECTS OF IMPLEMENTATION

A. Alternative A. The no action alternative would leave the greenback trout population as it is now, with a continual decline in abundance and size of the fish and degradation of habitat due to various impacts. No cost would be involved but extinction of the species would be enhanced under this alternative.

B. Alternative B. This alternative involves constructing small log dams, and bank seeding, closure of jeep trails crossing Como Creek and prevention of illegal livestock grazing and fishing in the Como Creek drainage.

1. Expected Environmental Changes. The main impact is the restoration of Como Creek and the surrounding area to a once-existing stable state. In accomplishing this, only a limited amount of disturbance to the environment will occur. A few trees will be lost in the construction of log dams. Stream flow will be altered slightly in places where log dams are constructed, but in the long run these structures are beneficial to fish populations and production.

   Other impacts include the closure of access roads and fishing on Como Creek. As a result recreation values will initially decrease. However, the proposed action will be in accord with the threatened and endangered species preservation values and guidelines established by the U.S. Fish and Wildlife Service and the Colorado Division of Wildlife.

   The proposed action will help to remove the greenback cutthroat trout from the threatened category by increasing the abundance of this trout. This may eventually make it possible for the State of Colorado, in cooperation with the U.S. Forest Service, to open some areas previously closed to fishing. This allows for a more efficient management scheme and increases good public relations and support for the recovery program.

2. Estimated Forest Service Expenditures. The habitat improvement and monitoring work will be done by the Colorado Division of Wildlife so there are no Forest Service costs initially. Followup site inspections yearly and increased enforcement of illegal grazing practices will be made at an estimated cost of $100.00 per year.

3. Expected Outputs. Initially Como Creek will be closed to fishing and fish will not be removed for establishment of new greenback cutthroat trout populations in other areas. After the population builds back up to carrying capacity, Como Creek may again provide brood stock for future introductions. If these transplants are successful, and the greenback cutthroat trout is declassified, fishing will then be allowed and recreation visitor days will increase in the area.

4. Significant Effects in Physical, Biological, Social and Economic Components of the Human Environment. The expected changes in the physical and biological environment are covered in the Environmental Changes section above. The social and economic effects of camping and jeep driving in or near Como Creek will decrease. Fishing and livestock grazing in this section of Como Creek is illegal, therefore, continued closure to these practices will not result in any social or economic loss.

   Minimal amount of disturbance will be done to the environment in the construction of various habitat improvement structures. Trees will be cut for the log dams but they can be replaced with tree seedlings. Although some recreation days will be lost under the proposed action, the end result will be restoration of the environment of the greenback cutthroat trout to its original state. No species will be eradicated from or introduced into Como Creek.

VI. EVALUATION OF ALTERNATIVES

This evaluation shows which alternative best satisfies the selection criteria described in Section III. A plus sign (+) indicates the criteria which accomplishes the criteria. A minus sign (-) indicates a detrimental effect. A zero (0) means no effect from the present condition.

Criteria	Alternatives A	B
1. Best satisfies the management objectives.	-	+
2. Best maximizes favorable effects and minimizes adverse effects.	-	+
3. Best maintains or enhances long-term productivity.	-	+

VII. IDENTIFICATION OF PREFERRED ALTERNATIVES

Alternative B, which will permanently close all roads that are now temporarily closed due to adverse impacts on Como Creek, maintain continued closure of Como Creek to fishing and implementation of habitat improvement work to restore Como Creek back to natural conditions, is the preferred alternative.

VIII. MANAGEMENT REQUIREMENTS AND CONSTRAINTS

A. Enforcement of laws by U.S. Forest Service and Colorado Division of Wildlife concerning fishing, grazing and off-road vehicle use in the Como Creek drainage.

B. Construction of habitat improvements only in sections of Como Creek where necessary. This results in minimal disturbance to the environment.

IX. CONSULTATION WITH OTHERS

The Greenback Cutthroat Trout Recovery Plan has been circulated and commented on by the interested public. This proposed action is planned within the framework of the Recovery Plan. Agencies and individuals consulted about this project include the following:

Greenback Trout Recovery Team

U.S. Fish and Wildlife Service.....Bruce D. Rosenlund
U.S. Forest Service.....Richard L. Moore
Colorado Division of Wildlife.....Dave Langlois
National Park Service.....Dave R. Stevens

Private Landowners.....University of Colorado
Caribou Ranch

No work will be done on private land but the above landowners own land adjacent to the section of Como Creek covered in the proposed action. Caribou Ranch should be informed about grazing in the Como Creek drainage.

X. FINDING OF NO SIGNIFICANT EFFECT

Como Creek Fisheries Rehabilitation
USDA-Forest Service
Arapaho and Roosevelt National Forest

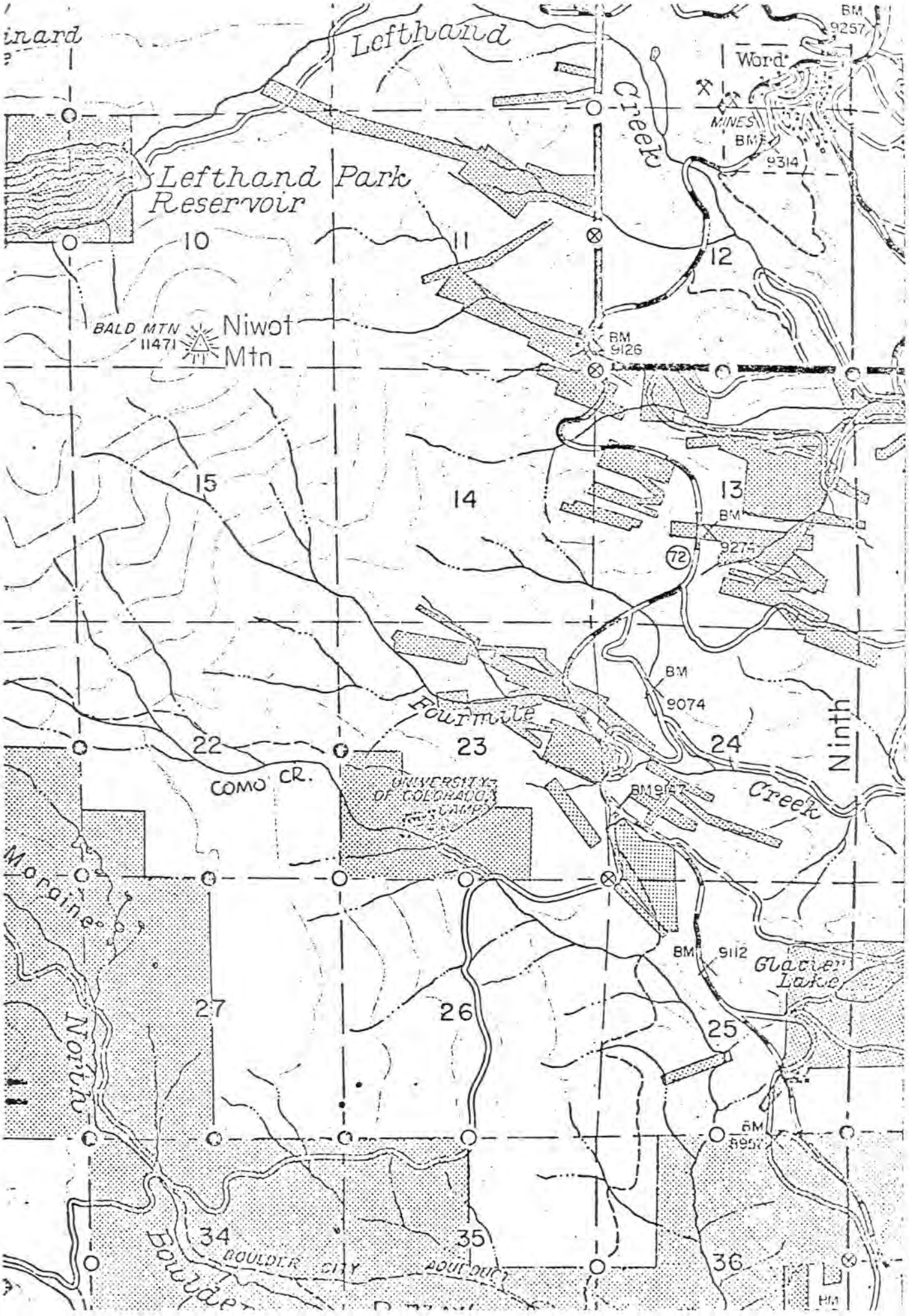
An Environmental Assessment Report that discusses permanent closure of all roads that are now temporarily closed due to adverse impacts on Como Creek, maintain continued closure of Como Creek to fishing and implementation of habitat improvement work to restore Como Creek to natural conditions is available for public review into the Poudre District Office, 148 Remington, Fort Collins, Colorado.

