

VELOCITY PROFILE, WATER-SURFACE SLOPE, AND
BED-MATERIAL SIZE FOR SELECTED STREAMS
IN COLORADO

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METRIC CONVERSION FACTORS

Inch-pound units used in this report may be converted to International System (SI) units by using the following conversion factors:

<i>Multiply</i>	<i>By</i>	<i>To obtain</i>
foot (ft)	0.3048	meter
foot (ft)	304.8	millimeter
foot per second (ft/s)	0.3048	meter per second
cubic foot per second (ft ³ /s)	0.02832	cubic meter per second
acre-foot per year (acre-ft/yr)	0.001233	cubic hectometer per year
square mile (mi ²)	2.590	square kilometer
pound (lb)	0.4536	kilogram

VELOCITY PROFILE, WATER-SURFACE SLOPE, AND BED-MATERIAL SIZE FOR SELECTED STREAMS IN COLORADO

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ABSTRACT

Existing methods for determining the mean velocity in a vertical do not address the conditions present in high-gradient, shallow-depth streams common to mountainous regions such as Colorado. This report presents velocity-profile data that were collected for 11 streamflow-gaging stations in Colorado using both a standard Price type AA current meter and a prototype Price Model PAA current meter¹. Computational results are compiled that will enable mean velocities calculated from measurements by the two current meters to be compared with each other and with existing methods for determining mean velocity. Water-surface slope, bed-material size, and flow-characteristic data for the 11 sites studied also are presented.

INTRODUCTION

Purpose

Conventional current-meter measurement of discharge involves summing the discharge computed in each of 25 to 30 subsections spanning the stream cross section (Rantz and others 1982). The subsection discharges are computed by multiplying the subsection area by the corresponding subsection mean velocity. Accurate stream discharge measurement depends on several factors including reliable determination of subsection mean velocity and depth, and also the number of subsections. This report presents data associated with mean velocity determination.

High-gradient and shallow-depth streams such as those common to the mountainous regions of Colorado are characterized by very turbulent flow and relatively large bed material. Limited velocity-profile data was collected in high-gradient streams (slopes greater than 0.01) during previous studies (Jarrett, 1984). Jarrett's study indicated that the velocity profiles, or vertical-velocity curves, associated with these streams were nonlogarithmic. Most methods for determining mean velocity assume a logarithmic velocity profile. These methods may underestimate the mean velocity of nonlogarithmic velocity-profile data on high-gradient streams. Previous velocity-profile investigations usually have been limited to smooth flumes or moderately sloped, deep streams (O'Brien, 1937; Tracy and Lester, 1961; Savini and Bodhaine, 1971; Sarma and others, 1983). However, Bridge and Jarvis (1977)

¹Any use of brand names in this report is for descriptive purposes only and does not constitute endorsement by the U.S. Geological Survey.

collected velocity-profile data in a shallow stream with a coarse-sand and gravel bed. They found that the velocity profiles over dunes and other large roughness elements were nonlogarithmic. This report presents data that was collected to evaluate the magnitude of the problem of computing subsection mean velocity and to determine the hydraulic conditions where the problem exists.

The methods used to collect this velocity-profile data, as well as the data itself, are presented in this report. This completes the first phase of an ongoing research project examining mean velocity determination in high-gradient, shallow-depth streams. The next phase of the project involves evaluation and interpretation of this data and publication of the results. Evaluation will center around existing methods for determining mean velocity by current-meter measurement, their application in high-gradient, shallow-depth streams, needs of additional data collection, and whether new methods for determining mean velocity in these streams are needed.

Problems with computing mean velocity in high-gradient, shallow-depth streams could be widespread. Shallow-depth streams, defined herein as those with depths generally less than 5 feet, are common throughout mountainous areas. High-gradient streams also are not limited to Colorado. About 25 percent of the land area in the United States could be classified as steep terrain having water courses that may be described as high-gradient and shallow-depth streams. These land areas include the Western and Eastern Mountain States.

Subsequent analysis of the velocity-profile data presented in this report may enable improvement of discharge-measurement techniques in high-gradient, shallow-depth streams and indicate areas where additional data collection and research is needed. Improved accuracy of velocity and streamflow determination on high-gradient mountain streams would improve the results of hydrologic studies and hydraulic designs in these areas. Investigations in streamflow, determinations of flood magnitude and frequency, flood-plain studies, and the design of transportation facilities would benefit from improvements in discharge-measurement accuracy.

Approach

Several types of data are required to examine techniques for determining mean velocity in high-gradient, shallow-depth streams. Velocity-profile data are necessary to compute mean velocities and to evaluate existing methods for estimating mean velocity. Water-surface slope data are needed to determine stream gradient and to assess the effect of slope on the velocity profile and subsequent mean velocity determination. Data that adequately describe the characteristics of the streambed are necessary for examination of possible relationships between depth, bed-particle size, and mean velocity.

To assess the contribution of a new development in current meter design, two Price current meters, each equipped with a different type bucket wheel, were used to collect the velocity-profile data. Velocity profiles obtained using the standard Price type AA meter that is commonly used by the U.S. Geological Survey may be compared to those profiles obtained using a prototype

Price Model PAA meter currently being developed by the Survey. The Price Model PAA meter incorporates a Lexan polycarbonate polymer, solid-cup bucket wheel in place of the metal, open-cup bucket wheel common to the Price type AA meter. Both current meters were equipped with a cat's whisker contact chamber.

The hydrologic data in this report consists of point velocities obtained using both the Price type AA and Model PAA current meters at 11 streamflow-gaging stations in Colorado. Water-surface slope data and bed-material size data for each station also is presented. A total of 887 point velocity measurements were made with each current meter resulting in 94 velocity profiles for each meter.

Site Selection

Eleven streamflow-gaging stations were selected to provide a variety of flow conditions including water-surface slope, depth, and bed material. A general description of the stream reach at each station and the assigned site number are given in table 1. The location of the study area is shown in figure 1; the locations of the selected streamflow-gaging stations are shown in figure 2. To provide a basis for comparison, stations with moderate slopes of 0.001 (South Platte River) and 0.002 (Cache La Poudre River) were among those selected for the study. Water-surface slopes ranged from 0.001 at the South Platte River to 0.029 at Lake Creek. Observation depths ranged from 1.15 to 11.2 feet. Almost half of the velocity profiles were obtained in depths of less than 2.5 feet. Nine profiles were obtained in depths greater than 5.0 feet. Bed material ranged from sand to large boulders. Bed material at the South Platte River site was all sand, while the Lake Creek site contained boulders as large as 3 feet in diameter.

Table 1.--*Streamflow-gaging stations selected for velocity-profile study and corresponding water-surface slopes*

Site No.	Station number and name		Latitude	Longitude	Slope
1	06710500	Bear Creek at Morrison-----	39 39'11"	105 11'43"	0.022
2	06716500	Clear Creek near Lawson-----	39 45'57"	105 37'32"	0.005
3	06719505	Clear Creek at Golden-----	39 45'11"	105 14'05"	0.006
4	06752260	Cache La Poudre River at Fort Collins-----	40 35'17"	105 04'08"	0.002
5	06754000	South Platte River near Kersey--	40 24'44"	104 33'46"	0.001
6	07083700	Arkansas River near Malta-----	39 10'08"	106 19'23"	0.002
7	07084500	Lake Creek above Twin Lakes Reservoir-----	39 03'47"	106 24'26"	0.029
8	07086500	Clear Creek above Clear Creek Reservoir-----	39 01'05"	106 16'38"	0.008
9	07089000	Cottonwood Creek below Hot Springs, near Buena Vista-----	38 48'46"	106 13'18"	0.022
10	09046600	Blue River near Dillon-----	39 32'55"	106 02'19"	0.013
11	09050100	Tenmile Creek below North Fork Tenmile at Frisco-----	39 34'35"	106 06'30"	0.009

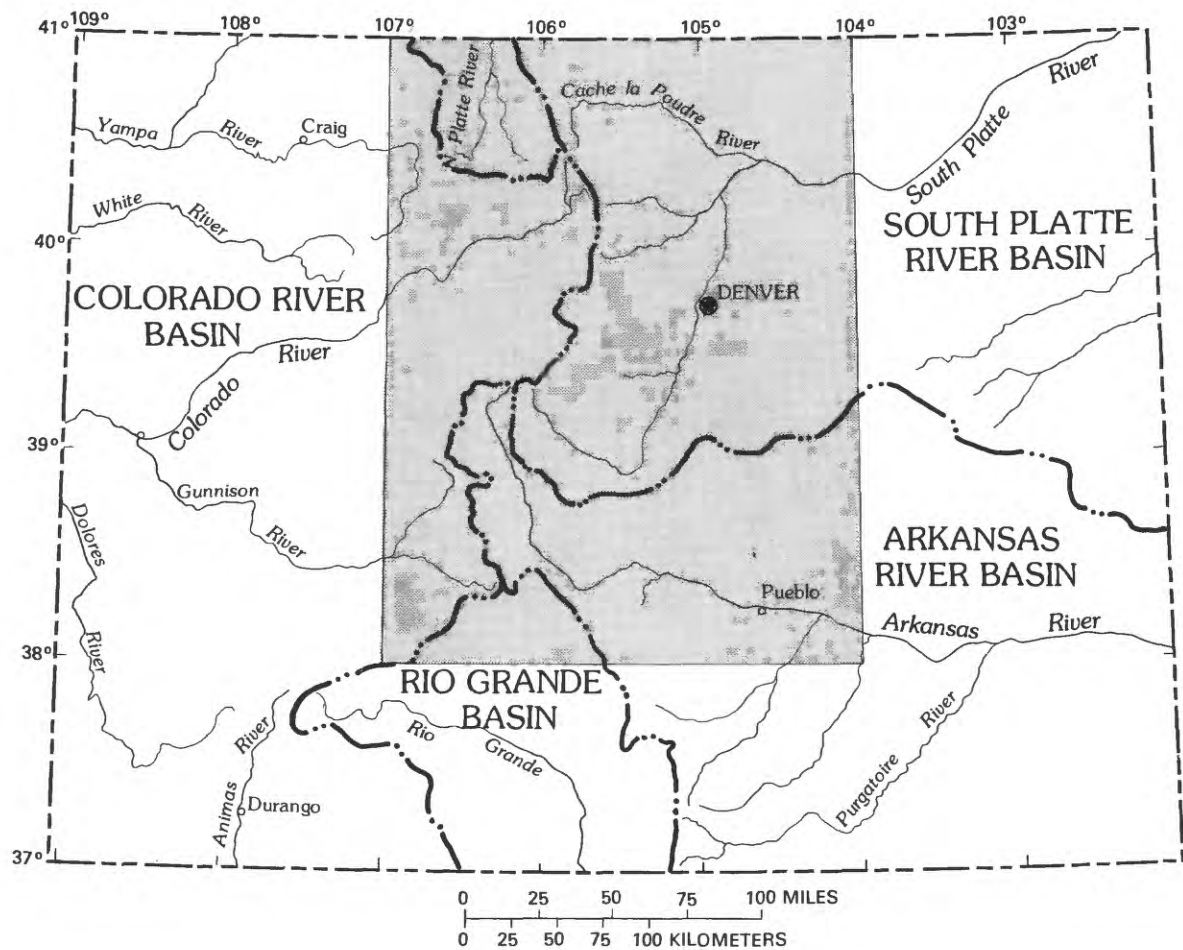


Figure 1.--Map of Colorado showing location of the study area.

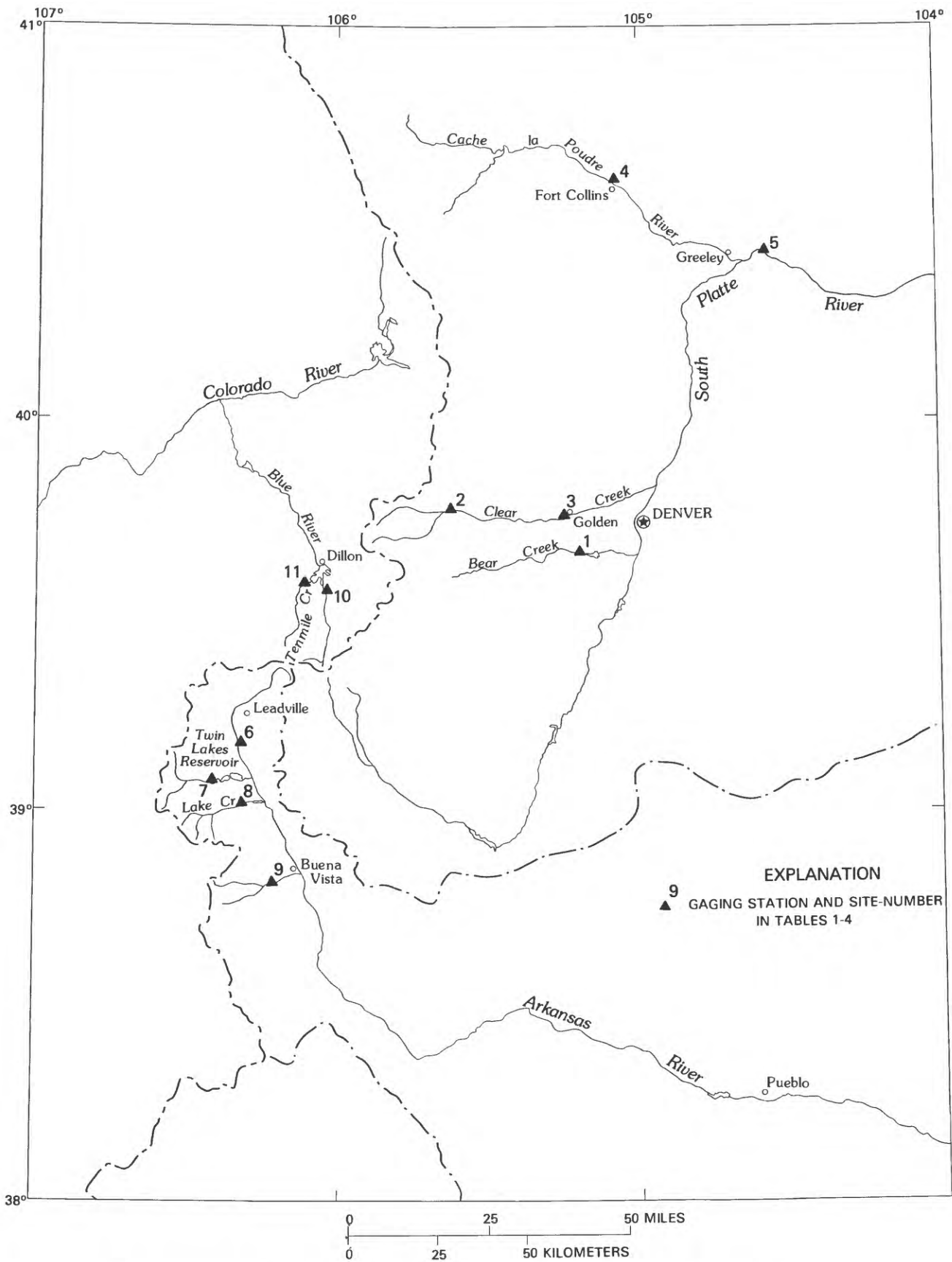


Figure 2.--Streamflow-gaging stations at which velocity-profile data were collected.

Most of the stations were located near bridges. At every station except the South Platte River and Cache La Poudre River sites, the bridges completely spanned the stream and had no piers and no encroachment on the stream width. Measurements on the South Platte River were made at the midpoint of the spans between piers; these spans were 45.5 feet wide. At the Cache La Poudre River, the bridge pier was 30 feet from the nearest vertical. For each station, details of the relationships between the measuring section location and nearby bridges are given in the Streamflow-gaging Station Description in the Tabulated Velocity-Profile Data section at the end of the report. In no instance were bridge piers or abutments felt to affect the flow at the section measured.

In general, selection of the streamflow-gaging stations was based on attaining as large a degree of variation in water-surface slope, depth, and bed material as possible. Sites were selected on streams that have a range of flow resulting from snowmelt so that changes in stage would be small during measurements. The maximum change in stage between velocity observations by the two current meters was 0.03 feet. Usually the stage was constant and no change occurred between observations. There are flow conditions that are not represented by the selected stations. For instance, deep, high-flow, high-gradient streams common in the Pacific Northwestern States were not included. The selected streams do, however, represent a good sampling of the type of streams normally found in Colorado and the Rocky Mountain States.

DATA COLLECTION

Each streamflow-gaging station listed in table 1 was visited at three different times to obtain velocity data for high-, medium-, and low-flow conditions. Velocity measurements were recorded only when the variation in gage height from previous visits was 0.5 foot or more. Therefore, two stations, site numbers 8 and 9, have only two sets of measurements.

During each measurement session velocities were measured at three or four verticals in the cross section using both the Price type AA current meter and the Price Model PAA current meter. Verticals were placed at the same locations in subsequent measurements. Within each vertical, point velocities were observed at intervals of 0.10 depth beginning at 0.10 depth (10 percent of total depth measured from the surface) and ending when the meter or sounding weight touched the top of the channel bed. An additional observation was made at 0.05 depth in each vertical. These intervals resulted in a significant number of point-velocity observations within 0.5 foot of the water surface or streambed. This is considered too close to the surface or streambed to give reliable results when using the Price type AA current meter; the meter may underregister when placed closer than 0.5 foot to the water surface or streambed (Pierce, 1941, p. 3; Buchanan and Somers, 1973, p. 31; Rantz and others, 1982, p. 132). Realizing that the point velocities observed close to the water surface or streambed may be unreliable, they are still presented in this report to allow for thorough examination of velocity profiles and mean velocities. Pierce (1941) took a similar approach when he observed point velocities very close to both the water surface and streambed to derive coefficients for determination of mean velocity in shallow-depth streams.

Photographs were taken depicting the flow conditions during each measurement session. The water-surface slope at each site was measured during two of the site visits. Bed-material data were collected during low-flow conditions.

Velocity Measurement

Measurements of velocity in streams most often are done to determine stream discharge. As noted in the Introduction of this report, the usual method for computing discharge is to sum the products of the subsectional mean velocities and the corresponding subsectional areas (Rantz and others, 1982). Methods for determining the subsectional mean velocity from point-velocity measurements are discussed briefly in the section "Mean Velocity". Point velocities normally are measured by use of a current meter. Two types of current meters, a standard Price type AA current meter and a prototype Price Model PAA current meter, were used in this study.

The Price type AA current meter (fig. 3) was used because it is the principal velocity measuring device used by the Survey (Rantz and others, 1982). Problems have been identified with using the Price type AA current meter where the velocities in the vertical are abnormally distributed by submerged objects such as large bed material (Rantz and others, 1982). The Price type AA current meter registers vertical-velocity components under the turbulent conditions that often exist in high-gradient streams (Townsend and Blust, 1960; Linsley and others, 1982, p. 104). Hence, recorded velocity is greater than the actual longitudinal velocity. Velocity-profile data were collected at two streams, sites 4 and 5, to evaluate the magnitude of the effects of turbulence on low-gradient streams.



Figure 3.--Price type AA current meter.

The Price Model PAA current meter and its solid-cup bucket wheel (fig. 4) were developed at the U.S. Geological Survey Gulf Coast Hydrosience Center. Laboratory experiments indicate that use of the solid-cup bucket wheel virtually eliminates the registration of vertical-velocity components (J.C. Futrell, U.S. Geological Survey, oral commun., 1984). Therefore, the Price Model PAA current meter would provide a more accurate reading of longitudinal velocity in turbulent streams than the Price type AA current meter. The solid-cup bucket wheel also is very durable.

