United States Department of the Interior

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

TAKE PRIDE IN AMERICA

In Reply Refer To:
7250 (CO-932)

JAN 14 2010

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

Dear Ms. Bassi:

The Bureau of Land Management (BLM) is writing this letter to formally communicate its instream flow recommendation for Indian Creek, located in Water Division 6.

Location and Land Status. Indian Creek is tributary to Arapaho Creek approximately seven miles northeast of Muddy Pass, in the southwest portion of Jackson County. This recommendation covers the stream reach beginning at the headwaters and extends downstream to the headgate of the Lawrence Ditch. Approximately 71% of the 7.76-mile reach is federally owned, while the remaining 29% is privately owned.

Biological Summary. Indian Creek is a moderate gradient stream, with small substrate size. The creek has a high number of beaver ponds that retain water and support an extensive riparian community that covers the creek valley floor. Fishery surveys have indicated populations of white suckers, creek chub, long nose dace, brown trout, and brook trout. However, the 2002 drought had a severe impact on this creek, and physical repopulation of some of these species may be required.

R2Cross Analysis. BLM's data analysis, coordinated with the Division of Wildlife, indicates that the following flows are needed to protect the fishery and natural environment to a reasonable degree.

> 4.0 cubic feet per second is recommended for the high temperature period from April 1 to July 15. This recommendation is driven by the average velocity criteria. It is important to provide adequate velocity and physical habitat during this time for fish spawning and incubation of eggs. In addition, it is important to provide adequate velocity to maintain low water temperatures during summer. Protecting flows during this time period is also important for recharging the alluvial aquifer, which discharges water to the stream and maintains flow levels during later summer.

0.7 cubic feet per second is recommended from July 16 to March 31. This recommendation is driven by the average depth criteria. This flow rate will allow fish to survive in pools, provide sufficient physical habitat in riffles between pools, and will prevent the riparian environment from being seriously stressed.

Water Availability. Two decreed diversions are located within this stream reach. The first, the McIsaac Ditch, has an absolute decree, and the second, the Indian Creek Arapahoe Pass Ditch, holds a conditional decree. BLM is not aware of any historical gage information for this creek. BLM recommends usage of the diversion records for Lawrence Ditch to get an approximate indication of water availability. In addition, BLM recommends an examination of the USGS stream flow gage on the Illinois River near Rand, CO. This watershed possesses slope, elevation, and aspect characteristics that are similar to Indian Creek, and a comparison of watershed sizes might provide additional water availability estimates.

Relationship to Management Plans. This stream reach is one of the few fisheries managed by BLM in North Park. Accordingly, BLM places a strong emphasis on managing grazing, transportation routes, and recreation use to maintain and enhance both riparian and fisheries resources. BLM's efforts to maintain riparian and fisheries health will be supplemented by an instream flow appropriation that works to keep the riparian community watered, especially during high temperature periods.

Data sheets, R2Cross output, fishery survey information, and photographs of the cross section were included with BLM's draft recommendation in February 2007. We thank both the Division of Wildlife and the Water Conservation Board for their cooperation in this effort.

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

Sincerely,

Linda Anania

Linda Anania
Deputy State Director, Natural Resources and Fire

cc: Paula Belcher, Kremmling FO
Dave Stout, Kremmling FO

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

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creek. BLM recommends usage of the diversion records for Lawrence Ditch to get an approximate indication of water availability. In addition, BLM recommends an examination of USGS Gage 06618000, Willow Creek near Rand, CO. This watershed possesses slope, elevation, and aspect characteristics that are similar to Indian Creek, and a comparison of watershed sizes might provide additional water availability estimates.

Relationship to Management Plans. This stream reach is one of the few fisheries managed by BLM in North Park. Accordingly, BLM places a strong emphasis on managing grazing, transportation routes, and recreation use to maintain and enhance both riparian and fisheries resources. BLM's efforts to maintain riparian and fisheries health will be supplemented by an instream flow appropriation that works to keep the riparian community watered, especially during high temperature periods.

The BLM requests that the Board recognize that this recommendation is based only upon the minimum flows necessary to support cold-water and cool-water fishery values. BLM may wish to work with the Board and/or through the Colorado water rights system to appropriate flows to optimally protect fish values and to protect other water-dependent values specified in BLM resource management plans.

Data sheets, R2Cross output, fishery survey information, and photographs of the cross section were included with BLM's draft recommendation in February 2007. We thank both the Division of Wildlife and the Water Conservation Board for their cooperation in this effort.

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

Sincerely,

Linda Anania
Deputy State Director
Resources and Fire

cc: Paula Belcher, Kremmling FO
Dave Stout, Kremmling FO

DRAFT INSTREAM FLOW RECOMMENDATION

Mr. Dan Merriman
Colorado Water Conservation Board
1313 Sherman Street, Room 721
Denver, Colorado 80203

Dear Mr. Merriman:

The Bureau of Land Management (BLM) is writing this letter to formally communicate its instream flow recommendation for Indian Creek, located in Water Division 6.

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Biological Summary. Indian Creek is a moderate gradient stream, with small substrate size. The creek has a high number of beaver ponds that retain water and support an extensive riparian community that covers the creek valley floor. Fishery surveys have indicated populations of white suckers, creek chub, long nose dace, brown trout, and brook trout. However, the 2002 drought had a severe impact on this creek, and physical repopulation of some of these species may be required.

R2Cross Analysis. BLM's data analysis, coordinated with the Division of Wildlife, indicates that the following flows are needed to protect the fishery and natural environment to a reasonable degree.

> 4.0 cubic feet per second is recommended for the high temperature period from May 1 to July 31. This recommendation is driven by the average velocity criteria. It is important to provide adequate velocity and physical habitat during this time for fish spawning and incubation of eggs. In addition, it is important to provide adequate velocity to maintain low water temperatures during summer. Protecting flows during this time period is also important for recharging the alluvial aquifer, which discharges water to the stream and maintains flow levels during later summer.
>
> 0.7 cubic feet per second is recommended from August 1 through April 30. This recommendation is driven by the average depth criteria. This flow rate will allow fish to survive in pools, provide sufficient physical habitat in riffles between pools, and will prevent the riparian environment from being seriously stressed.

Water Availability. Two decreed diversions are located within this stream reach. The first, the McIsaac Ditch, has an absolute decree, and the second, the Indian Creek Arapahoe Pass

Ditch, holds a conditional decree. BLM is not aware of any historical gage information for this creek. BLM recommends usage of the diversion records for Lawrence Ditch to get an approximate indication of water availability. In addition, BLM recommends an examination of USGS Gage 06618000, Willow Creek near Rand, CO. This watershed possesses slope, elevation, and aspect characteristics that are similar to Indian Creek, and a comparison of watershed sizes might provide additional water availability estimates.

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The BLM requests that the Board recognize that this recommendation is based only upon the minimum flows necessary to support cold-water and cool-water fishery values. BLM may wish to work with the Board and/or through the Colorado water rights system to appropriate flows to optimally protect fish values and to protect other water-dependent values specified in BLM resource management plans.

Data sheets, R2Cross output, fishery survey information, and photographs of the cross section are enclosed to support this recommendation. We thank both the Division of Wildlife and the Water Conservation Board for their cooperation in this effort.

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

Sincerely,

Linda Anania
Deputy State Director
Resources and Fire

4 Enclosures

cc: Paula Belcher, Kremmling FO
John Ruhs, Kremmling FO

Stream: Indian Creek

Executive Summary

Water Division: 6
Water District: 47
CDOW#: 11229
CWCB ID: 07/6/A-008

Segment: Headwaters to West Arapahoe Feeder Ditch 2

Upper Terminus: HEADWATERS
(Latitude 40° 20’ 56.7”N) (Longitude 106° 24’ 25.5”W)

Lower Terminus: WEST ARAPAHOE FEEDER DITCH 2
(Latitude 40° 25’ 35.8”N) (Longitude 106° 27’ 23.3”W)

Watershed: North Platte Headwaters (HUC#: 118001)
Counties: Jackson
Length: 7.7 miles
USGS Quad(s): Spicer Peak, Whiteley Peak
Flow Recommendation: 4.0 cfs (April 1 to June 30)
0.7 cfs (July 1 to March 30)

Summary

The information contained in this report and the associated appendix 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.i.

Colorado's Instream Flow Program was created in 1973 when the Colorado State Legislature recognized "the need to correlate the activities of mankind with some reasonable preservation of the natural environment" (see 37-92-102 (3) C.R.S.). The statute vests the CWCB with the exclusive authority to appropriate and acquire instream flow and natural lake level water rights. In order to encourage other entities to participate in Colorado's Instream Flow Program, the statute directs the CWCB to request instream flow recommendations from other state and federal agencies. The Bureau of Land Management recommended this segment of Indian Creek to the CWCB for a water right under the Instream Flow Program. Indian Creek is being considered for an enlargement because it has a natural environment that can be preserved to a reasonable degree with an enlarged instream flow water right. The BLM is very interested in protecting stream flows because Indian Creek is one of the few fisheries that it manages in the North Park area. An Instream Flow Appropriation will help it to maintain the health of Indian Creek's diverse fishery and riparian environment.

Located within Jackson County, Indian Creek is approximately 8.7 miles long and generally flows in a northwesterly direction. It begins on the north flank of the Rabbit Ears Range in the Routt National Forest at an elevation of approximately 12,200 feet and terminates in its confluence with Arapaho Creek at an elevation of approximately 8400 feet. Of the approximately 7.7 mile segment addressed in this report, approximately 71% percent is on federal lands with the remaining 29% on private. At the lower terminus, the creek's drainage area is approximately 12.3 square miles.

The subject of this report is the segment of Indian Creek beginning at its headwaters and extending downstream to the headgate of the West Arapahoe Feeder Ditch 2. The lower terminus is roughly one and a half miles upstream of the Arapahoe Creek - Indian Creek confluence (see figures 2 and 3) at an elevation of 8,470 feet. The proposed segment is approximately 19 miles east of the Steamboat Ski Area and seven miles northeast of Muddy Pass. Only the BLM has recommended to the CWCB staff that an instream flow be established for this segment. That recommendation is discussed below.

Instream Flow Recommendation(s)

The BLM recommendation for instream flow was 4.0 cfs during the summer and 0.7 cfs in the winter, based on its June and September 2005 data collection efforts (see Appendix). The R2Cross modeling results of the BLM's survey effort are within the confidence interval deemed acceptable for the model.

Land Status Review

Upper Terminus	Lower Terminus	Total Length (miles)	Land Ownership	
			% Private	% Public
Headwaters	West Arapahoe Feeder Ditch 2 Headgate	7.7	29 %	71 %

The public lands are 77% US Forest Service and 23% Bureau of Land Management.

Biological Data

The BLM has conducted field surveys of the fishery resources in this stream and have found a natural environment that can be preserved. As reported in the letter from BLM to the CWCB "Indian Creek is a moderate gradient stream with small substrate size. The creek has a high number of beaver ponds that retain water and support an extensive riparian community that covers the creek valley floor. Fishery surveys have indicated populations of white suckers, creek chub, long nose dace, brown trout, and brook trout." However, the 2002 drought had a severe impact on this creek, and physical repopulation of some of these species may be required.

Field Survey Data

BLM staff used the R2Cross methodology to quantify the amount of water required to preserve the natural environment to a reasonable degree. R2Cross requires that stream discharge and channel profile data be collected in a riffle stream habitat type. Riffles can be visualized as the stream habitat types that first dry up as streamflow diminishes. This collection of this data requires selecting a transect, surveying the channel geometry, and measuring discharge. The appendix contains copies of the field data collected for this proposed segment.

Biological Flow Recommendation

The CWCB staff relied upon the biological expertise of the cooperating agencies to interpret output from the R2Cross data collected to develop the initial, biologic instream flow recommendation. This initial recommendation is designed to address the unique biologic requirements of each stream without regard to water availability. Three instream flow hydraulic parameters, average depth, percent wetted perimeter, and average velocity are used to develop biologic instream flow recommendations. The CDOW has determined that by 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, 3 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 (Date), 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.

Party	Date	Q	250%-40%	Summer (3/3)	Winter (2/3)
BLM	20 June 2005 (lower)	4.97	2.0 – 12.4	3.9	N/A
BLM	20 June 2005 (upper)	5.89	2.4 – 14.7	4.0	N/A
BLM	27 Sep 2005	0.48	0.2 – 1.2	N/A	0.7

BLM = Bureau of Land Management DOW = Division of Wildlife

Table 1: Data

Biologic Flow Recommendation

The summer flow recommendation, which meets 3 of 3 criteria and is within the accuracy range of the R2CROSS model is 4.0 cfs. This recommendation was derived by averaging the results of the two data sets. It is our belief that recommendations that fall outside of the accuracy range of the model, over 250% of the measured discharge or under 40% of the measured discharge may not give an accurate estimate of the necessary instream flow required.

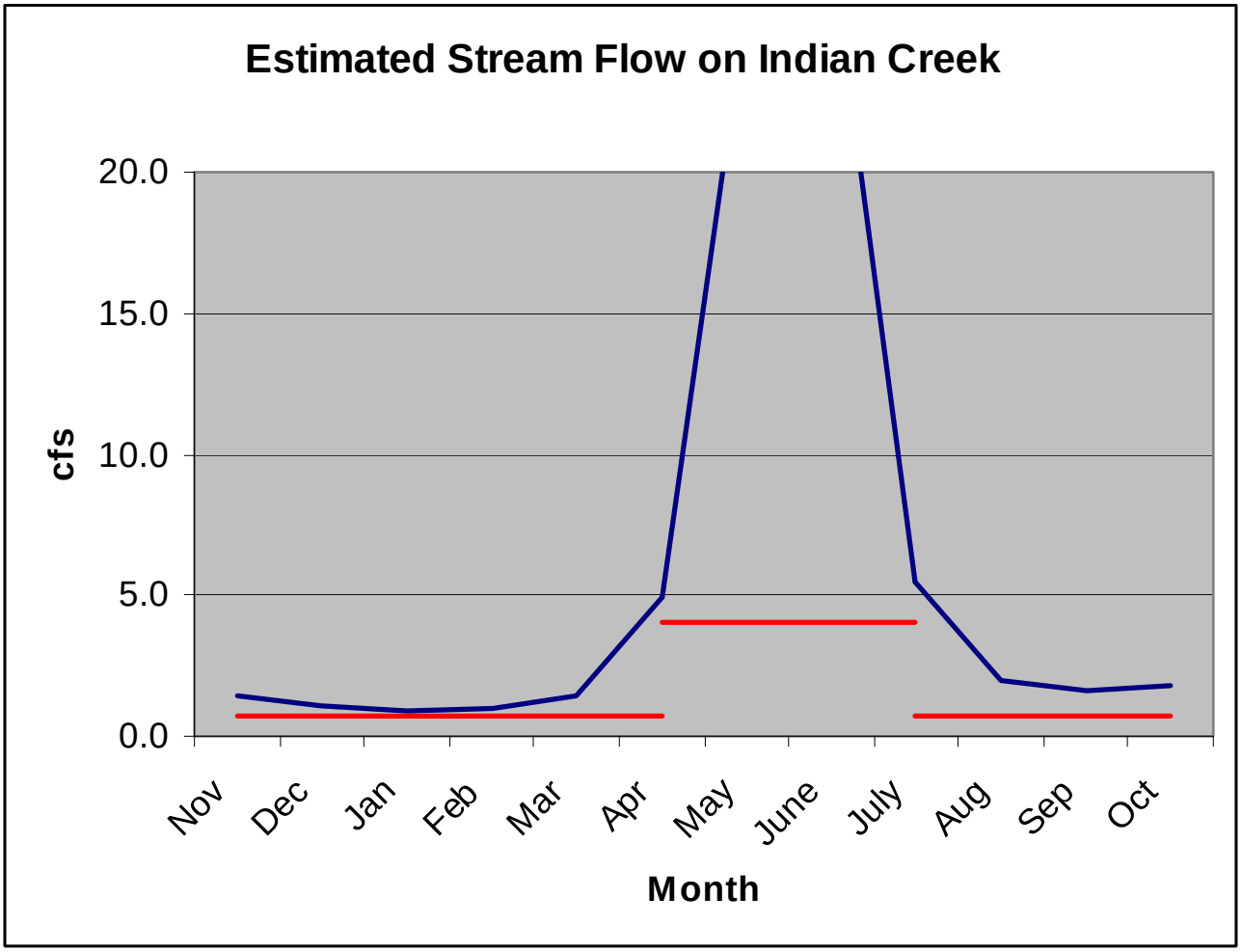
Hydrologic Data

After receiving the cooperating agency's biologic recommendation, the CWCB staff conducted an evaluation of the stream hydrology to determine if water was physically available for an instream flow appropriation. There are records for two USGS gaging stations in the vicinity of Indian Creek. Each has a very short record (three years for one and five for the other) and the periods of record have no overlap (station data are separated by twelve years). With so limited a record, it was necessary to use indirect methods to define the stream's flow regime (the appendix contains the summary of gage data for the two gages mentioned above). The hydrograph below was produced using the USDI Geological Survey's StreamStats system. This methodology estimates streamflow in ungaged basins through statistical analyses of selected watershed characteristics. The StreamStats values for discharge represent the "natural" or undiminished flow of the basin. However, water is diverted from Indian creek above the point at which the StreamStats analysis was made. To better estimate the actual (depleted) flows of Indian Creek, the mean monthly consumptive use associated with upstream diversions was subtracted from the mean monthly stream flows of StreamStats. To do this it was assumed that 1) consumptive use was 50% of the amount diverted, and 2) diversion occurred during each day of the irrigation season month, for 24 hours a day.

Table 2 and Figure 1 below show that the recommended summer flow of 4.0 cfs is available on average during the period of April 1 through June 30. The recommended winter flow of 0.7 cfs is available on average during the period of July 1 through March 30.