This report does not indicate that there will be any significant effects upon the quality of the human environment. It has been determined that an environmental statement will not be prepared.

This determination was based upon consideration of the following factors, which are discussed in detail in the Environmental Assessment Report: (a) There will be no significant impacts to the physical, biological, social and economic components of the human environment, and (b) Minimal amount of disturbance will be done to the environment in the construction of various habitat improvement structures. A few trees will be lost but they will be replaced with tree seedlings where necessary.

Implementation of the plan may take place on or after following public distribution of this Record of Decision. Questions regarding this decision should be sent to the Forest Service.

Forest Supervisor _____ Date _____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BM 9112
Glacier
Lake
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BOULDER CITY
BOULDER
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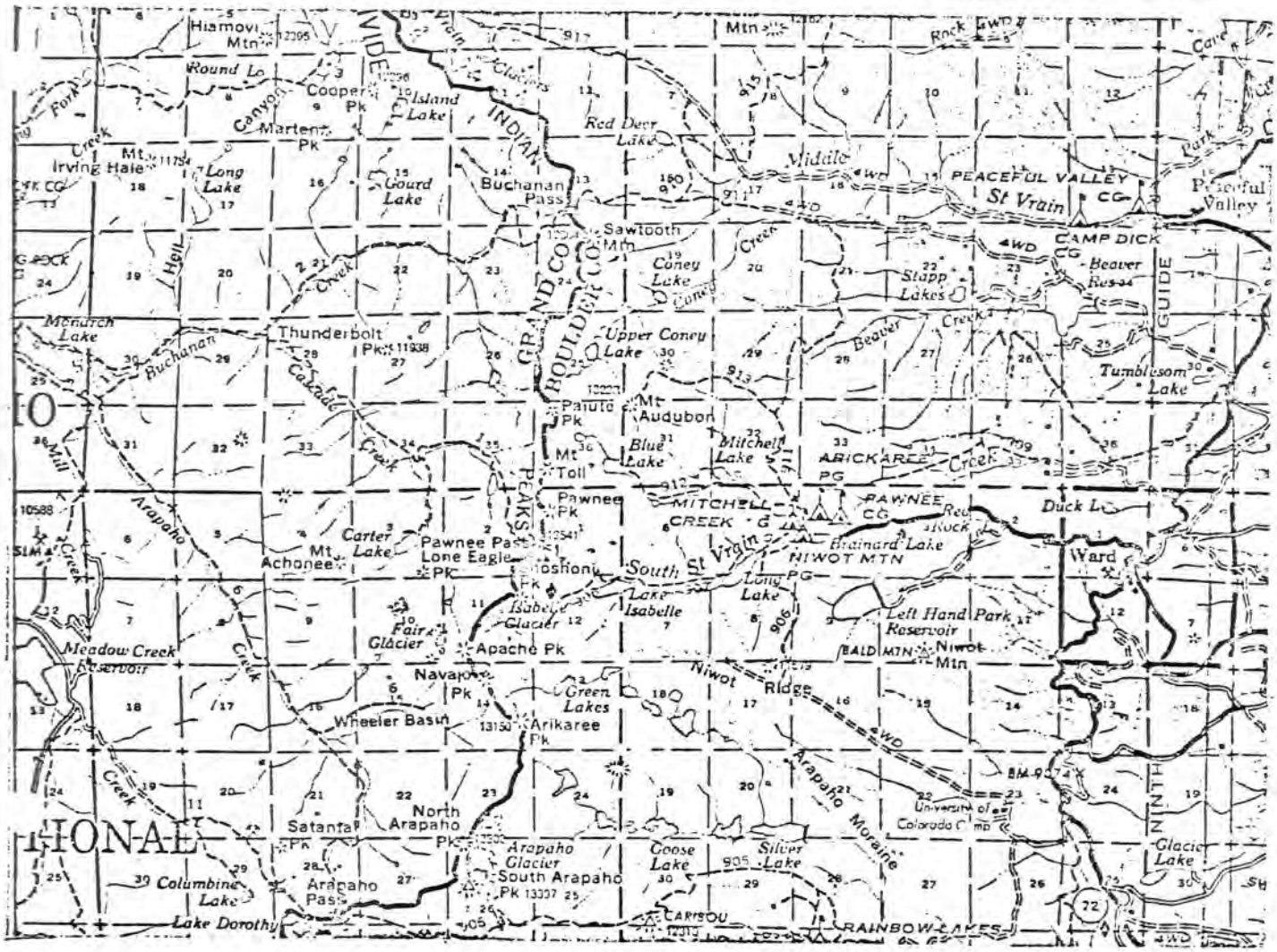
ROOSEVELT NATIONAL FOREST
COLORADO



LOCATOR MAP

LEGEND

- National Forest Boundary
- Adjacent National Forest Boundary
- State Boundary Line
- County Boundary Line
- Reservation Boundary
- Wilderness Boundary
- Interstate Highway (25)
- U.S. Highway (87)
- State Highway (14)
- Forest Route (449)
- Paved Road
- Forest Supervisors Headquarters
- District Ranger Station
- Forest Service Station
- Recreation Site
- Recreation Site other than Forest Service
- Ski Area
- Observation Site
- Point of Interest
- House, Cabin or other Building
- Water Well
- Mine, Quarry or Gravel Pit

Como Cr
13184

Job Progress Report

State of Colorado

Project No. SE-3-3 Endangered Wildlife Investigation

Work Plan No. 1: Endangered Fishes Job No. 2

Job Title: Greenback Cutthroat Trout Inventory, Restoration and Monitoring

Period Covered: 1 July 1979 - 28 February 1981

Personnel: David Langlois, Terry Hickman, David Miller, Steve Culver, Brian Anderson, Chuck Loeffler, Robin Knox, Gary Brown, Ted Washington

Abstract

To date, taxonomic analysis of greenback cutthroat trout Salmo clarki stomias based on the stream evaluation system developed by Binns (1977) has identified 18 populations of greenbacks, 7 of which are type "A." Of these 7, only greenbacks from Como Creek, Cascade Creek and to a limited extent the Little South Fork of the Poudre are being used to establish new population. Currently, in addition to those populations mentioned above, greenbacks have been transplanted to McAlpine Lake, May Creek and Hourglass Creek. By the end of the 1981-1982 field season, transplants will have been made to Lytle Pond at Fort Carson, Sheep Creek and possibly Williams Gulch and/or East Fork of Roaring Creek. Likewise, plans are to eradicate the existing fish population in George and Cornelius Creeks and put in a man-made barrier.

During 1978, a survey was conducted to determine the extent of brook trout reinvasion. Upstream from the constructed barrier, a natural rock barrier exists. The brook trout have been found between the two barriers, but not above. An eradication program for the section of stream below the second barrier will be necessary to insure the stability of the greenback population. Some reproduction of greenbacks has been noted. Eight fish were kept for taxonomic analysis.

Como Creek: R73W, T1N, Secs. 22, 23, 24, 25, 26; Ward Quad

In 1969, the only population ideally conforming to the diagnostic characters of the greenback cutthroat trout was found in Como Creek. Since then, the fish from Como Creek have been reintroduced into other available waters as part of the restoration program. A habitat assessment and population survey was conducted in May, 1978. The reach of the stream from the Rainbow Lakes road crossing downstream to the Caribou Ranch property line was assessed. As a result of this survey, this reach of stream was divided into three sections:

Section I: Numerous campsites were found with trash evident along stream as well as throughout the campsites. The downstream end of Section I was the best habitat for trout. Two hundred twenty-five fish were electroshocked with the largest only seven inches.

Section II: The evidence for heavy fishing pressure and environmental perturbations was substantial. Only 75 fish were shocked and the fish were much smaller. Fishing tackle was found along the stream. Several fishing parties were warned of fishing there during the survey. Livestock grazing was evident. A makeshift picnic ground with picnic tables was found--this only encouraged more fishing. Trash (bedsprings, bottles, etc.) were found in the stream. Erosion of banks and surrounding area was found to be due to numerous jeep trails that are fairly recent and were not made by the U.S. Forest Service. Access to this area is possible by numerous roads coming off of Colorado 160 (see map).