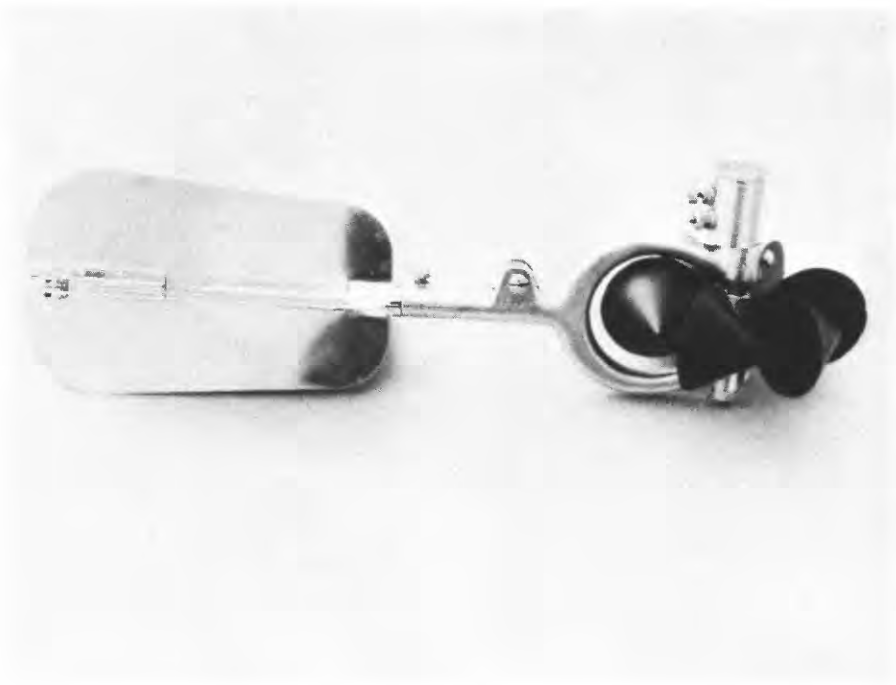


Figure 4.--Price Model PAA current meter.

Current-meter measurements were made by wading or by using a cableway or bridge whenever the stream was too deep or too swift to wade. When measuring from a cableway or bridge a 30-, 50-, 75-, or 100-pound Columbus weight was used depending on stream depth and swiftness. The current meters were placed 0.5 to 0.65 foot above the bottom of the weight. Flow depths were measured by standard techniques (Rantz and others, 1982).

The location of the deepest velocity observation was determined by the method of current-meter suspension and the presence of obstacles on the channel bottom. When it was necessary to suspend the current meter from a cable with a sounding weight, the current meter could be placed no closer than 0.5 foot above the channel bottom. If large boulders were present in the vertical, this minimum distance above the bottom was even less. For a stream only 3 feet deep, the deepest possible reading is at 0.83 depth. In some verticals a reading could not be obtained even at 0.80 depth.

The first set of velocity observations was made at Cottonwood Creek. Velocities across the entire cross section were recorded using first one of the two current meters, then the other. After the readings for the first current meter were completed, and the second current meter was placed in the water, the river stage had changed. To alleviate this problem in all subsequent observations, the current meters were alternated at each vertical. All point velocities in a vertical were measured using one of the current meters. Immediately afterwards, velocities were measured using the other current meter in the same vertical. Time between readings by different current meters was greatly reduced. No further problems with changing stage occurred. In all subsequent measurements the depths of flow in each vertical were the same for both current meters.

Placing each of the current meters in identical locations was difficult during cableway and bridge measurements. High velocities and turbulent flow conditions caused the current meters to move horizontally, even when heavy sounding weights were used. There were no problems with vertical angles. The cableways and bridges were all close to the water surface and depths were usually shallow. When measurements were made while wading, exact placement of the wading rod using alternate current meters was difficult at times because of swift flow and shifting cobble and gravel on the channel bottom.

Water-Surface Measurement

Water-surface measurements were necessary to describe conditions in the stream reach studied. Water-surface elevations were obtained by transit stadia survey made on two occasions at each site. Water-surface elevation readings usually were made at one point upstream of the measurement section, at the measurement section, and at a point downstream of the measurement section. Total horizontal distance of the slope measurement was normally about two and a half times the stream width. Because of the often greatly fluctuating water-surface and the soft bottom conditions sometimes found, it was difficult to exactly locate the water surface.

Bed-Material-Size Measurement

Bed-material data was collected at each station. Because of the range of bed-material size usually found, the Wolman method was used (Wolman, 1954; Benson and Dalrymple, 1967). A measuring tape was stretched across the full width of the stream, perpendicular to the stream axis. Particles were examined at intervals along the tape, usually at 3-foot intervals. Additional rows of particles were examined 3 feet upstream and 3 feet downstream of the tape.

The tape then was moved and measurements were repeated until a grid was completed that spanned the entire stream for a distance of usually 15 feet. The grid normally started 3 feet downstream of the measurement section and extended 12 feet upstream of the measurement section. The particle of bed material below each grid point was sampled by recording the short, intermediate, and long diameters, by recording which of these diameters were oriented vertically and horizontally, and also by estimating Krumbein roundness (Krumbein, 1941). Bed material was returned as close as possible to its original location and position in the stream. Bed material at a typical station is shown in figure 5. When significant amounts of fine material were found, bulk samples of the fine material near the surface of the bed were obtained, and a standard sieve analysis was conducted (Benson and Dalrymple, 1967). Bulk samples were obtained at the Cache La Poudre River and South Platte River sites. No measures of bed form were made at either site because of the high-flow conditions. Boils were noted during all three measurements at the South Platte River site and are indicative of dune bed forms (Simons and Senturk, 1976).



Figure 5.--Upstream view of rough bed material, Bear Creek at Morrison, October 18, 1983.

Some minor problems arose while collecting bed-material-size data. Large boulders and embedded particles had to be measured in place. Only two of the three particle diameters could be measured when the particle was embedded in the stream bottom. An interesting problem existed at the Cache La Poudre River at Fort Collins. Here, large strips of fine sandy material were bordered by bedrock and large particles. The Wolman method was used as described at the beginning of this section. When the large strips of fines were observed, bulk samples were collected. These bulk samples were combined, and a single, composite sieve analysis was made. The sieve and Wolman pebble-count data were then combined into a single overall size-frequency distribution. This was accomplished by: (1) Computing separate frequency distributions for the sieve data and the pebble-count data; and (2) combining the two distributions into one by weighting each size class percentage by the proportion of bed surface area occupied by the large stones or the fine sand. The method is described in detail by Williams and Guy (1973, p. 44-45) and by Benson and Dalrymple (1967, p. 19-20). At the Cache La Poudre River station 11 percent of the surface area was bedrock. The vertical height of the smooth, rounded bedrock was measured, and the particle size-frequency distribution was completed using the bedrock vertical height as an intermediate diameter (Benson and Dalrymple, 1967, p. 20). If the bedrock vertical height was assumed equal to zero, very little change occurred in the high and low ends of the size-frequency distribution. Therefore, the bedrock measurements were excluded when constructing particle size-frequency distributions for the short and long diameters. This produced consistent results between frequency distributions for the short, intermediate, and long diameters as shown in tables 2, 3, and 4. The method of dealing with the bedrock measurements, therefore, is considered satisfactory.

Table 2.--Summary of short diameter (c-axis) bed material

Site number	Statistical size distribution, in feet, shown for the following percentiles							Particles vertically oriented (percent)	Particles horizontally oriented (percent)
	16	25	50	75	84	90	95		
1	-----	0.05	0.12	0.26	0.34	0.45	0.70	93	3
2	0.04	.06	.17	.35	.47	.60	.78	93	5
3	.06	.08	.15	.26	.33	.40	.51	91	7
4 ¹	.001	.002	.12	.37	.50	.57	.62	93	2
5 ²	-----	-----	-----	-----	-----	-----	-----	--	-
6	.08	.10	.16	.22	.26	.32	.43	92	5
7	.17	.22	.38	.61	.77	.96	1.25	91	4
8	.04	.05	.10	.20	.28	.37	.52	93	2
9	.11	.15	.27	.43	.54	.67	.83	80	6
10	.08	.10	.16	.26	.33	.39	.49	94	0
11	.10	.13	.23	.35	.43	.54	.68	89	6

¹Combined Wolman method and sieve analysis (Wolman, 1954).

²Sieve analysis only.

Table 3.--Summary of intermediate diameter (b-axis) bed material

Site number	Statistical size distribution, in feet, shown for the following percentiles							Particles vertically oriented (percent)	Particles horizontally oriented (percent)	Average Krumbein roundness ³
	16	25	50	75	84	90	95			
1	0.04	0.08	0.20	0.49	0.74	1.05	1.45	3	34	0.4
2	.07	.15	.35	.64	.81	1.00	1.35	5	62	.5
3	.08	.15	.29	.50	.67	.85	1.10	8	62	.4
4 ¹	.001	.002	.18	.98	1.90	2.80	3.80	2	52	.4
5 ²	.001	.002	.003	.019	.04	.06	.08	--	--	--
6	.19	.24	.35	.44	.51	.61	.80	7	61	.5
7	.30	.42	.81	1.25	1.53	1.78	2.15	6	61	.4
8	.05	.10	.19	.33	.49	.68	.94	5	72	.4
9	.18	.26	.52	.94	1.25	1.60	2.05	14	54	.4
10	.14	.20	.36	.54	.64	.75	.92	6	57	.5
11	.17	.25	.40	.60	.76	.96	1.25	11	58	.4

¹Combined Wolman method and sieve analysis (Wolman, 1954).²Sieve analysis only.³Krumbein, 1941.

Table 4.--Summary of long diameter (a-axis) bed material

Site number	Statistical size distribution, in feet, for the following percentiles							Particles vertically oriented (percent)	Particles horizontally oriented (percent)
	16	25	50	75	84	90	95		
1	-----	0.09	0.27	0.66	0.96	1.35	2.20	4	63
2	0.07	.18	.50	.93	1.18	1.45	1.95	2	33
3	.09	.21	.47	.78	1.00	1.25	1.55	1	43
4 ¹	.001	.002	.20	2.40	3.70	4.35	5.20	5	46
5 ²	-----	-----	-----	-----	-----	-----	-----	-	--
6	.27	.34	.49	.64	.74	.87	1.10	1	34
7	.56	.74	1.30	1.85	2.15	2.50	3.00	3	35
8	.05	.12	.29	.45	.61	.87	1.35	2	26
9	.27	.39	.81	1.35	1.75	2.10	2.55	6	40
10	.22	.30	.52	.79	.96	1.15	1.35	0	43
11	.24	.33	.58	.90	1.13	1.35	1.60	0	36

¹Combined Wolman method and sieve analysis (Wolman, 1954).²Sieve analysis only.

DATA COMPILATION

The data were compiled and basic calculations completed. Computations of several important characteristics, velocity profiles, and bed-material size-frequency distributions were made by standard methods.

Mean Velocity

The mean velocity in a vertical may be obtained from velocity observations at many points in that vertical (Rantz and others, 1982). This method, commonly called the vertical-velocity curve method, was used to compute the mean velocity in each vertical, for each current meter. Observations were made at points distributed as previously described between the water surface and the streambed. The mean velocity in each vertical was computed by weighting each observed velocity in proportion to its corresponding increment of depth (Hulsing and others, 1966).

There are numerous methods of estimating the mean velocity in a vertical from only a few point-velocity observations (Rantz and others, 1982). Probably the two most common methods are the two-point and the six-tenths-depth methods.

In the two-point method, velocity observations are made at 0.2 and 0.8 depth in each vertical. The mean velocity in the vertical is assumed equal to the arithmetic average of the two readings. This method normally is used in depths greater than 2.5 feet when using a Price type AA current meter. In shallower depths, the current meter is within 0.5 foot of the surface or streambed.

In the six-tenths-depth method, a single observation of velocity in the vertical at 0.6 depth is assumed equal to the mean velocity. This method is used when the measurement needs to be completed rapidly or when a reading cannot be obtained at 0.8 depth. When a Price type AA current meter is being used, the six-tenths-depth method normally is used if the depth of flow is between 1.5 and 2.5 feet. In shallower depths, the current meter may be affected by proximity to the streambed.

The presence of submerged objects such as large boulders will distort the vertical-velocity curve (Rantz and others 1982). When this distortion occurs, use of the three-point method of computing mean velocity in a vertical has been recommended (Rantz and others, 1982). Usually, the average of the 0.2 and 0.8 depth readings is averaged with the 0.6 depth reading to obtain the mean velocity. If more emphasis on the 0.2 and 0.8 depth readings is desired, then all three readings may be averaged directly. When using a Price type AA meter, depths need to be greater than 2.5 feet to apply this method.

Velocity Profiles

For every vertical, velocity profiles were constructed using data from both the standard Price type AA current meter and the prototype Price Model PAA current meter. A typical profile resulting from this study, with a logarithmic velocity profile superimposed, is shown in figure 6. In the ratio of point velocity to mean velocity, v/V , the mean velocity V is the mean velocity determined by the vertical-velocity curve method for each current meter. The point at which the profile crosses the $v/V=1.0$ line is the observation depth to total depth ratio at which the point velocity equals the mean velocity.

Water-Surface Slope

Water-surface slope was determined from the water-surface elevations at each site. The average of two measured slope values was taken to represent the stream water-surface slope.

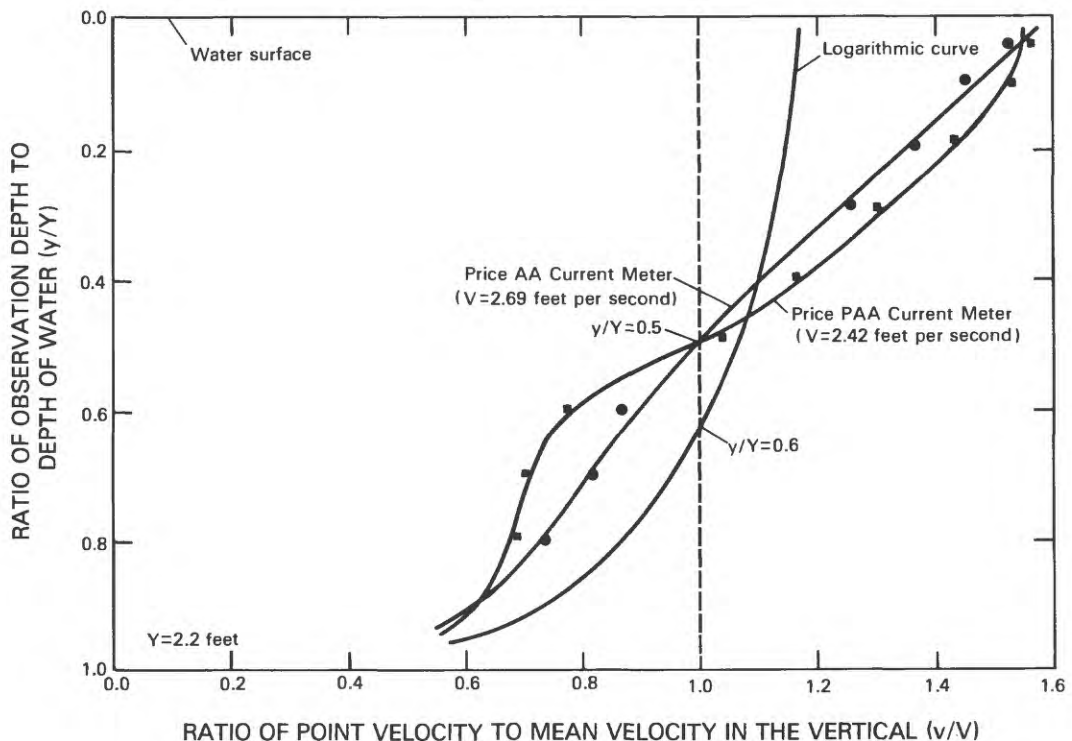


Figure 6.--Velocity profiles, Lake Creek above Twin Lakes Reservoir at station 22.9 feet, August 16, 1983.

Bed-Material Size

Stream bed-material size was described by constructing particle size-frequency distributions in accordance with standard practice (Benson and Dalrymple, 1967). Particle size-frequency distributions were constructed from short, intermediate, and long diameter data. A typical frequency distribution is shown in figure 7. The results of the particle size-frequency distributions for the short, intermediate, and long diameters are summarized in tables 2, 3, and 4. The tables also indicate what percentage of the particles had the particular diameter oriented vertically or horizontally. For each site, the average Krumbein roundness estimate is given in table 3.

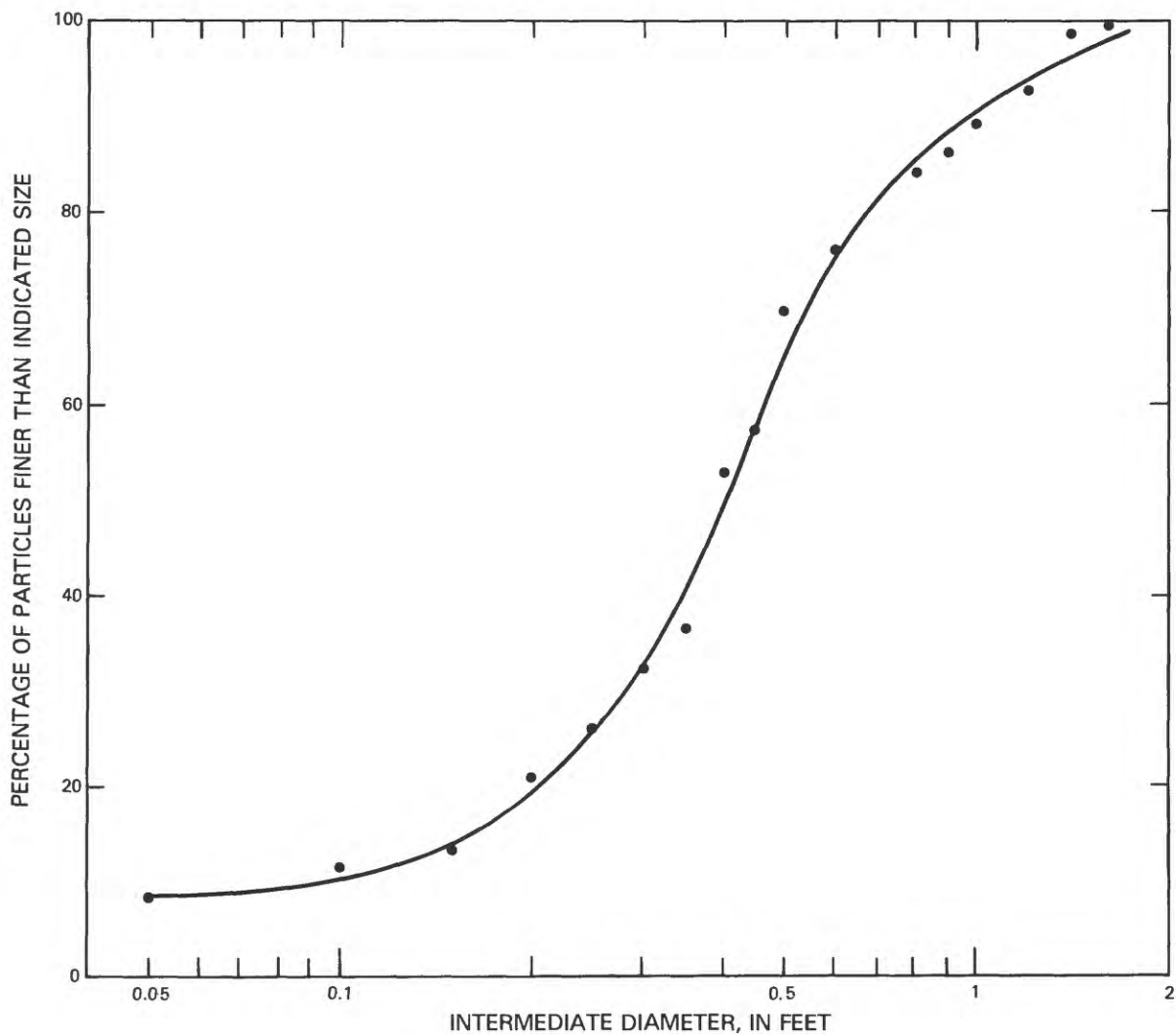


Figure 7.--Frequency distribution of intermediate diameter bed material, Tenmile Creek below North Fork Tenmile at Frisco.