Table 2: Estimated flow on Indian Creek

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Unadjusted Mean Monthly Stream Flow (cfs)	**0.9**	**1.0**	**1.5**	**5.0**	**26.0**	**28.1**	**6.0**	**2.3**	**1.7**	**1.8**	**1.4**	**1.1**
Mean Monthly Stream Flow Adjusted for Upstream Diversions (cfs)	**0.9**	**1.0**	**1.4**	**5.0**	**25.8**	**27.8**	**5.5**	**2.0**	**1.6**	**1.8**	**1.4**	**1.1**



Existing Water Right Information

Staff has analyzed the water rights tabulation and consulted with the Division Engineer Office (DEO) to identify any potential water availability problems. There is one decreed surface diversions within the reach of stream, the McIssaac Ditch. Upon review of the diversion records and consultation with the DEO, staff moved the downstream terminus upstream from the Lawrence Ditch to the Indian Creek Arapahoe Pass Ditch to ensure sufficient water availability. From its analysis, staff moved the downstream terminus upstream from the Lawrence Ditch to the West Arapahoe Feeder Ditch 2 to ensure sufficient water availability for appropriation on Indian Creek, between its headwater and the headgate of the West Arapahoe Feeder Ditch 2, to preserve the natural environment to a reasonable degree without limiting or foreclosing the exercise of valid 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 West Aprapahoe Feeder Ditch 2

Upper Terminus: HEADWATERS INDIAN CREEK
(Latitude 40° 20' 56.7"N) (Longitude 106° 24' 25.5"W)
UTM = 380504.1 N 4467454.7 E
NE SW S31 T5N R80W 6PM
2361' East of West Section Line; 1574' North of South Section Line

Lower Terminus: WEST ARAPAHOE FEEDER DITCH 2
(Latitude 40° 25' 35.8"N) (Longitude 106° 27' 23.3"W)
UTM = 4476126.2 N 376451.8 E
NE SW S2 T5N R81W 6PM
2196' East of West Section Line; 1484' North of South Section Line

Watershed: North Platte Headwaters (HUC#: 118001)
Counties: Jackson
Length: 7.7 miles
USGS Quad(s): Spicer Peak, Whiteley Peak
Flow Recommendation: 4.0 cfs (April 1 to June 30)
0.7 cfs (July 1 to March 30)

Figure 2: Indian Creek--Land Ownership

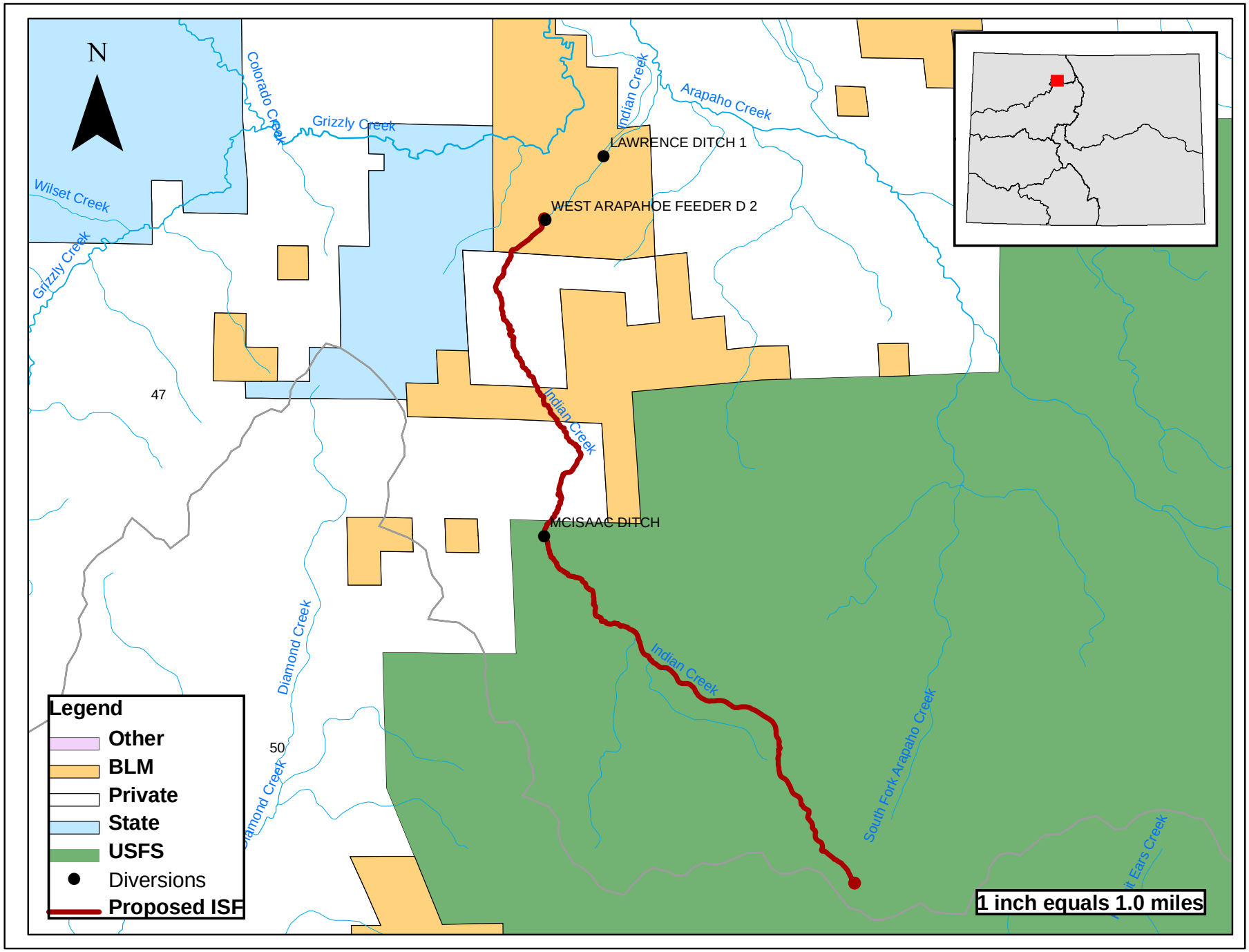
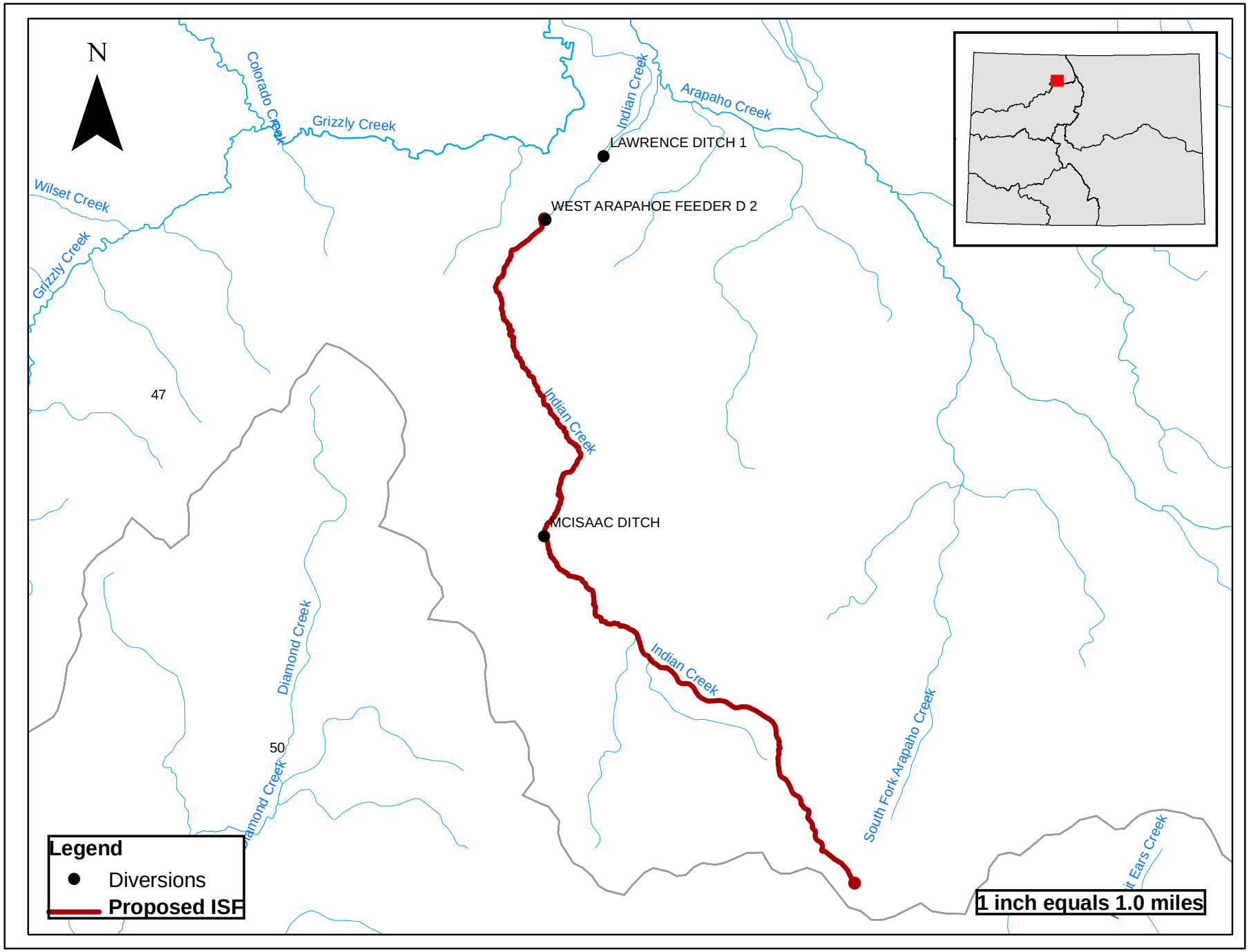


Figure 3: Indian Creek--Water Rights



DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Indian Creek | CROSS-SECTION NO 1 | DATE 9-27-05 | SHEET ___ OF ___

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (0.0 AT STAKE) | LEFT / RIGHT | Gage Reading: 0.2 ft | TIME 2:35 pm

Features (Stake (S), Grassline (G), Waterline (W), Rock (R))	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Velocity (ft/sec): Time (sec)	Velocity (ft/sec): At Point	Velocity (ft/sec): Mean in Vertical	Area (ft^2)	Discharge (cfs)
RS/G	0.0		5.24								
	1.5		5.54								
W	2.4		5.85	Ø							
	2.8		6.04	0.15				0.03			
	3.2		6.07	0.20				0.13			
	3.6		6.10	0.25				0.36			
	4.0		6.13	0.25				0.68			
	4.4		6.06	0.20				0.81			
	4.8		6.02	0.15				0.89			
	5.2		6.00	0.10				0.79			
	5.6		6.07	0.20				0.75			
	6.0		6.06	0.20				0.49			
	6.4		6.08	0.20				0.63			
	6.8		6.09	0.20				0.44			
	7.2		6.07	0.20				0.24			
	7.6		6.03	0.15				0.13			
	8.0		5.95	0.10				0.06			
	8.4		5.92	0.05				0			
W	8.6		5.85	Ø							
	11.0		5.54								
LS+G	13.2		5.12								

TOTALS:

End of Measurement | Time 2:55 | Gage Reading 0.2 ft | CALCULATIONS PERFORMED BY: | CALCULATIONS CHECKED BY

Data Input & Proofing

STREAM NAME: |Indian Creek
XS LOCATION: |0376435 4473750
XS NUMBER: |1
DATE: |9/29/05
OBSERVERS: |R. Smith, P. Belcher

1/4 SEC: |NW
SECTION: |14
TWP: |5 N
RANGE: |81 W
PM: |6th

COUNTY: |Jackson
WATERSHED: |N. Platte
DIVISION: |6
DOW CODE: |
USGS MAP: |
USFS MAP: |

Level and Rod Survey
TAPE WT: |0.0106 lbs / ft
TENSION: |99999 lbs

SLOPE: | 0.009|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
1	RS/GL	0.00	5.24			0.00	0.00	0.00
		1.50	5.54			0.00	0.00	0.00
	W	2.40	5.85	0.00		0.00	0.00	0.00
		2.80	6.14	0.15	0.03	0.06	0.00	5.99
		3.20	6.07	0.20	0.13	0.09	0.01	5.87
		3.60	6.10	0.25	0.36	0.10	0.04	5.85
		4.00	6.13	0.25	0.68	0.10	0.07	5.88
		4.40	6.06	0.20	0.81	0.08	0.06	5.86
		4.80	6.02	0.15	0.87	0.06	0.05	5.87
		5.20	6.00	0.10	0.79	0.04	0.03	5.90
		5.60	6.09	0.20	0.75	0.08	0.06	5.89
		6.00	6.06	0.20	0.49	0.08	0.04	5.86
		6.40	6.08	0.20	0.63	0.08	0.05	5.88
		6.80	6.09	0.20	0.44	0.08	0.04	5.89
		7.20	6.07	0.20	0.24	0.08	0.02	5.87
		7.60	6.03	0.15	0.13	0.06	0.01	5.88
		8.00	5.95	0.10	0.06	0.04	0.00	5.85
		8.40	5.92	0.05	0.00	0.02	0.00	5.87
	W	8.60	5.85	0.00		0.00	0.00	0.00
		11.00	5.54			0.00	0.00	0.00
1	LS/GL	13.20	5.12					

	Totals	1.04	0.48

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

LOCATION INFORMATION

STREAM NAME:	Indian Creek
XS LOCATION:	0376435 4473750
XS NUMBER:	1
DATE:	29-Sep-05
OBSERVERS:	R. Smith, P. Belcher
1/4 SEC:	NW
SECTION:	14
TWP:	5 N
RANGE:	81 W
PM:	6th
COUNTY:	Jackson
WATERSHED:	N. Platte
DIVISION:	6
DOW CODE:	0
USGS MAP:	0
USFS MAP:	0

SUPPLEMENTAL DATA

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

CHANNEL PROFILE DATA

SLOPE:	0.009

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

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

STREAM NAME: Indian Creek
XS LOCATION: 0376435 4473750
XS NUMBER: 1

DATA POINTS= 20

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
1 RS/GL	0.00	5.24			0.00		0.00	0.00	0.0%
	1.50	5.54			0.00		0.00	0.00	0.0%
W	2.40	5.85	0.00		0.00		0.00	0.00	0.0%
	2.80	6.14	0.15	0.03	0.49	0.15	0.06	0.00	0.4%
	3.20	6.07	0.20	0.13	0.41	0.20	0.08	0.01	2.2%
	3.60	6.10	0.25	0.36	0.40	0.25	0.10	0.04	7.5%
	4.00	6.13	0.25	0.68	0.40	0.25	0.10	0.07	14.2%
	4.40	6.06	0.20	0.81	0.41	0.20	0.08	0.06	13.5%
	4.80	6.02	0.15	0.87	0.40	0.15	0.06	0.05	10.9%
	5.20	6.00	0.10	0.79	0.40	0.10	0.04	0.03	6.6%
	5.60	6.09	0.20	0.75	0.41	0.20	0.08	0.06	12.5%
	6.00	6.06	0.20	0.49	0.40	0.20	0.08	0.04	8.2%
	6.40	6.08	0.20	0.63	0.40	0.20	0.08	0.05	10.5%
	6.80	6.09	0.20	0.44	0.40	0.20	0.08	0.04	7.3%
	7.20	6.07	0.20	0.24	0.40	0.20	0.08	0.02	4.0%
	7.60	6.03	0.15	0.13	0.40	0.15	0.06	0.01	1.6%
	8.00	5.95	0.10	0.06	0.41	0.10	0.04	0.00	0.5%
	8.40	5.92	0.05	0.00	0.40	0.05	0.02	0.00	0.0%
W	8.60	5.85	0.00		0.21		0.00	0.00	0.0%
	11.00	5.54			0.00		0.00	0.00	0.0%
TOTALS ----------					6.35	0.25 (Max.)	1.04	0.48	100.0%

Manning's n = 0.0909
Hydraulic Radius= 0.163091061

STREAM NAME: Indian Creek
XS LOCATION: 0376435 4473750
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	1.04	1.22	17.6%
5.60	1.04	3.10	199.5%
5.62	1.04	2.92	182.6%
5.64	1.04	2.75	166.1%
5.66	1.04	2.59	150.0%
5.68	1.04	2.42	134.3%
5.70	1.04	2.27	119.0%
5.72	1.04	2.11	104.2%
5.74	1.04	1.96	89.7%
5.76	1.04	1.82	75.7%
5.78	1.04	1.68	62.0%
5.80	1.04	1.54	48.8%
5.81	1.04	1.47	42.4%
5.82	1.04	1.41	36.0%
5.83	1.04	1.34	29.8%
5.84	1.04	1.28	23.6%
5.85	1.04	1.22	17.6%
5.86	1.04	1.16	11.6%
5.87	1.04	1.09	5.7%
5.88	1.04	1.03	-0.2%
5.89	1.04	0.97	-6.0%
5.90	1.04	0.91	-11.9%
5.92	1.04	0.79	-23.3%
5.94	1.04	0.68	-34.5%
5.96	1.04	0.57	-45.1%
5.98	1.04	0.46	-55.4%
6.00	1.04	0.36	-65.4%
6.02	1.04	0.26	-74.8%
6.04	1.04	0.17	-83.1%
6.06	1.04	0.10	-90.4%
6.08	1.04	0.04	-96.1%
6.10	1.04	0.01	-98.6%

WATERLINE AT ZERO
AREA ERROR = 5.880

STREAM NAME: Indian Creek
XS LOCATION: 0376435 4473750
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 24	11.00	0 61	0.90	6.73	11.25	100.0%	0.60	7.40	1.10
	5.28	10.80	0.58	0.86	6 29	11.05	98.2%	0 57	6.71	1.07
	5 33	10.55	0.55	0 81	5.76	10 79	95.9%	0 53	5 88	1.02
	5 38	10.30	0.51	0.76	5 24	10 54	93.7%	0.50	5.10	0.97
	5 43	10 05	0 47	0.71	4 73	10.28	91.4%	0 46	4.37	0.92
	5 48	9.80	0.43	0.66	4.23	10.03	89.1%	0 42	3.69	0.87
	5.53	9 55	0.39	0.61	3 75	9.77	86.9%	0.38	3 07	0.82
	5.58	9.08	0 36	0.56	3.28	9.29	82.6%	0.35	2.54	0.78
	5.63	8.55	0 33	0.51	2.84	8.74	77.7%	0.33	2 08	0 73
	5.68	8.01	0.30	0 46	2.43	8.20	72.9%	0.30	1.67	0.69
	5.73	7.48	0.27	0.41	2.04	7.66	68.1%	0.27	1.31	0.64
	5.78	6.95	0 24	0.36	1.68	7.11	63.2%	0 24	0.99	0.59
	5.83	6.42	0.21	0.31	1.35	6.57	58.4%	0.20	0.72	0.54
"WL"	5.88	6.07	0 17	0.26	1.03	6.21	55.2%	0.17	0 49	0.47
	5.93	5.76	0.13	0.21	0.74	5.87	52.2%	0 13	0 29	0.39
	5 98	5.27	0 09	0.16	0.46	5.36	47.7%	0.09	0 14	0.30
	6.03	4.33	0.05	0.11	0.22	4.39	39.0%	0.05	0.05	0 21
	6 08	2.19	0 02	0 06	0.04	2.22	19.8%	0.02	0.00	0.11
	6.13	0.07	0.01	0 01	0.00	0.08	0.7%	0.00	0.00	0.04

2/3 = 0.66 cfs

STREAM NAME: Indian Creek
XS LOCATION: 0376435 4473750
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	0.48	cfs
CALCULATED FLOW (Qc)=	0.49	cfs
(Qm-Qc)/Qm * 100 =	-1.5	%
MEASURED WATERLINE (WLm)=	5 85	ft
CALCULATED WATERLINE (WLc)=	5.88	ft
(WLm-WLc)/WLm * 100 =	-0.5	%
MAX MEASURED DEPTH (Dm)=	0.25	ft
MAX CALCULATED DEPTH (Dc)=	0 26	ft
(Dm-Dc)/Dm * 100	-4.1	%
MEAN VELOCITY=	0.47	ft/sec
MANNING'S N=	0 091	
SLOPE=	0.009	ft/ft
4 * Qm =	0.2	cfs
2.5 * Qm=	1.2	cfs

RECOMMENDED INSTREAM FLOW:

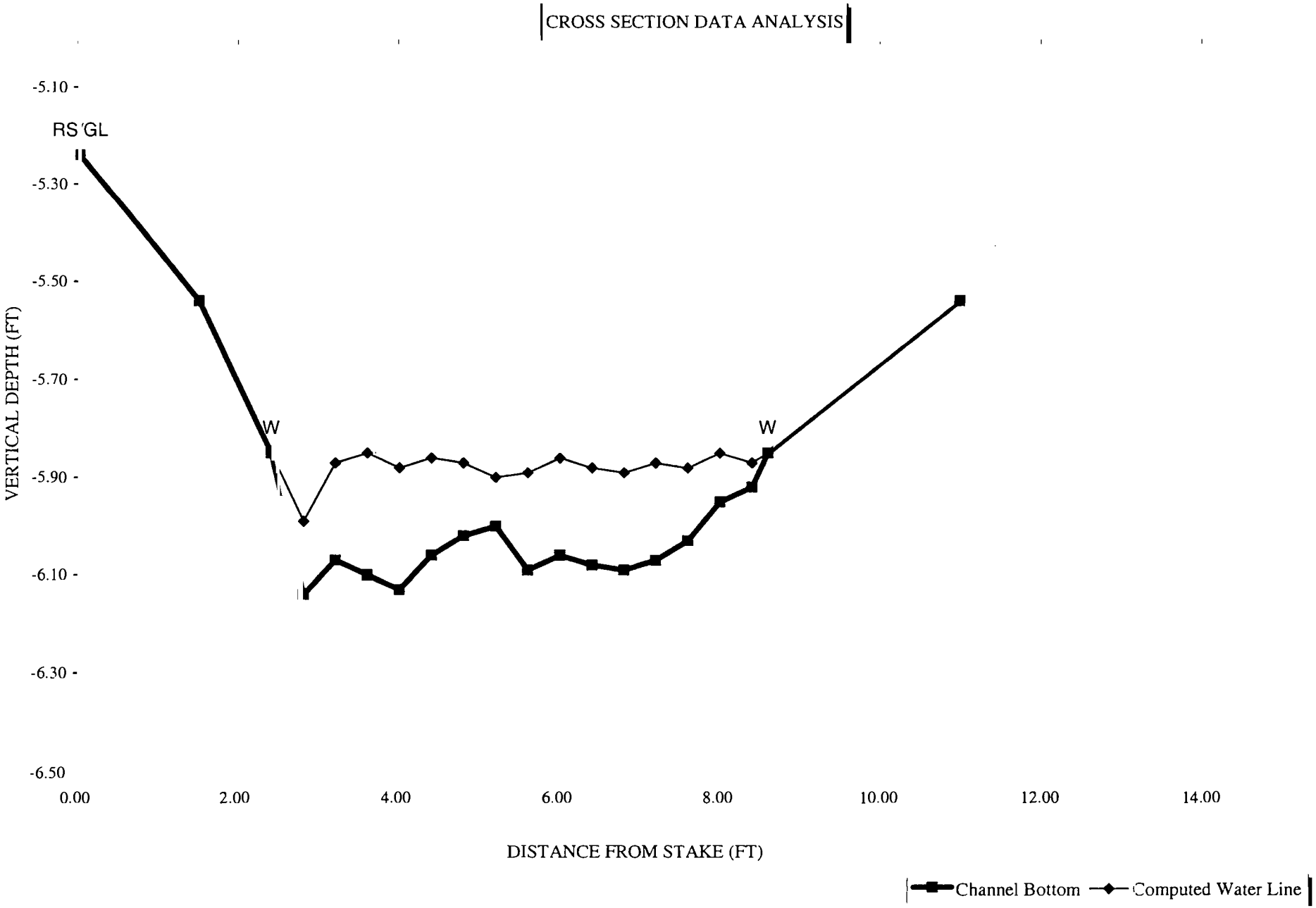
FLOW (CFS)	PERIOD

RATIONALE FOR RECOMMENDATION.