Section III: One hundred seventy-eight fish were shocked in this section. Larger fish (8 inches) were more abundant. Livestock grazing was apparent in upper half of this section. Trash was also found in this area.

GBC 1981 Prog. R
S. Culver

Como Cr
13184

II. Status of Existing Populations.

Five populations of greenback cutthroat trout are presently managed in the North East region (Table 1.) None of the populations at this point in time can be considered stable populations.

Table 1. Existing greenback cutthroat trout populations.

County	Stream	Drainage
Boulder	Como Creek	Boulder Creek
Clear Creek	-	-
Douglas	-	-
Jefferson	-	-
Gilpin	-	-
Larimer	Black Hollow	Poudre River
	Hourglass	Poudre River
	Little South Fork of Poudre River	Poudre River
	May Creek	Poudre River
Park	-	-

Como Creek

Habitat degradation and fishing are the main problems confronting the Como Creek population. Habitat degradation is manifested mainly in the lack of good deep pools and excessive silt loads. Washout from four wheel drive roads which run alongside and cross Como Creek in the lower sections is the main source of

siltation. Silt build up in the stream is a limiting factor to both reproductive success and food production. Fishing pressure is still a factor limiting this population. Although no anglers were encountered, there was evidence of fishing.

Blackhollow Creek

New signs were posted on Black Hollow Creek to alert the public of the status of the Black Hollow population. Letters explaining the status of the greenback cutthroat trout and of the Black Hollow Creek population (see appendix A) were also distributed to all landowners living near Black Hollow Creek. No attempt was made to collect any fish from this area during the 1981 field season.

Little South Fork of the Poudre

Several attempts were made in June to collect adult fish for an egg taking operation. Unfortunately, no fish over 10cm were captured. During 1980, large fish up to 30cm were collected. Based on evidence of camping along the stream, we suspect this population has been depleted due to fishing.

Signs were posted to alert the public of the status of this population. Furthermore, all landowners adjacent to the U.S. Forest Service property were notified of the status of the greenback cutthroat and fishing regulations (see appendix A).

During late August and early September fry traps were installed in the creek to determine if reproduction had been sucessful during 1981 and catch fry for transportation to a more secluded area upstream. No fry were captured.

offered his support in restoring the upper sections of Caribou Creek to its natural conditions, building a fish barrier, and reintroducing the greenback cutthroat trout. This is a moderate priority stream.

Como Creek(tributary of North Boulder Creek)

Surveyed on 22 September 1981. The lower reaches of Como Creek below the waterfall barrier and located on the Caribou Ranch was surveyed. Habitat was good with deep pools, adequate cover, and good flow (3.0cfs). An intense electroshocking survey was conduted to determine if any greenback cutthroat were below the waterfall. No greenback trout were captured. The only species found was brook trout. James Guercio, the owner of the Caribou Ranch, expressed some interest in the reclamation of the lower reaches of Como Creek.

Fourmile Creek(tributary of Boulder Creek)

Surveyed on 23 September 1981. Upper reaches were surveyed above Highway 72. Trout habitat was marginal with moderate flow and a few deep pools. No natural fish barriers were found, but several potential barrier sites were present. Brook trout was the only species collected. This is moderate priority stream.

Clear Creek County

Bard Creek(tributary of Clear Creek)

Surveyed on 1 October 1981. Bard Creek was brought to our attention by Steve Puttman after his stream survey crew found the

STOCKING AND FISH SAMPLING DATA

STREAM CODE 13184

STOCKING

STOCK 79-83 0 YRS

STOCKYRS N N N N N

SPECIES-SIZE STOCKED:

FISH SAMPLING

SAMPLE DATE: 08 / 30 / 86

METHODS: ELEC

	SPECIES	#TAKEN	AVG. LENGTH (cm)	RANGE (cm)	AVG. WT (g)	RANGE (g)	%TOTAL CATCH
1.	~~GBN~~	~~22~~	~~11.8~~	~~5-20~~			~~100~~
2.	GBN	7	15.3	11-20	40.6	15-80	100
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							
11.							
12.							
13.							
14.							
15.							

Appendix - C

Water Availability Analysis

Station: **SOUTH ST. VRAIN CREEK NEAR WARD, CO.**
Parameter: STREAM FLOW CFS
Year: 1925-1973
State: CO
County: BOULDER

ID: 06722500
Statistic: Mean
Latitude: 40:05:27
Longitude: 105:30:50
Elevation: 9372.00
Drainage Area: 14.40

Monthly Statistics

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
# Days	744	677	744	720	744	720	744	744	750	744	720	744	8795
Avg Day	2.84	2.63	2.94	6.49	40.38	123.6	80.95	38.60	18.75	10.21	5.30	3.65	28.08
Max Day	6.00	6.20	6.00	27.00	223.0	328.0	271.0	148.0	58.00	33.00	14.00	8.00	328.0
Min Day	1.10	1.10	1.30	1.80	3.00	30.00	24.00	11.00	5.20	2.70	1.90	1.30	1.10
# Months	24	24	24	24	24	24	24	24	25	24	24	24	24
SDev Month	1.19	1.04	1.24	4.19	19.74	28.00	35.64	14.19	6.36	3.50	2.15	1.74	6.46
Skew Month	1.21	0.784	1.40	1.95	1.13	-0.811	1.06	1.66	0.919	0.984	1.33	1.45	0.485
Min Month	1.41	1.10	1.44	2.65	15.03	52.90	36.39	20.52	9.51	4.06	2.51	1.80	15.24
Max Month	6.00	5.00	6.00	20.00	86.40	164.5	171.8	82.81	36.57	20.10	10.10	8.00	42.69
Exceedences													
1%	6.00	5.00	6.00	21.00	212.4	278.8	216.7	121.7	43.50	25.00	12.00	8.00	197.0
5%	5.16	5.00	6.00	20.00	109.4	215.0	176.0	80.00	36.00	19.00	10.00	8.00	128.3
10%	5.00	4.00	5.00	15.00	80.00	188.0	146.0	61.00	30.00	16.00	10.00	6.00	86.00
20%	4.00	3.60	3.70	10.00	60.00	163.0	110.0	50.00	25.00	14.00	6.80	4.50	44.00
50%	2.50	2.20	2.70	4.50	30.00	120.0	71.00	34.00	17.00	9.80	5.00	3.10	8.00
80%	2.00	1.80	2.00	3.00	12.00	77.00	45.00	24.00	11.00	6.16	3.30	2.30	2.70
90%	1.60	1.50	1.70	2.50	7.78	60.00	36.00	19.00	9.80	4.60	2.80	2.00	2.10
95%	1.50	1.38	1.50	2.30	5.80	51.00	32.20	16.00	8.25	3.60	2.40	1.80	1.90
99%	1.30	1.10	1.30	2.00	4.29	40.00	27.44	12.00	6.10	3.00	2.00	1.74	1.40

11.0 .71 .62 .96 1.27 8.5 32.9 26.1 7.6 4.8 2.27 1.41 .88

Streamflow Statistics Report

COMO CREEK
Total wls SEC 36

Date: Mon Feb 12 2007 17:26:48
Site Location: Colorado
Latitude: 40.0142
Longitude: -105.5147
Drainage Area: 4.07 mi2

Peak Flow Basin Characteristics			
100% Mountain Region Peak Flow (4.07 mi2)			
Parameter	**Value**	**Min**	**Max**
Drainage Area (square miles)	4.07 (below min value 5.5)	5.5	945
Mean Basin Slope ft per ft (dimensionless)	0.16	0.126	0.554

Warning: Some parameters are outside the suggested range. Estimates will be extrapolations with unknown errors.

Low Flow Basin Characteristics			
100% Mountain Region Low Flow (4.07 mi2)			
Parameter	**Value**	**Min**	**Max**
Drainage Area (square miles)	4.07	1	1150
Mean Basin Elevation (feet)	10100	8400	12200
Mean Annual Precipitation (inches)	25.6	17.5	39.4

Warning: Some parameters are outside the suggested range. Estimates will be extrapolations with unknown errors.