DATA FORMAT

The data in the Tabulated Velocity-Profile Data section at the back of this report has been compiled by streamflow-gaging station, by date and gage height, and by the cross-section station number of the vertical. Descriptions of the streamflow-gaging stations, the velocity-profile data, and the flow characteristics for each vertical are presented. Detailed descriptions of the abbreviations used are given at the beginning of the Tabulated Velocity-Profile Data section.

Streamflow-Gaging Station Description

Included in each station description are: Station name and number, gage location, drainage area, average discharge, and gage datum (U.S. Geological Survey, 1981; 1982a; 1982b). Details of the relationship between measurement section location and nearby bridges are presented under the "Measurement Section Location" subheading. Photographs for higher and lower flows also are presented for each site following its station description.

Velocity-Profile Data

Velocity-profile data includes: total depth, method used to collect the data, observation depth to total depth ratio, observation depth, point velocities recorded by the Price type AA current meter and the Price Model PAA current meter, percent difference between the point velocities of the two current meters, mean velocity for each current meter, ratio of point velocity to appropriate mean velocity, and the percent difference between the two mean velocities in each vertical. Computations of percent difference were computed using the Price Model PAA current meter results as the basis.

Flow Characteristics

For each current meter, the flow characteristics computed in each vertical include: Velocity-head coefficient, Froude number, estimated mean velocity by the six-tenths-depth method and by the two-point method, and percent difference between these estimated velocities and the mean velocity computed by the vertical-velocity curve method. The velocity-head coefficient α , was computed by the following formula:

$$\alpha = \frac{\sum(v^3 \Delta y)}{V^3 Y} \quad (1)$$

Froude number F, was computed as:

$$F = \frac{V}{\sqrt{gY \cos \theta / \alpha}} \quad (2)$$

All selected stations have slopes less than 6 degrees. Therefore, $\cos \theta$, the slope effect correction, is considered equal to 1.0 (Chow, 1959, p. 33).

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TABULATED VELOCITY-PROFILE DATA

TABULATED VELOCITY-PROFILE DATA

TERMS, SYMBOLS, AND ABBREVIATIONS

STATION:	Station number within the cross section defined by the distance, in feet, from an arbitrary point on the left bank of the stream.
LEW:	Left edge of water, in feet, from the same arbitrary point on the left bank.
REW:	Right edge of water, in feet, from the same arbitrary point on the left bank.
TYPE OF MEAS:	Type of current-meter measurement used to collect the velocity data; 'WADING' indicates measurement was made by wading. 'BRIDGE' indicates measurement was made from a bridge. 'CABLEWAY' indicates measurement was made from a cableway.
Y:	Total depth, in feet, in the vertical.
y:	Observation depth, in feet below the water surface.
y/Y:	Ratio of observation depth to total depth.
AA:	Price type AA current meter.
PAA:	Price Model PAA current meter, with solid-cup bucket wheel.
v:	Point velocity in feet per second.
PCT DIFF:	Percent difference between velocities with the PAA velocity used as a basis.
V:	Mean velocity by vertical-velocity curve method, in feet per second.
v/V:	Ratio of point velocity to vertical-velocity curve mean velocity.
ALPHA:	Velocity-head coefficient.
F:	Froude number.
V.6:	Mean velocity by the six-tenths-depth method, in feet per second.
V.2-.8:	Mean velocity by the two-point method, in feet per second.
PCT OF MEAN:	Percent difference between V.6 or V.2-.8 and the corresponding vertical-velocity curve mean velocity.

06710500 BEAR CREEK AT MORRISON, CO

LOCATION.--Lat 39°39'11", long 105°11'43", in SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec.35, T.4 S., R.70 W., Jefferson County, Hydrologic Unit 10190002, on left bank at Morrison, 180 ft (55 m) upstream from bridge on State Highway 8 and 0.2 mi (0.3 km) upstream from Mount Vernon Creek.

DRAINAGE AREA.--164 mi² (425 km²).

AVERAGE DISCHARGE.--67 years (water years 1891, 1897, 1899, 1901, 1920-82), 52.4 ft³/s (1.484 m³/s), 37,960 acre-ft/yr (46.8 hm³/yr).

GAGE DATUM.--5,780.43 ft (1,761.875 m).

MEASUREMENT SECTION LOCATION.--At upstream edge of Highway 285 bridge.



Figure 8.--Cross-stream view from right bank of Bear Creek:
A, June 7, 1983; B, July 20, 1983.

DATE: June 7, 1983 GAGE HEIGHT= 6.07 FT LEW: - REW: -

STATION: 20.0 FT Y= 2.3 FT TYPE OF MEAS: BRIDGE

Y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.11	5.45	3.94	38.3	1.23	1.00
0.10	0.23	5.45	4.73	15.2	1.23	1.20
0.20	0.46	5.64	5.49	2.7	1.27	1.40
0.30	0.69	6.06	5.25	15.4	1.36	1.34
0.40	0.92	6.06	5.49	10.4	1.36	1.40
0.50	1.15	5.45	5.25	3.8	1.23	1.34
0.60	1.39	4.37	4.38	-0.2	0.98	1.11
0.70	1.61	3.72	3.38	10.1	0.84	0.86
0.80	1.84	3.31	2.37	39.7	0.74	0.60
1.00	2.30	0.00	0.00	0.0	0.00	0.00
MEAN(FT/S):		4.44	3.93	PCT DIFF IN MEAN VELOCITIES= 13.1		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.39	0.61	4.37	-1.7	4.47	0.7
PAA	1.46	0.55	4.38	11.5	3.93	0.0

STATION: 25.0 FT Y= 2.7 FT TYPE OF MEAS: BRIDGE

Y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.13	10.12	9.78	3.5	1.71	1.71
0.10	0.27	9.54	9.78	-12.7	1.44	1.71
0.20	0.54	7.78	8.52	-8.7	1.32	1.49
0.30	0.81	7.26	7.12	2.0	1.23	1.24
0.40	1.08	6.67	6.57	1.5	1.13	1.15
0.50	1.35	5.84	6.01	-2.8	0.99	1.05
0.60	1.62	5.84	5.49	6.4	0.99	0.96
0.70	1.89	5.20	5.63	-7.6	0.88	0.98
0.80	2.16	4.37	2.21	97.7	0.74	0.39
1.00	2.70	0.00	0.00	0.0	0.00	0.00
V(FT/S):		5.91	5.73	PCT DIFF IN MEAN VELOCITIES= 3.2		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.48	0.77	5.84	-1.3	6.07	2.7
PAA	1.72	0.81	5.49	-4.2	5.36	-6.4

STATION: 30.0 FT Y= 3.0 FT TYPE OF MEAS: BRIDGE

Y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.15	11.45	12.68	-9.7	1.49	1.86
0.10	0.30	13.59	13.66	-0.5	1.77	2.00
0.20	0.60	11.45	10.92	4.9	1.49	1.60
0.30	0.90	9.67	9.39	3.0	1.26	1.37
0.40	1.20	7.43	6.57	13.1	0.97	0.96
0.50	1.50	6.54	5.91	10.7	0.85	0.87
0.60	1.80	5.55	5.03	10.3	0.72	0.74
0.70	2.10	6.41	4.61	39.0	0.84	0.67
0.80	2.40	7.26	4.08	77.9	0.95	0.60
1.00	3.00	0.00	0.00	0.0	0.00	0.00
V(FT/S):		7.67	6.83	PCT DIFF IN MEAN VELOCITIES= 12.3		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.57	0.98	5.55	-27.7	9.35	21.9
PAA	2.00	0.98	5.03	-26.4	7.50	9.8

STATION: 35.0 FT Y= 2.4 FT TYPE OF MEAS: BRIDGE

Y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.12	10.62	9.07	17.1	1.54	1.46
0.10	0.24	12.55	10.67	17.6	1.82	1.72
0.20	0.48	13.32	11.45	16.3	1.94	1.85
0.30	0.72	10.12	10.21	-0.9	1.47	1.65
0.40	0.96	8.71	8.32	4.7	1.27	1.34
0.50	1.20	5.02	7.76	-35.3	0.73	1.25
0.60	1.44	8.17	7.12	14.7	1.19	1.15
0.70	1.68	5.64	1.90	196.8	0.82	0.31
0.80	1.92	0.29	0.31	-6.5	0.04	0.05
1.00	2.40	0.00	0.00	0.0	0.00	0.00
V(FT/S):		6.88	6.20	PCT DIFF IN MEAN VELOCITIES= 10.9		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	2.24	1.17	8.17	18.8	6.80	-1.1
PAA	2.28	1.07	7.12	14.8	5.88	-5.2

STATION: 20.0 FT Y= 1.60 FT TYPE OF MEAS: WADING						
y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.08	3.50	3.38	3.6	1.45	1.34
0.10	0.16	3.43	3.23	6.2	1.42	1.28
0.20	0.32	3.28	3.38	-3.0	1.36	1.34
0.30	0.48	2.92	3.16	-7.6	1.21	1.25
0.40	0.64	2.63	2.96	-11.1	1.09	1.17
0.50	0.80	2.61	2.63	-0.8	1.08	1.04
0.60	0.96	2.24	2.32	-3.4	0.93	0.92
0.70	1.12	1.63	2.26	-27.9	0.68	0.89
0.80	1.28	1.92	1.90	1.1	0.80	0.75
0.90	1.44	1.67	1.70	-1.8	0.69	0.67
1.00	1.60	0.00	0.00	0.0	0.00	0.00
V(FT/S): 2.41 2.53				PCT DIFF IN MEAN VELOCITIES= -4.6		
FLOW CHARACTERISTICS:						
METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.33	0.39	2.24	-7.0	2.60	7.9
PAA	1.27	0.40	2.32	-8.2	2.64	4.5

STATION: 25.0 FT Y= 1.90 FT TYPE OF MEAS: WADING						
y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.09	3.28	3.02	9.6	1.05	1.10
0.10	0.19	3.37	3.30	2.1	1.07	1.21
0.20	0.33	3.50	3.46	1.2	1.12	1.26
0.30	0.57	3.57	3.38	5.6	1.14	1.23
0.40	0.76	3.65	3.55	2.3	1.16	1.30
0.50	0.95	3.57	3.23	10.5	1.14	1.18
0.60	1.14	3.37	2.63	28.1	1.07	0.96
0.70	1.33	3.21	2.58	24.4	1.02	0.94
0.80	1.52	3.06	2.52	21.4	0.98	0.92
0.90	1.71	2.44	1.28	90.6	0.78	0.47
1.00	1.90	0.00	0.00	0.0	0.00	0.00
V(FT/S): 3.14 2.74				PCT DIFF IN MEAN VELOCITIES= 14.6		
FLOW CHARACTERISTICS:						
METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.14	0.43	3.37	7.5	3.28	4.5
PAA	1.27	0.39	2.63	-3.9	2.99	9.2

STATION: 30.0 FT Y= 2.20 FT TYPE OF MEAS: WADING							
y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V	
0.05	0.11	9.67	9.58	0.9	1.75	1.75	
0.10	0.22	7.26	7.59	-4.3	1.32	1.38	
0.20	0.44	6.36	7.43	-6.3	1.26	1.35	
0.30	0.66	6.81	6.70	1.6	1.23	1.22	
0.40	0.88	6.41	5.91	8.5	1.16	1.08	
0.50	1.10	5.45	5.03	8.3	0.99	0.92	
0.60	1.32	4.65	4.61	0.7	0.84	0.84	
0.70	1.54	4.26	4.50	-5.3	0.77	0.82	
0.80	1.76	4.46	4.40	1.4	0.81	0.80	
0.90	1.98	3.50	3.38	3.6	0.63	0.62	
1.00	2.20	0.00	0.00	0.0	0.00	0.00	
V(FT/S): 5.52 5.48				PCT DIFF IN MEAN VELOCITIES= 0.7			
FLOW CHARACTERISTICS:							
METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN	
AA	1.40	0.78	4.65	-15.8	5.71	3.4	
PAA	1.42	0.78	4.61	-15.9	5.91	7.9	

STATION: 35.0 FT Y= 1.90 FT TYPE OF MEAS: WADING						
y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.09	3.72	3.79	-1.8	1.59	1.46
0.10	0.19	3.89	4.03	-3.5	1.67	1.55
0.20	0.38	3.89	4.73	-17.8	1.67	1.82
0.30	0.57	3.98	4.40	-9.5	1.71	1.69
0.40	0.76	2.99	3.79	-21.1	1.28	1.46
0.50	0.95	2.20	3.86	-43.0	0.94	1.48
0.60	1.14	1.80	1.52	18.4	0.77	0.58
0.70	1.33	1.01	0.53	90.6	0.43	0.20
0.80	1.52	0.95	0.45	111.1	0.41	0.17
0.90	1.71	0.81	0.86	-5.8	0.35	0.33
1.00	1.90	0.00	0.00	0.0	0.00	0.00
V(FT/S):		2.33	2.50	PCT DIFF IN MEAN VELOCITIES=-10.3		
FLOW CHARACTERISTICS:						
METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.97	0.42	1.80	-22.9	2.42	3.7
PAA	2.26	0.50	1.52	-41.5	2.59	-0.4

DATE: August 19, 1983 GAGE HEIGHT= 4.79 FT LEW:1.5 FT REM: 40 FT

STATION: 20.0 FT Y= - FT TYPE OF MEAS: WADING

Large boulder at vertical prevented observation
of velocities.

STATION: 25.0 FT Y= 2.35 FT TYPE OF MEAS: WADING

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.12	6.54	6.33	3.3	1.50	1.64
0.10	0.23	5.74	5.14	11.7	1.31	1.34
0.20	0.47	5.45	5.25	3.8	1.25	1.36
0.30	0.70	5.32	5.14	3.5	1.22	1.34
0.40	0.94	5.20	5.25	-1.0	1.19	1.36
0.50	1.17	5.20	4.73	9.9	1.19	1.23
0.60	1.41	4.75	4.20	13.1	1.09	1.09
0.70	1.64	3.72	3.09	20.4	0.85	0.80
0.80	1.88	3.21	1.49	115.4	0.74	0.39
1.00	2.35	0.00	0.00	0.0	0.00	0.00
V(FT/S):		4.37	3.85	PCT DIFF IN MEAN VELOCITIES= 13.4		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.39	0.59	4.75	8.8	4.33	-0.8
PAA	1.63	0.57	4.20	9.1	3.37	-12.5

STATION: 30.0 FT Y= 1.90 FT TYPE OF MEAS: WADING

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.09	3.13	3.16	-0.7	1.03	1.05
0.10	0.19	3.43	3.16	8.5	1.13	1.05
0.20	0.38	3.57	3.44	3.8	1.17	1.15
0.30	0.57	3.57	3.55	0.6	1.17	1.18
0.40	0.76	3.50	3.46	1.2	1.15	1.15
0.50	0.95	3.50	3.46	1.2	1.15	1.15
0.60	1.14	3.50	3.30	6.1	1.15	1.10
0.70	1.33	3.28	2.96	10.8	1.08	0.99
0.80	1.52	2.68	2.76	-2.9	0.88	0.92
0.90	1.71	1.88	2.32	-19.0	0.62	0.77
1.00	1.90	0.00	0.00	0.0	0.00	0.00
V(FT/S):		3.04	3.00	PCT DIFF IN MEAN VELOCITIES= 1.4		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.19	0.42	3.50	15.1	3.13	2.8
PAA	1.15	0.41	3.30	10.0	3.10	3.4

STATION: 35.0 FT Y= 1.90 FT TYPE OF MEAS: WADING

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.09	3.80	3.64	4.4	1.20	1.22
0.10	0.19	3.89	3.64	6.9	1.23	1.22
0.20	0.38	3.72	3.55	4.8	1.17	1.19
0.30	0.57	3.65	3.46	5.5	1.15	1.16
0.40	0.76	3.43	3.30	3.9	1.08	1.11
0.50	0.95	3.43	3.23	6.2	1.08	1.08
0.60	1.14	3.31	3.02	9.6	1.04	1.01
0.70	1.33	3.13	2.96	5.7	0.99	0.99
0.80	1.52	2.86	2.63	8.7	0.90	0.88
0.90	1.71	2.44	2.21	10.4	0.77	0.74
1.00	1.90	0.00	0.00	0.0	0.00	0.00
V(FT/S):		3.17	2.98	PCT DIFF IN MEAN VELOCITIES= 6.4		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.16	0.44	3.31	4.3	3.29	3.7
PAA	1.17	0.41	3.02	1.3	3.09	3.6

06716500 CLEAR CREEK NEAR LAWSON, CO

LOCATION.--Lat 39°45'57", long 105°37'32", in NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec.25, T.3 S., R.74 W., Clear Creek County, Hydrologic Unit 10190004, on left bank at east edge of Lawson, 30 ft (9 m) downstream from private bridge, and 2.0 mi (3.2 km) downstream from West Fork Clear Creek.

DRAINAGE AREA.--147 mi² (381 km²).

AVERAGE DISCHARGE.--36 years, 135 ft³/s (3.823 m³/s), 97,810 acre-ft/yr (121 hm³/yr).

GAGE DATUM.--8,080 ft (2,463 m).

MEASUREMENT SECTION LOCATION.--At cableway 42 ft downstream from private road bridge.



Figure 9.--Downstream view of Clear Creek: A, June 17, 1983;
B, October 14, 1983.