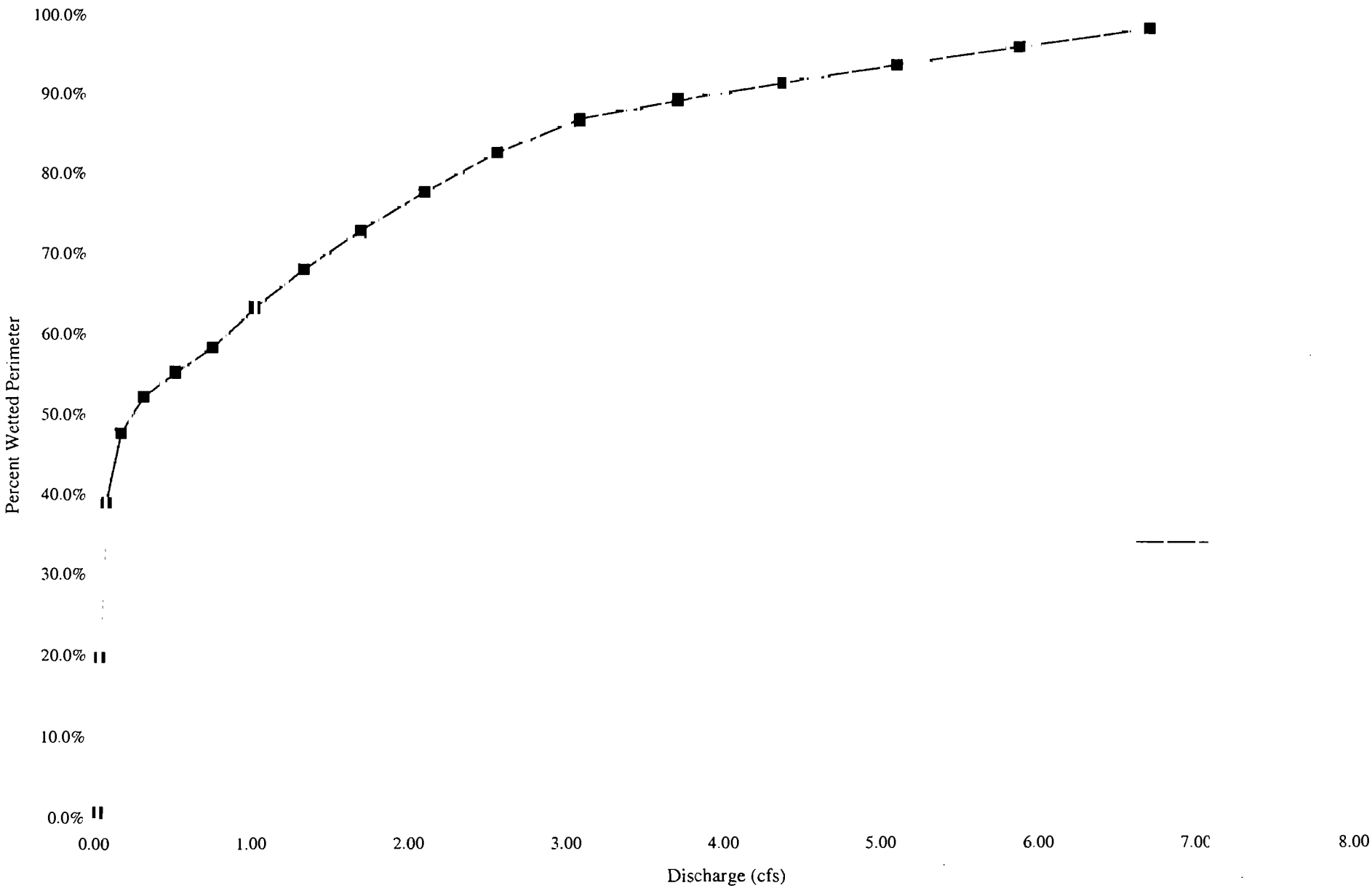
RECOMMENDATION BY: ..... AGENCY ..... DATE: .....

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

Indian Creek



Percent Wetted Perimeter vs. Discharge



COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Indian Creek | CROSS-SECTION NO.: 2

CROSS-SECTION LOCATION: SW of Ironclad Mtn.

DATE: 6-20-05 | OBSERVERS: R Smith, P. Belcher

LEGAL DESCRIPTION | ¼ SECTION: NE NW | SECTION: 14 | TOWNSHIP: 5 (N) S | RANGE: 81 E (W) | PM: 6th

COUNTY: Jackson | WATERSHED: N. Platte | WATER DIVISION: 6 | DOW WATER CODE: 11229

MAP(S): USGS: Spicer Peak 7.5' | USFS:

SUPPLEMENTAL DATA

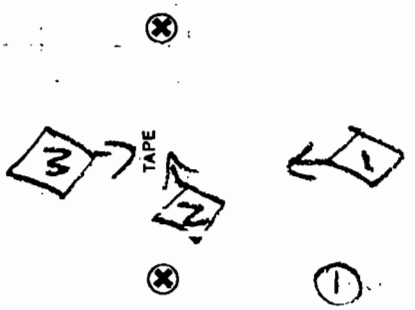
SAG TAPE SECTION SAME AS DISCHARGE SECTION: (YES) NO | METER TYPE: Marsh-McBirney | METER NUMBER: | DATE RATED: | CALIB/SPIN: _____ sec | TAPE WEIGHT: surveyed _____ lbs/foot | TAPE TENSION: surveyed _____ lbs

CHANNEL BED MATERIAL SIZE RANGE: silt to 6" cobbles | PHOTOGRAPHS TAKEN: (YES) NO | NUMBER OF PHOTOGRAPHS: 2

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	surveyed
⊗ Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB	0.0	11.9 / 11.95
② WS Upstream	25'	11.68
③ WS Downstream	15'	12.64
SLOPE	~~0.96~~ / 10 = 0.096	0.96/40 = 0.024

SKETCH



12.64
11.68

AQUATIC SAMPLING SUMMARY

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

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

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

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

mayfly, caddisfly, stonefly

COMMENTS

Temp = 5.4° C TDS = 90 Ph = 8.2

DISCHARGE/CROSS SECTION NOTES

[1] STREAM NAME: Upper Indian Creek | CROSS-SECTION NO: 1 | DATE: 6/20/05 | SHEET __ OF __

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (LEFT) / RIGHT | Gage Reading: 0.3 ft | TIME: 9:30 am

Features: Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Mean in Vertical	Area (ft^2)	Discharge (cfs)
LS	0.0		10.76								
G	2.0		11.42								
	5.0		11.78								
W	6.7		11.9								
	8.0		12.31	0.5					0.40		
	9.0		12.2	0.3					0.64		
			slick rock								
	10.0		12.44	0.5					0.54		
	11.0		12.29	0.45					1.67		
	11.5		12.44	0.55					1.40		
	12.0		12.40	0.5					1.80		
	12.5		12.40	0.5					1.64		
	13.0		12.36	0.45					1.60		
	13.5		12.33	0.4					0.64		
	14.0		12.13	0.2					0.92		
	14.5		12.16	0.25					1.83		
	15.0		12.39	0.5					1.87		
	15.5		12.4	0.55					2.02		
	16.0		12.36	0.45					0.42		
	16.5		12.26	0.4					1.38		
	17.0		12.15	0.3					1.50		
	17.5		12.04	0.15					0.65		
	18.0		12.32	0.42					0.02		
W	18.5		11.95								
G/RS	19		11.21								
RS	20		11.04								
TOTALS:											

End of Measurement | Time: 9:50 | Gage Rd ng: 0.3 ft | CALCULATIONS PERFORMED BY: | CALCULATIONS CHECKED BY:

Data Input & Proofing

STREAM NAME: |Indian Creek
XS LOCATION: |SW of Ironclad Mountain
XS NUMBER: |1
DATE: |6/20/05
OBSERVERS: |R.Smith, P. Belcher

1/4 SEC: |NW
SECTION: |14
TWP: |5N
RANGE: |81W
PM: |Sixth

COUNTY: |Jackson
WATERSHED: |North Platte
DIVISION: |6
DOW CODE: |11229
USGS MAP: |Spicer Peak 7.5'
USFS MAP: |

| Level and Rod Survey |
TAPE WT: |0.0106 lbs / ft
TENSION: |99999 lbs

SLOPE: | 0.024|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
	LS	0.00	10.76			0.00	0.00	0.00
1	G	2.00	11.42			0.00	0.00	0.00
		5.00	11.78			0.00	0.00	0.00
	W	6.70	11.90			0.00	0.00	0.00
		8.00	12.36	0.50	0.40	0.59	0.23	11.86
		9.00	12.20	0.30	0.66	0.30	0.20	11.90
		10.00	12.44	0.50	0.54	0.50	0.27	11.94
		11.00	12.29	0.45	1.67	0.34	0.56	11.84
		11.50	12.44	0.55	1.40	0.28	0.39	11.89
		12.00	12.40	0.50	1.90	0.25	0.48	11.90
		12.50	12.40	0.50	1.64	0.25	0.41	11.90
		13.00	12.36	0.45	1.40	0.23	0.32	11.91
		13.50	12.33	0.40	0.64	0.20	0.13	11.93
		14.00	12.13	0.20	0.92	0.10	0.09	11.93
		14.50	12.16	0.25	1.83	0.13	0.23	11.91
		15.00	12.37	0.50	1.87	0.25	0.47	11.87
		15.50	12.40	0.55	2.02	0.28	0.56	11.85
		16.00	12.36	0.45	0.42	0.23	0.09	11.91
		16.50	12.26	0.40	1.38	0.20	0.28	11.86
		17.00	12.15	0.30	1.50	0.15	0.23	11.85
		17.50	12.04	0.15	0.65	0.08	0.05	11.89
		18.00	12.32	0.40	0.02	0.20	0.00	11.92
	W	18.50	11.95			0.00	0.00	0.00
1	G	19.00	11.26			0.00	0.00	0.00
	RS	20.00	11.04					
					Totals	4.51	4.97	

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

LOCATION INFORMATION

STREAM NAME:	Indian Creek
XS LOCATION:	SW of Ironclad Mountain
XS NUMBER:	1
DATE:	20-Jun-05
OBSERVERS:	R.Smith, P. Belcher
1/4 SEC:	NW
SECTION:	14
TWP:	5N
RANGE:	81W
PM:	Sixth
COUNTY:	Jackson
WATERSHED:	North Platte
DIVISION:	6
DOW CODE:	11229
USGS MAP:	Spicer Peak 7.5'
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:	0.024

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

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

STREAM NAME: Indian Creek
XS LOCATION: SW of Ironclad Mountain
XS NUMBER: 1

DATA POINTS= 24

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
LS	0.00	10.76			0.00		0.00	0.00	0.0%
1 G	2.00	11.42			0.00		0.00	0.00	0.0%
	5.00	11.78			0.00		0.00	0.00	0.0%
W	6.70	11.90			0.00		0.00	0.00	0.0%
	8.00	12.36	0.50	0.40	1.38	0.50	0.58	0.23	4.6%
	9.00	12.20	0.30	0.66	1.01	0.30	0.30	0.20	4.0%
	10.00	12.44	0.50	0.54	1.03	0.50	0.50	0.27	5.4%
	11.00	12.29	0.45	1.67	1.01	0.45	0.34	0.56	11.3%
	11.50	12.44	0.55	1.40	0.52	0.55	0.28	0.39	7.8%
	12.00	12.40	0.50	1.90	0.50	0.50	0.25	0.48	9.6%
	12.50	12.40	0.50	1.64	0.50	0.50	0.25	0.41	8.3%
	13.00	12.36	0.45	1.40	0.50	0.45	0.23	0.32	6.3%
	13.50	12.33	0.40	0.64	0.50	0.40	0.20	0.13	2.6%
	14.00	12.13	0.20	0.92	0.54	0.20	0.10	0.09	1.9%
	14.50	12.16	0.25	1.83	0.50	0.25	0.13	0.23	4.6%
	15.00	12.37	0.50	1.87	0.54	0.50	0.25	0.47	9.4%
	15.50	12.40	0.55	2.02	0.50	0.55	0.28	0.56	11.2%
	16.00	12.36	0.45	0.42	0.50	0.45	0.23	0.09	1.9%
	16.50	12.26	0.40	1.38	0.51	0.40	0.20	0.28	5.6%
	17.00	12.15	0.30	1.50	0.51	0.30	0.15	0.23	4.5%
	17.50	12.04	0.15	0.65	0.51	0.15	0.08	0.05	1.0%
	18.00	12.32	0.40	0.02	0.57	0.40	0.20	0.00	0.1%
W	18.50	11.95			0.62		0.00	0.00	0.0%
1 G	19.00	11.26			0.00		0.00	0.00	0.0%
TOTALS ----------					12.27	0.55 (Max.)	4.51	4.97	100.0%

Manning's n = 0.1074
Hydraulic Radius= 0.367751599

STREAM NAME: Indian Creek
XS LOCATION: SW of Ironclad Mountain
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	4.51	4.14	-8.3%
11.68	4.51	7.44	64.9%
11.70	4.51	7.15	58.5%
11.72	4.51	6.87	52.2%
11.74	4.51	6.58	45.9%
11.76	4.51	6.31	39.7%
11.78	4.51	6.03	33.6%
11.80	4.51	5.76	27.6%
11.82	4.51	5.49	21.8%
11.84	4.51	5.24	16.0%
11.86	4.51	4.98	10.4%
11.88	4.51	4.74	4.9%
11.89	4.51	4.61	2.3%
11.90	4.51	4.49	-0.4%
11.91	4.51	4.38	-3.0%
11.92	4.51	4.26	-5.6%
11.93	4.51	4.14	-8.3%
11.94	4.51	4.02	-10.9%
11.95	4.51	3.91	-13.4%
11.96	4.51	3.79	-16.0%
11.97	4.51	3.67	-18.6%
11.98	4.51	3.56	-21.2%
12.00	4.51	3.33	-26.3%
12.02	4.51	3.10	-31.3%
12.04	4.51	2.87	-36.4%
12.06	4.51	2.65	-41.3%
12.08	4.51	2.43	-46.2%
12.10	4.51	2.21	-51.0%
12.12	4.51	2.00	-55.7%
12.14	4.51	1.79	-60.3%
12.16	4.51	1.59	-64.7%
12.18	4.51	1.41	-68.9%

WATERLINE AT ZERO
AREA ERROR = 11.893

STREAM NAME: Indian Creek
XS LOCATION: SW of Ironclad Mountain
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"	11.42	16.88	0.68	1.02	11.45	17.65	100.0%	0.65	18.41	1.61
	11.44	16.67	0.68	1.00	11.06	17.42	98.7%	0.63	17.52	1.58
	11.49	16.22	0.63	0.95	10.24	16.94	96.0%	0.60	15.69	1.53
	11.54	15.77	0.60	0.90	9.44	16.46	93.3%	0.57	13.97	1.48
	11.59	15.31	0.57	0.85	8.66	15.98	90.5%	0.54	12.35	1.43
	11.64	14.86	0.53	0.80	7.91	15.50	87.8%	0.51	10.82	1.37
	11.69	14.41	0.50	0.75	7.18	15.02	85.1%	0.48	9.40	1.31
	11.74	13.95	0.46	0.70	6.47	14.54	82.4%	0.44	8.08	1.25
	11.79	13.42	0.43	0.65	5.78	13.98	79.2%	0.41	6.88	1.19
	11.84	12.68	0.40	0.60	5.13	13.20	74.8%	0.39	5.85	1.14
"WL"	11.89	11.93	0.38	0.55	4.51	12.43	70.4%	0.36	4.92	1.09
	11.94	11.68	0.34	0.50	3.92	12.15	68.8%	0.32	3.96	1.01
	11.99	11.48	0.29	0.45	3.34	11.92	67.5%	0.28	3.07	0.92
	12.04	11.25	0.25	0.40	2.78	11.66	66.1%	0.24	2.29	0.82
	12.09	10.72	0.21	0.35	2.23	11.09	62.8%	0.20	1.64	0.74
	12.14	9.94	0.17	0.30	1.71	10.26	58.1%	0.17	1.11	0.65
	12.19	8.93	0.14	0.25	1.24	9.19	52.1%	0.13	0.70	0.56
	12.24	7.71	0.11	0.20	0.82	7.90	44.8%	0.10	0.39	0.47
	12.29	6.37	0.07	0.15	0.47	6.49	36.7%	0.07	0.17	0.37
	12.34	4.44	0.04	0.10	0.19	4.49	25.4%	0.04	0.05	0.26
	12.39	1.93	0.02	0.05	0.03	1.95	11.0%	0.02	0.00	0.14

STREAM NAME: Indian Creek
XS LOCATION: SW of Ironclad Mountain
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	4.97	cfs
CALCULATED FLOW (Qc)=	4.92	cfs
(Qm-Qc)/Qm * 100 =	0.9	%
MEASURED WATERLINE (WLm)=	11.93	ft
CALCULATED WATERLINE (WLc)=	11.89	ft
(WLm-WLc)/WLm * 100 =	0.3	%
MAX MEASURED DEPTH (Dm)=	0.55	ft
MAX CALCULATED DEPTH (Dc)=	0.55	ft
(Dm-Dc)/Dm * 100	0.6	%
MEAN VELOCITY=	1.09	ft/sec
MANNING'S N=	0.107	
SLOPE=	0.024	ft/ft
.4 * Qm =	2.0	cfs
2.5 * Qm=	12.4	cfs

RECOMMENDED INSTREAM FLOW:

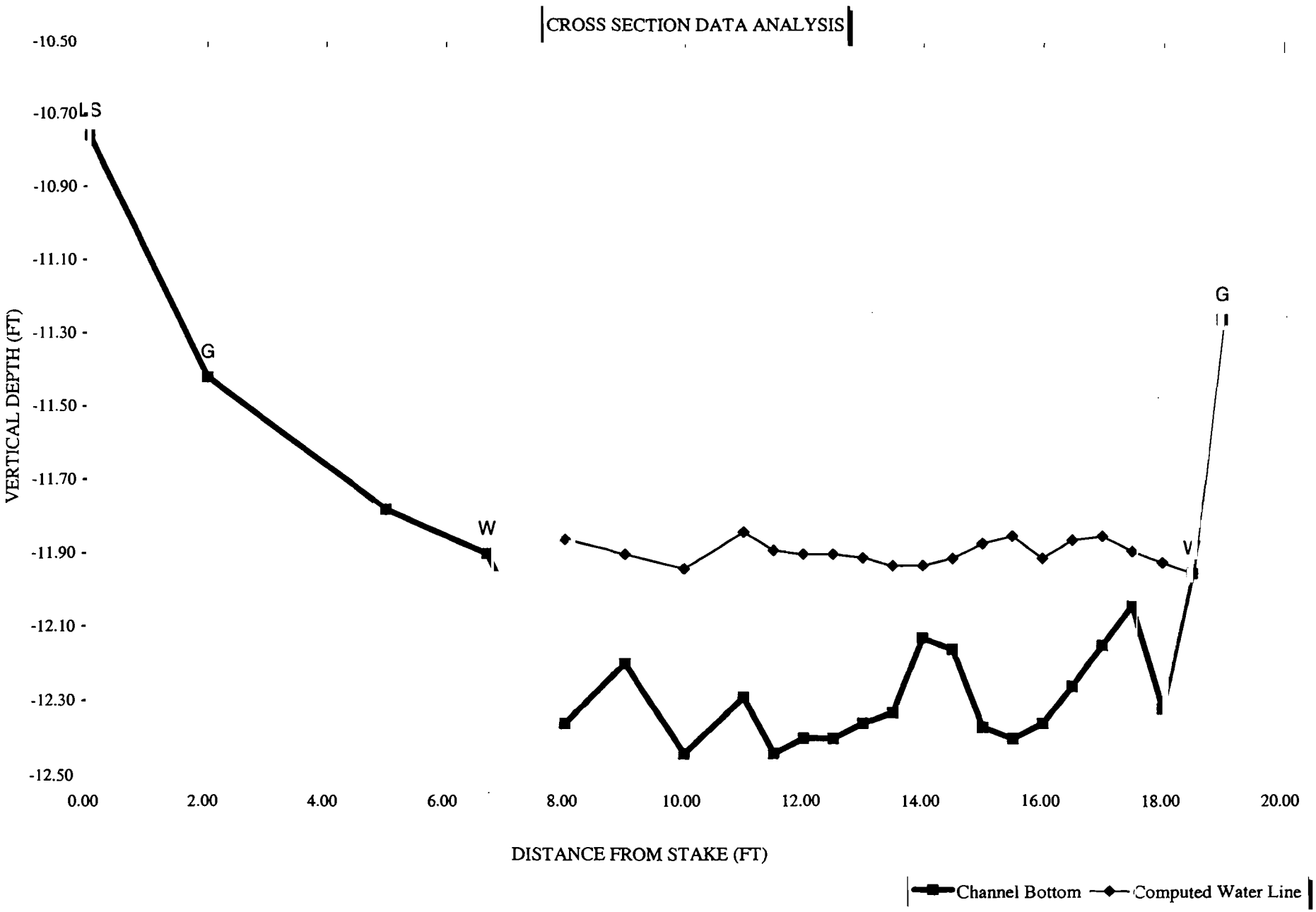
FLOW (CFS)	PERIOD

RATIONALE FOR RECOMMENDATION:

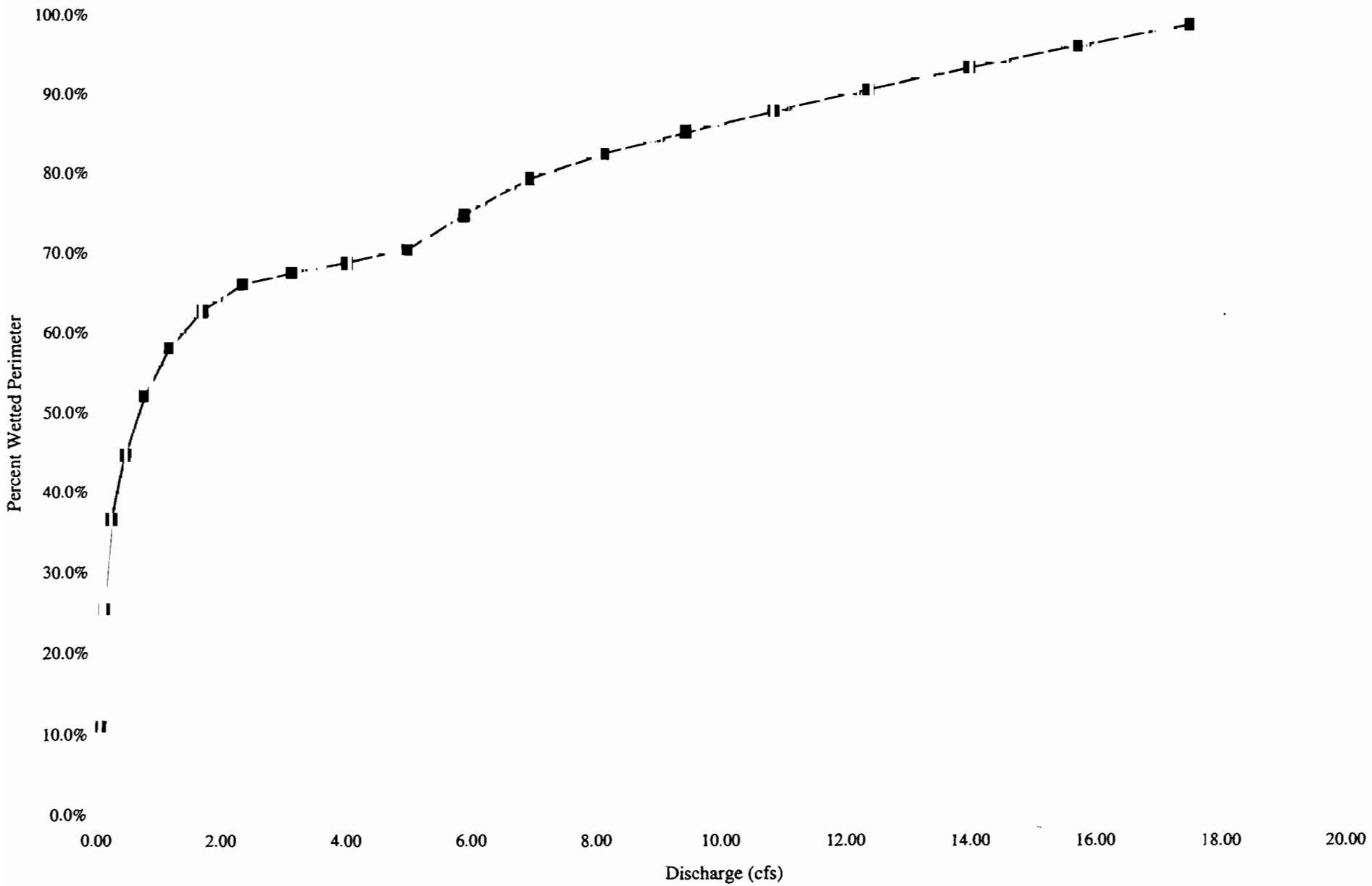
RECOMMENDATION BY: ..... AGENCY..... DATE:.....

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

Indian Creek



Percent Wetted Perimeter vs. Discharge



COLORADO WATER CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS

COLORADO DIVISION OF WILDLIFE

LOCATION INFORMATION

STREAM NAME: Indian Creek - upper BLM (above) | CROSS-SECTION NO.: 1

CROSS-SECTION LOCATION: SW of Ironclad Mtn.

DATE: 6/20/05 | OBSERVERS: Smith, Belcher

LEGAL DESCRIPTION | ¼ SECTION: NE NW | SECTION: 14 | TOWNSHIP: 5 (N) S | RANGE: 81 E (W) | PM: 6th

COUNTY: Jackson | WATERSHED: N. Platte | WATER DIVISION: 6 | DOW WATER CODE: 11229

MAP(S): USGS: Sorcer Peak 7.5' UTM 13 0376458

USFS: Elev. 8725' 4473736

SUPPLEMENTAL DATA

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

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

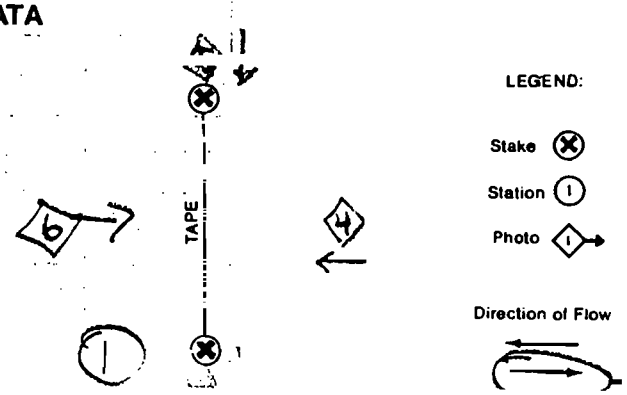
CHANNEL BED MATERIAL SIZE RANGE: gravel to 1 foot boulders | PHOTOGRAPHS TAKEN: (YES)/NO | NUMBER OF PHOTOGRAPHS: 3

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	surveyed
⊗ Tape @ Stake RB	0.0	surveyed
① WS @ Tape LB/RB	0.0	5.80 / 5.82
② WS Upstream	27'	5.45
③ WS Downstream	36'	6.38

SLOPE | 0.97/63.0 = 0.015

SKETCH



LEGEND:
Stake ⊗
Station ①
Photo ◇
Direction of Flow

AQUATIC SAMPLING SUMMARY

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

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

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

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

mayfly, caddisfly, stonefly

COMMENTS

TDS = 90 Temp = 54° pH = 8.1

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Indian Creek (upper) | CROSS-SECTION NO.: 2 | DATE: 6/20/05 | SHEET ___ OF ___

BEGINNING OF MEASUREMENT | EDGE OF WATER LOOKING DOWNSTREAM: (LEFT) / RIGHT | Gage Reading: 0.4 ft | TIME: 11:39

Features	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point	Velocity (ft/sec) Mean in Vertical	Area (ft^2)	Discharge (cfs)
LS	0		4.54								
G	2'		5.08								
W	4.7		5.80	Ø							
	6.0		6.18	0.4					0.89		
	7.0		6.19	0.5					0.28		
	7.5		6.18	0.4					1.08		
	8.0		6.16	0.45					1.80		
	8.5		6.36	0.6					1.80		
	9.0		6.12	0.4					1.63		
	9.5		6.26	0.6					1.18		
	10.0		6.34	0.55					0.44		
	10.5		6.10	0.35					0.67		
	11.0		6.28	0.55					1.46		
	11.5		6.28	0.55					0.45		
	12.0		6.24	0.55					1.50		
	12.5		6.24	0.50					0.63		
	13.0		6.17	0.45					1.72		
	13.5		6.16	0.4					1.72		
	14.0		6.26	0.5					1.87		
	14.5		6.16	0.4					1.59		
	15.0		6.11	0.4					1.73		
	15.5		6.03	0.3					1.06		
	16.0		5.98	0.25					0.91		
	17.0		5.88	0.1					0.09		
W	18.0		5.82	Ø							
BF	22.0		5.08								
RS	27.0		3.68								

TOTALS:

End of Measurement | Time: 11:46 | Gage Reading: 0.4 ft | CALCULATIONS PERFORMED BY: | CALCULATIONS CHECKED BY:

Data Input & Proofing

STREAM NAME: |Indian Creek Upper
XS LOCATION: |SW of Ironclad Mountain
XS NUMBER: |1
DATE: |6/20/05
OBSERVERS: |R.Smith, P. Belcher

1/4 SEC: |NW
SECTION: |14
TWP: |5N
RANGE: |81W
PM: |Sixth

COUNTY: |Jackson
WATERSHED: |North Platte
DIVISION: |6
DOW CODE: |11229
USGS MAP: |Spicer Peak 7.5'
USFS MAP: |

| Level and Rod Survey |

TAPE WT: |0.0106 lbs / ft
TENSION: |99999 lbs

SLOPE: | 0.015|ft / ft

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

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

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
		Total Data Points = 26						
	LS	0.00	4.54			0.00	0.00	0.00
		2.00	5.08			0.00	0.00	0.00
1	G	4.70	5.80	0.00		0.00	0.00	0.00
		6.00	6.18	0.40	0.89	0.46	0.41	5.78
	W	7.00	6.19	0.50	0.29	0.39	0.11	5.69
		7.50	6.18	0.40	1.08	0.20	0.22	5.78
		8.00	6.16	0.45	1.80	0.23	0.41	5.71
		8.50	6.36	0.60	1.80	0.30	0.54	5.76
		9.00	6.12	0.40	1.63	0.20	0.33	5.72
		9.50	6.36	0.60	1.18	0.30	0.35	5.76
		10.00	6.34	0.55	0.44	0.28	0.12	5.79
		10.50	6.10	0.35	0.67	0.18	0.12	5.75
		11.00	6.28	0.55	1.46	0.28	0.40	5.73
		11.50	6.28	0.55	0.45	0.28	0.12	5.73
		12.00	6.24	0.55	1.50	0.28	0.41	5.69
		12.50	6.24	0.50	0.63	0.25	0.16	5.74
		13.00	6.17	0.45	1.72	0.23	0.39	5.72
		13.50	6.16	0.40	1.72	0.20	0.34	5.76
		14.00	6.26	0.50	1.87	0.25	0.47	5.76
		14.50	6.16	0.40	1.59	0.20	0.32	5.76
		15.00	6.16	0.40	1.73	0.20	0.35	5.76
		15.50	6.03	0.30	1.06	0.15	0.16	5.73
		16.00	5.98	0.25	0.91	0.19	0.17	5.73
		17.00	5.88	0.10	0.09	0.10	0.01	5.78
	W	18.00	5.82	0.00		0.00	0.00	0.00
1	G? BF	23.00	5.08			0.00	0.00	0.00
		27.00	3.68					
	RS							
					Totals	5.10	5.89	

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

LOCATION INFORMATION

STREAM NAME:	Indian Creek Upper
XS LOCATION:	SW of Ironclad Mountain
XS NUMBER:	1
DATE:	20-Jun-05
OBSERVERS:	R.Smith, P. Belcher
1/4 SEC:	NW
SECTION:	14
TWP:	5N
RANGE:	81W
PM:	Sixth
COUNTY:	Jackson
WATERSHED:	North Platte
DIVISION:	6
DOW CODE:	11229
USGS MAP:	Spicer Peak 7.5'
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:	0.015

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

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

STREAM NAME: Indian Creek Upper
XS LOCATION: SW of Ironclad Mountain
XS NUMBER: 1

DATA POINTS= 26

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	WETTED PERIM.	WATER DEPTH	AREA (Am)	Q (Qm)	% Q CELL
LS	0.00	4.54			0.00		0.00	0.00	0.0%
	2.00	5.08			0.00		0.00	0.00	0.0%
1 G	4.70	5.80	0.00		0.00		0.00	0.00	0.0%
	6.00	6.18	0.40	0.89	1.35	0.40	0.46	0.41	7.0%
W	7.00	6.19	0.50	0.28	1.00	0.50	0.38	0.11	1.8%
	7.50	6.18	0.40	1.08	0.50	0.40	0.20	0.22	3.7%
	8.00	6.16	0.45	1.80	0.50	0.45	0.23	0.41	6.9%
	8.50	6.36	0.60	1.80	0.54	0.60	0.30	0.54	9.2%
	9.00	6.12	0.40	1.63	0.55	0.40	0.20	0.33	5.5%
	9.50	6.36	0.60	1.18	0.55	0.60	0.30	0.35	6.0%
	10.00	6.34	0.55	0.44	0.50	0.55	0.28	0.12	2.1%
	10.50	6.10	0.35	0.67	0.55	0.35	0.18	0.12	2.0%
	11.00	6.28	0.55	1.46	0.53	0.55	0.28	0.40	6.8%
	11.50	6.28	0.55	0.45	0.50	0.55	0.28	0.12	2.1%
	12.00	6.24	0.55	1.50	0.50	0.55	0.28	0.41	7.0%
	12.50	6.24	0.50	0.63	0.50	0.50	0.25	0.16	2.7%
	13.00	6.17	0.45	1.72	0.50	0.45	0.23	0.39	6.6%
	13.50	6.16	0.40	1.72	0.50	0.40	0.20	0.34	5.8%
	14.00	6.26	0.50	1.87	0.51	0.50	0.25	0.47	7.9%
	14.50	6.16	0.40	1.59	0.51	0.40	0.20	0.32	5.4%
	15.00	6.16	0.40	1.73	0.50	0.40	0.20	0.35	5.9%
	15.50	6.03	0.30	1.06	0.52	0.30	0.15	0.16	2.7%
	16.00	5.98	0.25	0.91	0.50	0.25	0.19	0.17	2.9%
	17.00	5.88	0.10	0.09	1.00	0.10	0.10	0.01	0.2%
W	18.00	5.82	0.00		1.00		0.00	0.00	0.0%
1 G? BF	23.00	5.08			0.00		0.00	0.00	0.0%
TOTALS ----------					13.64	0.6 (Max.)	5.10	5.89	100.0%

Manning's n = 0.0817
Hydraulic Radius= 0.37367834

STREAM NAME: Indian Creek Upper
XS LOCATION: SW of Ironclad Mountain
XS NUMBER: 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
	5.10	4.32	-15.2%
5.56	5.10	7.98	56.6%
5.58	5.10	7.67	50.4%
5.60	5.10	7.35	44.2%
5.62	5.10	7.04	38.2%
5.64	5.10	6.74	32.2%
5.66	5.10	6.44	26.3%
5.68	5.10	6.14	20.5%
5.70	5.10	5.85	14.8%
5.72	5.10	5.56	9.2%
5.74	5.10	5.28	3.6%
5.76	5.10	5.00	-1.9%
5.77	5.10	4.86	-4.6%
5.78	5.10	4.73	-7.3%
5.79	5.10	4.59	-9.9%
5.80	5.10	4.46	-12.6%
5.81	5.10	4.32	-15.2%
5.82	5.10	4.19	-17.8%
5.83	5.10	4.06	-20.4%
5.84	5.10	3.93	-22.9%
5.85	5.10	3.80	-25.4%
5.86	5.10	3.68	-27.9%
5.88	5.10	3.43	-32.7%
5.90	5.10	3.19	-37.3%
5.92	5.10	2.96	-41.9%
5.94	5.10	2.73	-46.4%
5.96	5.10	2.51	-50.7%
5.98	5.10	2.30	-55.0%
6.00	5.10	2.08	-59.1%
6.02	5.10	1.88	-63.1%
6.04	5.10	1.68	-67.1%
6.06	5.10	1.48	-70.9%

WATERLINE AT ZERO
AREA ERROR = 5.753

STREAM NAME: Indian Creek Upper
XS LOCATION: SW of Ironclad Mountain
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"	5.80	13.44	0.33	0.56	4.46	13.78	100.0%	0.32	4.68	1.05
	5.80	13.40	0.33	0.56	4.41	13.75	99.8%	0.32	4.61	1.04
	5.85	12.57	0.30	0.51	3.76	12.90	93.6%	0.29	3.68	0.98
	5.90	11.72	0.27	0.46	3.16	12.04	87.4%	0.26	2.88	0.91
	5.95	11.04	0.23	0.41	2.59	11.36	82.4%	0.23	2.15	0.83
	6.00	10.37	0.20	0.36	2.05	10.68	77.5%	0.19	1.52	0.74
	6.05	9.85	0.16	0.31	1.55	10.14	73.6%	0.15	0.99	0.64
	6.10	9.47	0.11	0.26	1.07	9.74	70.7%	0.11	0.54	0.51
	6.15	8.72	0.07	0.21	0.61	8.95	65.0%	0.07	0.23	0.37
	6.20	4.38	0.07	0.16	0.29	4.54	32.9%	0.06	0.10	0.36
	6.25	2.37	0.05	0.11	0.11	2.47	17.9%	0.05	0.03	0.29
	6.30	0.96	0.04	0.06	0.04	1.00	7.3%	0.04	0.01	0.24
	6.35	0.22	0.00	0.01	0.00	0.22	1.6%	0.00	0.00	0.05

summer = 4.0 cfs
winter = out of range

STREAM NAME: Indian Creek Upper
XS LOCATION: SW of Ironclad Mountain
XS NUMBER: 1

SUMMARY SHEET

MEASURED FLOW (Qm)=	5.89	cfs
CALCULATED FLOW (Qc)=	5.71	cfs
(Qm-Qc)/Qm * 100 =	3.0	%
MEASURED WATERLINE (WLm)=	5.81	ft
CALCULATED WATERLINE (WLc)=	5.75	ft
(WLm-WLc)/WLm * 100 =	1.0	%
MAX MEASURED DEPTH (Dm)=	0.60	ft
MAX CALCULATED DEPTH (Dc)=	0.61	ft
(Dm-Dc)/Dm * 100	-1.1	%
MEAN VELOCITY=	1.12	ft/sec
MANNING'S N=	0.082	
SLOPE=	0.015	ft/ft
.4 * Qm =	2.4	cfs
2.5 * Qm=	14.7	cfs

RECOMMENDED INSTREAM FLOW:

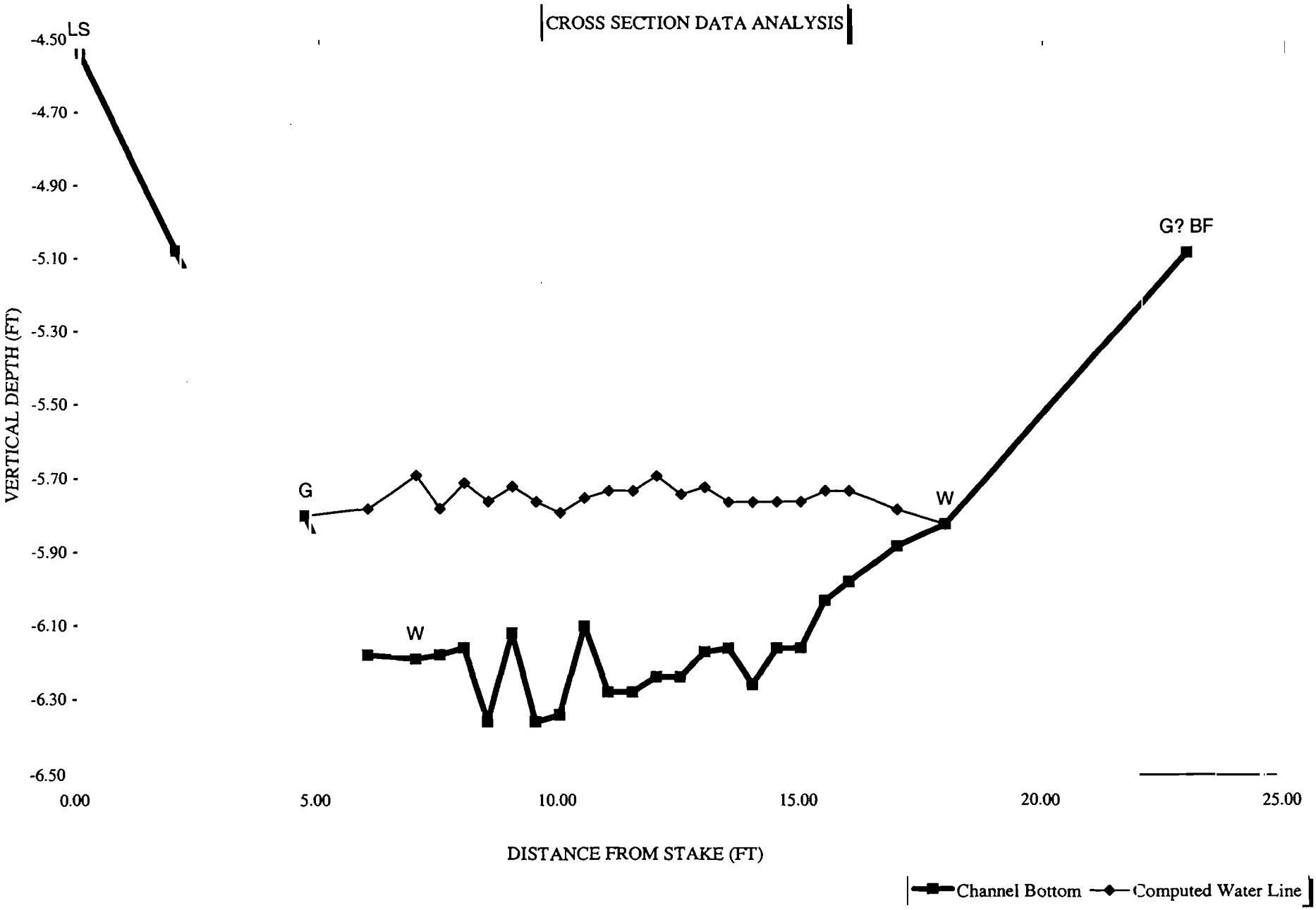
FLOW (CFS)	PERIOD

RATIONALE FOR RECOMMENDATION:

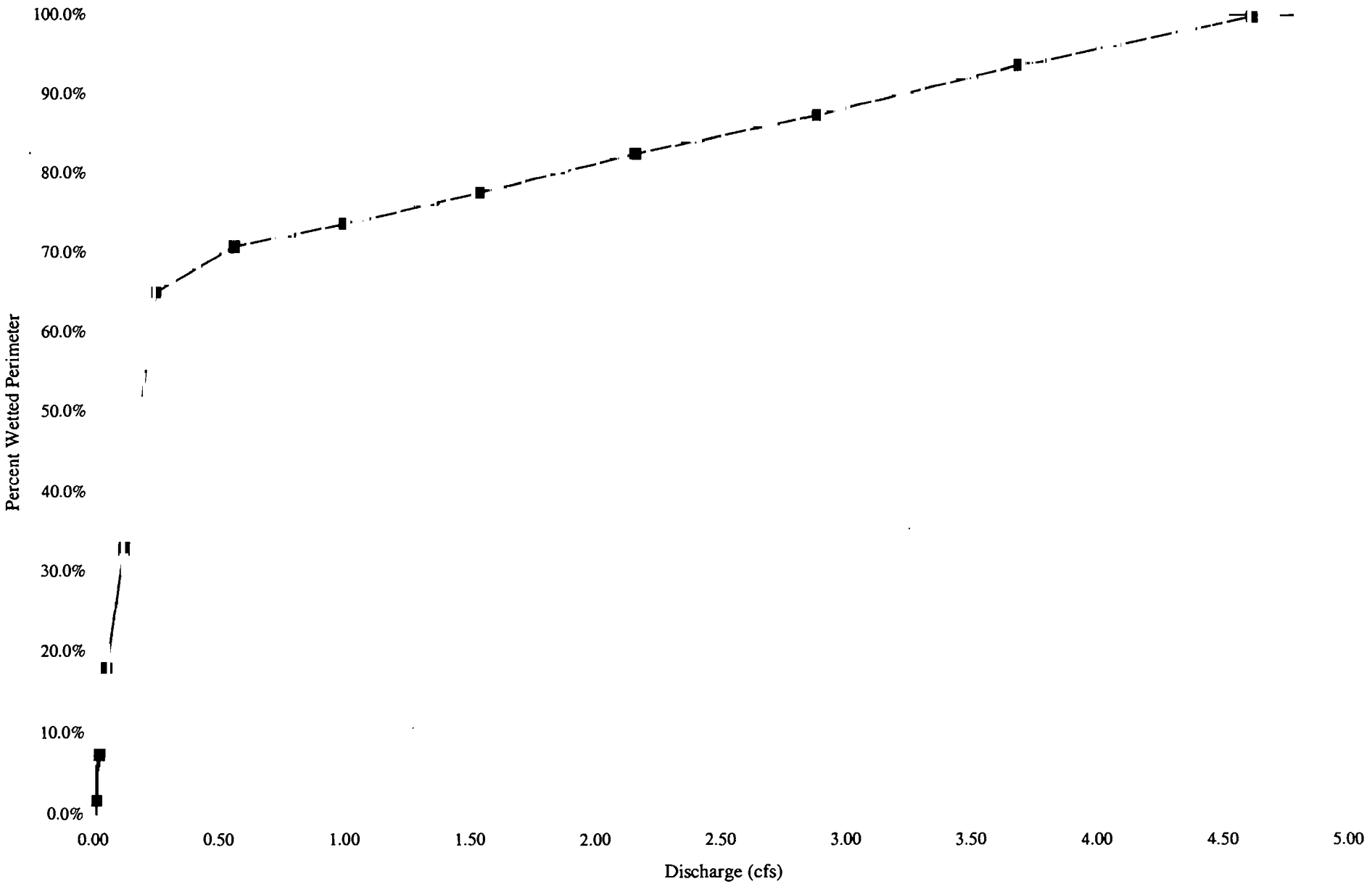
RECOMMENDATION BY: ..... AGENCY..... DATE:.....

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

Indian Creek Upper



Percent Wetted Perimeter vs. Discharge



Upper Indian Creek Aug. 3, 1979

	LENGTH	WEIGHT	CON-COEF	SPECIES	LENGTH	WEIGHT	CON-COEF
Brk	6	3.5			7.5	3	
	4	4			6.5	1.5	
	6.5	2			7	2.5	
	10	6			7	2	
	5				7	2.5	
	9	4			8	3	
	5.5				5	1	
	5			Brn	4	2.5	
Brn	8.5	2.5		Brk	7	2.5	
Brk	5.5				9	4	
	5.5				5		
	6				4.5		
	7	2			5.5		
	5				5.5		
	5.5				5.5		
Dace	4				6	1.5	
Brk	5				5.5		
	5				7.5	3	
	5				5		
	9.5	5			7	2	
	9	4			5		
	6.5	1.5		Chub	5		
	4	3.5					
	9	4					
Brn	7	7.5					
Brk	9	4					
	8	3					
	7.5	2.5					
	8.5	3					

Water Availability

Basin Characteristics Report

Date: Wed Jan 3 2007 12:16:10
Latitude: 40.4264
Longitude: -106.4565

Parameter	Value
Area that drains to a point on a stream in square miles	11.9
Maximum - minimum basin elevation in feet	2080
Mean Basin Elevation in feet	9240
Maximum basin elevation in feet	10600
Minimum basin elevation in feet	8530
Mean basin slope in percent, computed from 10 m DEM	15.4
Mean annual precipitation in inches (unadjusted)	26.3
Mean basin slope determined using the grid-sampling method (dimensionless)	0.14
Percent of area with slope greater than 30%	6.21
Percent of area with slope greater than 30% and facing North	1.86
Percent of area covered by forest	83.2
Mean annual precipitation in inches (adjusted)	24.4
Percentage of basin above 7500 ft elevation	100
Elevation at basin outlet in feet	8530

Streamflow Statistics Report

Date: Wed Jan 3 2007 12:18:53
Site Location: Colorado
Latitude: 40.4264
Longitude: -106.4565
Drainage Area: 11.9 mi2

Peak Flow Basin Characteristics

100% Mountain Region Peak Flow (11.9 mi2)

Parameter	Value	Min	Max
Drainage Area (square miles)	11.9	5.5	945
Mean Basin Slope ft per ft (dimensionless)	0.14	0.126	0.554

Low Flow Basin Characteristics

100% Mountain Region Low Flow (11.9 mi2)

Parameter	Value	Min	Max
Drainage Area (square miles)	11.9	1	1150
Mean Basin Elevation (feet)	9240	8400	12200
Mean Annual Precipitation (inches)	24.3	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	89.5	60			
PK5	137	49			
PK10	171	45			
PK25	214	42			
PK50	246	42			
PK100	279	43			
PK200	311	45			
PK500	355	49			

Streamflow Statistics

			Equivalent	90-Percent Prediction Interval

Statistic	Flow (ft^3/s)	Estimation Error (percent)	years of record	Minimum	Maximum
Q1	0.9	49			
Q2	0.93	49			
Q3	1.41	43			
Q4	4.85	56			
Q5	25.5	58			
Q6	27.8	510			
Q7	5.96	63			
Q8	2.27	70			
Q9	1.66	63			
QA	7.77	43			
Q10	1.74	50			
Q11	1.4	43			
Q12	1.07	45			
Low-Flow Statistics					
M7D2Y	0.48	62			
M7D10Y	0.2	100			
M7D50Y	0.1	160			

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Unadjusted Mean Monthly Stream Flow (cfs)	**0.92**	**0.95**	**1.45**	**5**	**26**	**28.1**	**5.99**	**2.29**	**1.68**	**1.77**	**1.43**	**1.1**
Mean Monthly Stream Flow Adjusted for Upstream Diversions (cfs)	**0.92**	**0.95**	**1.43**	**4.14**	**23.86**	**27.45**	**5.52**	**2**	**1.6**	**1.77**	**1.43**	**1.1**

	30 Nov	31 Dec	31 Jan	28 Feb	31 Mar	30 Apr	31 May	30 June	31 July	31 Aug	30 Sep	31 Oct
McIssaac Ditch					0.55	2.92	29	35.8	59.7	36.9	10.4	0
Total (AF)	0	0	0	0	0.55	2.92	29	35.8	59.7	36.9	10.4	0
cfs	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.6	1.0	0.6	0.2	0.0
CU--cfs	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.5	0.3	0.1	0.0

	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct
StreamStats	**1.4**	**1.1**	**0.9**	**1.0**	**1.5**	**5.0**	**26.0**	**28.1**	**6.0**	**2.3**	**1.7**	**1.8**
StreamStats minus CU	**1.4**	**1.1**	**0.9**	**1.0**	**1.4**	**5.0**	**25.8**	**27.8**	**5.5**	**2.0**	**1.6**	**1.8**

	30 Nov	31 Dec	31 Jan	28 Feb	31 Mar	30 Apr	31 May	30 June	31 July	31 Aug	30 Sep	31 Oct
West Arapahoe Feeder D 2						93.1	219	32.6				
Lawrence Ditch 2						4.3	137	286	63.5	0.87	7.19	9.89
Total (AF)	0	0	0	0	0	97.4	356	318.6	63.5	0.87	7.19	9.89
cfs	0.0	0.0	0.0	0.0	0.0	1.6	5.8	5.4	1.0	0.0	0.1	0.2

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StreamStats: A U.S. Geological Survey Web Application for Stream Information

by Kernell G. Ries III, Peter A. Steeves, Jacqueline D. Coles, Alan H. Rea, and David W. Stewart

Introduction

The U.S. Geological Survey (USGS) provides streamflow and other stream-related information needed to protect people and property from floods, to plan and manage water resources, and to protect water quality. Streamflow statistics provided by the USGS, such as the 100-year flood, the annual mean flow, and the 7-day 10-year low flow (7Q10), frequently are used by engineers, land managers, biologists, and many others to help guide decisions in their everyday work. For example, streamflow statistics are used for flood-plain mapping, which is used as the basis for setting insurance rates and zoning land use. Streamflow statistics also are used for dam, bridge, and culvert design; water-supply planning and management, and water-use appropriations and permitting; wastewater and industrial discharge permitting; hydropower facility design and regulation; and habitat preservation for protection of endangered species. In addition, researchers, planners, regulators, and others often need to know the physical and climatic characteristics (basin characteristics) of the drainage basins upstream from locations of interest to help them understand the mechanisms that control water availability and water quality at these locations.

Streamflow statistics can be needed at any location along a stream. Commonly, the statistics are computed from available data when they are needed at the locations of USGS data-collection stations, which include streamgaging stations, where streamflow data are collected continuously; partial-record stations, where streamflow measurements

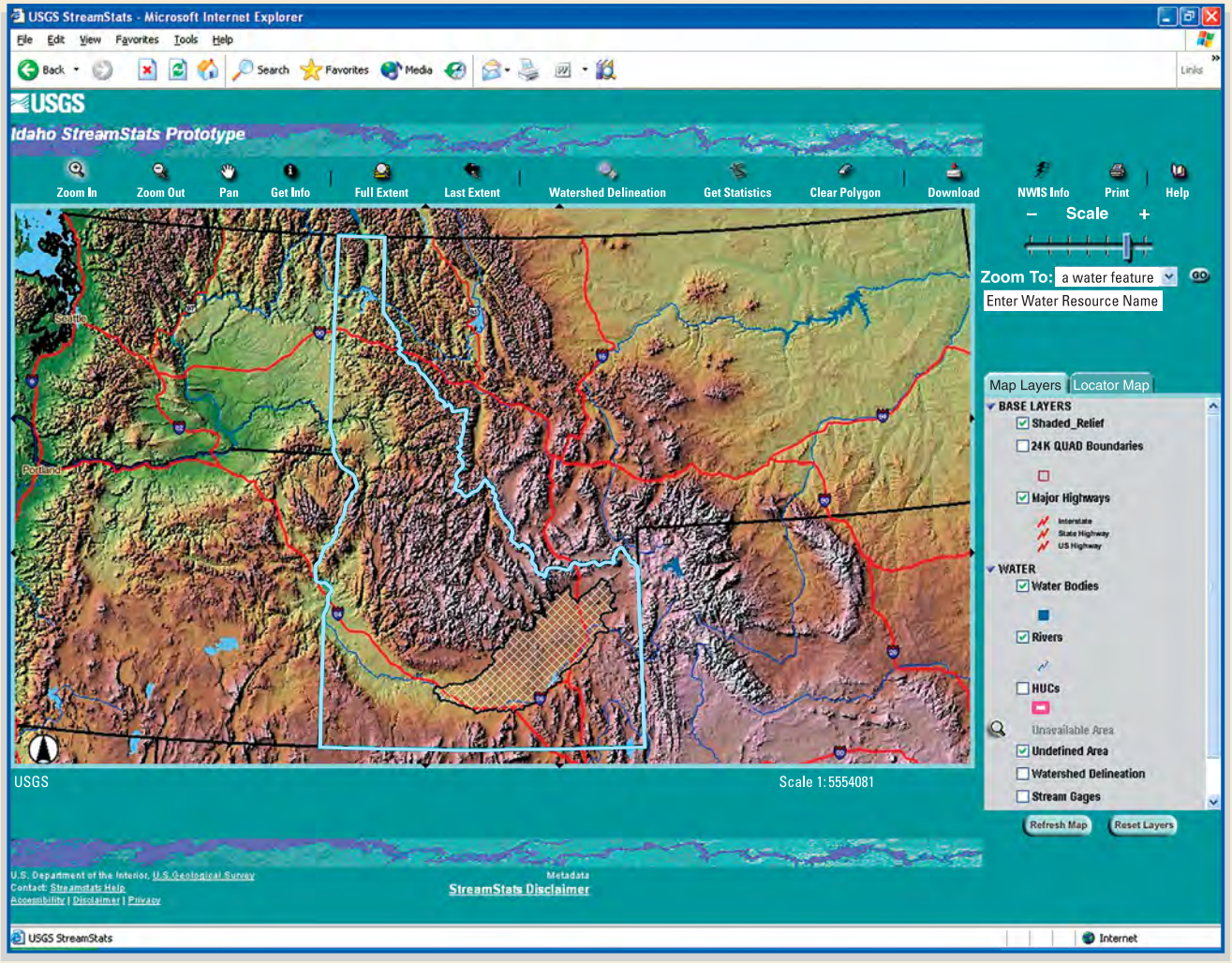


Figure 1. View of the StreamStats user interface zoomed in to Idaho.

are collected systematically over a period of years to estimate peak-flow or low-flow statistics; and miscellaneous-measurement stations, where streamflow measurements usually are collected for specific hydrologic studies with various objectives. More often, however, the statistics are needed at ungaged sites, where no observed data are available to compute the statistics.

StreamStats is a map-based Web application that makes it easy for users to obtain streamflow statistics, basin characteristics, and other information for user-selected USGS data-collection stations and ungaged sites of interest. If a user selects the location of a data-collection station, StreamStats will provide previously published information for the station from a database. If a user selects a location where no data are available (an ungaged site), StreamStats will run a Geographic Information System (GIS) program to measure basin characteristics and estimate streamflow statistics for the site. These estimates assume that natural flow conditions exist at the ungaged site. In the past, it could take an experienced person more than a day to determine the estimates. StreamStats reduces the effort to only a few minutes.

StreamStats was developed cooperatively by the USGS and the Environmental Systems Research Institute, Inc. (ESRI, *http://www.esri.com*), and was designed for national implementation. The application consists of five major components: (1) a user interface that displays maps and allows users to select stream locations where they want streamflow statistics information (fig. 1), (2) a database that contains previously published streamflow statistics and descriptive information for USGS data-collection stations, (3) an automated GIS process that determines drainage boundaries for user-selected ungaged sites and measures the basin characteristics for those sites, (4) a GIS database that stores base-map data needed for users to locate sites of interest and other map data needed for measuring basin characteristics, and (5) an automated process that takes the measured basin characteristics for ungaged sites as input, solves regression equations to estimate various streamflow statistics, and outputs the estimates for display to the user in a Web browser window. Each of these components are described below and guidance for using the application is provided.

StreamStats User Interface

The StreamStats user interface (fig. 1) allows users to navigate to areas of the map and select gaged and ungaged sites of interest. The largest part of the user interface consists of the Map Frame, which displays default and selected map layers. The Map Layers Frame, located to the right of the Map Frame, shows the layers that are or can be displayed on the Map Frame, and allows users to change the layers that are displayed. Above the Map Frame is a series of buttons that allow navigation by zooming in and out (going to a larger or smaller scale view while the map is centered on the same position), panning (moving the center of view in any direction), or returning to the previous or original map extent. Additional buttons allow the user to query for information on features in selected map layers, delineate drainage boundaries for ungaged sites, get streamflow statistics for ungaged sites, clear drainage boundaries, download drainage boundaries to a file, print the views shown in the Map Frame, retrieve information for USGS data-collection site stations from the National Water Information System (NWIS) database, and get help on using StreamStats. A "Zoom To" pull-down menu above the Map Layers Frame allows users to zoom to a named place, a water feature, an address, or a specified latitude and longitude.

The user interface is accessed initially through a Web page *(http://streamstats.usgs.gov)* that briefly describes StreamStats, provides links to documentation, and presents a map of the United States that indicates where StreamStats has been implemented. Clicking on a highlighted State on the map will take users to the user interface for that State. The initial homepage also includes a map that indicates where cooperative studies are underway to implement StreamStats for additional States.