Streamflow Statistics					
Statistic	**Flow (ft^3/s)**	**Standard Error (percent)**	**Equivalent years of record**	**90-Percent Prediction Interval**	
				Minimum	**Maximum**
PK2	46.7				
PK5	69.5				
PK10	85.4				
PK25	105				
PK50	120				
PK100	134				
PK200	149				
PK500	168				

Streamflow Statistics

Statistic	Flow (ft^3/s)	Estimation Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
Q1 J	0.47	49			
Q2 F	0.45	49			
Q3 M	0.57	43			
Q4 A	1.59	56			
Q5 M	10.3	58			
Q6 J	20.6	510			
Q7 J	6.19	63			
Q8 A	1.97	70			
Q9 S	1.26	63			
QA	4.63	43			
Q10 O	1.1	50			
Q11 N	0.76	43			
Q12 D	0.56	45			
Low-Flow Statistics					
M7D2Y	0.28	62			
M7D10Y	0.13	100			
M7D50Y	0.0757	160			

USGS science for a changing world

StreamStats

Basin Characteristics Report

Date: Mon Feb 12 2007 17:26:01
Latitude: 40.0142
Longitude: -105.5147

Parameter	Value
Area that drains to a point on a stream in square miles	4.07
Mean Basin Elevation in feet	10100
Mean basin slope in percent, computed from 10 m DEM	17.6
Mean annual precipitation in inches (unadjusted)	27.6
Mean basin slope determined using the grid-sampling method (dimensionless)	0.16
Mean annual precipitation in inches (adjusted)	25.6

Monthly Climatic Data for SILVER LAKE for years 1931 - 1955
Station - 57648 Latitude - 4002 Longitude - 10535 Elevation - 10200

Total monthly precipitation.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1931	28	338	149	340	316	283	184	232	120	142	97	52	22.81
1932	195	174	589	431	236	349	256	196	71	243	169	173	30.82
1933	121	171	306	647	272	89	280	186	379	30	31	171	26.83
1934	84	475	265	210	387	104	196	161	200	T	246	149	24.77
1935	99	88	97	493	431	131	452	240	130	191	95	26	24.73
1936	388	273	392	103	241	399	587	447	170	202	28	55	32.85
1937	60	165	195	295	222	426	417	94	216	169	305	269	28.33
1938	229	159	292	252	441	210	256	439	334	102	99	265	30.78
1939	199	311	314	184	122	123	154	108	132	144	35	68	18.94
1940	498	320	350	302	375	96	435	228	372	120	154	131	33.81
1941	112	327	351	479	232	264	145	275	164	235	62	64	27.10
1942	190	203	133	807	186	222	221	52	93	345	270	292	30.14
1943	102	260	470	180	345	130	114	219	136	120	112	87	22.75
1944	71	130	731	548	353	133	285	78	T	102	155	145	27.31
1945	245	341	211	531	214	252	366	526	183	150	274	349	36.42
1946	240	70	168	146	305	181	330	244	220	307	541	47	27.99
1947	63	350	350	258	570	496	226	500	115	359	154	85	35.26
1948	M	M	M	M	M	M	M	116	113	132	178	204	
1949	0	480I	231	164	310	892	381	256	109	221	65	92	32.01
1950	159	121	229	314	238	152	192	65	0	0	0	0I	14.70
1951	0	0	0	0	0	0	0	0	0	0	0	0I	0.00
1952	0	0	0	0	0	0	0	0	0	0	0	0I	0.00
1953	0	0	0	0	0	0	0	0	0	0	0	0I	0.00
1954	0	0	0	0	0	0	0	0	0	0	0	0I	0.00
1955	0	0	0	0	0	0	114	387	47	131	299	M	
Ave	1.28	1.98	2.43	2.78	2.42	2.06	2.33	2.02	1.32	1.38	1.35	1.14	22.97
Max	4.98	4.80	7.31	8.07	5.70	8.92	5.87	5.26	3.79	3.59	5.41	3.49	36.42
Year	1940	1949	1944	1942	1947	1949	1936	1945	1933	1947	1946	1945	1945
Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Year	1955+	1955+	1955+	1955+	1955+	1955+	1954+	1954+	1954+	1954+	1954+	1954+	1954+
Count	24	24	24	24	24	24	24	25	25	25	25	24	23

Monthly Climatic Data for NEDERLAND 2 NNE for years 1970 - 1988
Station - 55878 Latitude - 3959 Longitude - 10530 Elevation - 8240

Total monthly precipitation.

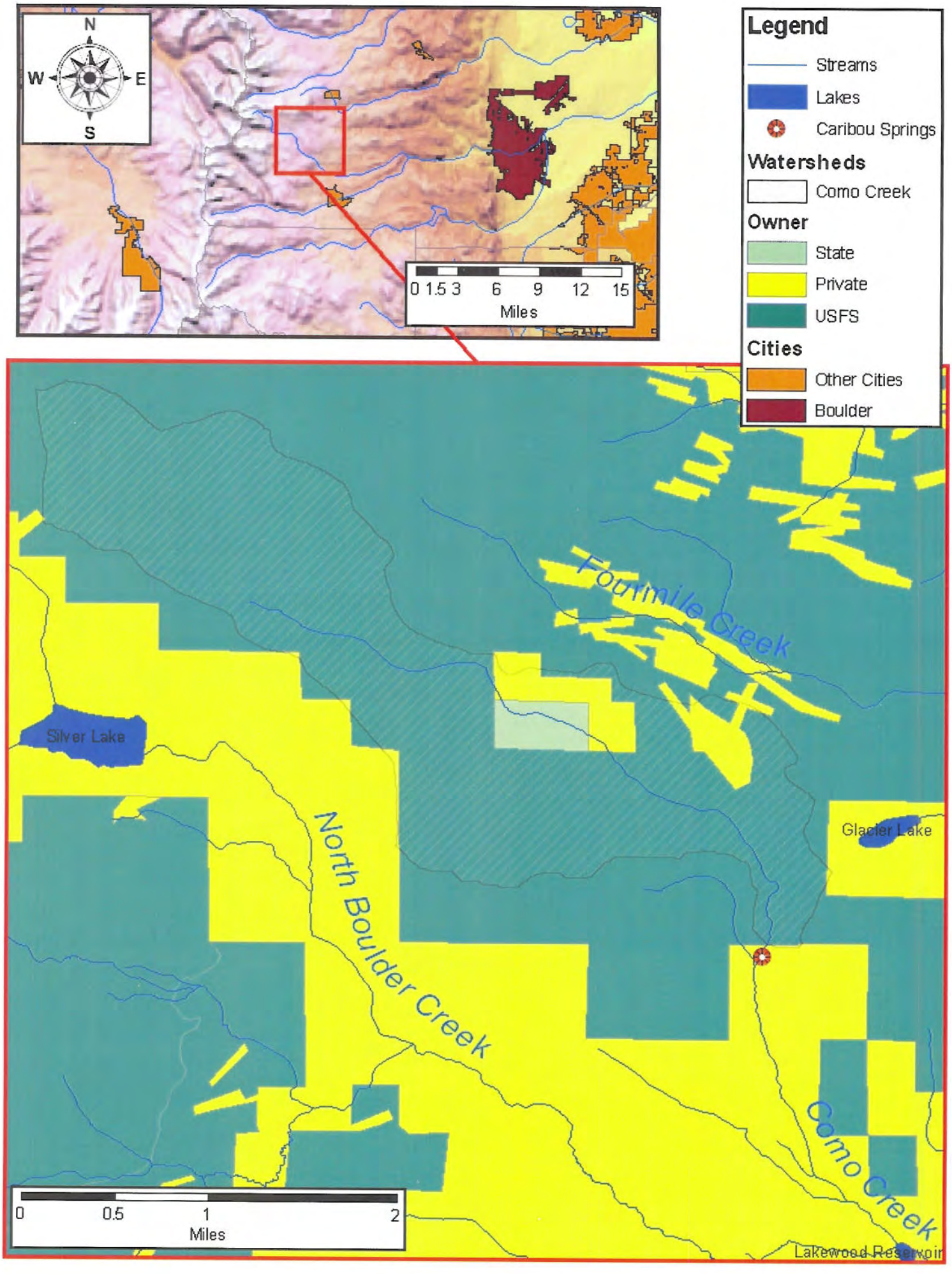
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1970	M	M	M	M	67	219	332	96	398	34	120	15	
1971	37	116	101	461	179	45	309	146	326	23	42	47	18.32
1972	133	40	79	65	165	192	116	244	199	121	306	67	17.27
1973	85	6	113	385	475	117	263	97	185	76	93	200	20.95
1974	70	67	115	248	7	184	265	116	149	221	86	34	15.62
1975	73	55	129	130I	252	192	343	116	119	64	145	26	16.44
1976	63	49	103	167	180	137	221	167	323	138	45	49	16.42
1977	12	65	72	221	102	106	303	197	21	89	72	51	13.11
1978	39	20	167	131	355	202	48	48	22	194	16	113	13.55
1979	53	37	213	181	476	190	114	381	106	93	219	86	21.49
1980	152	41I	77	319	440	6	139	150	105	31	53	0	15.13
1981	18	45	191	73	410	272	280	209	263	123	28	52	19.64
1982	29	32	59	73I	469	308	200	316	196	48	25	180	19.35
1983	11	43	330	234	370	188	354	477	87	10	329	118I	25.51
1984	30	92	141	270	62	112	312	437I	110	244	12	23	18.45
1985	36	92	73	139	156	107I	313	20	283	85	117	41	14.62
1986	25	M	59	413	260	226	212	122I	167	174	205	55	
1987	45	169	M	183	341	198	178	284	72	69	106	153	
1988	59	35	163	227	339	M	M	M	M	M	M	M	
Ave	0.54	0.59	1.29	2.18	2.69	1.67	2.39	2.01	1.74	1.02	1.12	0.73	17.72
Max	1.52	1.69	3.30	4.61	4.76	3.08	3.54	4.77	3.98	2.44	3.29	2.00	25.51
Year	1980	1987	1983	1971	1979	1982	1983	1983	1970	1984	1983	1973	1983
Min	0.11	0.06	0.59	0.65	0.07	0.06	0.48	0.20	0.21	0.10	0.12	0.00	13.11
Year	1983	1973	1986+	1972	1974	1980	1978	1985	1977	1983	1984	1980	1977
Count	18	17	17	18	19	18	18	18	18	18	18	18	15