C6716500 CLEAR CREEK NEAR LAWSON, CO

DATE: June 17, 1983 GAGE HEIGHT= 4.82 FT LEW: 2 FT REW: 54 FT

STATION: 12.0 FT Y= 3.7 FT TYPE OF MEAS: CABLEWAY						
y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.18	8.54	7.76	10.1	1.51	1.52
0.10	0.37	7.60	6.84	11.1	1.34	1.34
0.20	0.74	6.67	6.33	5.4	1.18	1.24
0.30	1.11	6.81	6.33	7.6	1.20	1.24
0.40	1.48	6.67	6.22	7.2	1.18	1.22
0.50	1.85	6.29	5.76	9.2	1.11	1.13
0.60	2.22	6.06	4.73	28.1	1.07	0.93
0.70	2.59	4.37	4.03	8.4	0.77	0.79
0.80	2.96	4.37	4.03	8.4	0.77	0.79
0.84	3.11	4.65	3.86	20.5	0.82	0.76
1.00	3.70	0.00	0.00	0.0	0.00	0.00
V(FT/S):		5.67	5.10	PCT DIFF IN MEAN VELOCITIES= 11.1		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.33	0.60	6.05	6.9	5.52	-2.6
PAA	1.36	0.54	4.73	-7.3	5.18	1.5

STATION: 20.0 FT Y= 3.0 FT TYPE OF MEAS: CABLEWAY						
y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.15	13.59	13.40	1.4	1.66	1.71
0.10	0.30	13.59	12.55	8.3	1.66	1.60
0.20	0.60	10.88	10.67	2.0	1.33	1.36
0.30	0.90	10.36	9.99	3.7	1.26	1.27
0.40	1.20	9.67	9.58	0.9	1.18	1.22
0.50	1.50	8.71	8.32	4.7	1.06	1.06
0.60	1.80	7.60	7.43	2.3	0.93	0.95
0.70	2.10	5.74	5.25	9.3	0.70	0.67
0.80	2.40	5.74	5.14	11.7	0.70	0.66
1.00	3.00	0.00	0.00	0.0	0.00	0.00
V(FT/S):		8.20	7.84	PCT DIFF IN MEAN VELOCITIES= 4.5		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.57	1.04	7.60	-7.3	9.31	1.4
PAA	1.60	1.01	7.43	-5.2	7.90	0.8

STATION: 31.0 FT Y= 3.3 FT TYPE OF MEAS: CABLEWAY						
y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.16	9.54	7.94	7.6	1.62	1.63
0.10	0.33	7.43	6.45	15.2	1.41	1.32
0.20	0.66	5.67	6.33	5.4	1.27	1.30
0.30	0.99	6.54	5.91	10.7	1.24	1.21
0.40	1.32	4.17	5.76	7.1	1.17	1.18
0.50	1.65	5.84	5.49	6.4	1.11	1.13
0.60	1.98	5.20	4.73	9.9	0.99	0.97
0.70	2.31	4.75	4.30	10.5	0.90	0.88
0.80	2.64	3.43	3.46	-0.7	0.65	0.71
0.82	2.71	3.50	3.38	3.6	0.66	0.69
1.00	3.30	0.00	0.00	0.0	0.00	0.00
V(FT/S):		5.27	4.88	PCT DIFF IN MEAN VELOCITIES= 8.1		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.43	0.61	5.20	-1.3	5.05	-4.2
PAA	1.42	0.56	4.73	-3.0	4.89	0.4

06716500 CLEAR CREEK NEAR LAWSON, CO---Continued

DATE: June 22, 1983 GAGE HEIGHT= 5.93 FT LEW: 0 FT REW: 54 FT

STATION: 12.0 FT Y= 4.5 FT TYPE OF MEAS: CABLEWAY

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
.025	0.11	14.18	13.10	8.2	1.60	1.52
0.05	0.22	13.59	12.29	10.6	1.53	1.42
0.10	0.45	11.82	11.45	3.2	1.33	1.32
0.20	0.90	11.10	10.67	4.0	1.25	1.23
0.30	1.35	10.62	10.43	1.8	1.20	1.21
0.40	1.80	10.12	10.43	-3.0	1.14	1.21
0.50	2.25	9.89	9.39	5.3	1.12	1.09
0.60	2.70	8.89	8.52	4.3	1.00	0.99
0.70	3.15	8.22	8.13	1.1	0.93	0.94
0.80	3.60	6.41	6.45	-0.6	0.72	0.75
0.85	3.82	5.74	5.91	-2.9	0.65	0.68
1.00	4.50	0.00	0.00	0.0	0.00	0.00
V(FT/S):		8.87	8.64	PCT DIFF IN MEAN VELOCITIES= 2.6		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.36	0.86	8.89	0.3	8.75	-1.3
PAA	1.32	0.83	8.52	-1.4	8.56	-1.0

STATION: 20.0 FT Y= 4.0 FT TYPE OF MEAS: CABLEWAY

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.20	12.09	12.82	-5.7	1.32	1.42
0.10	0.40	10.88	11.18	-2.7	1.18	1.24
0.20	0.80	10.88	10.67	2.0	1.18	1.18
0.30	1.20	10.88	10.67	2.0	1.18	1.18
0.40	1.60	10.88	10.67	2.0	1.18	1.18
0.50	2.00	10.62	10.43	1.8	1.16	1.16
0.60	2.40	10.36	10.21	1.5	1.13	1.13
0.70	2.80	9.07	8.52	6.5	0.99	0.95
0.80	3.20	7.97	7.27	9.6	0.87	0.81
1.00	4.00	0.00	0.00	0.0	0.00	0.00
V(FT/S):		9.19	9.01	PCT DIFF IN MEAN VELOCITIES= 2.0		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.29	0.92	10.36	12.8	9.42	2.6
PAA	1.32	0.91	10.21	13.4	8.97	-0.4

STATION: 31.0 FT Y= 4.2 FT TYPE OF MEAS: CABLEWAY

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.21	8.17	8.52	-4.1	1.34	1.41
0.10	0.42	7.78	7.76	0.3	1.28	1.29
0.20	0.84	7.79	7.59	2.5	1.28	1.26
0.30	1.26	7.43	7.12	4.4	1.22	1.18
0.40	1.68	6.96	6.84	1.8	1.15	1.13
0.50	2.10	6.81	6.57	3.7	1.12	1.09
0.60	2.52	6.06	6.11	-0.8	1.00	1.01
0.70	2.94	5.74	5.49	4.5	0.94	0.91
0.80	3.36	4.75	5.03	-5.6	0.78	0.83
0.85	3.57	4.46	4.61	-3.3	0.73	0.76
1.00	4.20	0.00	0.00	0.0	0.00	0.00
V(FT/S):		6.08	6.03	PCT DIFF IN MEAN VELOCITIES= 0.8		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.28	0.59	6.06	-0.3	6.26	3.1
PAA	1.28	0.59	6.11	1.3	6.31	4.6

06716500 CLEAR CREEK NEAR LAWSON, CO--Continued

DATE: August 18, 1983 GAGE HEIGHT= 3.98 FT LEW: 2 FT REW: 44 FT

STATION: 12.0 FT Y= 2.2 FT TYPE OF MEAS: CABLEWAY

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.11	7.60	7.76	-2.1	1.67	1.80
0.10	0.22	7.43	6.84	8.6	1.63	1.59
0.20	0.44	5.95	5.49	8.4	1.31	1.27
0.30	0.66	5.45	5.25	3.8	1.20	1.22
0.40	0.88	4.96	4.50	10.2	1.09	1.04
0.50	1.10	4.65	4.50	3.3	1.02	1.04
0.60	1.32	4.55	4.20	8.3	1.00	0.97
0.70	1.54	3.98	3.71	7.3	0.87	0.86
0.77	1.69	3.57	3.38	5.6	0.78	0.78
1.00	2.20	0.00	0.00	0.0	0.00	0.00
V(FT/S):		4.56	4.31	PCT DIFF IN MEAN VELOCITIES= 5.7		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.53	0.67	4.55	-0.2	-	-
PAA	1.57	0.64	4.20	-2.6	-	-

STATION: 20.0 FT Y= 2.3 FT TYPE OF MEAS: CABLEWAY

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.11	9.89	9.58	3.2	1.74	1.75
0.10	0.23	9.89	9.20	7.5	1.74	1.68
0.20	0.46	7.60	7.27	4.5	1.34	1.33
0.30	0.69	7.11	7.27	-2.2	1.25	1.33
0.40	0.92	6.41	6.57	-2.4	1.13	1.20
0.50	1.15	5.84	5.63	3.7	1.03	1.03
0.60	1.38	5.20	5.25	-1.0	0.92	0.96
0.70	1.61	4.37	4.03	8.4	0.77	0.74
0.78	1.79	3.85	3.38	15.1	0.69	0.62
1.00	2.30	0.00	0.00	0.0	0.00	0.00
V(FT/S):		5.68	5.48	PCT DIFF IN MEAN VELOCITIES= 3.6		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.65	0.85	5.20	-8.4	-	-
PAA	1.66	0.82	5.25	-4.1	-	-

STATION: 31.0 FT Y= 2.1 FT TYPE OF MEAS: CABLEWAY

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.10	4.85	4.40	10.2	1.32	1.25
0.10	0.21	4.75	4.40	8.0	1.29	1.25
0.20	0.42	4.65	4.61	0.9	1.26	1.31
0.30	0.63	4.55	4.40	3.4	1.24	1.25
0.40	0.84	4.46	4.30	3.7	1.21	1.22
0.50	1.05	4.16	4.03	3.2	1.13	1.14
0.60	1.26	3.80	3.64	4.4	1.03	1.03
0.70	1.47	3.57	3.23	10.5	0.97	0.92
0.76	1.60	3.43	3.38	1.5	0.93	0.96
1.00	2.10	0.00	0.00	0.0	0.00	0.00
V(FT/S):		3.68	3.52	PCT DIFF IN MEAN VELOCITIES= 4.5		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.35	0.52	3.80	3.2	-	-
PAA	1.35	0.50	3.64	3.3	-	-

06719505 CLEAR CREEK AT GOLDEN, CO

LOCATION.--Lat $39^{\circ}45'11''$, long $105^{\circ}14'05''$, in NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec.33, T.3 S., R.70 W., Jefferson County, Hydrologic Unit 10190004, on left bank 100 ft (30 m) downstream from U.S. Highway 6 bridge at west edge of Golden, 0.7 mi (1.1 km) downstream from headgate of Church ditch, and 13.3 mi (21.4 km) downstream from North Clear Creek.

DRAINAGE AREA.--400 mi² (1,036 km²).

AVERAGE DISCHARGE.--8 years, 168 ft³/s (4,758 m³/s) 121,700 acre-ft/yr (150 hm³/yr).

GAGE DATUM.--5,695 ft (1,736 m).

MEASUREMENT SECTION LOCATION.--At cableway 70 ft downstream of Highway 6 bridge.



Figure 10.--Cross-stream view from left bank of Clear Creek:
A, July 15, 1983; B, October 14, 1983.

06719505 CLEAR CREEK AT GOLDEN, CO

DATE: June 20, 1983 GAGE HEIGHT= 5.30 FT LEW: - REM: -

STATION: 41.4 FT Y= 4.3 FT TYPE OF MEAS: CABLEWAY						
y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.21	13.88	13.71	1.2	1.49	1.46
0.10	0.43	11.33	11.18	1.3	1.22	1.19
0.20	0.86	11.33	11.45	-1.0	1.22	1.22
0.30	1.29	11.82	11.18	5.7	1.27	1.19
0.40	1.72	10.88	10.92	-0.4	1.17	1.17
0.50	2.15	10.62	10.67	-0.5	1.14	1.14
0.60	2.58	9.67	9.78	-1.1	1.04	1.04
0.70	3.01	9.07	9.78	-7.3	0.97	1.04
0.80	3.44	7.26	7.43	-2.3	0.78	0.79
1.00	4.30	0.00	0.00	0.0	0.00	0.00
V(FT/S):		9.32	9.36	PCT DIFF IN MEAN VELOCITIES= -0.4		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.35	0.92	9.67	3.8	9.30	-0.3
PAA	1.33	0.92	9.78	4.5	9.44	0.9

STATION: 49.4 FT Y= 4.5 FT TYPE OF MEAS: CABLEWAY						
y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.22	14.50	13.40	8.2	1.48	1.41
0.10	0.45	12.36	12.03	2.7	1.26	1.26
0.20	0.90	12.09	11.45	5.6	1.24	1.20
0.30	1.35	11.57	11.45	1.0	1.18	1.20
0.40	1.80	11.10	11.74	-5.5	1.13	1.23
0.50	2.25	10.88	10.67	2.0	1.11	1.12
0.60	2.70	10.12	10.67	-5.2	1.03	1.12
0.70	3.15	9.67	8.74	10.6	0.99	0.92
0.80	3.60	8.17	7.59	7.6	0.84	0.80
1.00	4.50	0.00	0.00	0.0	0.00	0.00
V(FT/S):		9.78	9.52	PCT DIFF IN MEAN VELOCITIES= 2.8		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.33	0.94	10.12	3.4	10.13	3.5
PAA	1.33	0.91	10.67	12.1	9.52	0.0

STATION: 59.7 FT Y= 4.2 FT TYPE OF MEAS: CABLEWAY						
y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.21	15.17	14.03	8.1	1.49	1.44
0.10	0.42	13.59	12.29	10.6	1.33	1.27
0.20	0.84	12.65	12.03	5.2	1.24	1.24
0.30	1.26	12.36	11.45	7.9	1.21	1.18
0.40	1.68	11.82	11.45	3.2	1.16	1.18
0.50	2.10	10.62	10.92	-2.7	1.04	1.12
0.60	2.52	10.36	10.43	-0.7	1.02	1.07
0.70	2.94	9.46	9.20	2.8	0.93	0.95
0.80	3.36	8.71	7.94	9.7	0.85	0.82
1.00	4.20	0.00	0.00	0.0	0.00	0.00
V(FT/S):		10.15	9.71	PCT DIFF IN MEAN VELOCITIES= 4.9		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.34	1.02	10.36	1.7	10.68	4.8
PAA	1.33	0.96	10.43	7.4	9.98	2.8

06719505 CLEAR CREEK AT GOLDEN, CO--Continued

DATE: July 15, 1983 GAGE HEIGHT= 4.83 FT LEW: 20 FT REW: 82 FT

STATION: 41.4 FT Y= 3.6 FT TYPE OF MEAS: CABLEWAY

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.18	10.62	8.74	21.5	1.47	1.33
0.10	0.36	9.26	8.74	5.9	1.29	1.33
0.20	0.72	8.71	8.52	2.2	1.21	1.30
0.30	1.09	8.54	8.13	5.0	1.19	1.24
0.40	1.44	8.38	7.59	10.4	1.16	1.16
0.50	1.80	7.60	6.98	8.9	1.05	1.06
0.60	2.16	7.11	6.70	6.1	0.99	1.02
0.70	2.52	6.96	6.22	11.3	0.97	0.95
0.80	2.88	6.17	5.37	14.9	0.86	0.82
0.83	2.99	5.84	4.82	21.2	0.81	0.74
1.00	3.60	0.00	0.00	0.0	0.00	0.00
V(FT/S):		7.21	6.56	PCT DIFF IN MEAN VELOCITIES= 9.9		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.30	0.76	7.11	-1.3	7.44	3.2
PAA	1.31	0.70	6.70	2.2	6.94	5.9

STATION: 45.4 FT Y= 3.9 FT TYPE OF MEAS: CABLEWAY

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.19	13.59	11.74	15.8	1.67	1.59
0.10	0.39	12.65	10.43	21.3	1.56	1.41
0.20	0.78	10.36	10.21	1.5	1.28	1.38
0.30	1.17	10.12	9.78	3.5	1.25	1.32
0.40	1.56	9.26	8.96	3.3	1.14	1.21
0.50	1.95	8.17	7.27	12.4	1.01	0.98
0.60	2.34	7.60	6.57	15.7	0.94	0.89
0.70	2.73	6.06	5.76	5.2	0.75	0.78
0.80	3.12	5.45	5.25	3.8	0.67	0.71
0.85	3.32	5.84	4.73	23.5	0.72	0.64
1.00	3.90	0.00	0.00	0.0	0.00	0.00
V(FT/S):		8.12	7.38	PCT DIFF IN MEAN VELOCITIES= 9.9		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.47	0.88	7.60	-6.4	7.90	-2.6
PAA	1.45	0.79	6.57	-11.0	7.73	4.7

STATION: 59.7 FT Y= 3.6 FT TYPE OF MEAS: CABLEWAY

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.18	9.67	8.96	7.9	1.54	1.53
0.10	0.36	7.78	7.59	2.5	1.24	1.29
0.20	0.72	7.60	7.43	2.3	1.21	1.27
0.30	1.08	7.78	7.27	7.0	1.24	1.24
0.40	1.44	7.11	6.70	6.1	1.13	1.14
0.50	1.80	6.81	6.33	7.6	1.09	1.08
0.60	2.16	6.17	5.76	7.1	0.98	0.98
0.70	2.52	5.64	5.49	2.7	0.90	0.94
0.80	2.88	5.20	4.61	12.8	0.83	0.79
0.83	2.99	5.08	4.30	18.1	0.81	0.73
1.00	3.60	0.00	0.00	0.0	0.00	0.00
V(FT/S):		6.27	5.87	PCT DIFF IN MEAN VELOCITIES= 6.8		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.32	0.67	6.17	-1.5	6.40	2.1
PAA	1.34	0.63	5.76	-1.9	6.02	2.6

06715505 CLEAR CREEK AT GOLDEN, CO--Continued

DATE: August 19, 1983 GAGE HEIGHT= 3.90 FT LEW: 23 FT REW: 79 FT

STATION: 41.4 FT Y= 2.4 FT TYPE OF MEAS: CABLEWAY						
y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.12	7.78	6.98	11.5	1.62	1.45
0.10	0.24	6.54	7.12	-8.1	1.36	1.48
0.20	0.48	6.06	5.91	2.5	1.26	1.23
0.30	0.72	5.74	5.37	6.9	1.19	1.12
0.40	0.96	5.08	5.14	-1.2	1.06	1.07
0.50	1.20	4.96	4.92	0.8	1.03	1.02
0.60	1.44	4.65	4.82	-3.5	0.97	1.00
0.70	1.68	4.46	4.82	-7.5	0.93	1.00
0.80	1.92	4.28	4.40	-2.7	0.89	0.91
1.00	2.40	0.00	0.00	0.0	0.00	0.00
V(FT/S):		4.81	4.82	PCT DIFF IN MEAN VELOCITIES= -0.1		
FLOW CHARACTERISTICS:						
METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.38	0.64	4.65	-3.3	5.17	7.5
PAA	1.34	0.63	4.82	0.1	5.15	7.1

STATION: 49.4 FT Y= 2.7 FT TYPE OF MEAS: CABLEWAY						
y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.13	8.22	7.76	5.9	1.70	1.72
0.10	0.27	7.60	7.27	4.5	1.57	1.61
0.20	0.54	6.06	6.01	0.8	1.25	1.33
0.30	0.81	5.74	5.21	10.2	1.18	1.15
0.40	1.08	5.32	4.64	14.7	1.10	1.03
0.50	1.35	4.96	4.46	11.2	1.02	0.99
0.60	1.62	4.65	4.03	15.4	0.96	0.89
0.70	1.89	4.20	3.94	6.6	0.87	0.87
0.81	2.19	3.65	3.64	0.3	0.75	0.80
1.00	2.70	0.00	0.00	0.0	0.00	0.00
V(FT/S):		4.85	4.52	PCT DIFF IN MEAN VELOCITIES= 7.2		
FLOW CHARACTERISTICS:						
METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.48	0.63	4.65	-4.1	-	-
PAA	1.50	0.59	4.03	-10.9	-	-

STATION: 59.7 FT Y= 2.2 FT TYPE OF MEAS: CABLEWAY						
y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.11	5.08	4.50	12.0	1.27	1.20
0.10	0.22	4.96	4.55	9.0	1.24	1.21
0.20	0.44	5.08	4.73	7.4	1.27	1.26
0.30	0.66	4.96	4.50	10.2	1.24	1.20
0.40	0.88	4.55	4.61	-1.3	1.14	1.23
0.50	1.10	4.55	4.30	5.8	1.14	1.15
0.60	1.32	4.16	4.11	1.2	1.04	1.10
0.70	1.54	4.07	3.86	5.4	1.02	1.03
0.77	1.69	3.72	3.44	8.1	0.93	0.92
1.00	2.20	0.00	0.00	0.0	0.00	0.00
V(FT/S):		3.99	3.75	PCT DIFF IN MEAN VELOCITIES= 6.4		
FLOW CHARACTERISTICS:						
METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.32	0.54	4.16	4.3	-	-
PAA	1.32	0.51	4.11	9.7	-	-

06752260 CACHE LA POUDRE RIVER AT FORT COLLINS, CO

LOCATION.--Lat 40°35'17", long 105°04'08", in NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec.12, T.7 N., R.69 W., Larimer County, Hydrologic Unit 10190007, on left bank 150 ft (46 m) downstream from Lincoln Ave. Bridge and 2,200 ft (670 m) east of intersection of College Ave. (U.S. Highway 287) and Mountain Ave. in Fort Collins.

DRAINAGE AREA.--1,127 mi² (2,919 km²).

GAGE DATUM.--4,940 ft (1,506 m).

MEASUREMENT SECTION LOCATION.--At upstream edge of Lincoln Ave. bridge. A single bridge pier 3 ft wide is centered at station 95.5. The nearest vertical is at station 127, 30 feet from the edge of the pier.



Figure 11. Views of Cache la Poudre River: A, Cross-stream view from left bank, June 21, 1983; B, Downstream view from right bank, October 11, 1983.