Streamflow Statistics for Data-Collection Stations

The USGS periodically computes and publishes streamflow statistics and basin characteristics for its streamflow data-collection stations. This information typically is published in data reports prepared annually by each of the 48 USGS District offices, or in reports that are products of statewide or regional studies done in cooperation with State and local agencies. Because available streamflow statistics and basin characteristics for a given area commonly are scattered among many reports, and many older reports may not be readily available to the public, users of this information often find it difficult to obtain the information they need. StreamStats provides convenient access to a database, StreamStatsDB, that contains previously published information for data-collection stations.

The different types of data-collection stations are shown on the map in the user interface by different symbol shapes and colors. Clicking on the location of a station gives access to the available information for that station. The available information varies by station type and by the needs of local cooperators, who may have shared in the cost of computing the statistics. The information is entered into StreamStatsDB and is quality-assured by scientists in the USGS District offices where the data were collected.

StreamStats output for data-collection stations includes descriptive information, any streamflow statistics and basin characteristics that are available for the stations, and links to the homepages for the stations in NWISWeb *(http://waterdata.usgs.gov/usa/nwis/nwis)*, the online database that contains data collected for all USGS data-collection stations. Descriptive information in StreamStatsDB includes: USGS station identification number, station name, station type, period of record, latitude, longitude, hydrologic unit code, major drainage basin name, county name, U.S. Census Bureau Minor Civil Division (MCD) name, directions to locate the station, and remarks indicating any effects of human impacts or other pertinent information about the stations.

More than 165 different basin characteristics are available in StreamStatsDB, though typically there are less than one dozen available for most stations. Drainage area is the most commonly available basin characteristic. Some other widely available characteristics include stream slope, mean annual precipitation, and area of surface-water storage (lakes, ponds, and wetlands).

About 500 different streamflow statistics are available in StreamStatsDB, including peak-flow and low-flow frequencies, annual and monthly means, medians, and flow-duration percentiles.

Most stations, however, have only a small number of statistics available. Data from NWISWeb were used to determine the statistics. Though there is some overlap in the information contained in NWISWeb and StreamStatsDB, NWISWeb was not designed to store most of the streamflow statistics and many of the basin characteristics contained in StreamStatsDB.

All streamflow statistics and basin characteristics for stations in StreamStatsDB were published in previous reports, and citations for those reports are provided in the StreamStats output. Methods used to determine the information are described in the reports. A link from the StreamStats homepage provides definitions of the streamflow statistics and basin characteristics in the database.

Streamflow Statistics for Ungaged Sites

The USGS has developed numerous equations that can be used to estimate various streamflow statistics for locations on ungaged streams throughout the Nation. The equations were obtained by use of regression analysis to statistically relate the streamflow statistics to the basin characteristics of the drainage basins for a group of data-collection stations. The basin characteristics can be measured for an ungaged site and inserted into the regression equations to obtain estimates of the streamflow statistics under natural flow conditions for the site. (See box on p. 4)

Use of the regression equations has been limited in the past because measuring the basin characteristics was difficult and time-consuming, and the equations sometimes are difficult to calculate. Historically, most physical characteristics were measured by hand from various maps. This process could take from an hour to a few days to complete for a single site, depending on the size of the basin and the characteristics measured. In addition, many of the maps were not widely circulated, and many potential users did not possess the equipment or expertise necessary to measure the values from the maps. StreamStats eliminates these problems by automatically defining the drainage boundary, measuring the basin characteristics, and solving the regression equations to obtain estimates of streamflow statistics for user-selected ungaged sites in a process that takes only a few minutes. Users simply select the location of interest from the map displayed in the user interface, and StreamStats does the rest.

StreamStats determines the drainage-basin boundary for a selected site using a Digital Elevation Model (DEM), which is a regularly spaced grid of elevation points, and a digital representation of the stream network. When a user selects a site along the digital stream network, the site location is transferred to a point in the DEM, which is then used to determine the drainage boundary for the site. Usually the DEM used for delineation has been enhanced by a process that makes it conform to the stream network and a data set of pre-existing drainage boundaries. As a result, delineations obtained from StreamStats usually are of greater accuracy than delineations obtained from a standard DEM (fig. 2).

StreamStats was designed to allow use of data sets at various scales so that

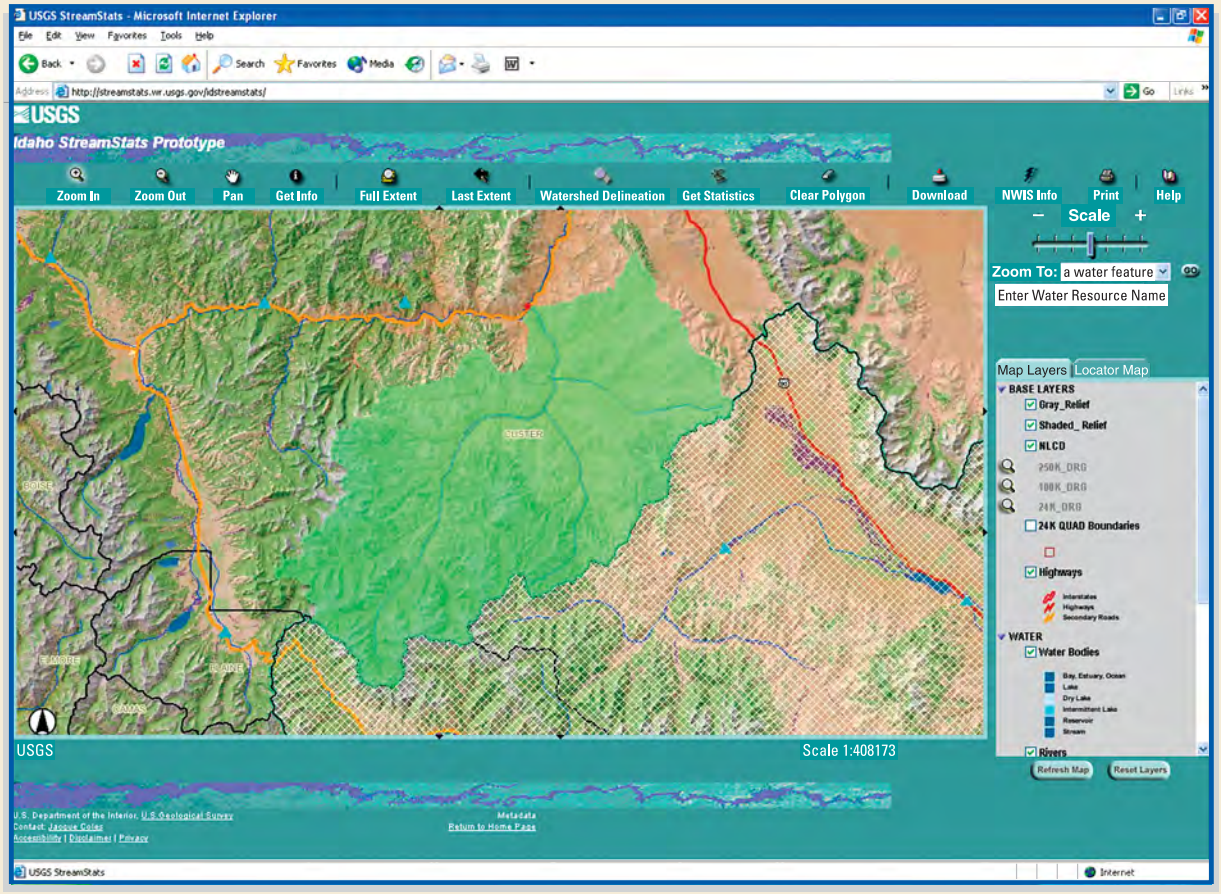


Figure 2. Drainage basin delineation for an ungaged site using StreamStats.

Regression Equations

The USGS has developed equations to estimate peak-flow frequency statistics, such as the 100-year flood, for ungaged sites in every State. Regression equations also have been developed to estimate other types of streamflow statistics for many States. As an example, the equation for estimating the 100-year flood for ungaged sites in part of northern Idaho is:

$$Q_{100} = 5.39\ A^{0.874}(E/1{,}000)^{-1.13}\ P^{1.18}$$

where

Q_{100} is the peak flow that occurs, on average, once in 100 years (1-percent chance of occurrence in any year), in cubic feet per second;

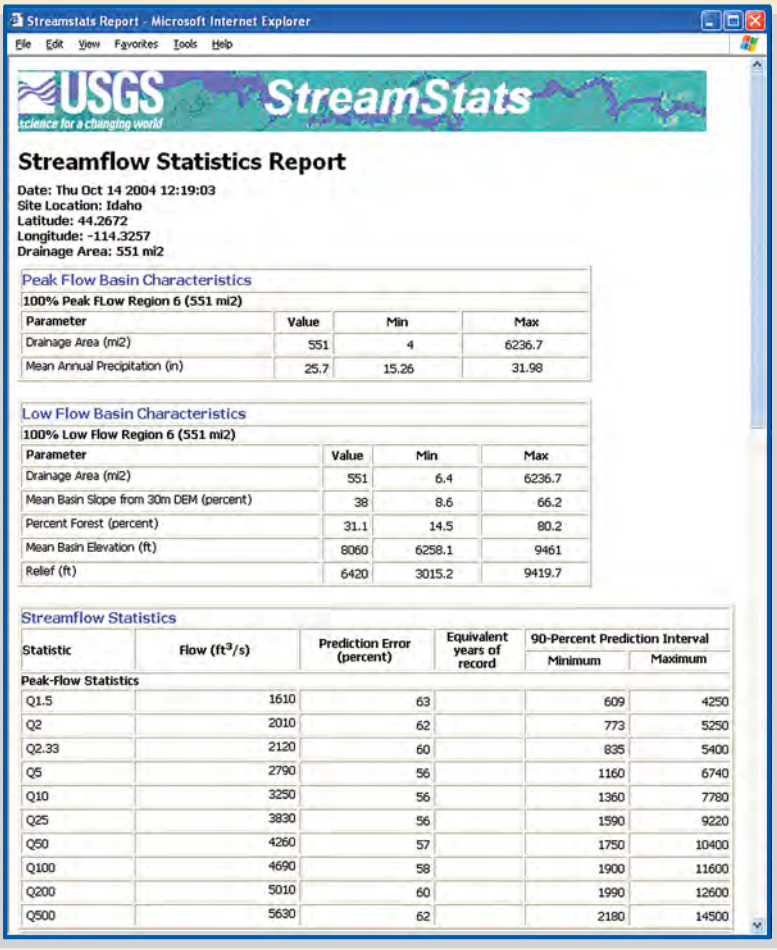
A is the drainage area, in square miles;

E is the mean basin elevation, in feet; and

P is the mean annual precipitation, in inches.

Reference

Berenbrock, Charles, 2002, *Estimating the magnitude of peak flows at selected recurrence intervals for streams in Idaho: U.S. Geological Survey Water-Resources Investigations Report 02-4170, 59 p.*



Streamstats Report - Microsoft Internet Explorer

File Edit View Favorites Tools Help

USGS science for a changing world — StreamStats

Streamflow Statistics Report

Date: Thu Oct 14 2004 12:19:03
Site Location: Idaho
Latitude: 44.2672
Longitude: -114.3257
Drainage Area: 551 mi2

Peak Flow Basin Characteristics

100% Peak FLow Region 6 (551 mi2)

Parameter	Value	Min	Max
Drainage Area (mi2)	551	4	6236.7
Mean Annual Precipitation (in)	25.7	15.26	31.98

Low Flow Basin Characteristics

100% Low Flow Region 6 (551 mi2)

Parameter	Value	Min	Max
Drainage Area (mi2)	551	6.4	6236.7
Mean Basin Slope from 30m DEM (percent)	38	8.6	66.2
Percent Forest (percent)	31.1	14.5	80.2
Mean Basin Elevation (ft)	8060	6258.1	9461
Relief (ft)	6420	3015.2	9419.7

Streamflow Statistics

Statistic	Flow (ft^3/s)	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
Peak-Flow Statistics					
Q1.5	1610	63		609	4250
Q2	2010	62		773	5250
Q2.33	2120	60		835	5400
Q5	2790	56		1160	6740
Q10	3250	56		1360	7780
Q25	3830	56		1590	9220
Q50	4260	57		1750	10400
Q100	4690	58		1900	11600
Q200	5010	60		1990	12600
Q500	5630	62		2180	14500

Figure 3. Partial output from StreamStats for an ungaged site.

the best available local data can be used to determine drainage boundaries and to measure basin characteristics. The local USGS District offices determine the source and scale of the data layers used.

StreamStats determines what regression equations are available in the region in which the ungaged site is located, and what basin characteristics are needed to solve them. StreamStats then measures the basin characteristics and inserts them into the National Flood Frequency (NFF) program, which solves the equations. The estimated streamflow statistics, indicators of the errors associated with the estimates, and the basin characteristics for the site appear in a pop-up Web browser window (fig. 3). Documentation of the equations in NFF and the methods used to develop them is provided through links for each State on the NFF Web page at *http://water.usgs.gov/software/nff.html*.

Limitations

StreamStats provides estimates of streamflow statistics for ungaged sites assuming natural flow conditions. If human activities such as dam regulation and water withdrawals substantially affect the timing, magnitude, or duration of flows at a selected site, the estimates provided by StreamStats should be adjusted by the user to account for those activities. StreamStats can be used to obtain regression-equation-based estimates of streamflow statistics for USGS data-collection stations that are affected by human activities. Users should not assume, however, that the differences between the data-based estimates for the stations and the regression equation-based estimates are equivalent to the effects of the human activities on streamflow at the stations because there are errors associated with both sets of estimates. When StreamStats is used to obtain estimates for sites with basin characteristics outside the ranges of the basin characteristics for the sites used to develop the regression equations, the estimates are extrapolated, and the errors associated with the estimates are unknown. StreamStats provides a warning when extrapolation occurs.

Additional Information

For further information, please contact:
District Chief, MD-DE-DC District
U.S. Geological Survey
8987 Yellow Brick Road
Baltimore, Maryland 21237
http://md.water.usgs.gov
(410-238-4200)

or visit the USGS Office of Surface Water StreamStats Program homepage at:
http://water.usgs.gov/osw/programs/streamstats.html

Editor: Valerie M. Gaine
Graphics and design: Timothy W. Auer

FS 2004-3115

ESRI

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Water Rights

Name of Structure	Typ	Name of Source	WD	- - L O C A T I O N - -	Use	Net Abs	Net Cond	AltP/Exch	U	Adj Date	P Adj Date	Appro Date	Or	AdminNumber
LAWRENCE DITCH 1		INDIAN CK of ARAPAHO	47	NE NE 2 5 N 81 W S	I	5.000			C	09/19/1892		04/15/1887		13619.00000
MCISAAC DITCH		INDIAN CK of ARAPAHO	47	NE NW 23 5 N 81 W S	I	8.000			C	01/06/1913	01/06/1913	07/12/1909		21742.00000
WEST ARAPAHOE FEEDER D 2		INDIAN CK of ARAPAHO	47	SE SW 2 5 N 81 W S	IRS	60.000			C	12/31/1980	12/31/1980	04/02/1980		47574.00000
LAWRENCE DITCH 1		INDIAN CK of ARAPAHO	47	NE NE 2 5 N 81 W S	S	2.000			C	12/31/1990	12/31/1990	04/01/1987		51134.50129

STRUCTURE SUMMARY FOR: WEST ARAPAHOE FEEDER D 2

WATER DISTRICT: 47
ID NUMBER: 2049
WATER SOURCE: INDIAN CK of ARAPAHOE CK AT STREAM MILE: 82.42
LOCATION: 5N 81W 2 SW SE IN JACKSON COUNTY
TOTAL IRRIGATED ACRES: See irrigated acres summary.
STRUCTURE TYPE: Headgate
CIU (CURRENTLY IN USE): Active Structure with contemporary diversion records
IS TRANSBASIN:
ESTIMATED CAPACITY:
DECREED CAPACITY (SUM OF ABSOLUTE NET AMOUNT RIGHTS): 60.0000 CFS
MEASURING DEVICE/RECORDER: NONE
CONTACT: MEYRING LIVESTOCK
ADDRESS 1: WALDEN, COLO.

WATER RIGHTS TRANSACTION INFORMATION

ADMIN NO	ADJ DATE	APPRO DATE	COURT NO	DECREED RATE (CFS)	DECREED VOL. (AF)	ADJUDICATION TYPE	USES	COMMENT
47574.00000	1980-12-31	1980-04-02	83CW0079	60.00		S,CA	STOIRRRECSTK	
47574.00000	1980-12-31	1980-04-02	80CW0030	60.00		S,C	STOIRRRECSTK	

WATER RIGHTS NET AMOUNT INFORMATION

ADMIN NO	ADJ DATE	PADJ DATE	APRO DATE	ORDER NO	PRIOR CASE NO	ADJ TYPE	RATE ABS (CFS)	VOL ABS (AF)	RATE COND (CFS)	VOL COND (AF)	RATE APEX (CFS)	VOL APEX (AF)	USE TYPE
47574.00000	1980-12-31	1979-12-31	1980-04-02	0	80CW0030	S	60.0000	0.0000	0.0000	0.0000	0.0000	0.0000	STOIRRRECSTK

IRRIGATED ACRES SUMMARY -- TOTALS FROM VARIOUS SOURCES

GIS Total (Acres):		Reported:
Diversion Comments Total (Acres):	0.0	Reported: 2004
Structure Total (Acres):	53.0	Reported: 2002

IRRIGATED ACRES FROM GIS DATA -- BY CROP, YEAR, AND IRRIGATION METHOD

No GIS irrigated acres records to display

DIVERSION SUMMARY IN ACRE FEET - TOTAL THROUGH STRUCTURE

YEAR	FDU	LDU	DWC	MAXQ & DAY	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	TOTAL

1982	04/01	04/30	30	7.00	04/01	0	0	0	0	0	417	0	0	0	0	0	0	417
1983	05/16	06/09	25	5.00	05/16	0	0	0	0	0	0	159	89.3	0	0	0	0	248
1984	05/16	06/09	25	5.00	05/16	0	0	0	0	0	0	159	89.3	0	0	0	0	248
1985	05/01	05/14	14	6.70	05/01	0	0	0	0	0	0	186	0	0	0	0	0	186
1986	05/01	05/15	15	6.00	05/01	0	0	0	0	0	0	179	0	0	0	0	0	179
1987	04/16	04/30	15	6.00	04/16	0	0	0	0	0	179	0	0	0	0	0	0	179
1988	05/01	05/14	14	6.00	05/01	0	0	0	0	0	0	167	0	0	0	0	0	167
1989	05/04	05/25	22	7.00	05/11	0	0	0	0	0	0	278	0	0	0	0	0	278
1990	04/11	05/12	32	7.00	05/01	0	0	0	0	0	198	167	0	0	0	0	0	365
1991	04/11	04/30	20	9.00	04/11	0	0	0	0	0	357	0	0	0	0	0	0	357
1992	04/24	05/14	21	5.00	04/24	0	0	0	0	0	69.4	139	0	0	0	0	0	208
1993	05/15	05/27	13	15.0	05/15	0	0	0	0	0	0	387	0	0	0	0	0	387
1994	04/16	05/05	20	12.0	04/16	0	0	0	0	0	357	119	0	0	0	0	0	476
1995	05/01	06/25	56	15.0	06/05	0	0	0	0	0	0	444	411	0	0	0	0	855
1996	05/22	05/31	10	12.0	05/22	0	0	0	0	0	0	238	0	0	0	0	0	238
1997	05/16	06/15	30	15.0	05/16	0	0	0	0	0	0	240	49.6	0	0	0	0	290
1998	05/13	06/15	33	15.0	05/18	0	0	0	0	0	0	244	49.6	0	0	0	0	294
1999	04/21	06/09	50	14.5	05/16	0	0	0	0	0	19.8	453	17.9	0	0	0	0	491
2000	05/03	05/21	19	40.0	05/04	0	0	0	0	0	0	775	0	0	0	0	0	775
2001	04/20	06/09	51	9.00	04/20	0	0	0	0	0	95.6	326	44.6	0	0	0	0	466
2002	04/10	04/24	15	9.40	04/12	0	0	0	0	0	95.4	0	0	0	0	0	0	95.4
2003	04/26	05/22	27	26.5	04/26	0	0	0	0	0	171	340	0	0	0	0	0	511
2004	04/02	05/11	40	5.60	04/05	0	0	0	0	0	182	35.1	0	0	0	0	0	217
AVE:	04/27	05/22	25	11.2	05/01	0	0	0	0	0	93.1	219	32.6	0	0	0	0	345

23 years with diversion records Average Flow = 6.95 CFS

Notes: The average considers all years with diversion records, even if no water is diverted.
The above summary lists total monthly diversions.
* = Infrequent data. All other values are derived from daily records.
Average values include infrequent data if infrequent data are the only data for the year.