Monthly Climatic Data for CARIBOU RANCH for years 1962 - 1970
Station - 51342 Latitude - 4000 Longitude - 10531 Elevation - 8360

Total monthly precipitation.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1962	M	M	M	M	M	M	M	M	M	M	M	26	
1963	173	72	150	0	75	M	236	579	254	43	8	45	
1964	28I	140	135	185	350	170	261	59	110	15	125	232	18.10
1965	430	81	159	220	142	376	844	120	211	0	18	24	26.25
1966	22	120	0	120	96	140	159	178	143	87	0	58	11.23
1967	57	76	112	89	296	458	245	355	156	0	125	0I	19.69
1968	13	109	73	146	0	70	149	0	0	0	98	M	
1969	47	14	83	153	771	0	0	0	M	441	27	M	
1970	0	89	M	M	M	M	M	M	M	M	M	M	
Ave	0.96	0.88	1.02	1.30	2.47	2.02	2.71	1.84	1.46	0.84	0.57	0.64	18.82
Max	4.30	1.40	1.59	2.20	7.71	4.58	8.44	5.79	2.54	4.41	1.25	2.32	26.25
Year	1965	1964	1965	1965	1969	1967	1965	1963	1963	1969	1967+	1964	1965
Min	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.23
Year	1970	1969	1966	1963	1968	1969	1969	1969+	1968	1968+	1966	1967	1966
Count	8	8	7	7	7	6	7	7	6	7	7	6	4

Como Creek


N
W
E
S
0 1.5 3 6 9 12 15
Miles
Legend
Streams
Lakes
Caribou Springs
Watersheds
Como Creek
Owner
State
Private
USFS
Cities
Other Cities
Boulder
Fourmile Creek
Silver Lake
Glacier Lake
North Boulder Creek
Como Creek
Lakewood Reservoir
0 0.5 1 2
Miles

Streamflow Statistics Report COMO CREEK

Date: Tue Nov 28 2006 14:06:55
Site Location: Colorado
Latitude: 40.0134
Longitude: -105.5154
Drainage Area: 4.1 mi2

Peak Flow Basin Characteristics			
100% Mountain Region Peak Flow (4.1 mi2)			
Parameter	**Value**	**Min**	**Max**
Drainage Area (square miles)	4.1 (below min value 5.5)	5.5	945
Mean Basin Slope ft per ft (dimensionless)	0.08 (below min value 0.126)	0.126	0.554

Warning: Some parameters are outside the suggested range. Estimates will be extrapolations with unknown errors.

Low Flow Basin Characteristics			
100% Mountain Region Low Flow (4.1 mi2)			
Parameter	**Value**	**Min**	**Max**
Drainage Area (square miles)	4.1	1	1150
Mean Basin Elevation (feet)	10000	8400	12200
Mean Annual Precipitation (inches)	25.5	17.5	39.4

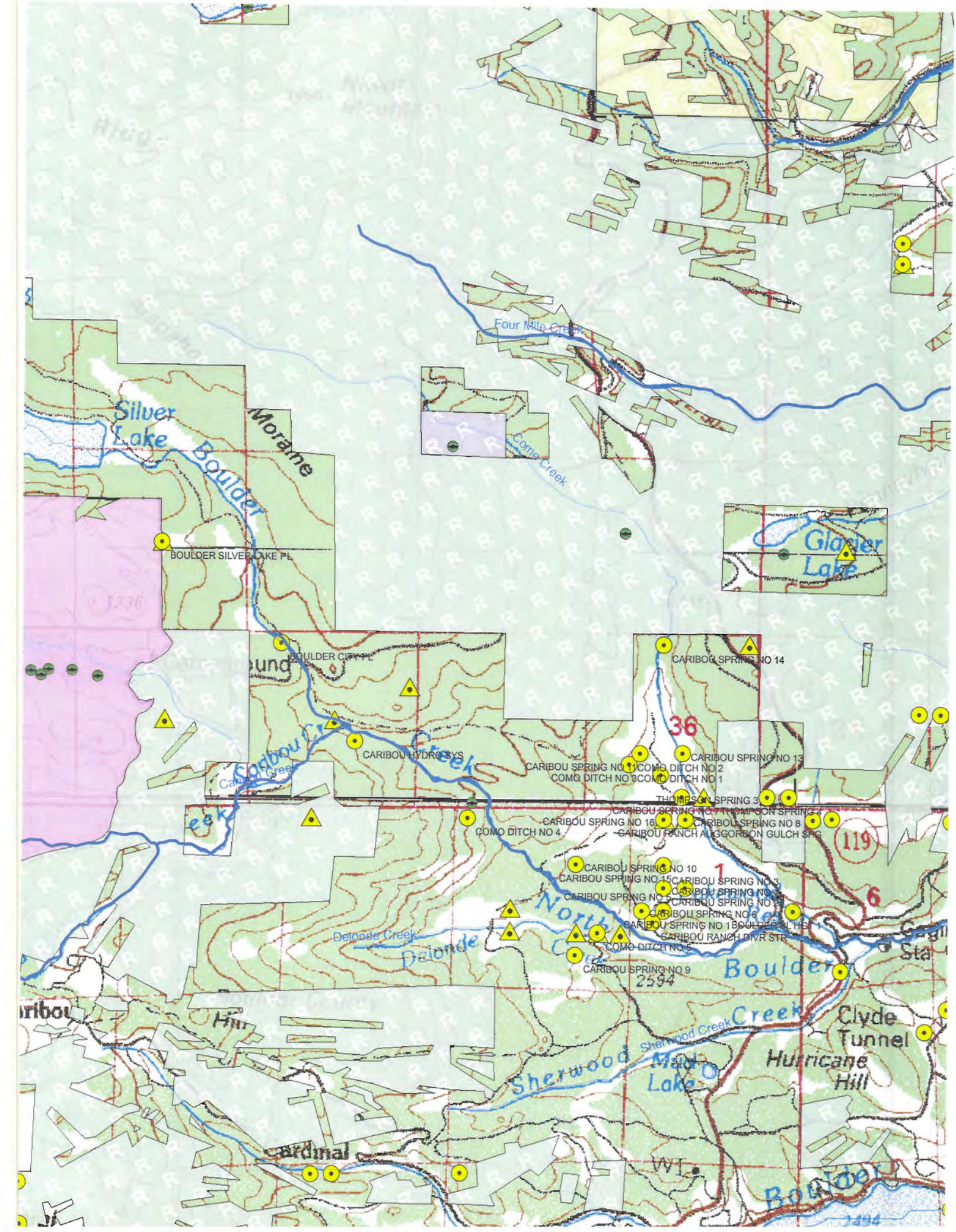
Warning: Some parameters are outside the suggested range. Estimates will be extrapolations with unknown errors.