06752260 CACHE LA POUDRE RIVER AT FORT COLLINS, CO

DATE: June 21, 1983 GAGE HEIGHT= 8.14 FT LEW: 50 FT REW: 163 FT

STATION: 127.0 FT Y= 10.7 FT TYPE OF MEAS: BRIDGE

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/v	PAA v/v
0.025	0.27	14.83	13.40	10.7	1.43	1.23
0.05	0.53	12.95	12.03	7.6	1.25	1.11
0.10	1.07	12.36	12.03	2.7	1.19	1.11
0.20	2.14	12.36	12.03	2.7	1.19	1.11
0.30	3.21	12.36	12.03	2.7	1.19	1.11
0.40	4.28	12.36	12.03	2.7	1.19	1.11
0.50	5.35	12.36	12.03	2.7	1.19	1.11
0.60	6.42	12.36	12.03	2.7	1.19	1.11
0.70	7.49	11.82	11.18	5.7	1.14	1.03
0.80	8.56	4.85	9.39	-48.3	0.47	0.86
0.90	9.63	4.37	7.94	-45.0	0.42	0.73
0.94	10.06	5.20	7.94	-34.5	0.50	0.73
1.00	10.70	0.00	0.00	0.0	0.00	0.00

V(FT/S): 10.38 10.88 PCT DIFF IN MEAN VELOCITIES= -4.6

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.32	0.64	12.36	19.1	8.60	-17.1
PAA	1.12	0.62	12.03	10.6	10.71	-1.6

STATION: 134.0 FT Y= 8.9 FT TYPE OF MEAS: BRIDGE

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/v	PAA v/v
0.05	0.44	12.36	11.74	5.3	1.27	1.26
0.10	0.89	11.57	10.43	10.1	1.19	1.12
0.20	1.78	11.33	10.43	8.6	1.17	1.12
0.30	2.67	11.33	10.67	6.2	1.17	1.14
0.40	3.56	10.62	10.21	4.0	1.09	1.09
0.50	4.45	10.62	9.99	6.3	1.09	1.07
0.60	5.34	10.12	8.74	15.8	1.04	0.94
0.70	6.23	9.67	9.20	5.1	1.00	0.98
0.80	7.12	9.07	9.02	0.6	0.94	0.97
0.90	8.01	6.29	8.52	-26.2	0.65	0.91
1.00	8.90	0.00	0.00	0.0	0.00	0.00

V(FT/S): 9.70 9.34 PCT DIFF IN MEAN VELOCITIES= 3.8

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.19	0.62	10.12	4.3	10.20	5.2
PAA	1.14	0.59	8.74	-6.4	9.73	4.1

STATION: 144.0 FT Y= 7.1 FT TYPE OF MEAS: BRIDGE

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/v	PAA v/v
0.05	0.35	12.05	11.45	5.6	1.57	1.54
0.10	0.71	10.36	9.78	5.9	1.34	1.31
0.20	1.42	10.12	9.78	3.5	1.31	1.31
0.30	2.13	10.36	10.21	1.5	1.34	1.37
0.40	2.84	9.67	9.58	0.9	1.25	1.29
0.50	3.55	7.97	7.76	2.7	1.03	1.04
0.60	4.26	6.81	5.63	21.0	0.88	0.76
0.70	4.97	5.84	5.49	6.4	0.76	0.74
0.80	5.68	5.08	4.82	5.4	0.66	0.65
0.90	6.39	4.55	5.25	-13.3	0.59	0.71
1.00	7.10	0.00	0.00	0.0	0.00	0.00

V(FT/S): 7.72 7.44 PCT DIFF IN MEAN VELOCITIES= 3.8

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.40	0.60	6.81	-11.8	7.60	-1.6
PAA	1.40	0.58	5.63	-24.4	7.30	-1.9

DATE: June 27, 1983 GAGE HEIGHT= 7.25 FT LEW: 61 FT REW: 161 FT

STATION: 127.0 FT Y= 9.7 FT TYPE OF MEAS: BRIDGE

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.48	9.67	9.99	-3.2	1.02	1.07
0.10	0.97	9.89	9.99	-1.0	1.04	1.07
0.20	1.94	10.12	9.99	1.3	1.07	1.07
0.30	2.91	10.62	10.67	-0.5	1.12	1.14
0.40	3.88	11.10	10.92	1.6	1.17	1.17
0.50	4.85	11.10	10.92	1.6	1.17	1.17
0.60	5.82	11.10	11.18	-0.7	1.17	1.20
0.70	6.79	10.36	10.21	1.5	1.09	1.09
0.80	7.76	9.89	9.74	1.7	0.94	0.94
0.90	8.73	6.81	5.63	21.0	0.72	0.60
1.00	9.70	0.00	0.00	0.0	0.00	0.00
V(FT/S):		9.48	9.32	PCT DIFF IN MEAN VELOCITIES= 1.6		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.16	0.58	11.10	17.1	9.50	0.3
PAA	1.19	0.57	11.18	19.9	9.36	0.4

STATION: 134.0 FT Y= 7.7 FT TYPE OF MEAS: BRIDGE

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.38	9.71	9.74	-0.3	1.02	1.05
0.10	0.77	9.26	9.02	2.7	1.08	1.09
0.20	1.54	5.26	9.20	0.7	1.08	1.11
0.30	2.31	9.46	9.20	2.4	1.11	1.11
0.40	3.08	9.46	8.96	5.6	1.11	1.08
0.50	3.85	9.46	8.96	5.6	1.11	1.08
0.60	4.62	9.46	9.02	4.9	1.11	1.09
0.70	5.39	9.89	9.02	-1.4	1.04	1.09
0.80	6.16	9.71	8.13	7.1	1.02	0.98
0.90	6.93	7.43	7.12	4.4	0.87	0.86
1.00	7.70	0.00	0.00	0.0	0.00	0.00
V(FT/S):		8.56	8.29	PCT DIFF IN MEAN VELOCITIES= 3.2		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.12	0.58	9.46	10.5	8.98	5.0
PAA	1.12	0.56	9.02	8.8	8.66	4.5

STATION: 144.0 FT Y= 5.7 FT TYPE OF MEAS: BRIDGE

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.28	7.97	7.59	5.0	1.24	1.26
0.10	0.57	8.17	7.94	2.9	1.27	1.32
0.20	1.14	9.38	7.74	5.5	1.30	1.32
0.30	1.71	9.54	8.32	2.6	1.33	1.38
0.40	2.28	9.54	7.76	10.1	1.33	1.29
0.50	2.85	7.60	7.12	6.7	1.18	1.18
0.60	3.42	6.67	6.45	3.4	1.04	1.07
0.70	3.99	5.20	4.73	9.9	0.81	0.78
0.80	4.56	4.85	4.20	15.5	0.75	0.70
1.00	5.70	0.00	0.00	0.0	0.00	0.00
V(FT/S):		6.43	6.03	PCT DIFF IN MEAN VELOCITIES= 6.7		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.38	0.56	6.67	3.7	6.61	2.9
PAA	1.41	0.53	6.45	7.0	6.07	0.7

DATE: August 31, 1983 GAGE HEIGHT= 1.90 FT LEW: 88 FT REW: 154 FT

STATION: 127.0 FT Y= 2.45 FT TYPE OF MEAS: WADING

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/v	PAA v/v
0.05	0.12	0.93	0.84	10.7	1.03	0.98
0.10	0.24	0.95	0.94	1.1	1.05	1.09
0.20	0.49	0.95	0.92	3.3	1.05	1.07
0.30	0.73	0.97	0.94	3.2	1.08	1.09
0.40	0.98	0.93	0.91	2.2	1.03	1.06
0.50	1.22	0.97	0.89	9.0	1.08	1.04
0.60	1.47	0.97	0.92	5.4	1.08	1.07
0.70	1.71	0.93	0.92	1.1	1.03	1.07
0.80	1.96	0.89	0.90	-1.1	0.99	1.05
0.90	2.20	0.99	0.86	15.1	1.10	1.00
1.00	2.45	0.00	0.00	0.0	0.00	0.00

V(FT/S): 0.90 0.86 PCT DIFF IN MEAN VELOCITIES= 4.8

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.11	0.11	0.97	7.7	0.92	2.1
PAA	1.11	0.10	0.92	7.0	0.91	5.9

STATION: 134.0 FT Y= 1.50 FT TYPE OF MEAS: WADING

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/v	PAA v/v
0.05	0.07	0.31	0.38	-18.4	0.78	1.06
0.10	0.15	0.31	0.33	-6.1	0.78	0.92
0.20	0.30	0.33	0.33	0.0	0.83	0.92
0.30	0.45	0.43	0.39	10.3	1.08	1.09
0.40	0.60	0.47	0.38	23.7	1.18	1.06
0.50	0.75	0.46	0.46	0.0	1.16	1.29
0.60	0.90	0.59	0.51	15.7	1.49	1.43
0.70	1.05	0.52	0.42	23.8	1.31	1.17
0.80	1.20	0.47	0.37	27.0	1.18	1.03
1.00	1.50	0.00	0.00	0.0	0.00	0.00

V(FT/S): 0.40 0.36 PCT DIFF IN MEAN VELOCITIES= 11.0

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.38	0.07	0.59	48.6	0.40	0.8
PAA	1.31	0.06	0.51	42.6	0.35	-2.2

STATION: 144.0 FT Y= 0.80 FT TYPE OF MEAS: WADING

Zero velocity readings throughout this vertical.

06754000 SOUTH PLATTE RIVER NEAR KERSEY, CO

LOCATION.--Lat 40°24'44", long 104°33'46", in NW¼SW¼ sec.9, T.5 N., R.64 W., Weld County, Hydrologic Unit 10190003, on downstream side of bridge on State Highway 37, 1.9 mi (3.1 km) north of railroad in Kersey, and 2.5 mi (4.0 km) downstream from Cache la Poudre River.

DRAINAGE AREA.--9,598 mi² (24,859 km²).

AVERAGE DISCHARGE.--71 years (water years 1902-03, 1906-74), 777 ft³/s (22.00 m³/s), 562,900 acre-ft/yr (694 hm³/yr, prior to completion of Chatfield Dam; 7 years (water years 1976-82), 986 ft³/s (27.92 m³/s), 714,400 acre-ft/yr (881 hm³/yr), subsequent to completion of Chatfield Dam.

GAGE DATUM.--4,575.77 ft (1,394.695 m).

MEASUREMENT SECTION LOCATION.--At upstream edge of Highway 37 bridge. Bridge piers are 1.7 ft wide with a clear span of 45.5 ft. Verticals were located at midpoint of clear span.



Figure 12.--Views of South Platte River: A, Cross-stream view from left bank, July 12, 1983; B, Upstream view from bridge, October 11, 1983.

DATE: July 12, 1983 GAGE HEIGHT= 8.00 FT LEW: 8 FT RFW: 647 FT

STATION: 74.7 FT Y= 11.2 FT TYPE OF MEAS: BRIDGE

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.56	5.45	5.25	3.8	1.19	1.17
0.10	1.12	5.64	5.37	5.0	1.23	1.19
0.20	2.24	5.45	5.49	-0.7	1.19	1.22
0.30	3.36	5.20	5.49	-5.3	1.13	1.22
0.40	4.48	5.08	5.37	-5.4	1.11	1.19
0.50	5.60	4.96	5.03	-1.4	1.09	1.12
0.60	6.72	4.55	4.20	8.3	0.99	0.93
0.70	7.84	4.28	3.79	12.9	0.93	0.84
0.80	8.96	4.07	3.71	9.7	0.89	0.82
0.90	10.08	3.13	3.38	-7.4	0.68	0.75
0.95	10.64	3.13	2.84	10.2	0.68	0.63
1.00	11.20	0.00	0.00	0.0	0.00	0.00

V(FT/S): 4.58 4.50 PCT DIFF IN MEAN VELOCITIES= 1.8

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.13	0.26	4.55	-0.7	4.76	3.9
PAA	1.16	0.26	4.20	-6.7	4.60	2.2

STATION: 179.6 FT Y= 6.1 FT TYPE OF MEAS: BRIDGE

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.30	5.32	5.25	1.3	1.07	1.03
0.10	0.61	5.55	5.63	-1.4	1.11	1.10
0.20	1.22	5.74	5.49	4.6	1.15	1.07
0.30	1.83	5.74	5.63	2.0	1.15	1.10
0.40	2.44	5.95	5.63	5.7	1.19	1.10
0.50	3.05	5.45	5.37	1.5	1.09	1.05
0.60	3.66	5.20	5.25	-1.0	1.04	1.03
0.70	4.27	4.96	5.25	-5.5	0.99	1.03
0.80	4.88	4.37	5.25	-16.8	0.88	1.03
0.90	5.49	4.37	5.14	-15.0	0.88	1.00
1.00	6.10	0.00	0.00	0.0	0.00	0.00

V(FT/S): 4.99 5.12 PCT DIFF IN MEAN VELOCITIES= -2.4

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.14	0.30	5.20	4.1	5.05	1.2
PAA	1.11	0.38	5.25	2.6	5.37	4.9

STATION: 279.6 FT Y= 3.6 FT TYPE OF MEAS: BRIDGE

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.18	4.96	4.82	2.9	1.08	1.31
0.10	0.36	5.55	5.37	3.4	1.21	1.46
0.20	0.72	5.20	4.73	9.9	1.13	1.28
0.30	1.08	5.32	4.40	20.7	1.16	1.19
0.40	1.44	5.20	4.11	26.5	1.13	1.12
0.50	1.80	5.32	4.20	26.7	1.16	1.14
0.60	2.16	5.32	4.03	32.0	1.16	1.09
0.70	2.52	4.75	3.30	43.9	1.03	0.90
0.80	2.88	3.98	2.96	34.5	0.87	0.80
0.84	3.02	4.16	2.37	75.5	0.91	0.64
1.00	3.60	0.00	0.00	0.0	0.00	0.00

V(FT/S): 4.59 3.69 PCT DIFF IN MEAN VELOCITIES= 24.6

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.21	0.47	5.32	15.8	4.59	-0.1
PAA	1.33	0.40	4.03	9.3	3.84	4.3

06754000 SOUTH PLATTE RIVER NEAR KERSEY, CO--Continued

DATE: July 14, 1983 GAGE HEIGHT= 6.31 FT LEW: 11 FT RFW: 503 FT

STATION: 74.7 FT Y= 8.1 FT TYPE OF MEAS: BRIDGE						
y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.40	4.75	4.61	3.0	1.30	1.26
0.10	0.81	5.20	4.73	9.9	1.43	1.29
0.20	1.62	4.65	4.61	0.9	1.28	1.26
0.30	2.43	4.55	4.50	1.1	1.25	1.23
0.40	3.24	4.16	4.30	-3.3	1.14	1.18
0.50	4.05	3.80	4.03	-5.7	1.04	1.10
0.60	4.86	3.24	3.71	-12.7	0.89	1.01
0.70	5.67	3.28	3.46	-5.2	0.90	0.95
0.80	6.48	2.86	2.74	4.4	0.78	0.75
0.90	7.29	2.40	1.90	26.3	0.66	0.52
0.93	7.53	1.80	1.98	-9.1	0.49	0.54
1.00	8.10	0.00	0.00	0.0	0.00	0.00
V(FT/S):		3.65	3.66	PCT DIFF IN MEAN VELOCITIES= -0.3		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.26	0.25	3.24	-11.1	3.75	3.0
PAA	1.24	0.25	3.71	1.4	3.67	0.5

STATION: 179.6 FT Y= 3.5 FT TYPE OF MEAS: BRIDGE						
y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.17	4.65	4.03	15.4	1.23	1.15
0.10	0.35	4.65	4.40	5.7	1.23	1.25
0.20	0.70	4.55	4.20	8.3	1.21	1.20
0.30	1.05	4.46	4.20	6.2	1.18	1.20
0.40	1.40	4.37	4.03	8.4	1.16	1.15
0.50	1.75	4.55	4.40	3.4	1.21	1.26
0.60	2.10	4.16	4.20	-1.0	1.10	1.20
0.70	2.45	4.07	3.23	26.0	1.08	0.92
0.80	2.80	3.65	2.37	54.0	0.97	0.68
0.83	2.90	2.16	2.90	-25.5	0.57	0.83
1.00	3.50	0.00	0.00	0.0	0.00	0.00
V(FT/S):		3.77	3.50	PCT DIFF IN MEAN VELOCITIES= 7.6		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.30	0.40	4.16	10.4	4.10	8.8
PAA	1.29	0.37	4.20	19.9	3.28	-6.2

STATION: 279.6 FT Y= 2.2 FT TYPE OF MEAS: BRIDGE						
y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.11	3.65	3.79	-3.7	1.16	1.14
0.10	0.22	3.72	3.96	-3.6	1.19	1.17
0.20	0.44	3.80	4.20	-9.5	1.21	1.27
0.30	0.66	3.89	4.30	-9.5	1.24	1.30
0.40	0.88	3.72	4.03	-7.7	1.19	1.22
0.50	1.10	3.57	4.03	-11.4	1.14	1.22
0.60	1.32	3.50	3.64	-3.8	1.12	1.10
0.70	1.54	3.28	3.38	-3.0	1.05	1.02
0.75	1.65	3.28	3.09	6.1	1.05	0.93
1.00	2.20	0.00	0.00	0.0	0.00	0.00
V(FT/S):		3.14	3.31	PCT DIFF IN MEAN VELOCITIES= -5.2		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.32	0.43	3.50	11.5	-	-
PAA	1.35	0.46	3.64	9.9	-	-

DATE: August 30, 1983 GAGE HEIGHT= 4.87 FT LEW: 13 FT REW: 501 FT

STATION: 74.7 FT Y= 3.9 FT TYPE OF MEAS: BRIDGE

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/v	PAA v/v
0.05	0.19	3.72	3.64	2.2	1.21	1.21
0.10	0.39	3.80	3.86	-1.6	1.24	1.28
0.20	0.78	3.57	3.71	-3.8	1.17	1.23
0.30	1.17	3.65	3.55	2.9	1.19	1.18
0.40	1.56	3.50	3.46	1.2	1.14	1.15
0.50	1.95	3.06	3.38	-9.5	1.00	1.12
0.60	2.34	3.13	3.09	1.3	1.02	1.03
0.70	2.73	3.06	2.76	10.9	1.00	0.92
0.80	3.12	2.92	2.92	3.5	0.95	0.94
0.87	3.39	2.55	2.11	20.9	0.83	0.70
1.00	3.90	0.00	0.00	0.0	0.00	0.00
V(FT/S):		3.06	3.01	PCT DIFF IN MEAN VELOCITIES= 1.9		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.19	0.30	3.13	2.1	3.24	5.9
PAA	1.23	0.30	3.09	2.7	3.25	8.5

STATION: 179.6 FT Y= 1.90 FT TYPE OF MEAS: WADING

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/v	PAA v/v
0.05	0.09	3.06	2.89	5.9	1.07	1.00
0.10	0.19	3.13	3.30	-5.2	1.09	1.14
0.20	0.39	3.21	3.38	-5.0	1.12	1.17
0.30	0.57	3.13	3.46	-9.5	1.09	1.19
0.40	0.76	3.21	3.55	-9.6	1.12	1.22
0.50	0.95	3.13	3.16	-0.9	1.09	1.09
0.60	1.14	3.13	2.82	11.0	1.09	0.97
0.70	1.33	2.92	2.96	-1.4	1.02	1.02
0.80	1.52	2.86	2.59	6.3	1.00	0.93
0.90	1.71	2.44	2.32	5.2	0.85	0.80
1.00	1.90	0.00	0.00	0.0	0.00	0.00
V(FT/S):		2.87	2.90	PCT DIFF IN MEAN VELOCITIES= -1.1		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.13	0.39	3.13	9.2	3.03	5.9
PAA	1.16	0.40	2.82	-2.7	3.03	4.7

STATION: 279.6 FT Y= 1.70 FT TYPE OF MEAS: WADING

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/v	PAA v/v
0.05	0.08	2.61	2.11	23.7	1.08	0.90
0.10	0.17	2.74	2.69	1.9	1.14	1.15
0.20	0.34	3.06	3.02	1.3	1.27	1.29
0.30	0.51	2.99	3.02	-1.0	1.24	1.29
0.40	0.68	2.92	2.76	5.8	1.21	1.18
0.50	0.85	2.74	2.76	-0.7	1.14	1.18
0.60	1.02	2.61	2.37	10.1	1.08	1.01
0.70	1.19	2.61	2.32	12.5	1.08	0.99
0.80	1.36	2.10	2.37	-11.4	0.87	1.01
1.00	1.70	0.00	0.00	0.0	0.00	0.00
V(FT/S):		2.41	2.34	PCT DIFF IN MEAN VELOCITIES= 2.9		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.28	0.37	2.61	8.3	2.58	7.1
PAA	1.28	0.36	2.37	1.3	2.69	15.1

07083700 ARKANSAS RIVER NEAR MALTA, CO

LOCATION.--Lat 39°10'08", long 106°19'23", in NE¼NW¼ sec.22, T.10 S., R.80 W., Lake County, Hydrologic Unit 11020001, on left bank 40 ft (12 m) downstream and 30 ft (9 m) shoreward of left end of bridge on U.S. Highway 24, 3.5 mi (5.6 km) downstream from Lake Fork, 4.4 mi (7.1 km) southeast of Malta, and 5.7 mi (9.2 km) south of Leadville.