DIVERSION COMMENTS

YEAR	COMMENTS
2002	No water available for irrigation. (ACRES IRRIG = 0.000)
2003	No water available for irrigation. (ACRES IRRIG = 0.000)
2004	NO WATER AVAILABLE FOR IRRIGATION. (ACRES IRRIG = 0.000)

Note: Diversion comments and reservoir comments may be shown for a structure, if both are available.

STRUCTURE SUMMARY FOR: MCISAAC DITCH

WATER DISTRICT: 47
ID NUMBER: 985
WATER SOURCE: INDIAN CK of ARAPAHOE CK AT STREAM MILE: 85.35
LOCATION: 5N 81W 23 NW NE IN JACKSON COUNTY
TOTAL IRRIGATED ACRES: See irrigated acres summary.
STRUCTURE TYPE: Headgate
CIU (CURRENTLY IN USE): Active Structure with contemporary diversion records
IS TRANSBASIN:
ESTIMATED CAPACITY:
DECREED CAPACITY (SUM OF ABSOLUTE NET AMOUNT RIGHTS): 8.0000 CFS
MEASURING DEVICE/RECORDER: 2 FT METAL PARSHALL
CONTACT: STAPLETON, BEN
ADDRESS 1: 925 PARK AVE #9B, NEW YORK NY

WATER RIGHTS TRANSACTION INFORMATION

ADMIN NO	ADJ DATE	APPRO DATE	COURT NO	DECREED RATE (CFS)	DECREED VOL. (AF)	ADJUDICATION TYPE	USES	COMMENT
21742.00000	1913-01-06	1909-07-12	CA2890	8.00		S	IRR	

WATER RIGHTS NET AMOUNT INFORMATION

ADMIN NO	ADJ DATE	PADJ DATE	APRO DATE	ORDER NO	PRIOR CASE NO	ADJ TYPE	RATE ABS (CFS)	VOL ABS (AF)	RATE COND (CFS)	VOL COND (AF)	RATE APEX (CFS)	VOL APEX (AF)	USE TYPE
21742.00000	1913-01-06	1908-07-01	1909-07-12	0	187	S	8.0000	0.0000	0.0000	0.0000	0.0000	0.0000	IRR

IRRIGATED ACRES SUMMARY -- TOTALS FROM VARIOUS SOURCES

GIS Total (Acres):		Reported:
Diversion Comments Total (Acres):	57.0	Reported: 2004
Structure Total (Acres):	57.0	Reported: 2002

IRRIGATED ACRES FROM GIS DATA -- BY CROP, YEAR, AND IRRIGATION METHOD

No GIS irrigated acres records to display

DIVERSION SUMMARY IN ACRE FEET - TOTAL THROUGH STRUCTURE

YEAR	FDU	LDU	DWC	MAXQ & DAY	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	TOTAL
1973	06/10	09/20	103	8.00 06/10	0	0	0	0	0	0	0	333	492	492	159	0	1476

1974	07/05	08/01	28	8.00	07/05	0	0	0	0	0	0	0	0	428	15.9	0	0	444
1975	07/10	09/09	62	8.00	07/10	0	0	0	0	0	0	0	0	349	492	143	0	984
1976	06/10	07/30	12	3.00	06/10	0	0	0	0	0	0	0	65.5	0.99	0	0	0	66.4
1978	07/10	07/31	22	1.00	07/10	0	0	0	0	0	0	0	0	43.6	0	0	0	43.6
1979	07/16	08/15	31	1.00	07/16	0	0	0	0	0	0	0	0	31.7	29.8	0	0	61.5
1980	05/25	07/20	17	4.00	05/25	0	0	0	0	0	0	55.5	0	19.8	0	0	0	75.4
1981	07/05	07/31	27	1.00	07/05	0	0	0	0	0	0	0	0	53.6	0	0	0	53.6
1982	06/01	06/15	15	2.00	06/01	0	0	0	0	0	0	0	59.5	0	0	0	0	59.5
1983	07/18	08/10	24	2.00	07/18	0	0	0	0	0	0	0	0	55.5	39.7	0	0	95.2
1984	06/15	07/31	17	2.00	06/15	0	0	0	0	0	0	0	27.8	39.7	0	0	0	67.4
1985	07/16	07/31	16	1.00	07/16	0	0	0	0	0	0	0	0	31.7	0	0	0	31.7
1986	07/15	07/31	17	1.00	07/15	0	0	0	0	0	0	0	0	33.7	0	0	0	33.7
1987	06/06	06/15	10	1.00	06/06	0	0	0	0	0	0	0	19.8	0	0	0	0	19.8
1988	06/01	07/17	17	1.00	06/01	0	0	0	0	0	0	0	19.8	13.9	0	0	0	33.7
1990	07/11	07/31	21	1.00	07/11	0	0	0	0	0	0	0	0	41.7	0	0	0	41.7
1991	07/16	07/31	16	1.00	07/16	0	0	0	0	0	0	0	0	31.7	0	0	0	31.7
1992	07/16	07/31	16	1.00	07/16	0	0	0	0	0	0	0	0	31.7	0	0	0	31.7
1993	06/11	07/31	25	2.00	06/11	0	0	0	0	0	0	0	31.7	33.7	0	0	0	65.5
1995	05/24	06/20	28	2.00	06/01	0	0	0	0	0	0	15.9	59.5	0	0	0	0	75.4
1996	05/21	06/08	19	1.00	05/21	0	0	0	0	0	0	21.8	15.9	0	0	0	0	37.7
1997	05/21	06/08	19	1.00	05/21	0	0	0	0	0	0	21.8	15.9	0	0	0	0	37.7
1998	05/21	06/15	26	1.00	05/21	0	0	0	0	0	0	21.8	29.8	0	0	0	0	51.6
1999	05/21	06/19	30	2.00	06/01	0	0	0	0	0	0	21.8	59.5	0	0	0	0	81.3
2000	05/04	06/29	57	4.00	05/22	0	0	0	0	0	0	190	157	0	0	0	0	347
2001	05/01	06/23	54	4.00	05/14	0	0	0	0	0	0	214	81.3	0	0	0	0	296
2002	04/14	06/09	55	2.50	04/14	0	0	0	0	0	26.2	35.7	5.36	0	0	0	0	67.2
2003	05/12	06/29	49	7.50	05/12	0	0	0	0	0	0	242	56.9	0	0	0	0	299
2004	03/28	04/25	29	2.00	03/28	0	0	0	0	15.9	58.5	0	0	0	0	0	0	74.4
AVE:	06/10	07/14	29	2.62	06/11	0	0	0	0	0.55	2.92	29.0	35.8	59.7	36.9	10.4	0	175

29 years with diversion records Average Flow = 3.05 CFS

Notes: The average considers all years with diversion records, even if no water is diverted.
The above summary lists total monthly diversions.
* = Infrequent data. All other values are derived from daily records.
Average values include infrequent data if infrequent data are the only data for the year.

DIVERSION COMMENTS

YEAR	COMMENTS
1977	Water available, but not taken
1989	No water is available
1994	No water is available
2002	No irrigation, didnt even keep ditch wet at pasture. (ACRES IRRIG = 0.000)

Note: Diversion comments and reservoir comments may be shown for a structure, if both are available.

STRUCTURE SUMMARY FOR: LAWRENCE DITCH 2

WATER DISTRICT: 47
ID NUMBER: 718
WATER SOURCE: ARAPAHOE CK AT STREAM MILE: 80.01
LOCATION: 6N 81W 36 NW NW IN JACKSON COUNTY
TOTAL IRRIGATED ACRES: See irrigated acres summary.
STRUCTURE TYPE: Headgate
CIU (CURRENTLY IN USE): Active Structure with contemporary diversion records
IS TRANSBASIN:
ESTIMATED CAPACITY:
DECREED CAPACITY (SUM OF ABSOLUTE NET AMOUNT RIGHTS): 2.0000 CFS
MEASURING DEVICE/RECORDER: 2 FT PF METAL
CONTACT: MOSSMAN, SHANNON
ADDRESS 1: 9721 SH14 COALMONT CO 80430

WATER RIGHTS TRANSACTION INFORMATION

ADMIN NO	ADJ DATE	APPRO DATE	COURT NO	DECREED RATE (CFS)	DECREED VOL. (AF)	ADJUDICATION TYPE	USES	COMMENT
13265.00000	1892-09-19	1886-04-26	CA0922	2.00		O	IRR	

WATER RIGHTS NET AMOUNT INFORMATION

ADMIN NO	ADJ DATE	PADJ DATE	APRO DATE	ORDER NO	PRIOR CASE NO	ADJ TYPE	RATE ABS (CFS)	VOL ABS (AF)	RATE COND (CFS)	VOL COND (AF)	RATE APEX (CFS)	VOL APEX (AF)	USE TYPE
13265.00000	1892-09-19		1886-04-26	0	24	O	2.0000	0.0000	0.0000	0.0000	0.0000	0.0000	IRR

IRRIGATED ACRES SUMMARY -- TOTALS FROM VARIOUS SOURCES

GIS Total (Acres):		Reported:
Diversion Comments Total (Acres):	45.0	Reported: 2004
Structure Total (Acres):	45.0	Reported: 2002

IRRIGATED ACRES FROM GIS DATA -- BY CROP, YEAR, AND IRRIGATION METHOD

No GIS irrigated acres records to display

DIVERSION SUMMARY IN ACRE FEET - TOTAL THROUGH STRUCTURE

YEAR	FDU	LDU	DWC	MAXQ	& DAY	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	TOTAL
1972	05/12	10/14	132	2.00	05/12	0	0	0	0	0	0	79.3	119	55.5	47.6	59.5	27.8	389

1973	05/10	10/31	175	5.00	09/01	0	0	0	0	0	0	87.3	119	123	123	298	299	1048
1974	05/06	07/10	66	1.00	05/06	0	0	0	0	0	0	51.6	59.5	19.8	0	0	0	131
1975	06/01	07/20	50	2.00	06/01	0	0	0	0	0	0	0	119	79.3	0	0	0	198
1976	05/20	07/20	62	2.00	05/20	0	0	0	0	0	0	47.6	99.2	41.7	0	0	0	188
1978	05/21	07/05	46	1.00	06/01	0	0	0	0	0	0	10.9	59.5	4.96	0	0	0	75.4
1979	06/01	07/05	35	1.00	06/01	0	0	0	0	0	0	0	59.5	9.92	0	0	0	69.4
1980	07/01	07/10	10	2.00	07/01	0	0	0	0	0	0	0	0	39.7	0	0	0	39.7
1981	06/01	07/15	24	2.00	06/01	0	0	0	0	0	0	0	55.5	39.7	0	0	0	95.2
1982	06/08	07/11	21	2.00	06/08	0	0	0	0	0	0	0	55.5	27.8	0	0	0	83.3
1983	06/03	07/15	28	2.00	06/03	0	0	0	0	0	0	0	71.4	39.7	0	0	0	111
1984	06/08	07/08	21	2.00	06/08	0	0	0	0	0	0	0	55.5	27.8	0	0	0	83.3
1985	05/23	07/12	30	2.00	05/23	0	0	0	0	0	0	35.7	55.5	27.8	0	0	0	119
1986	05/23	07/12	30	2.00	05/23	0	0	0	0	0	0	35.7	55.5	27.8	0	0	0	119
1987	06/01	07/01	21	2.00	06/01	0	0	0	0	0	0	0	79.3	3.97	0	0	0	83.3
1988	06/01	07/12	27	2.00	06/01	0	0	0	0	0	0	0	79.3	13.9	0	0	0	93.2
1989	05/22	06/19	29	0.50	05/22	0	0	0	0	0	0	9.92	18.8	0	0	0	0	28.8
1990	05/24	07/10	28	2.00	05/24	0	0	0	0	0	0	31.7	59.5	19.8	0	0	0	111
1991	06/11	07/15	21	2.00	06/11	0	0	0	0	0	0	0	39.7	43.6	0	0	0	83.3
1992	05/15	07/07	26	2.00	05/15	0	0	0	0	0	0	17.3	55.5	27.8	0	0	0	101
1993	06/01	07/17	47	4.00	06/18	0	0	0	0	0	0	0	151	61.5	0	0	0	212
1994	05/15	07/10	57	3.00	05/15	0	0	0	0	0	0	79.3	119	39.7	0	0	0	238
1995	06/13	07/19	21	3.50	06/13	0	0	0	0	0	0	0	64.5	53.6	0	0	0	118
1996	05/10	07/14	46	3.70	06/09	0	0	0	0	0	0	67.4	83.1	55.5	0	0	0	206
1997	05/08	07/07	39	2.00	06/01	0	0	0	0	0	0	25.8	75.4	13.1	0	0	0	114
1998	06/01	07/24	54	2.00	06/01	0	0	0	0	0	0	0	119	95.2	0	0	0	214
1999	05/25	07/07	44	2.00	05/25	0	0	0	0	0	0	27.8	119	27.8	0	0	0	175
2000	05/16	07/10	56	2.70	05/24	0	0	0	0	0	0	82.5	116	25.8	0	0	0	224
2001	05/21	07/17	58	2.00	05/21	0	0	0	0	0	0	41.7	89.3	51.8	0	0	0	183
2002	04/23	06/26	65	2.70	05/06	0	0	0	0	0	12.7	108	95.6	0	0	0	0	216
2003	04/28	07/08	72	4.00	05/04	0	0	0	0	0	18.4	162	122	21.0	0	0	0	324
2004	04/28	07/05	69	2.40	06/14	0	0	0	0	0	11.9	123	133	19.8	0	0	0	288
AVE:	05/23	07/17	47	2.27	05/31	0	0	0	0	0	1.35	35.2	81.3	35.6	5.33	11.2	10.2	180

32 years with diversion records Average Flow = 1.93 CFS

Notes: The average considers all years with diversion records, even if no water is diverted.
The above summary lists total monthly diversions.
* = Infrequent data. All other values are derived from daily records.
Average values include infrequent data if infrequent data are the only data for the year.

DIVERSION COMMENTS

YEAR	COMMENTS
2002	33% Hay Crop (Includes Lawrence 1). Reset Flum May 7, 2002. (ACRES IRRIG = 45.000)

Note: Diversion comments and reservoir comments may be shown for a structure, if both are available.

STRUCTURE SUMMARY FOR: LAWRENCE DITCH 1

WATER DISTRICT: 47
ID NUMBER: 719
WATER SOURCE: INDIAN CK of ARAPAHOE CK AT STREAM MILE: 81.64
LOCATION: 5N 81W 2 NE NE IN JACKSON COUNTY
TOTAL IRRIGATED ACRES: See irrigated acres summary.
STRUCTURE TYPE: Headgate
CIU (CURRENTLY IN USE): Active Structure with contemporary diversion records
IS TRANSBASIN:
ESTIMATED CAPACITY:
DECREED CAPACITY (SUM OF ABSOLUTE NET AMOUNT RIGHTS): 7.0000 CFS
MEASURING DEVICE/RECORDER: 3 FT PF METAL
CONTACT: MOSSMAN, SHANNON
ADDRESS 1: 9721 SH14 COALMONT CO 80430

WATER RIGHTS TRANSACTION INFORMATION

ADMIN NO	ADJ DATE	APPRO DATE	COURT NO	DECREED RATE (CFS)	DECREED VOL. (AF)	ADJUDICATION TYPE	USES	COMMENT
13619.00000	1892-09-19	1887-04-15	CA0922	5.00		O	IRR	
51134.50129	1990-12-31	1987-04-01	90CW0042	2.00		S	STK	

WATER RIGHTS NET AMOUNT INFORMATION

ADMIN NO	ADJ DATE	PADJ DATE	APRO DATE	ORDER NO	PRIOR CASE NO	ADJ TYPE	RATE ABS (CFS)	VOL ABS (AF)	RATE COND (CFS)	VOL COND (AF)	RATE APEX (CFS)	VOL APEX (AF)	USE TYPE
13619.00000	1892-09-19		1887-04-15	0	35	O	5.0000	0.0000	0.0000	0.0000	0.0000	0.0000	IRR
51134.50129	1990-12-31	1989-12-31	1987-04-01	0	90CW0042	S	2.0000	0.0000	0.0000	0.0000	0.0000	0.0000	STK

IRRIGATED ACRES SUMMARY -- TOTALS FROM VARIOUS SOURCES

GIS Total (Acres):		Reported:
Diversion Comments Total (Acres):	200.0	Reported: 2004
Structure Total (Acres):	269.0	Reported: 2002

IRRIGATED ACRES FROM GIS DATA -- BY CROP, YEAR, AND IRRIGATION METHOD

No GIS irrigated acres records to display

DIVERSION SUMMARY IN ACRE FEET - TOTAL THROUGH STRUCTURE

YEAR	FDU	LDU	DWC	MAXQ & DAY	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	TOTAL

1972	05/13	07/09	58	5.00	05/13	0	0	0	0	0	0	188	298	89.3	0	0	0	575
1973	05/10	07/15	67	5.00	05/10	0	0	0	0	0	0	218	298	149	0	0	0	664
1974	05/10	10/31	123	5.00	05/10	0	0	0	0	0	0	218	298	99.2	0	59.5	61.5	736
1975	06/01	07/20	50	6.00	06/01	0	0	0	0	0	0	0	357	238	0	0	0	595
1976	05/20	07/20	62	5.00	05/20	0	0	0	0	0	0	119	298	192	0	0	0	609
1978	05/21	07/05	46	5.00	05/21	0	0	0	0	0	0	109	298	24.8	0	0	0	431
1979	05/21	07/10	51	5.00	05/21	0	0	0	0	0	0	109	298	99.2	0	0	0	506
1980	05/20	10/20	70	6.26	05/20	0	0	0	0	0	0	149	252	0	0	21.8	39.7	463
1981	05/22	10/31	71	5.00	06/01	0	0	0	0	0	0	39.7	253	0	0	0	61.5	354
1982	05/22	07/07	47	6.00	06/01	0	0	0	0	0	0	99.2	357	55.5	0	0	0	512
1983	06/05	07/17	43	6.00	06/05	0	0	0	0	0	0	0	309	186	0	0	0	496
1984	06/05	10/31	102	7.00	06/05	0	0	0	0	0	0	0	343	149	0	44.6	46.1	583
1985	05/07	10/31	121	7.00	06/01	0	0	0	0	0	0	184	381	39.7	0	44.6	46.1	696
1986	05/16	10/31	112	7.00	06/01	0	0	0	0	0	0	159	381	49.6	0	59.5	61.5	710
1987	05/15	06/25	42	5.00	05/15	0	0	0	0	0	0	169	204	0	0	0	0	373
1988	05/26	06/30	36	5.00	05/26	0	0	0	0	0	0	59.5	248	0	0	0	0	307
1989	04/26	07/14	80	2.00	04/26	0	0	0	0	0	19.8	89.3	99.2	13.4	0	0	0	222
1990	05/02	07/05	65	5.00	05/02	0	0	0	0	0	0	298	222	9.92	0	0	0	530
1991	05/22	07/05	45	7.00	05/31	0	0	0	0	0	0	103	377	19.8	0	0	0	500
1992	04/11	06/30	81	7.00	05/23	0	0	0	0	0	39.7	232	300	0	0	0	0	571
1993	05/18	07/17	61	7.00	05/18	0	0	0	0	0	0	194	373	101	0	0	0	668
1994	05/15	06/30	47	7.00	05/15	0	0	0	0	0	0	236	198	0	0	0	0	434
1995	05/24	07/19	57	15.6	06/05	0	0	0	0	0	0	111	576	149	0	0	0	835
1996	05/22	07/14	54	7.00	05/22	0	0	0	0	0	0	139	353	69.4	0	0	0	561
1997	05/25	07/14	51	7.00	05/25	0	0	0	0	0	0	97.2	317	67.8	0	0	0	482
1998	05/25	07/14	51	6.00	06/01	0	0	0	0	0	0	69.4	313	83.3	0	0	0	466
1999	06/01	07/14	44	7.00	06/13	0	0	0	0	0	0	0	329	77.4	0	0	0	407
2000	05/11	08/28	110	7.30	05/24	0	0	0	0	0	0	129	249	51.6	27.8	0	0	457
2001	05/21	07/05	46	7.00	05/30	0	0	0	0	0	0	132	239	14.9	0	0	0	386
2002	04/23	06/19	58	3.50	05/06	0	0	0	0	0	11.9	152	55.5	0	0	0	0	220
2003	04/28	07/02	66	6.00	05/06	0	0	0	0	0	27.4	321	206	1.98	0	0	0	557
2004	04/23	06/22	61	5.00	05/07	0	0	0	0	0	38.9	263	58.0	0	0	0	0	360
AVE:	05/16	07/31	64	6.15	05/22	0	0	0	0	0	4.30	137	286	63.5	0.87	7.19	9.89	508

32 years with diversion records Average Flow = 4.00 CFS

Notes: The average considers all years with diversion records, even if no water is diverted.
The above summary lists total monthly diversions.
* = Infrequent data. All other values are derived from daily records.
Average values include infrequent data if infrequent data are the only data for the year.