Streamflow Statistics					
Statistic	**Flow (ft^3/s)**	**Standard Error (percent)**	**Equivalent years of record**	**90-Percent Prediction Interval**	
				Minimum	**Maximum**
PK2	36.6				
PK5	57.4				
PK10	72.5				
PK25	91.5				
PK50	106				
PK100	121				
PK200	135				
PK500	155				

Streamflow Statistics					
Statistic	Flow (ft^3/s)	Estimation Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
Q1	0.45	49			
Q2	0.44	49			
Q3	0.56	43			
Q4	1.6	56			
Q5	10.3	58			
Q6	19.5	510			
Q7	5.62	63			
Q8	1.8	70			
Q9	1.17	63			
QA	4.47	43			
Q10	1.04	50			
Q11	0.73	43			
Q12	0.54	45			
Low-Flow Statistics					
M7D2Y	0.26	62			
M7D10Y	0.12	100			
M7D50Y	0.069	160			

O	N	D	J	F	M	A	M	J	J	A	S
1.0	.73	.54	.45	.44	.56	1.6	10.	20.	5.6	1.8	1.2

2.90 (5/1 - 7/31)
1.0 (8/1 - 10/15)
0.4 (10/16 - 4/30)

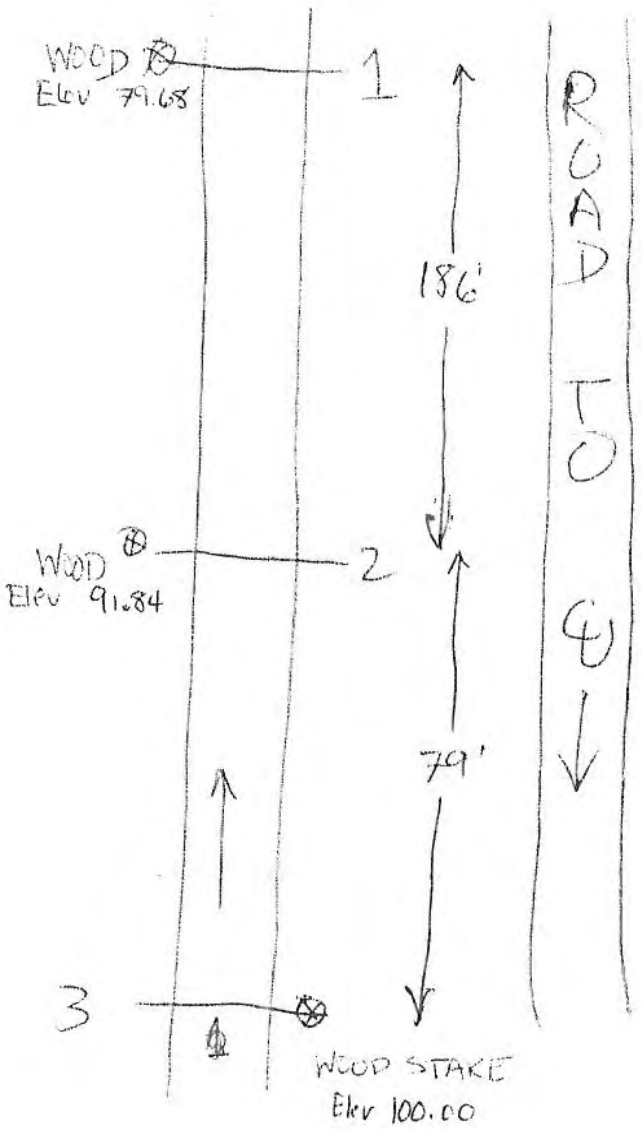

Four Mile Creek
Como Creek
Silver Lake
Boulder
Morane
BOULDER SILVER LAKE PL
Glacier Lake
BOULDER CITY PL
CARIBOU SPRING NO 14
CARIBOU HYDRO SYS
CARIBOU SPRING NO 13
CARIBOU SPRING NO 11
COMO DITCH NO 2
COMO DITCH NO 3
COMO DITCH NO 1
THOMPSON SPRING 3
CARIBOU SPRING NO 7
THOMPSON SPRING 4
CARIBOU SPRING NO 16
CARIBOU SPRING NO 8
COMO DITCH NO 4
CARIBOU RANCH ALLGORDON GULCH SPG
CARIBOU SPRING NO 10
CARIBOU SPRING NO 15
CARIBOU SPRING NO 3
CARIBOU SPRING NO 5
CARIBOU SPRING NO 2
CARIBOU SPRING NO 6
CARIBOU SPRING NO 1
BOULDER PL HDR 1
CARIBOU RANCH DIVR STR
COMO DITCH NO 5
CARIBOU SPRING NO 9
Delonde Creek
North Boulder Creek
Boulder
Sherwood Creek
Clyde Tunnel
Hurricane Hill
Mud Lake
Cardinal
36
1
6
119
2594

TOMO CREEK

10 Sept 88 1125

JWS C. WOLFE

	+	HI	-	Elev	
PIN 3	5.59	105.59		100.00	
TEMP			8.05		
TP			8.05	97.54	
	2.26	99.80			
PIN 2			7.96	91.84	
TP	~~11.45~~		11.45	~~96.31~~	88.35
	1.39	~~89.71~~	~~93~~		
PIN 1			10.06	79.68	
TP			0.23	~~89.45~~	89.51
	9.17	98.68			
TEMP			1.15	~~89.57~~	97.53



Station: **MIDDLE ST. VRAIN CREEK NEAR ALLENS PARK, CO.**
Parameter: STREAM FLOW CFS
Year: 1925-1930
State: CO
County: BOULDER

ID: 06723000
Statistic: Mean
Latitude: 40:10:00
Longitude: 105:26:38
Elevation: 7560.00
Drainage Area: 28.00

Monthly Statistics

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
# Days	155	141	155	150	155	150	155	155	150	155	150	155	1826
Avg Day	5.11	4.71	5.81	24.13	104.5	160.7	106.2	61.30	22.39	13.94	9.49	6.60	43.93
Max Day	6.00	6.00	12.00	84.00	246.0	312.0	219.0	183.0	57.00	35.00	15.00	8.00	312.0
Min Day	3.90	3.20	3.00	6.60	17.00	86.00	48.00	16.00	10.00	4.00	4.00	5.00	3.00
# Months	5	5	5	5	5	5	5	5	5	5	5	5	5
SDev Month	0.883	0.827	1.68	10.62	33.87	33.40	22.15	17.89	10.99	7.07	3.86	1.14	6.04
Skew Month	-0.094	1.06	-1.64	0.175	-0.068	0.892	-1.47	1.66	1.74	1.50	0.504	-0.405	0.576
Min Month	4.00	4.00	3.00	12.40	67.26	128.0	69.81	44.13	13.07	7.65	5.63	5.00	36.87
Max Month	6.00	6.00	7.00	36.60	142.2	210.1	125.1	91.74	41.13	25.68	15.00	8.00	52.72
Exceedences													
1%	6.00	6.00	11.45	81.50	245.4	301.5	193.1	181.9	56.50	35.00	15.00	8.00	230.2
5%	6.00	6.00	9.00	58.00	225.3	256.5	159.0	150.0	51.50	28.50	15.00	8.00	162.0
10%	6.00	6.00	7.00	54.00	206.0	228.0	152.0	95.00	42.00	26.00	15.00	8.00	137.4
20%	6.00	5.94	7.00	34.00	150.0	181.0	130.0	75.00	29.00	18.00	15.00	8.00	85.00
50%	5.00	4.65	6.20	20.00	94.50	152.0	108.5	52.50	19.00	13.00	10.00	7.00	14.00
80%	4.00	4.00	4.40	12.00	53.00	130.0	76.00	41.00	13.00	8.60	6.00	6.00	6.00
90%	4.00	4.00	3.00	11.00	39.50	114.0	65.50	33.50	12.00	7.00	6.00	5.00	4.80
95%	4.00	4.00	3.00	10.00	32.75	100.0	59.75	31.75	11.00	6.00	5.00	5.00	4.00
99%	4.00	3.76	3.00	7.55	17.55	92.50	49.10	18.10	10.00	5.00	4.00	5.00	3.00