DRAINAGE AREA.--228 mi² (590 km²).

AVERAGE DISCHARGE.--8 years (water years 1975-82), 235 ft³/s (6.655 m³/s), 170,300 acre-ft/yr (210 hm³/yr), subsequent to enlarging Turquoise Lake in 1968.

GAGE DATUM.--9,300 ft (2,835 m).

MEASUREMENT SECTION LOCATION.--At cableway 60 ft downstream of Highway 24 bridge.

A



B



Figure 13.--Cross-stream view from left bank of Arkansas River:
A, June 15, 1983; B, October 13, 1983.

DATE: June 15, 1983 GAGE HEIGHT= 3.48 FT LEW: 25 FT REW: 85 FT

STATION: 40.0 FT Y= 2.8 FT TYPE OF MEAS: CABLEWAY						
y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.14	5.84	6.33	-7.7	1.41	1.53
0.10	0.28	5.08	5.49	-7.5	1.23	1.33
0.20	0.56	5.20	5.14	1.2	1.25	1.24
0.30	0.84	5.20	4.92	5.7	1.25	1.19
0.40	1.12	4.85	4.92	-1.4	1.17	1.19
0.50	1.40	4.55	4.50	1.1	1.10	1.09
0.60	1.68	4.16	4.20	-1.0	1.00	1.01
0.70	1.96	3.72	3.55	4.8	0.90	0.86
0.80	2.24	3.72	3.55	4.8	0.90	0.86
1.00	2.80	0.00	0.00	0.0	0.00	0.00
V (FT/S):		4.14	4.14	PCT DIFF IN MEAN VELOCITIES= 0.1		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.32	0.50	4.16	0.4	4.46	7.6
PAA	1.36	0.51	4.20	1.4	4.35	4.9

STATION: 50.0 FT Y= 3.0 FT TYPE OF MEAS: CABLEWAY						
y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.15	8.38	7.76	8.0	1.54	1.55
0.10	0.30	7.60	6.33	20.1	1.40	1.26
0.20	0.60	6.81	6.33	7.6	1.26	1.26
0.30	0.90	6.81	6.11	11.5	1.26	1.22
0.40	1.20	6.29	5.63	11.7	1.16	1.12
0.50	1.50	5.84	5.63	3.7	1.08	1.12
0.60	1.80	5.74	5.49	4.6	1.06	1.09
0.70	2.10	5.08	4.82	5.4	0.94	0.96
0.80	2.40	3.80	3.71	2.4	0.70	0.74
1.00	3.00	0.00	0.00	0.0	0.00	0.00
V (FT/S):		5.43	5.01	PCT DIFF IN MEAN VELOCITIES= 8.2		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.41	0.66	5.74	5.8	5.31	-2.2
PAA	1.37	0.60	5.49	9.5	5.02	0.1

STATION: 65.0 FT Y= 2.7 FT TYPE OF MEAS: CABLEWAY						
y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.13	3.13	3.46	-9.5	1.04	1.23
0.10	0.27	3.43	3.46	-0.9	1.14	1.23
0.20	0.54	3.57	3.30	8.2	1.19	1.17
0.30	0.81	3.65	3.23	13.0	1.21	1.15
0.40	1.08	3.65	3.30	10.6	1.21	1.17
0.50	1.35	3.57	3.16	13.0	1.19	1.12
0.60	1.62	3.43	2.96	15.9	1.14	1.05
0.70	1.89	3.13	2.89	8.3	1.04	1.03
0.78	2.11	2.99	2.96	1.0	0.99	1.05
1.00	2.70	0.00	0.00	0.0	0.00	0.00
V (FT/S):		3.01	2.82	PCT DIFF IN MEAN VELOCITIES= 6.8		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.28	0.37	3.43	14.0	-	-
PAA	1.28	0.34	2.96	5.0	-	-

DATE: July 1, 1983 GAGE HEIGHT= 4.35 FT LEW: 23 FT REW:115 FT

STATION: 40.0 FT Y= 3.8 FT TYPE OF MEAS: CABLEWAY						
y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.19	10.62	9.58	10.9	1.65	1.52
0.10	0.38	8.54	8.32	2.6	1.32	1.32
0.20	0.76	8.22	8.13	1.1	1.27	1.29
0.30	1.14	7.97	7.76	2.7	1.23	1.23
0.40	1.52	7.43	7.27	2.2	1.15	1.15
0.50	1.90	6.81	6.98	-2.4	1.05	1.11
0.60	2.28	6.54	5.76	13.5	1.01	0.91
0.70	2.66	5.84	5.49	6.4	0.90	0.87
0.80	3.04	5.32	4.92	8.1	0.82	0.78
0.84	3.19	3.65	4.82	-24.3	0.57	0.76
1.00	3.80	0.00	0.00	0.0	0.00	0.00
V(FT/S):		6.46	6.31	PCT DIFF IN MEAN VELOCITIES= 2.3		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.41	0.69	6.54	1.3	6.77	4.9
PAA	1.34	0.66	5.76	-8.7	6.52	3.4

STATION: 50.0 FT Y= 3.6 FT TYPE OF MEAS: CABLEWAY						
y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.18	11.82	10.67	10.8	1.59	1.53
0.10	0.36	9.89	9.20	7.5	1.33	1.32
0.20	0.72	9.07	8.96	1.2	1.22	1.29
0.30	1.08	9.07	8.74	3.4	1.22	1.25
0.40	1.44	8.38	8.13	3.1	1.13	1.17
0.50	1.80	8.17	7.43	10.0	1.10	1.07
0.60	2.16	7.26	6.84	6.1	0.98	0.98
0.70	2.52	6.96	6.01	15.8	0.94	0.86
0.80	2.88	5.64	5.37	5.0	0.76	0.77
0.83	2.99	5.32	5.14	3.5	0.72	0.74
1.00	3.60	0.00	0.00	0.0	0.00	0.00
V(FT/S):		7.42	6.96	PCT DIFF IN MEAN VELOCITIES= 6.5		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.37	0.81	7.26	-2.1	7.35	-0.8
PAA	1.36	0.76	6.84	-1.8	7.16	2.9

STATION: 65.0 FT Y= 3.4 FT TYPE OF MEAS: CABLEWAY						
y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.17	11.33	10.43	8.6	1.43	1.41
0.10	0.34	10.88	9.99	8.9	1.37	1.35
0.20	0.68	9.26	8.96	3.3	1.17	1.21
0.30	1.02	9.26	8.96	3.3	1.17	1.21
0.40	1.36	9.07	8.96	1.2	1.14	1.21
0.50	1.70	8.71	8.52	2.2	1.10	1.15
0.60	2.04	9.71	8.13	7.1	1.10	1.10
0.70	2.38	7.43	7.43	0.0	0.94	1.01
0.80	2.72	6.54	4.82	35.7	0.82	0.65
0.82	2.79	4.41	4.73	35.5	0.81	0.64
1.00	3.40	0.00	0.00	0.0	0.00	0.00
V(FT/S):		7.94	7.39	PCT DIFF IN MEAN VELOCITIES= 7.5		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.31	0.87	8.71	9.7	7.90	-0.5
PAA	1.36	0.82	8.13	10.0	6.89	-6.8

DATE: August 16, 1983 GAGE HEIGHT= 3.01 FT LEW: - REW: -

STATION: 40.0 FT Y= 2.25 FT TYPE OF MEAS: WADING

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.11	3.72	3.38	10.1	1.42	1.30
0.10	0.22	3.65	3.46	5.5	1.40	1.33
0.20	0.45	3.65	3.30	10.6	1.40	1.27
0.30	0.67	3.43	3.30	3.9	1.31	1.27
0.40	0.90	3.13	2.96	5.7	1.20	1.14
0.50	1.13	3.21	2.89	11.1	1.23	1.11
0.60	1.35	2.92	2.82	3.5	1.12	1.09
0.70	1.58	2.74	2.69	1.9	1.05	1.04
0.80	1.80	1.01	1.90	-46.8	0.39	0.73
1.00	2.25	0.00	0.00	0.0	0.00	0.00
V(FT/S):		2.61	2.59	PCT DIFF IN MEAN VELOCITIES= 0.7		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.54	0.38	2.92	11.8	2.33	-10.8
PAA	1.34	0.35	2.82	8.7	2.60	0.2

STATION: 50.0 FT Y= 2.20 FT TYPE OF MEAS: WADING

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.11	5.08	4.61	10.2	1.30	1.23
0.10	0.22	4.85	4.50	7.8	1.24	1.20
0.20	0.44	4.85	4.82	0.6	1.24	1.28
0.30	0.66	4.85	4.73	2.5	1.24	1.26
0.40	0.88	4.65	4.61	0.9	1.19	1.23
0.50	1.10	4.55	4.11	10.7	1.16	1.10
0.60	1.32	4.07	4.11	-1.0	1.04	1.10
0.70	1.54	3.80	3.79	0.3	0.97	1.01
0.80	1.76	3.29	3.02	8.6	0.84	0.80
1.00	2.20	0.00	0.00	0.0	0.00	0.00
V(FT/S):		3.91	3.75	PCT DIFF IN MEAN VELOCITIES= 4.3		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.30	0.53	4.07	4.0	4.06	3.9
PAA	1.31	0.51	4.11	9.5	3.92	4.4

STATION: 65.0 FT Y= 1.80 FT TYPE OF MEAS: WADING

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.09	2.29	1.87	22.5	0.94	0.75
0.10	0.18	2.44	2.42	0.4	1.00	0.97
0.20	0.36	2.92	2.89	1.0	1.20	1.16
0.30	0.54	2.86	2.89	-1.0	1.17	1.16
0.40	0.72	2.74	2.89	-5.2	1.12	1.16
0.50	0.90	2.68	2.89	-7.3	1.10	1.16
0.60	1.09	2.68	2.76	-2.9	1.10	1.11
0.70	1.25	2.68	2.69	-0.4	1.10	1.08
0.80	1.44	2.44	2.47	-1.2	1.00	0.99
0.90	1.62	1.84	2.16	-14.8	0.75	0.87
1.00	1.80	0.00	0.00	0.0	0.00	0.00
V(FT/S):		2.44	2.49	PCT DIFF IN MEAN VELOCITIES= -1.9		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.15	0.34	2.68	9.9	2.68	9.9
PAA	1.16	0.35	2.76	11.0	2.68	7.8

07084500 LAKE CREEK ABOVE TWIN LAKES RESERVOIR, CO

LOCATION.--Lat 39°03'47", long 106°24'26", Lake County, Hydrologic Unit 11020001, on left bank 1.2 mi (1.9 km) upstream from water line of Twin Lakes Reservoir at elevation 9,200 ft (2,804.2 m) and 1.9 mi (3.1 km) southwest of village of Twin Lakes.

DRAINAGE AREA.--75 mi² (194 km²).

AVERAGE DISCHARGE.--34 years (water years 1947-62, 1964-81), 166 ft³/s (4.701 m³/s), 120,300 acre-ft/yr (148 hm³/yr).

GAGE DATUM.--9,310 ft (2,838 m).

MEASUREMENT SECTION LOCATION.--At upstream edge of foot bridge at abandoned Forest Service flume and streamflow-gaging station several hundred feet upstream of this gage.



Figure 14.--Views of Lake Creek: A, Cross-stream view from left bank, June 15, 1983; B, Upstream view, October 13, 1983.

07084500 LAKE CREEK ABOVE TWIN LAKES RESERVOIR, CO

DATE: June 15, 1983 GAGE HEIGHT= 3.20 FT LEW: 0 FT REW: 43 FT

STATION: 9.0 FT Y= 2.4 FT TYPE OF MEAS: BRIDGE

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/v	PAA v/v
0.05	0.12	9.46	8.52	11.0	1.20	1.17
0.10	0.24	9.89	9.58	3.2	1.25	1.32
0.20	0.48	10.62	9.58	10.9	1.35	1.32
0.30	0.72	10.12	8.32	21.6	1.28	1.14
0.40	0.96	8.89	7.76	14.5	1.13	1.07
0.50	1.20	8.17	8.13	0.5	1.04	1.12
0.60	1.44	8.38	7.94	5.5	1.06	1.09
0.70	1.68	8.38	7.76	8.0	1.06	1.07
0.75	1.80	7.97	7.76	2.7	1.01	1.07
1.00	2.40	0.00	0.00	0.0	0.00	0.00
V(FT/S):		7.89	7.28	PCT DIFF IN MEAN VELOCITIES= 8.5		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.35	1.04	8.38	6.2	-	-
PAA	1.33	0.96	7.94	9.1	-	-

STATION: 15.0 FT Y= 2.6 FT TYPE OF MEAS: BRIDGE

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/v	PAA v/v
0.05	0.13	12.09	11.15	8.4	1.33	1.32
0.10	0.26	13.88	12.82	8.3	1.53	1.52
0.20	0.52	13.59	13.10	3.7	1.50	1.55
0.30	0.78	11.10	10.21	8.7	1.23	1.21
0.40	1.04	10.12	9.58	5.6	1.12	1.13
0.50	1.30	9.26	8.96	3.3	1.02	1.06
0.60	1.56	8.71	8.13	7.1	0.96	0.96
0.70	1.82	8.17	7.43	10.0	0.90	0.88
0.77	2.00	7.60	6.84	11.1	0.84	0.81
1.00	2.60	0.00	0.00	0.0	0.00	0.00
V(FT/S):		9.06	8.45	PCT DIFF IN MEAN VELOCITIES= 7.2		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.46	1.19	8.71	-3.9	-	-
PAA	1.47	1.12	8.13	-3.8	-	-

STATION: 22.9 FT Y= 3.3 FT TYPE OF MEAS: BRIDGE

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/v	PAA v/v
0.05	0.16	6.96	5.63	23.6	1.57	1.34
0.10	0.33	5.84	5.25	11.2	1.32	1.25
0.20	0.66	5.74	5.03	14.1	1.29	1.20
0.30	0.99	5.32	4.92	8.1	1.20	1.17
0.40	1.32	4.65	4.73	-1.7	1.05	1.13
0.50	1.65	4.07	4.40	-7.5	0.92	1.05
0.60	1.98	4.07	4.11	-1.0	0.92	0.98
0.70	2.31	4.16	4.30	-3.3	0.94	1.02
0.80	2.64	4.16	4.11	1.2	0.94	0.98
0.82	2.71	4.26	3.86	10.4	0.96	0.92
1.00	3.30	0.00	0.00	0.0	0.00	0.00
V(FT/S):		4.44	4.20	PCT DIFF IN MEAN VELOCITIES= 5.7		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.34	0.50	4.07	-8.3	4.95	11.6
PAA	1.25	0.46	4.11	-2.1	4.57	8.9

07084500 LAKE CREEK ABOVE TWIN LAKES RESERVOIR, CO--Continued

DATE: June 30, 1983 GAGE HEIGHT= 3.98 FT LEW: 0 FT REM: 43 FT

STATION: 9.0 FT Y= 2.5 FT TYPE OF MEAS: BRIDGE						
y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.12	15.53	14.03	10.7	1.29	1.24
0.10	0.25	16.91	15.77	7.2	1.41	1.39
0.20	0.50	16.54	14.73	12.3	1.38	1.30
0.30	0.75	13.88	13.40	3.6	1.15	1.18
0.40	1.00	13.59	12.92	6.0	1.13	1.13
0.50	1.25	13.26	12.55	5.7	1.10	1.11
0.60	1.50	12.36	12.03	2.7	1.03	1.06
0.70	1.75	11.82	11.45	3.2	0.98	1.01
0.75	1.89	11.57	11.18	3.5	0.96	0.99
1.00	2.50	0.00	0.00	0.0	0.00	0.00
V(FT/S):		12.02	11.32	PCT DIFF IN MEAN VELOCITIES= 6.1		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.38	1.57	12.36	2.8	-	-
PAA	1.35	1.47	12.03	6.2	-	-

STATION: 15.0 FT Y= 3.0 FT TYPE OF MEAS: BRIDGE						
y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.15	15.91	15.11	5.3	1.53	1.53
0.10	0.30	15.91	14.73	8.0	1.53	1.50
0.20	0.60	12.09	12.03	0.5	1.16	1.22
0.30	0.90	11.82	11.19	5.7	1.14	1.14
0.40	1.20	11.10	10.43	6.4	1.07	1.06
0.50	1.50	10.88	9.99	8.9	1.05	1.01
0.60	1.80	10.12	9.78	3.5	0.97	0.99
0.70	2.10	9.89	9.58	3.2	0.95	0.97
0.80	2.40	9.46	8.74	8.2	0.91	0.89
1.00	3.00	0.00	0.00	0.0	0.00	0.00
V(FT/S):		10.40	9.85	PCT DIFF IN MEAN VELOCITIES= 5.6		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.37	1.24	10.12	-2.7	10.77	3.7
PAA	1.37	1.17	9.78	-0.7	10.39	5.5

STATION: 22.9 FT Y= 3.6 FT TYPE OF MEAS: BRIDGE						
y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.18	8.71	6.84	27.3	1.56	1.47
0.10	0.36	8.89	7.12	24.9	1.60	1.53
0.20	0.72	8.17	6.84	19.4	1.47	1.47
0.30	1.08	7.97	6.45	23.6	1.43	1.38
0.40	1.44	6.81	6.45	5.6	1.22	1.38
0.50	1.80	6.29	5.37	17.1	1.13	1.15
0.60	2.16	5.45	4.73	15.2	0.98	1.01
0.70	2.52	3.89	3.16	23.1	0.70	0.68
1.00	3.60	0.00	0.00	0.0	0.00	0.00
V(FT/S):		5.57	4.66	PCT DIFF IN MEAN VELOCITIES= 19.4		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.69	0.67	5.45	-2.1	-	-
PAA	1.67	0.56	4.73	1.4	-	-

DATE: August 16, 1983 GAGE HEIGHT= 2.58 FT LEW: 0 FT REW: 43 FT

STATION: 9.0 FT Y= 1.20 FT TYPE OF MEAS: WADING						
y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.06	8.17	7.94	2.9	1.44	1.48
0.10	0.12	8.17	6.98	17.0	1.44	1.30
0.20	0.24	6.67	6.45	3.4	1.18	1.20
0.30	0.36	6.54	6.33	3.3	1.15	1.18
0.40	0.48	6.29	5.91	6.4	1.11	1.10
0.50	0.60	6.17	5.63	9.6	1.09	1.05
0.60	0.72	5.32	5.37	-0.9	0.94	1.00
0.70	0.84	4.96	4.73	4.9	0.87	0.88
0.80	0.96	4.55	4.30	5.8	0.80	0.80
0.90	1.08	3.98	3.86	3.1	0.70	0.72
1.00	1.20	0.00	0.00	0.0	0.00	0.00
V(FT/S):		5.67	5.38	PCT DIFF IN MEAN VELOCITIES= 5.5		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.26	1.03	5.32	-6.2	5.61	-1.1
PAA	1.24	0.97	5.37	-0.1	5.38	-0.0

STATION: 15.0 FT Y= 1.75 FT TYPE OF MEAS: WADING						
y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.09	10.12	9.39	7.8	1.50	1.46
0.10	0.17	8.89	9.39	-5.3	1.31	1.46
0.20	0.35	7.78	7.76	0.3	1.15	1.20
0.30	0.52	7.78	7.27	7.0	1.15	1.13
0.40	0.70	7.43	6.98	6.4	1.10	1.08
0.50	0.88	6.96	6.70	3.9	1.03	1.04
0.60	1.05	6.67	6.33	5.4	0.99	0.98
0.70	1.22	6.41	5.76	11.3	0.95	0.89
0.80	1.40	5.32	5.14	3.5	0.79	0.80
0.90	1.57	5.08	4.40	15.5	0.75	0.68
1.00	1.75	0.00	0.00	0.0	0.00	0.00
V(FT/S):		6.77	6.44	PCT DIFF IN MEAN VELOCITIES= 5.1		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.24	1.00	6.67	-1.5	6.55	-3.2
PAA	1.27	0.97	6.33	-1.7	6.45	0.1

STATION: 22.9 FT Y= 2.20 FT TYPE OF MEAS: WADING						
y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.11	4.16	3.71	12.1	1.55	1.53
0.10	0.22	3.89	3.71	4.9	1.45	1.53
0.20	0.44	3.65	3.46	5.5	1.36	1.43
0.30	0.66	3.43	3.16	8.5	1.27	1.30
0.40	0.88	2.92	2.82	3.5	1.09	1.16
0.50	1.10	2.68	2.52	6.3	1.00	1.04
0.60	1.32	2.34	1.87	25.1	0.87	0.77
0.70	1.54	2.20	1.70	29.4	0.82	0.70
0.80	1.76	2.00	1.66	20.5	0.74	0.68
0.90	1.98	1.65	1.49	10.7	0.61	0.61
1.00	2.20	0.00	0.00	0.0	0.00	0.00
V(FT/S):		2.69	2.42	PCT DIFF IN MEAN VELOCITIES= 11.0		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.37	0.37	2.34	-13.0	2.82	5.0
PAA	1.45	0.35	1.87	-22.9	2.56	5.6

07086500 CLEAR CREEK ABOVE CLEAR CREEK RESERVOIR, CO

LOCATION.--Lat 39°01'05", long 106°16'38", in SE¼ sec.12, T.12 S., R.80 W., Chaffee County, Hydrologic Unit 11020001, on right bank 0.5 mi (0.8 km) upstream from water line of Clear Creek Reservoir at elevation 8,875 ft (2,705.1 m), 1.5 mi (2.4 km) downstream from unnamed tributary, and 1.9 mi (3.1 km) southwest of Granite.