DIVERSION COMMENTS

YEAR	COMMENTS
2002	No Hay Crop (ACRES IRRIG = 25.000)

Note: Diversion comments and reservoir comments may be shown for a structure, if both are available.

STRUCTURE SUMMARY FOR: INDIAN CK ARAP PASS D

WATER DISTRICT: 47
ID NUMBER: 4601
WATER SOURCE: INDIAN CK of ARAPAHOE CK AT STREAM MILE:
LOCATION: 5N 81W 23 SE SE IN JACKSON COUNTY
TOTAL IRRIGATED ACRES: See irrigated acres summary.
STRUCTURE TYPE: Headgate
CIU (CURRENTLY IN USE): Structure abandoned by the court
IS TRANSBASIN: YES
ESTIMATED CAPACITY:
DECREED CAPACITY (SUM OF ABSOLUTE NET AMOUNT RIGHTS):
MEASURING DEVICE/RECORDER:
CONTACT: GRAND RIVER RANCH (CLAIMANT)
ADDRESS 1: KREMMLING, CO 80452

WATER RIGHTS TRANSACTION INFORMATION

ADMIN NO	ADJ DATE	APPRO DATE	COURT NO	DECREED RATE (CFS)	DECREED VOL. (AF)	ADJUDICATION TYPE	USES	COMMENT
48484.00000	1982-12-31	1982-09-29	82CW0252	20.00		S,C	IRRRECFISSTKAUG	
48484.00000	1982-12-31	1982-09-29	82CW0252	20.00		S,C,AB	IRRRECFISSTKAUG	ABANDONED 12/31/1988

No water right net amounts records to display

IRRIGATED ACRES SUMMARY -- TOTALS FROM VARIOUS SOURCES

GIS Total (Acres): Reported:
Diversion Comments Total (Acres): Reported:
Structure Total (Acres): Reported:

IRRIGATED ACRES FROM GIS DATA -- BY CROP, YEAR, AND IRRIGATION METHOD

No GIS irrigated acres records to display

No annual amount records to display for diversions

STRUCTURE SUMMARY FOR: WEST ARAPAHOE FDR DITCH

WATER DISTRICT: 47
ID NUMBER: 2046
WATER SOURCE: ARAPAHOE CK AT STREAM MILE: 83.44
LOCATION: 5N 81W 12 NE SW IN JACKSON COUNTY
TOTAL IRRIGATED ACRES: See irrigated acres summary.
STRUCTURE TYPE: Headgate
CIU (CURRENTLY IN USE): Active Structure with contemporary diversion records
IS TRANSBASIN:
ESTIMATED CAPACITY:
DECREED CAPACITY (SUM OF ABSOLUTE NET AMOUNT RIGHTS): 3.0000 CFS
MEASURING DEVICE/RECORDER: NONE
CONTACT: MEYRING LIVESTOCK
ADDRESS 1: WALDEN, COLO.

WATER RIGHTS TRANSACTION INFORMATION

ADMIN NO	ADJ DATE	APPRO DATE	COURT NO	DECREED RATE (CFS)	DECREED VOL. (AF)	ADJUDICATION TYPE	USES	COMMENT
47116.41448	1979-12-31	1963-06-25	79CW0038	3.00		S	IRR	
47116.41448	1979-12-31	1963-06-25	79CW0038	3.75		S,C	IRR	
47116.41448	1979-12-31	1963-06-25	79CW0038	3.75		S,C,AB	IRR	

WATER RIGHTS NET AMOUNT INFORMATION

ADMIN NO	ADJ DATE	PADJ DATE	APRO DATE	ORDER NO	PRIOR CASE NO	ADJ TYPE	RATE ABS (CFS)	VOL ABS (AF)	RATE COND (CFS)	VOL COND (AF)	RATE APEX (CFS)	VOL APEX (AF)	USE TYPE
47116.41448	1979-12-31	1978-12-31	1963-06-25	0	79CW0038	S	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	IRR

IRRIGATED ACRES SUMMARY -- TOTALS FROM VARIOUS SOURCES

GIS Total (Acres):		Reported:
Diversion Comments Total (Acres):	35.0	Reported: 2003
Structure Total (Acres):	35.0	Reported: 2002

IRRIGATED ACRES FROM GIS DATA -- BY CROP, YEAR, AND IRRIGATION METHOD

No GIS irrigated acres records to display

DIVERSION SUMMARY IN ACRE FEET - TOTAL THROUGH STRUCTURE

YEAR	FDU	LDU	DWC	MAXQ & DAY	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	TOTAL

1982	04/01	04/30	30	1.30	04/01	0	0	0	0	0	77.4	0	0	0	0	0	0	77.4
1983	05/16	06/09	25	1.00	05/16	0	0	0	0	0	0	31.7	17.9	0	0	0	0	49.6
1984	05/16	06/09	25	1.00	05/16	0	0	0	0	0	0	31.7	17.9	0	0	0	0	49.6
1985	05/15	05/29	15	3.75	05/15	0	0	0	0	0	0	112	0	0	0	0	0	112
1986	04/20	05/21	32	3.00	04/20	0	0	0	0	0	65.5	125	0	0	0	0	0	190
1987	04/01	04/30	30	1.00	04/01	0	0	0	0	0	59.5	0	0	0	0	0	0	59.5
1988	04/01	05/14	44	3.00	04/15	0	0	0	0	0	151	83.3	0	0	0	0	0	234
1989	03/15	04/30	47	2.00	03/15	0	0	0	0	67.4	79.3	0	0	0	0	0	0	147
1990	03/26	04/30	36	2.00	03/26	0	0	0	0	23.8	99.2	0	0	0	0	0	0	123
1991	04/01	04/30	30	2.00	04/01	0	0	0	0	0	119	0	0	0	0	0	0	119
1992	04/01	04/30	30	1.00	04/01	0	0	0	0	0	59.5	0	0	0	0	0	0	59.5
1993	05/01	05/27	27	3.00	05/01	0	0	0	0	0	0	96.2	0	0	0	0	0	96.2
1995	04/01	05/23	53	3.00	05/11	0	0	0	0	0	59.5	117	0	0	0	0	0	177
1996	05/22	05/31	10	3.00	05/22	0	0	0	0	0	0	59.5	0	0	0	0	0	59.5
1997	05/14	05/20	7	3.00	05/14	0	0	0	0	0	0	41.7	0	0	0	0	0	41.7
1998	05/16	05/22	7	3.00	05/16	0	0	0	0	0	0	41.7	0	0	0	0	0	41.7
1999	05/01	05/10	10	2.00	05/01	0	0	0	0	0	0	39.7	0	0	0	0	0	39.7
2000	04/25	05/09	15	1.00	04/25	0	0	0	0	0	11.9	17.9	0	0	0	0	0	29.8
2001	05/03	07/05	64	2.00	05/03	0	0	0	0	0	0	104	62.5	4.96	0	0	0	172
2003	05/01	06/01	32	1.50	05/17	0	0	0	0	0	0	63.5	0.99	0	0	0	0	64.5
AVE:	04/22	05/19	28	2.13	04/25	0	0	0	0	4.56	39.1	48.2	4.96	0.25	0	0	0	97.1

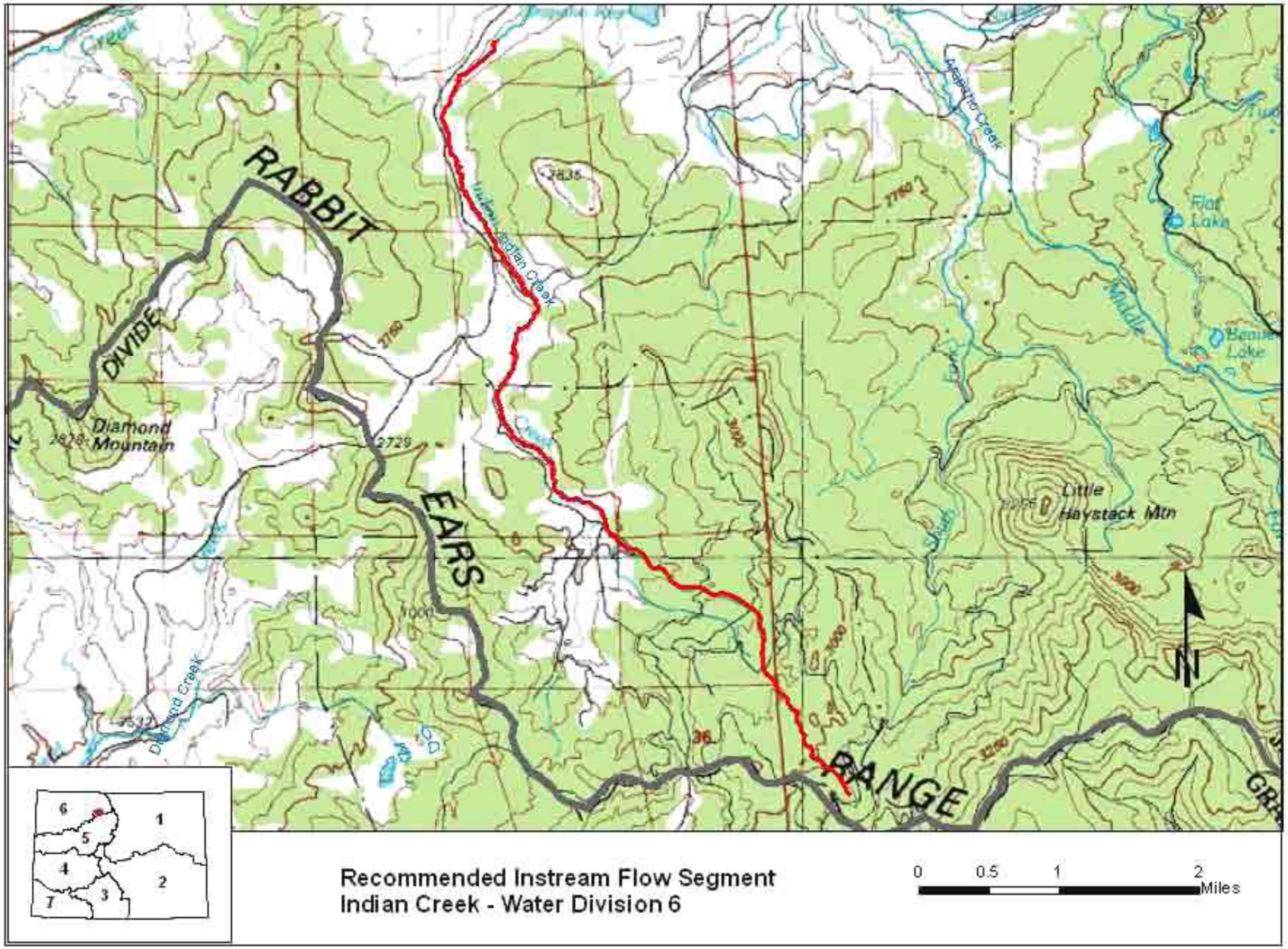
20 years with diversion records Average Flow = 1.75 CFS

Notes: The average considers all years with diversion records, even if no water is diverted.
The above summary lists total monthly diversions.
* = Infrequent data. All other values are derived from daily records.
Average values include infrequent data if infrequent data are the only data for the year.

DIVERSION COMMENTS

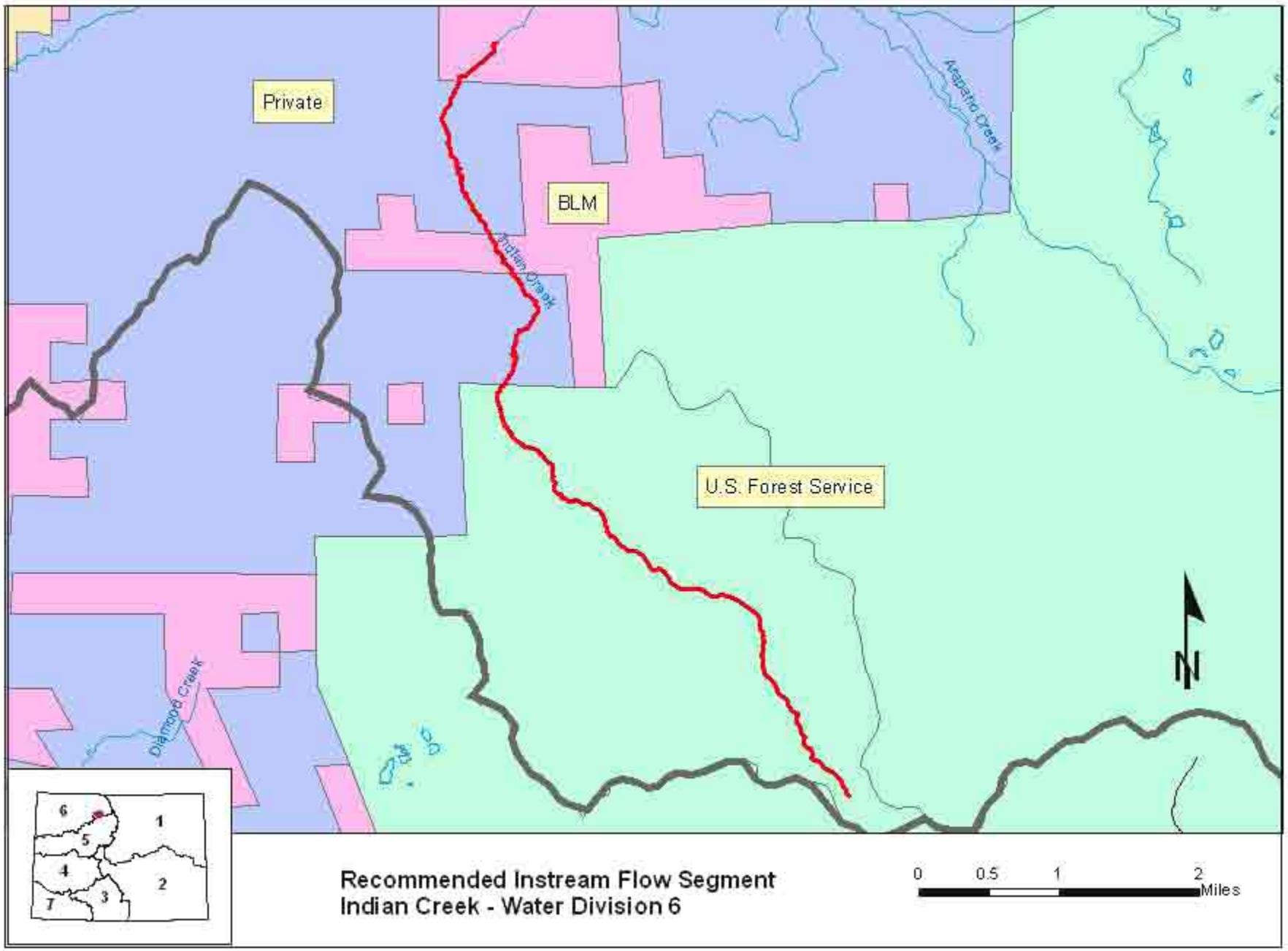
YEAR	COMMENTS
2002	No water is available
2004	No water is available

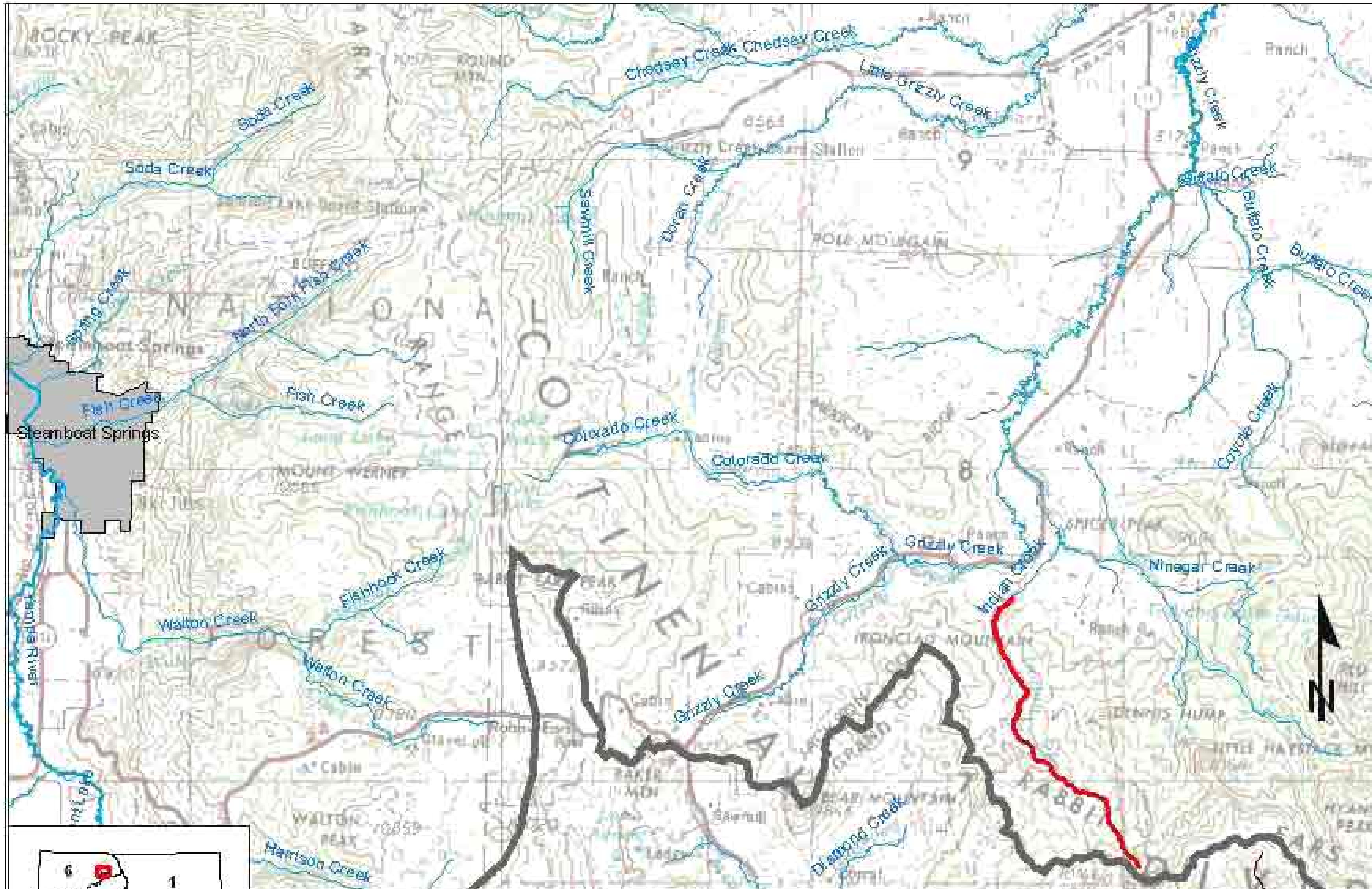
Note: Diversion comments and reservoir comments may be shown for a structure, if both are available.

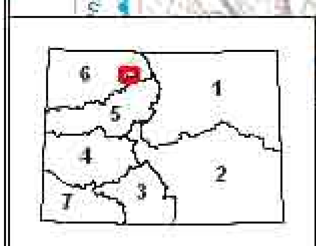


Recommended Instream Flow Segment
Indian Creek - Water Division 6

0 0.5 1 2 Miles


Private
BLM
U.S. Forest Service
Indian Creek
Arapaho Creek
Oldwood Creek
N
6
1
5
4
2
7
3
Recommended Instream Flow Segment
Indian Creek - Water Division 6
0
0.5
1
2
Miles





Recommended Instream Flow Segment
Indian Creek - Water Division 6