Station: **MIDDLE BOULDER CREEK AT NEDERLAND, CO.**
Parameter: STREAM FLOW CFS
Year: 1907-1995
State: CO
County: BOULDER

ID: 06725500
Statistic: Mean
Latitude: 39:57:42
Longitude: 105:30:14
Elevation: 8186.00
Drainage Area: 36.20

Monthly Statistics

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
# Days	2697	2458	2697	2640	2728	2670	2759	2759	2670	2697	2610	2697	[illegible]
Avg Day	5.41	5.04	6.44	23.03	124.4	240.2	134.6	53.03	24.99	17.67	11.40	7.11	[illegible]
Max Day	14.00	12.00	74.00	130.0	508.0	698.0	542.0	288.0	153.0	80.00	67.00	26.00	[illegible]
Min Day	0.800	1.90	2.20	3.00	12.00	27.00	15.00	9.60	6.60	4.40	2.70	2.20	0.800
# Months	87	87	87	88	88	89	89	89	89	87	87	87	87
SDev Month	1.32	1.15	2.09	10.72	39.65	72.66	61.87	23.81	10.32	7.30	3.80	1.96	12.47
Skew Month	-0.225	0.123	1.89	1.03	0.757	-0.014	1.05	0.798	1.14	1.41	0.834	0.589	0.074
Min Month	2.00	2.75	3.46	6.70	62.03	68.67	26.45	14.09	10.08	7.74	5.43	3.97	26.16
Max Month	8.77	8.42	15.41	57.47	251.3	399.3	326.4	117.5	65.17	47.19	23.13	12.65	83.22
Exceedences													
1%	9.50	8.30	18.00	101.6	369.4	547.5	398.8	165.0	69.00	48.03	26.00	14.00	372.4
5%	7.90	7.11	11.00	66.00	278.6	415.0	275.0	113.0	50.00	32.00	20.00	12.00	246.0
10%	7.20	6.50	9.00	45.00	233.2	370.0	239.0	95.00	41.00	28.00	18.00	10.00	176.0
20%	6.60	6.00	7.50	32.00	189.0	319.0	191.2	75.00	33.00	24.00	14.00	8.90	91.00
50%	5.30	5.00	5.80	16.00	107.0	230.0	116.0	44.00	23.00	16.00	10.00	6.80	16.00
80%	4.10	4.00	4.50	9.20	52.00	153.0	71.00	28.00	14.00	10.00	7.70	5.10	6.00
90%	3.60	3.40	4.00	7.30	37.80	120.0	55.00	22.00	12.00	8.70	6.70	4.30	4.90
95%	3.00	3.00	3.70	6.30	29.00	101.5	45.00	18.00	10.00	7.70	5.90	4.00	4.10
99%	2.00	2.50	3.00	5.10	18.28	67.10	29.00	13.00	8.37	6.20	4.70	3.00	3.00

USGS StreamStats

Streamflow Statistics Report

Date: Tue Feb 13 2007 10:32:33
Site Location: Colorado
Latitude: 39.9953
Longitude: -105.5070
Drainage Area: 5.63 mi2

Peak Flow Basin Characteristics			
100% Mountain Region Peak Flow (5.63 mi2)			
Parameter	**Value**	**Min**	**Max**
Drainage Area (square miles)	5.63	5.5	945
Mean Basin Slope ft per ft (dimensionless)	0.18	0.126	0.554

Low Flow Basin Characteristics			
100% Mountain Region Low Flow (5.63 mi2)			
Parameter	**Value**	**Min**	**Max**
Drainage Area (square miles)	5.63	1	1150
Mean Basin Elevation (feet)	9780	8400	12200
Mean Annual Precipitation (inches)	24.4	17.5	39.4

Streamflow Statistics					
Statistic	**Flow (ft^3/s)**	**Standard Error (percent)**	**Equivalent years of record**	**90-Percent Prediction Interval**	
				Minimum	**Maximum**
PK2	61.4	60			
PK5	90.7	49			
PK10	111	45			
PK25	136	42			
PK50	155	42			
PK100	174	43			
PK200	192	45			
PK500	216	49			

Streamflow Statistics					
Statistic	**Flow (ft^3/s)**	**Estimation Error (percent)**	**Equivalent years of record**	**90-Percent Prediction Interval**	
				Minimum	**Maximum**
	0.56				

Q1	0.56	49			
Q2	0.55	49			
Q3	0.74	43			
Q4	2.18	56			
Q5	13.1	58			
Q6	22	510			
Q7	5.84	63			
Q8	1.97	70			
Q9	1.32	63			
QA	5.32	43			
Q10	1.23	50			
Q11	0.89	43			
Q12	0.67	45			
Low-Flow Statistics					
M7D2Y	0.32	62			
M7D10Y	0.15	100			
M7D50Y	0.0797	160			

StreamStats

Basin Characteristics Report

Date: Tue Feb 13 2007 10:31:12
Latitude: 39.9953
Longitude: -105.5070

Parameter	Value
Area that drains to a point on a stream in square miles	5.64
Mean Basin Elevation in feet	9780
Mean basin slope in percent, computed from 10 m DEM	19.5
Mean annual precipitation in inches (unadjusted)	26.4
Mean basin slope determined using the grid-sampling method (dimensionless)	0.18
Mean annual precipitation in inches (adjusted)	24.5

Streamflow Statistics Report

Date: Mon Feb 12 2007 17:39:17
Site Location: Colorado
Latitude: 40.0313
Longitude: -105.5373
Drainage Area: 2.08 mi2

Peak Flow Basin Characteristics			
100% Mountain Region Peak Flow (2.08 mi2)			
Parameter	**Value**	**Min**	**Max**
Drainage Area (square miles)	2.08 (below min value 5.5)	5.5	945
Mean Basin Slope ft per ft (dimensionless)	0.17	0.126	0.554

Warning: Some parameters are outside the suggested range. Estimates will be extrapolations with unknown errors.

Low Flow Basin Characteristics			
100% Mountain Region Low Flow (2.08 mi2)			
Parameter	**Value**	**Min**	**Max**
Drainage Area (square miles)	2.08	1	1150
Mean Basin Elevation (feet)	10700	8400	12200
Mean Annual Precipitation (inches)	27.5	17.5	39.4

Warning: Some parameters are outside the suggested range. Estimates will be extrapolations with unknown errors.

Streamflow Statistics					
Statistic	**Flow (ft^3/s)**	**Standard Error (percent)**	**Equivalent years of record**	**90-Percent Prediction Interval**	
				Minimum	**Maximum**
PK2	30.8				
PK5	45.2				
PK10	55.1				
PK25	67				
PK50	76				
PK100	84.9				
PK200	93.6				
PK500	105				

Streamflow Statistics					
Statistic	Flow (ft^3/s)	Estimation Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
Q1	0.3	49			
Q2	0.28	49			
Q3	0.32	43			
Q4	0.81	56			
Q5	6.04	58			
Q6	16.9	510			
Q7	6.19	63			
Q8	1.76	70			
Q9	1.04	63			
QA	3.32	43			
Q10	0.82	50			
Q11	0.52	43			
Q12	0.37	45			
Low-Flow Statistics					
M7D2Y	0.19	62			
M7D10Y	0.0989	100			
M7D50Y	0.0607	160			

USGS science for a changing world StreamStats

Basin Characteristics Report

Date: Mon Feb 12 2007 17:38:45
Latitude: 40.0313
Longitude: -105.5373

Parameter	Value
Area that drains to a point on a stream in square miles	2.08
Mean Basin Elevation in feet	10700
Mean basin slope in percent, computed from 10 m DEM	18.7
Mean annual precipitation in inches (unadjusted)	29.7
Mean basin slope determined using the grid-sampling method (dimensionless)	0.17
Mean annual precipitation in inches (adjusted)	27.5

Streamflow Statistics Report

@ CU base

Date: Mon Feb 12 2007 17:42:33
Site Location: Colorado
Latitude: 40.0333
Longitude: -105.5420
Drainage Area: 1.89 mi2

Peak Flow Basin Characteristics			
100% Mountain Region Peak Flow (1.89 mi2)			
Parameter	**Value**	**Min**	**Max**
Drainage Area (square miles)	1.89 (below min value 5.5)	5.5	945
Mean Basin Slope ft per ft (dimensionless)	0.18	0.126	0.554

Warning: Some parameters are outside the suggested range. Estimates will be extrapolations with unknown errors.