DRAINAGE AREA.--67.1 mi² (173.3 km²).

AVERAGE DISCHARGE.--35 years, 66.5 ft³/s (1.883 m³/s), 48,180 acre-ft/yr (59.4 hm³/yr).

GAGE DATUM.--8,835 ft (2,703 m).

MEASUREMENT SECTION LOCATION.--At upstream edge of foot bridge.



Figure 15.--Cross-stream views of Clear Creek: A, From left bank, June 14, 1983; B, From right bank, October 13, 1983.

DATE: June 14, 1983 GAGE HEIGHT= 1.05 FT LEW: 14 FT REW: 56 FT

STATION: 28.0 FT Y= 1.50 FT TYPE OF MEAS: WADING						
y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.07	6.67	6.11	9.2	1.57	1.51
0.10	0.15	6.17	5.37	14.9	1.45	1.33
0.20	0.30	5.45	5.14	6.0	1.28	1.27
0.30	0.45	5.20	5.03	3.4	1.22	1.24
0.40	0.60	4.96	4.73	4.9	1.17	1.17
0.50	0.75	4.37	4.11	6.3	1.03	1.01
0.60	0.90	4.65	4.20	10.7	1.10	1.04
0.70	1.05	3.72	3.94	-5.6	0.88	0.97
0.80	1.20	2.99	3.16	-5.4	0.70	0.78
1.00	1.50	0.00	0.00	0.0	0.00	0.00
V(FT/S):		4.25	4.05	PCT DIFF IN MEAN VELOCITIES= 4.9		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.43	0.73	4.65	9.5	4.22	-0.6
PAA	1.37	0.68	4.20	3.7	4.15	2.5

STATION: 37.9 FT Y= 1.95 FT TYPE OF MEAS: WADING						
y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.10	6.96	5.49	26.8	1.62	1.39
0.10	0.19	5.64	5.03	12.1	1.32	1.27
0.20	0.39	5.32	5.03	5.8	1.24	1.27
0.30	0.58	5.08	4.73	7.4	1.18	1.20
0.40	0.78	4.96	4.73	4.7	1.16	1.20
0.50	0.98	4.55	4.30	5.8	1.06	1.09
0.60	1.17	4.16	4.03	3.2	0.97	1.02
0.70	1.37	3.89	3.55	9.6	0.91	0.90
0.80	1.56	3.13	2.96	5.7	0.73	0.75
0.90	1.75	2.24	2.16	3.7	0.52	0.55
0.92	1.79	2.00	2.11	-5.2	0.47	0.53
1.00	1.95	0.00	0.00	0.0	0.00	0.00
V(FT/S):		4.29	3.96	PCT DIFF IN MEAN VELOCITIES= 8.4		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.34	0.63	4.16	-3.0	4.22	-1.5
PAA	1.27	0.56	4.03	1.8	3.99	1.0

STATION: 45.7 FT Y= 2.05 FT TYPE OF MEAS: WADING						
y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.10	7.26	7.43	-2.3	1.63	1.78
0.10	0.20	6.29	6.11	2.9	1.41	1.46
0.20	0.41	5.64	5.37	5.0	1.27	1.29
0.30	0.62	5.45	5.14	6.0	1.23	1.23
0.40	0.82	4.96	4.61	7.6	1.12	1.11
0.50	1.03	4.65	4.40	5.7	1.05	1.05
0.60	1.23	4.37	4.11	6.3	0.98	0.99
0.70	1.44	4.16	3.79	9.8	0.94	0.91
0.80	1.64	3.37	2.89	16.6	0.76	0.69
0.90	1.85	1.65	1.30	26.9	0.37	0.31
0.91	1.87	1.58	1.06	49.1	0.36	0.25
1.00	2.05	0.00	0.00	0.0	0.00	0.00
V(FT/S):		4.45	4.17	PCT DIFF IN MEAN VELOCITIES= 6.6		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.41	0.65	4.37	-1.7	4.51	1.3
PAA	1.52	0.63	4.11	-1.5	4.13	-1.0

DATE: August 15, 1983 GAGE HEIGHT= 0.77 FT LEW: - REW: -

STATION: 28.0 FT Y= 1.25 FT TYPE OF MEAS: WADING

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.06	4.96	4.30	15.3	1.52	1.43
0.10	0.12	4.55	4.03	12.3	1.40	1.34
0.20	0.25	4.26	4.11	3.6	1.31	1.37
0.30	0.39	4.26	4.03	5.7	1.31	1.34
0.40	0.50	3.98	3.79	5.0	1.22	1.26
0.50	0.63	3.65	3.38	8.0	1.12	1.13
0.60	0.75	3.21	3.16	1.6	0.99	1.05
0.70	0.88	2.92	2.37	23.2	0.90	0.79
0.80	1.00	2.10	1.94	8.2	0.64	0.65
1.00	1.25	0.00	0.00	0.0	0.00	0.00
V(FT/S):		3.26	3.00	PCT DIFF IN MEAN VELOCITIES= 8.6		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.45	0.62	3.21	-1.4	3.18	-2.3
PAA	1.45	0.57	3.16	5.3	3.02	0.8

STATION: 37.9 FT Y= 1.95 FT TYPE OF MEAS: WADING

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.10	5.45	4.50	21.1	1.30	1.15
0.10	0.19	5.08	4.92	3.3	1.22	1.25
0.20	0.39	5.32	5.25	1.3	1.27	1.34
0.30	0.58	5.20	5.14	1.2	1.24	1.31
0.40	0.78	5.08	5.03	1.0	1.22	1.28
0.50	0.98	4.85	4.61	5.2	1.16	1.17
0.60	1.17	4.46	4.20	6.2	1.07	1.07
0.70	1.37	3.98	3.55	12.1	0.95	0.90
0.80	1.56	3.28	2.89	13.5	0.78	0.74
0.90	1.75	1.73	1.55	11.6	0.41	0.39
1.00	1.95	0.00	0.00	0.0	0.00	0.00
V(FT/S):		4.18	3.93	PCT DIFF IN MEAN VELOCITIES= 6.4		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.30	0.60	4.46	6.7	4.30	2.9
PAA	1.34	0.57	4.20	6.9	4.07	3.6

STATION: 45.7 FT Y= 1.85 FT TYPE OF MEAS: WADING

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.09	5.64	4.30	31.2	1.55	1.30
0.10	0.18	4.65	4.30	8.1	1.28	1.30
0.20	0.37	4.46	4.30	3.7	1.22	1.30
0.30	0.55	4.16	4.11	1.2	1.14	1.24
0.40	0.74	3.80	3.79	0.3	1.04	1.14
0.50	0.92	3.57	3.38	5.6	0.98	1.02
0.60	1.11	3.31	2.96	11.8	0.91	0.89
0.70	1.29	3.28	2.96	10.8	0.90	0.89
0.80	1.48	3.13	2.82	11.0	0.86	0.85
0.90	1.66	2.99	2.42	23.6	0.82	0.73
1.00	1.85	0.00	0.00	0.0	0.00	0.00
V(FT/S):		3.64	3.32	PCT DIFF IN MEAN VELOCITIES= 9.7		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.24	0.53	3.31	-9.1	3.80	4.2
PAA	1.23	0.48	2.96	-10.8	3.56	7.3

07089000 COTTONWOOD CREEK BELOW HOT SPRINGS, NEAR BUENA VISTA, CO

LOCATION.--Lat $38^{\circ}48'46''$, long $106^{\circ}13'18''$, in SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec.21, T.14 S., R.79 W., Chaffee County, Hydrologic Unit 11020001, on left bank 0.2 mi (0.3 km) downstream from Cottonwood Hot Springs, 0.9 mi (1.4 km) downstream from confluence of Middle Cottonwood and South Cottonwood Creeks, 2.9 mi (4.7 km) upstream from North Cottonwood Creek, and 5.5 mi (8.8 km) southwest of Buena Vista.

DRAINAGE AREA.--65.0 mi² (168 km²).

AVERAGE DISCHARGE.--46 years (water years 1911-23, 1950-82), 55.2 ft³/s (1.563 m³/s), 39,990 acre-ft/yr (49.3 hm³/yr).

GAGE DATUM.--8,532 ft (2,600.6 m).

MEASUREMENT SECTION LOCATION.--At downstream edge of private road bridge.

A



B



Figure 16.--Views of Cottonwood Creek: A, Cross-stream view from right bank, June 29, 1983; B, Upstream view, June 14, 1983.

DATE: June 14, 1983 GAGE HEIGHT= 1.61 FT LEW: - REW: -

STATION: 6.7 FT Y= 2.20 FT TYPE OF MEAS: WADING

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.11	6.65	6.70	-0.7	2.00	1.90
0.10	0.22	5.45	5.91	-7.8	1.64	1.67
0.20	0.44	4.65	5.37	-13.4	1.40	1.52
0.30	0.66	3.98	4.73	-15.9	1.20	1.34
0.40	0.88	3.50	3.94	-11.2	1.05	1.11
0.50	1.10	3.31	3.23	2.5	1.00	0.91
0.60	1.32	2.86	2.76	3.6	0.86	0.78
0.70	1.54	2.44	2.37	3.0	0.73	0.67
0.80	1.76	2.29	2.32	-1.3	0.69	0.66
1.00	2.20	0.00	0.00	0.0	0.00	0.00
V(FT/S):		3.32	3.53	PCT DIFF IN MEAN VELOCITIES= -5.9		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.74	0.52	2.86	-14.0	3.47	4.4
PAA	1.79	0.56	2.76	-21.9	3.84	8.8

STATION: 10.7 FT Y= 2.30 FT TYPE OF MEAS: WADING

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.11	3.57	4.40	-18.9	1.18	1.33
0.10	0.23	3.57	4.20	-15.0	1.18	1.27
0.20	0.46	3.72	4.20	-11.4	1.23	1.27
0.30	0.69	3.72	4.03	-7.7	1.23	1.22
0.40	0.92	3.72	3.94	-5.6	1.23	1.19
0.50	1.15	3.89	3.86	0.8	1.28	1.17
0.60	1.38	3.65	3.79	-3.7	1.20	1.14
0.70	1.61	3.37	3.46	-2.6	1.11	1.04
0.80	1.84	1.92	2.26	-15.0	0.63	0.68
1.00	2.30	0.00	0.00	0.0	0.00	0.00
V(FT/S):		3.03	3.31	PCT DIFF IN MEAN VELOCITIES= -8.5		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.36	0.41	3.65	20.4	2.82	-6.9
PAA	1.35	0.45	3.79	14.4	3.23	-2.5

STATION: 14.3 FT Y= 1.80 FT TYPE OF MEAS: WADING

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.09	3.65	3.38	8.0	1.20	1.23
0.10	0.18	3.57	3.23	10.5	1.18	1.17
0.20	0.36	3.65	3.55	2.9	1.20	1.29
0.30	0.54	3.65	3.46	5.5	1.20	1.26
0.40	0.72	3.57	3.30	8.2	1.18	1.20
0.50	0.90	3.43	3.23	6.2	1.13	1.17
0.60	1.08	3.21	2.96	8.4	1.06	1.08
0.70	1.26	3.06	2.89	5.9	1.01	1.05
0.80	1.44	2.92	2.11	38.4	0.96	0.77
1.00	1.80	0.00	0.00	0.0	0.00	0.00
V(FT/S):		3.04	2.75	PCT DIFF IN MEAN VELOCITIES= 10.4		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.26	0.45	3.21	5.7	3.28	8.2
PAA	1.32	0.41	2.96	7.6	2.83	2.9

DATE: June 29, 1983 GAGE HEIGHT= 2.44 FT LEW: - REM: -

STATION: 6.7 FT Y= 2.8 FT TYPE OF MEAS: BRIDGE						
y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.14	12.95	9.99	29.6	1.86	1.73
0.10	0.28	10.36	9.39	10.3	1.49	1.63
0.20	0.56	9.46	8.74	8.2	1.36	1.51
0.30	0.84	8.89	7.59	17.1	1.28	1.31
0.40	1.12	7.78	6.98	11.5	1.12	1.21
0.50	1.40	6.81	5.76	18.2	0.98	1.00
0.60	1.68	6.67	4.73	41.0	0.96	0.82
0.70	1.96	5.08	5.25	-3.2	0.73	0.91
0.80	2.24	4.96	2.76	79.7	0.71	0.48
1.00	2.80	0.00	0.00	0.0	0.00	0.00
V(FT/S):		6.96	5.77	PCT DIFF IN MEAN VELOCITIES= 20.6		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.60	0.93	6.67	-4.2	7.21	3.6
PAA	1.71	0.77	4.73	-18.1	5.75	-0.4

STATION: 10.7 FT Y= 2.8 FT TYPE OF MEAS: BRIDGE						
y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.14	13.26	12.29	7.9	1.78	1.58
0.10	0.28	11.10	10.92	1.6	1.49	1.41
0.20	0.56	10.36	10.67	-2.9	1.39	1.38
0.30	0.84	10.12	10.43	-3.0	1.36	1.34
0.40	1.12	9.67	9.58	0.9	1.30	1.24
0.50	1.40	8.54	8.74	-2.3	1.14	1.13
0.60	1.68	7.26	7.59	-4.3	0.97	0.98
0.70	1.96	5.45	6.70	-18.7	0.73	0.86
0.80	2.24	3.31	4.30	-23.0	0.44	0.55
1.00	2.80	0.00	0.00	0.0	0.00	0.00
V(FT/S):		7.46	7.76	PCT DIFF IN MEAN VELOCITIES= -3.8		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.70	1.02	7.26	-2.7	6.84	-8.4
PAA	1.53	1.01	7.59	-2.1	7.48	-3.5

STATION: 14.3 FT Y= 2.8 FT TYPE OF MEAS: BRIDGE						
y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.14	9.07	8.74	3.8	1.51	1.50
0.10	0.28	6.96	6.98	-0.3	1.16	1.20
0.20	0.56	7.11	6.84	3.9	1.18	1.18
0.30	0.84	6.96	6.84	1.8	1.16	1.18
0.40	1.12	6.81	6.45	5.6	1.13	1.11
0.50	1.40	6.29	6.11	2.9	1.05	1.05
0.60	1.68	6.29	6.22	1.1	1.05	1.07
0.70	1.96	6.17	5.63	9.6	1.03	0.97
0.80	2.24	5.64	5.49	2.7	0.94	0.94
1.00	2.80	0.00	0.00	0.0	0.00	0.00
V(FT/S):		6.01	5.81	PCT DIFF IN MEAN VELOCITIES= 3.4		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.30	0.72	6.29	4.6	6.38	6.1
PAA	1.30	0.70	6.22	7.0	6.16	6.1

09046600 BLUE RIVER NEAR DILLON, CO

LOCATION.--Lat 39°32'55", long 106°02'19", in NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec.7, T.6 S., R.77 W., Summit County, Hydrologic Unit 14010002, on right bank 0.2 mi (0.3 km) downstream from Swan River and 5.5 mi (8.8 km) south of Dillon.

DRAINAGE AREA.--119 mi² (308 km²).

AVERAGE DISCHARGE.--25 years, 98.2 ft³/s (2.781 m³/s), 71,150 acre-ft/yr (87.7 hm³/yr), including diversion to Hoosier Pass tunnel.

MEASUREMENT SECTION LOCATION.--At cableway. No bridge nearby.

A



B

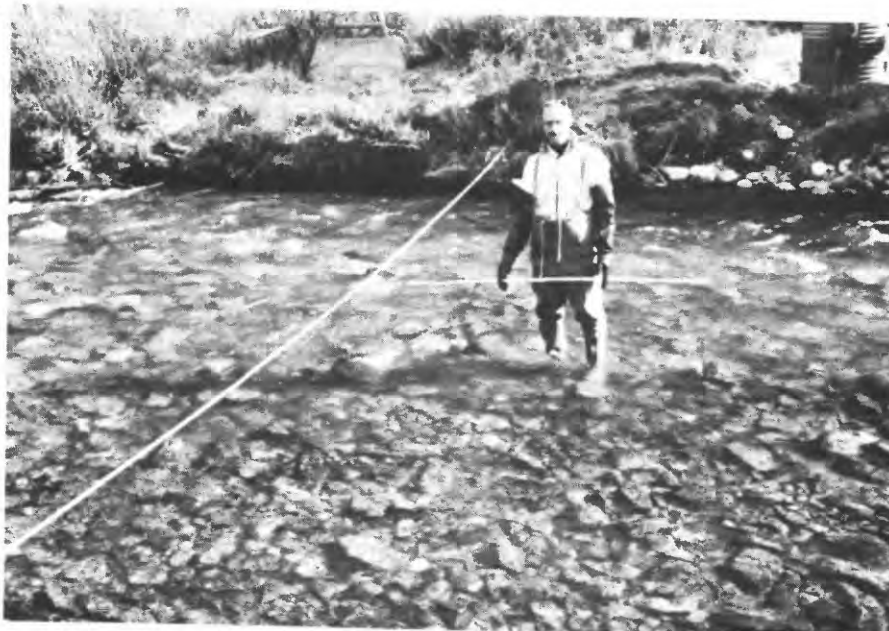


Figure 17.--Cross-stream view from left bank of Blue River:
A, June 23, 1983; B, October 20, 1983.

DATE: June 17, 1983 GAGE HEIGHT= 3.95 FT LEW: 26 FT REW: 72 FT

STATION: 42.0 FT Y= 1.80 FT TYPE OF MEAS: WADING

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.09	8.54	8.74	-2.3	1.65	1.67
0.10	0.18	6.96	7.27	-4.3	1.35	1.39
0.20	0.36	6.54	6.57	-0.5	1.26	1.26
0.30	0.54	6.06	6.22	-2.6	1.17	1.19
0.40	0.72	5.95	5.91	0.7	1.15	1.13
0.50	0.90	5.64	5.49	2.7	1.09	1.05
0.60	1.08	5.32	5.14	3.5	1.03	0.98
0.70	1.26	4.65	4.73	-1.7	0.90	0.91
0.78	1.40	4.26	4.40	-3.2	0.82	0.84
1.00	1.80	0.00	0.00	0.0	0.00	0.00
V(FT/S):		5.17	5.22	PCT DIFF IN MEAN VELOCITIES= -0.9		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.42	0.81	5.32	2.9	-	-
PAA	1.44	0.82	5.14	-1.5	-	-

STATION: 56.0 FT Y= 2.1 FT TYPE OF MEAS: CABLEWAY

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.10	11.33	11.18	1.3	1.66	1.68
0.10	0.21	11.33	11.18	1.3	1.66	1.68
0.20	0.42	9.46	9.20	2.8	1.38	1.38
0.30	0.63	8.71	8.52	2.2	1.27	1.28
0.40	0.84	7.97	8.13	-2.0	1.16	1.22
0.50	1.05	7.26	7.12	2.0	1.06	1.07
0.60	1.26	6.54	5.91	10.7	0.96	0.89
0.70	1.47	5.74	5.49	4.6	0.84	0.82
1.00	2.10	0.00	0.00	0.0	0.00	0.00
V(FT/S):		6.84	6.66	PCT DIFF IN MEAN VELOCITIES= 2.7		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.64	1.06	6.54	-4.4	-	-
PAA	1.67	1.05	5.91	-11.3	-	-

STATION: 63.0 FT Y= 2.2 FT TYPE OF MEAS: CABLEWAY

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.11	10.88	10.67	2.0	1.86	1.78
0.10	0.22	10.36	10.67	-2.9	1.77	1.78
0.20	0.44	8.17	9.20	-11.2	1.39	1.54
0.30	0.66	7.43	7.27	2.2	1.27	1.22
0.40	0.88	6.67	6.70	-0.4	1.14	1.12
0.50	1.10	6.06	5.91	2.5	1.03	0.99
0.60	1.32	5.32	5.37	-0.9	0.91	0.90
0.70	1.54	4.55	4.73	-3.8	0.78	0.79
0.73	1.61	4.07	4.20	-3.1	0.69	0.70
1.00	2.20	0.00	0.00	0.0	0.00	0.00
V(FT/S):		5.86	5.98	PCT DIFF IN MEAN VELOCITIES= -2.0		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.78	0.93	5.32	-9.3	-	-
PAA	1.79	0.95	5.37	-10.2	-	-

DATE: June 23, 1983 GAGE HEIGHT= 4.96 FT LEW: 12 FT REW: 71 FT

STATION: 42.0 FT Y= 2.4 FT TYPE OF MEAS: CABLEWAY

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.12	12.09	11.45	5.6	1.66	1.63
0.10	0.24	11.57	11.18	3.5	1.58	1.59
0.20	0.48	9.26	9.02	2.7	1.27	1.29
0.30	0.72	8.71	8.85	-1.6	1.19	1.26
0.40	0.96	8.22	8.13	1.1	1.13	1.16
0.50	1.20	7.97	7.76	2.7	1.09	1.11
0.60	1.44	7.26	6.84	6.1	0.99	0.98
0.70	1.68	6.17	5.49	12.4	0.84	0.78
0.75	1.80	6.17	5.63	9.6	0.84	0.80
1.00	2.40	0.00	0.00	0.0	0.00	0.00

V(FT/S): 7.30 7.01 PCT DIFF IN MEAN VELOCITIES= 4.2

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.52	1.02	7.26	-0.6	-	-
PAA	1.54	0.99	6.84	-2.5	-	-

STATION: 56.0 FT Y= 2.9 FT TYPE OF MEAS: CABLEWAY

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.14	12.95	12.55	3.2	1.63	1.64
0.10	0.29	12.65	10.67	18.6	1.59	1.40
0.20	0.58	10.12	10.21	-0.9	1.27	1.34
0.30	0.87	9.67	9.78	-1.1	1.22	1.28
0.40	1.16	9.46	9.39	0.7	1.19	1.23
0.50	1.45	9.07	8.52	6.5	1.14	1.12
0.60	1.74	7.97	7.94	0.4	1.00	1.04
0.70	2.03	6.96	6.57	5.9	0.88	0.86
1.00	2.90	0.00	0.00	0.0	0.00	0.00

V(FT/S): 7.94 7.64 PCT DIFF IN MEAN VELOCITIES= 3.9

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.57	1.03	7.97	0.4	-	-
PAA	1.55	0.98	7.94	3.9	-	-

STATION: 63.0 FT Y= 3.1 FT TYPE OF MEAS: CABLEWAY

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.15	11.82	11.74	0.7	1.82	1.80
0.10	0.31	11.57	11.18	3.5	1.78	1.72
0.20	0.62	9.07	9.58	-5.3	1.39	1.47
0.30	0.93	8.17	8.32	-1.8	1.26	1.28
0.40	1.24	7.60	7.76	-2.1	1.17	1.19
0.50	1.55	6.29	6.45	-2.5	0.97	0.99
0.60	1.86	5.64	5.63	0.2	0.87	0.86
0.70	2.17	4.65	4.50	3.3	0.71	0.69
0.80	2.48	4.07	3.79	7.4	0.63	0.58
1.00	3.10	0.00	0.00	0.0	0.00	0.00

V(FT/S): 6.51 6.51 PCT DIFF IN MEAN VELOCITIES= -0.1

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.73	0.86	5.64	-13.3	6.57	1.0
PAA	1.74	0.86	5.63	-13.5	6.68	2.7

DATE: August 17, 1983 GAGE HEIGHT= 3.30 FT LEW: 23 FT REM: 70 FT

STATION: 42.0 FT Y= 1.15 FT TYPE OF MEAS: WADING

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.06	2.58	2.58	0.0	1.20	1.02
0.10	0.11	2.80	2.63	6.3	1.30	1.04
0.20	0.23	2.92	3.09	-5.5	1.35	1.22
0.30	0.35	2.86	3.02	-5.3	1.32	1.19
0.40	0.46	2.80	3.02	-7.3	1.30	1.19
0.50	0.58	2.39	3.02	-20.9	1.11	1.19
0.60	0.69	2.16	2.96	-27.0	1.00	1.17
0.70	0.81	2.05	2.76	-25.7	0.95	1.09
0.80	0.92	1.58	2.37	-33.3	0.73	0.94
1.00	1.15	0.00	0.00	0.0	0.00	0.00
V(FT/S):		2.16	2.53	PCT DIFF IN MEAN VELOCITIES=-14.8		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.37	0.42	2.16	0.1	2.25	4.2
PAA	1.26	0.47	2.96	16.8	2.73	7.8

STATION: 56.0 FT Y= 1.45 FT TYPE OF MEAS: WADING

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.07	5.95	5.25	13.3	1.50	1.55
0.10	0.14	6.17	5.25	17.5	1.56	1.55
0.20	0.29	5.64	5.03	12.1	1.42	1.49
0.30	0.44	5.32	4.55	16.9	1.34	1.35
0.40	0.58	4.85	3.86	25.6	1.22	1.14
0.50	0.73	4.37	3.64	20.1	1.10	1.08
0.60	0.87	3.65	3.30	10.6	0.92	0.98
0.70	1.01	3.06	3.02	1.3	0.77	0.89
0.80	1.16	2.44	1.66	47.0	0.62	0.49
1.00	1.45	0.00	0.00	0.0	0.00	0.00
V(FT/S):		3.96	3.38	PCT DIFF IN MEAN VELOCITIES= 17.4		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.54	0.72	3.65	-7.9	4.04	1.9
PAA	1.60	0.62	3.30	-2.3	3.34	-0.9

STATION: 63.0 FT Y= 1.65 FT TYPE OF MEAS: WADING

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.08	5.74	5.72	0.3	1.75	1.75
0.10	0.16	4.96	4.64	6.7	1.51	1.42
0.20	0.33	4.75	4.64	2.4	1.45	1.42
0.30	0.50	4.46	4.50	-0.9	1.36	1.38
0.40	0.66	4.16	3.94	5.6	1.27	1.21
0.50	0.83	3.50	3.71	-5.7	1.07	1.14
0.60	0.99	2.80	3.09	-9.4	0.85	0.95
0.70	1.15	2.24	2.37	-5.5	0.68	0.73
0.80	1.32	1.92	1.76	9.1	0.59	0.54
1.00	1.65	0.00	0.00	0.0	0.00	0.00
V(FT/S):		3.28	3.27	PCT DIFF IN MEAN VELOCITIES= 0.5		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.66	0.58	2.80	-14.7	3.34	1.6
PAA	1.63	0.57	3.09	-5.4	3.20	-2.0

09050100 TENMILE CREEK BELOW NORTH TENMILE CREEK, AT FRISCO, CO

LOCATION.--Lat 39°34'35", long 106°06'30", in SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec.34, T.5 S., R.78 W., Summit County, Hydrologic Unit 14010002, on right bank 220 ft (67 m) upstream from bridge on U.S. Highway 6, 160 ft (49 m) downstream from North Tenmile Creek, and 3.6 mi (1.0 km) west of Frisco.

DRAINAGE AREA.--93.3 mi² (241.6 km²).

AVERAGE DISCHARGE.--25 years, 92.9 ft³/s (2.631 m³/s), 67,310 acre-ft/yr (83.0 hm³/yr).

GAGE DATUM.--9,100 ft (2,774 m).

MEASUREMENT SECTION LOCATION.--At downstream edge of Highway 6 bridge.



Figure 18.--Views of Tenmile Creek: A, Cross-stream view from right bank, June 23, 1983; B, Overhead view, October 13, 1983.

DATE: June 16, 1983 GAGE HEIGHT= 2.81 FT LEW: 30 FT REW: 82 FT

STATION: 48.7 FT Y= 2.9 FT TYPE OF MEAS: BRIDGE

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.14	11.57	11.18	3.5	1.57	1.67
0.10	0.29	12.36	11.18	10.6	1.68	1.67
0.20	0.58	8.89	8.52	4.3	1.21	1.27
0.30	0.87	9.07	8.13	11.6	1.23	1.21
0.40	1.16	8.38	7.43	12.8	1.14	1.11
0.50	1.45	7.97	7.12	11.9	1.08	1.06
0.60	1.74	6.67	6.57	1.5	0.91	0.98
0.70	2.03	6.41	5.76	11.3	0.87	0.86
0.80	2.32	5.45	4.50	21.1	0.74	0.67
1.00	2.90	0.00	0.00	0.0	0.00	0.00
V(FT/S):		7.35	6.70	PCT DIFF IN MEAN VELOCITIES= 9.6		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.49	0.93	6.67	-9.3	7.17	-2.5
PAA	1.54	0.86	6.57	-2.0	6.51	-2.9

STATION: 58.7 FT Y= 3.1 FT TYPE OF MEAS: BRIDGE

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.15	10.12	8.74	15.8	1.77	1.44
0.10	0.31	8.89	10.21	-12.9	1.55	1.69
0.20	0.62	7.43	8.52	-12.8	1.30	1.41
0.30	0.93	7.26	7.76	-6.4	1.27	1.28
0.40	1.24	6.54	7.12	-8.1	1.14	1.18
0.50	1.55	5.64	6.45	-12.6	0.98	1.07
0.60	1.86	4.96	5.91	-16.1	0.87	0.98
0.70	2.17	4.96	4.73	4.9	0.87	0.78
0.80	2.48	4.16	3.86	7.8	0.73	0.64
1.00	3.10	0.00	0.00	0.0	0.00	0.00
V(FT/S):		5.73	6.05	PCT DIFF IN MEAN VELOCITIES= -5.3		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.55	0.71	4.96	-13.4	5.80	1.2
PAA	1.54	0.75	5.91	-2.3	6.19	2.3

STATION: 66.4 FT Y= 2.0 FT TYPE OF MEAS: BRIDGE

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.10	5.84	5.49	6.4	1.58	1.62
0.10	0.20	4.85	4.73	2.5	1.32	1.40
0.20	0.40	4.55	4.30	5.8	1.23	1.27
0.30	0.60	4.37	4.11	6.3	1.19	1.21
0.40	0.80	3.89	4.30	-9.5	1.06	1.27
0.50	1.00	3.98	3.55	12.1	1.08	1.05
0.60	1.20	3.72	3.38	10.1	1.01	1.00
0.70	1.40	4.16	3.30	26.1	1.13	0.97
1.00	2.00	0.00	0.00	0.0	0.00	0.00
V(FT/S):		3.68	3.39	PCT DIFF IN MEAN VELOCITIES= 8.7		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.46	0.55	3.72	1.0	-	-
PAA	1.51	0.52	3.38	-0.3	-	-

DATE: June 23, 1983 GAGE HEIGHT= 3.61 FT LEW: 26 FT REW: 85 FT

STATION: 48.7 FT Y= 3.5 FT TYPE OF MEAS: BRIDGE

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.17	13.88	13.40	3.6	1.67	1.68
0.10	0.35	13.26	12.03	10.2	1.60	1.50
0.20	0.70	10.62	10.21	4.0	1.28	1.28
0.30	1.05	10.36	9.99	3.7	1.25	1.25
0.40	1.40	9.26	9.58	-3.3	1.11	1.20
0.50	1.75	8.89	8.74	1.7	1.07	1.09
0.60	2.10	8.17	7.59	7.6	0.98	0.95
0.70	2.45	6.81	6.57	3.7	0.82	0.82
0.80	2.80	5.74	5.49	4.6	0.69	0.69
1.00	3.50	0.00	0.00	0.0	0.00	0.00
V(FT/S):		8.31	8.00	PCT DIFF IN MEAN VELOCITIES= 3.9		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.52	0.96	8.17	-1.7	8.18	-1.5
PAA	1.50	0.92	7.59	-5.1	7.85	-1.9

STATION: 58.7 FT Y= 3.7 FT TYPE OF MEAS: BRIDGE

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.18	13.59	12.82	6.0	1.70	1.70
0.10	0.37	11.57	10.92	6.0	1.45	1.45
0.20	0.74	10.62	9.78	8.6	1.33	1.30
0.30	1.11	10.12	9.39	7.8	1.27	1.25
0.40	1.48	9.67	8.52	13.5	1.21	1.13
0.50	1.85	8.54	8.52	0.2	1.07	1.13
0.60	2.22	7.78	7.12	9.3	0.98	0.95
0.70	2.59	6.54	6.45	1.4	0.82	0.86
0.80	2.96	5.08	5.14	-1.2	0.64	0.68
1.00	3.70	0.00	0.00	0.0	0.00	0.00
V(FT/S):		7.98	7.53	PCT DIFF IN MEAN VELOCITIES= 5.9		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.53	0.90	7.78	-2.5	7.85	-1.6
PAA	1.50	0.84	7.12	-5.4	7.46	-0.9

STATION: 66.4 FT Y= 2.7 FT TYPE OF MEAS: BRIDGE

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.13	10.36	9.58	8.1	1.60	1.53
0.10	0.27	8.54	8.32	2.6	1.32	1.33
0.20	0.54	8.22	8.32	-1.2	1.27	1.33
0.30	0.81	7.78	7.94	-2.0	1.20	1.27
0.40	1.08	7.60	7.43	2.3	1.17	1.19
0.50	1.35	7.26	6.84	6.1	1.12	1.09
0.60	1.62	6.29	5.91	6.4	0.97	0.95
0.70	1.89	5.84	5.76	1.4	0.90	0.92
0.77	2.08	5.64	5.14	9.7	0.87	0.82
1.00	2.70	0.00	0.00	0.0	0.00	0.00
V(FT/S):		6.47	6.25	PCT DIFF IN MEAN VELOCITIES= 3.6		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.41	0.83	6.29	-2.9	-	-
PAA	1.42	0.80	5.91	-5.4	-	-

DATE: August 17, 1983 GAGE HEIGHT= 1.74 FT LEW: 34 FT REW: 77 FT

STATION: 48.7 FT Y= 2.00 FT TYPE OF MEAS: WADING

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.10	2.80	2.69	4.1	1.30	1.31
0.10	0.20	3.13	2.82	11.0	1.45	1.38
0.20	0.40	2.99	2.89	3.5	1.39	1.41
0.30	0.60	2.86	2.69	6.3	1.33	1.31
0.40	0.80	2.55	2.52	1.2	1.19	1.23
0.50	1.00	2.50	2.32	7.8	1.16	1.13
0.60	1.20	2.10	2.07	1.4	0.98	1.01
0.70	1.40	1.76	1.87	-5.9	0.82	0.91
0.80	1.60	1.54	1.33	15.8	0.72	0.65
1.00	2.00	0.00	0.00	0.0	0.00	0.00
V(FT/S):		2.15	2.05	PCT DIFF IN MEAN VELOCITIES= 5.0		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.43	0.32	2.10	-2.4	2.26	5.3
PAA	1.42	0.30	2.07	1.0	2.11	3.0

STATION: 58.7 FT Y= 2.15 FT TYPE OF MEAS: WADING

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.11	3.50	3.30	6.1	1.39	1.34
0.10	0.21	3.37	3.23	4.3	1.34	1.32
0.20	0.43	3.37	3.30	2.1	1.34	1.34
0.30	0.64	3.21	3.16	1.6	1.27	1.29
0.40	0.86	2.99	2.84	5.3	1.19	1.16
0.50	1.09	2.61	2.52	3.6	1.04	1.03
0.60	1.29	2.39	2.37	0.8	0.95	0.97
0.70	1.51	2.24	2.21	1.4	0.89	0.90
0.80	1.72	1.76	1.76	0.0	0.70	0.72
0.90	1.93	1.47	1.49	-1.3	0.58	0.61
1.00	2.15	0.00	0.00	0.0	0.00	0.00
V(FT/S):		2.52	2.45	PCT DIFF IN MEAN VELOCITIES= 2.6		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.31	0.35	2.39	-5.1	2.56	1.8
PAA	1.29	0.34	2.37	-3.5	2.53	3.1

STATION: 66.4 FT Y= 1.70 FT TYPE OF MEAS: WADING

y/Y	y (FT)	AA v (FT/S)	PAA v (FT/S)	PCT DIFF	AA v/V	PAA v/V
0.05	0.08	1.58	1.30	21.5	1.20	0.97
0.10	0.17	1.80	1.55	16.1	1.36	1.16
0.20	0.34	2.00	1.98	1.0	1.52	1.48
0.30	0.51	1.80	1.98	-9.1	1.36	1.48
0.40	0.69	1.70	1.66	2.4	1.29	1.24
0.50	0.85	1.44	1.49	-3.4	1.09	1.12
0.60	1.02	1.58	1.55	1.9	1.20	1.16
0.70	1.19	1.07	1.27	-15.7	0.81	0.95
1.00	1.70	0.00	0.00	0.0	0.00	0.00
V(FT/S):		1.32	1.33	PCT DIFF IN MEAN VELOCITIES= -1.1		

FLOW CHARACTERISTICS:

METER	ALPHA	F	V.6	PCT OF MEAN	V.2-.8	PCT OF MEAN
AA	1.54	0.22	1.58	19.7	-	-
PAA	1.50	0.22	1.55	16.2	-	-