Low Flow Basin Characteristics			
100% Mountain Region Low Flow (1.89 mi2)			
Parameter	**Value**	**Min**	**Max**
Drainage Area (square miles)	1.89	1	1150
Mean Basin Elevation (feet)	10800	8400	12200
Mean Annual Precipitation (inches)	27.7	17.5	39.4

Warning: Some parameters are outside the suggested range. Estimates will be extrapolations with unknown errors.

Streamflow Statistics					
Statistic	**Flow (ft^3/s)**	**Standard Error (percent)**	**Equivalent years of record**	**90-Percent Prediction Interval**	
				Minimum	**Maximum**
PK2	29.8				
PK5	43.3				
PK10	52.6				
PK25	63.8				
PK50	72.2				
PK100	80.4				
PK200	88.5				
PK500	99.2				

Streamflow Statistics

Statistic	Flow (ft^3/s)	Estimation Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
Q1	0.29	49			
Q2	0.27	49			
Q3	0.29	43			
Q4	0.73	56			
Q5	5.58	58			
Q6	16.5	510			
Q7	6.24	63			
Q8	1.74	70			
Q9	1.02	63			
QA	3.18	43			
Q10	0.79	50			
Q11	0.49	43			
Q12	0.35	45			
Low-Flow Statistics					
M7D2Y	0.19	62			
M7D10Y	0.0955	100			
M7D50Y	0.0593	160			

USGS science for a changing world

StreamStats

Basin Characteristics Report

Date: Mon Feb 12 2007 17:42:08
Latitude: 40.0333
Longitude: -105.5420

Parameter	Value
Area that drains to a point on a stream in square miles	1.9
Mean Basin Elevation in feet	10800
Mean annual precipitation in inches (unadjusted)	29.9
Mean annual precipitation in inches (adjusted)	27.7

Monthly Climatic Data for SILVER LAKE for years 1931 - 1955
Station - 57648 Latitude - 4002 Longitude - 10535 Elevation - 10200

Total monthly precipitation.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1931	28	338	149	340	316	283	184	232	120	142	97	52	22.81
1932	195	174	589	431	236	349	256	196	71	243	169	173	30.82
1933	121	171	306	647	272	89	280	186	379	30	31	171	26.83
1934	84	475	265	210	387	104	196	161	200	T	246	149	24.77
1935	99	88	97	493	431	131	452	240	130	191	95	26	24.73
1936	388	273	392	103	241	399	587	447	170	202	28	55	32.85
1937	60	165	195	295	222	426	417	94	216	169	305	269	28.33
1938	229	159	292	252	441	210	256	439	334	102	99	265	30.78
1939	199	311	314	184	122	123	154	108	132	144	35	68	18.94
1940	498	320	350	302	375	96	435	228	372	120	154	131	33.81
1941	112	327	351	479	232	264	145	275	164	235	62	64	27.10
1942	190	203	133	807	186	222	221	52	93	345	270	292	30.14
1943	102	260	470	180	345	130	114	219	136	120	112	87	22.75
1944	71	130	731	548	353	133	285	78	T	102	155	145	27.31
1945	245	341	211	531	214	252	366	526	183	150	274	349	36.42
1946	240	70	168	146	305	181	330	244	220	307	541	47	27.99
1947	63	350	350	258	570	496	226	500	115	359	154	85	35.26
1948	M	M	M	M	M	M	M	116	113	132	178	204	
1949	0	480I	231	164	310	892	381	256	109	221	65	92	32.01
1950	159	121	229	314	238	152	192	65	0	0	0	0I	14.70
1951	0	0	0	0	0	0	0	0	0	0	0	0I	0.00
1952	0	0	0	0	0	0	0	0	0	0	0	0I	0.00
1953	0	0	0	0	0	0	0	0	0	0	0	0I	0.00
1954	0	0	0	0	0	0	0	0	0	0	0	0I	0.00
1955	0	0	0	0	0	0	114	387	47	131	299	M	
Ave	1.28	1.98	2.43	2.78	2.42	2.06	2.33	2.02	1.32	1.38	1.35	1.14	22.97
Max	4.98	4.80	7.31	8.07	5.70	8.92	5.87	5.26	3.79	3.59	5.41	3.49	36.42
Year	1940	1949	1944	1942	1947	1949	1936	1945	1933	1947	1946	1945	1945
Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Year	1955+	1955+	1955+	1955+	1955+	1955+	1954+	1954+	1954+	1954+	1954+	1954+	1954+
Count	24	24	24	24	24	24	24	25	25	25	25	24	23

Monthly Climatic Data for NEDERLAND 2 NNE for years 1970 - 1988
Station - 55878 Latitude - 3959 Longitude - 10530 Elevation - 8240

Total monthly precipitation.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1970	M	M	M	M	67	219	332	96	398	34	120	15	
1971	37	116	101	461	179	45	309	146	326	23	42	47	18.32
1972	133	40	79	65	165	192	116	244	199	121	306	67	17.27
1973	85	6	113	385	475	117	263	97	185	76	93	200	20.95
1974	70	67	115	248	7	184	265	116	149	221	86	34	15.62
1975	73	55	129	130I	252	192	343	116	119	64	145	26	16.44
1976	63	49	103	167	180	137	221	167	323	138	45	49	16.42
1977	12	65	72	221	102	106	303	197	21	89	72	51	13.11
1978	39	20	167	131	355	202	48	48	22	194	16	113	13.55
1979	53	37	213	181	476	190	114	381	106	93	219	86	21.49
1980	152	41I	77	319	440	6	139	150	105	31	53	0	15.13
1981	18	45	191	73	410	272	280	209	263	123	28	52	19.64
1982	29	32	59	73I	469	308	200	316	196	48	25	180	19.35
1983	11	43	330	234	370	188	354	477	87	10	329	118I	25.51
1984	30	92	141	270	62	112	312	437I	110	244	12	23	18.45
1985	36	92	73	139	156	107I	313	20	283	85	117	41	14.62
1986	25	M	59	413	260	226	212	122I	167	174	205	55	
1987	45	169	M	183	341	198	178	284	72	69	106	153	
1988	59	35	163	227	339	M	M	M	M	M	M	M	
Ave	0.54	0.59	1.29	2.18	2.69	1.67	2.39	2.01	1.74	1.02	1.12	0.73	17.72
Max	1.52	1.69	3.30	4.61	4.76	3.08	3.54	4.77	3.98	2.44	3.29	2.00	25.51
Year	1980	1987	1983	1971	1979	1982	1983	1983	1970	1984	1983	1973	1983
Min	0.11	0.06	0.59	0.65	0.07	0.06	0.48	0.20	0.21	0.10	0.12	0.00	13.11
Year	1983	1973	1986+	1972	1974	1980	1978	1985	1977	1983	1984	1980	1977
Count	18	17	17	18	19	18	18	18	18	18	18	18	15

Monthly Climatic Data for CARIBOU RANCH for years 1962 - 1970
Station - 51342 Latitude - 4000 Longitude - 10531 Elevation - 8360

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Total monthly precipitation.													
1962	M	M	M	M	M	M	M	M	M	M	M	26	
1963	173	72	150	0	75	M	236	579	254	43	8	45	
1964	28I	140	135	185	350	170	261	59	110	15	125	232	18.10
1965	430	81	159	220	142	376	844	120	211	0	18	24	26.25
1966	22	120	0	120	96	140	159	178	143	87	0	58	11.23
1967	57	76	112	89	296	458	245	355	156	0	125	0I	19.69
1968	13	109	73	146	0	70	149	0	0	0	98	M	
1969	47	14	83	153	771	0	0	0	M	441	27	M	
1970	0	89	M	M	M	M	M	M	M	M	M	M	
Ave	0.96	0.88	1.02	1.30	2.47	2.02	2.71	1.84	1.46	0.84	0.57	0.64	18.82
Max	4.30	1.40	1.59	2.20	7.71	4.58	8.44	5.79	2.54	4.41	1.25	2.32	26.25
Year	1965	1964	1965	1965	1969	1967	1965	1963	1963	1969	1967+	1964	1965
Min	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.23
Year	1970	1969	1966	1963	1968	1969	1969	1969+	1968	1968+	1966	1967	1966
Count	8	8	7	7	7	6	7	7	6	7	7	6	4